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**NUCLEAR CRITICALITY EXPERIMENTS FROM 1943 TO 1978,
AN ANNOTATED BIBLIOGRAPHY: VOLUME 1, MAIN LISTING**

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MS. date: April 24, 1979 ~

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PREFACE

Nuclear energy is an important and increasing source of world energy supplies. From a review of the reports* of criticality experiments in support of nuclear energy published each year over the past three-and-a-half decades, we note a peaking of activities in the 1960's then a substantial decline (Fig. 1). This can be interpreted as a maturing of nuclear engineering methods.

Criticality experiments were first used to validate nuclear reaction rates, to establish criticality parameters, and to normalize computer calculations. The 1960's saw a rapid growth in understanding of the fission process, related neutron-transport phenomena, and the availability of experimental microscopic nuclear data. This led to construction of some nuclear reactors from calculated design predictions alone, without prior mockups or near-critical prototypes. Today, the state of the art of neutronic calculations by computer is sufficiently advanced to permit the design, construction, and use of some nuclear facilities without direct dependence on critical experiments. Current criticality experiments are being performed in a continuing worldwide effort to further improve calculational techniques for the accurate prediction of new and more complex situations.

Our collecting and indexing the large number of reports of valuable criticality experiments into one bibliography builds on the work begun in partial collections by A. D. Callihan, J. H. Chalmers, H. C. Paxton, and many others. Its publication was intended at an earlier date, but more immediate programmatic requirements precluded the comprehensive compilation, proofing, and release. We hope that this guide to the topical literature will contribute to the continued safe use of fissile materials.

*We use "reports" in a broad sense to include such other documents as journal articles and proceedings papers.

FIG. 1. Published nuclear criticality reports peaked in the 1960's. The next decade saw a substantial decline. (At printing time, we had not indexed all 1978 reports.)

CONTENTS

Abstract	vii
Introduction	vii
Contents of the Bibliography	viii
How to Use the Bibliography	xi
How We Created the Bibliography by Computer	xiv
Acknowledgments	xv
References	xv
Main Listing*	1
Lookup Tables [†]	359
Report Number	359
Publication Date	411
Experimental Facility	462
Author Name	541
Subject Index**	771
Keyphrase Concordance on Titles	771
Keyterm Concordance on Titles and Abstracts	953

*Volume 1.
[†]Volume 2.
 **Volume 3.

NUCLEAR CRITICALITY EXPERIMENTS FROM 1943 TO 1978, AN ANNOTATED BIBLIOGRAPHY: VOLUME 1, MAIN LISTING

ABSTRACT

This bibliography contains 1067 citations from the literature of critical and near-critical nuclear experiments. It provides an up-to-date index to reports containing useful data for many types of criticality studies. Most of the reports can provide specifications for relatively simple critical configurations necessary for validating nuclear constants and calculational techniques. The reports of more than 1143 experimentors at 38 international facilities since 1943 are cross-referenced. This collection contains the prototypes of many different designs of nuclear reactors and studies performed to insure the safe use of fissile materials in chemical processing plants, storage facilities, and transportation containers.

The bibliography has three volumes. Volume 1 contains the main listing of citations with abstracts. Volume 2 is a set of indexes organized by report number, publication date, experimental facility, and author name. Volume 3 provides a subject index, concorded on the significant keyphrases derived from titles, and an index of keyterms extracted from titles and abstracts. The bibliography was printed by computer as a selection from a computerized system at Lawrence Livermore Laboratory containing information and data on criticality experiments.

INTRODUCTION

This bibliography points to the literature of criticality experiments crucial to nuclear power development. Throughout the world, in the past 35 years, considerable effort went into these experiments, usually for a particular objective. This objective may have been the design of a nuclear power station; or the safe transfer and storage of fuel in chemical processing, diffusion, or isotope-separation plants; or the transport of fissile material in safe containers.

Although Lawrence Livermore Laboratory (LLL) no longer has an experimental criticality measurement program, we have a continuing interest in the properties of fissile materials and systems. Criticality data are needed to routinely specify safe operating conditions with these materials. They are also needed to validate computational constants and techniques. Some LLL progress in producing a benchmark library of well defined critical experiments has been discussed at meetings of the American Nuclear Society.¹⁻⁵ These data are in a system of descriptive data bases. The bibliographic portion dealing with this particular subset of experiments was used to create this printed index. It complements a larger integrated system for the production of neutronics and photonics calculational constants.⁶

CONTENTS OF THE BIBLIOGRAPHY

References to reports that discuss critical or near-critical nuclear configurations form the base for this bibliography. From the large numbers of such reports we have omitted those dealing with only theoretical studies, calculational techniques, neutron cross-section data, experimental techniques, control rod or reactivity worth measurements, and other general reactor physics measurements. Text books have also been excluded. This leaves only reports containing experimental results or information that would assist a reader in understanding and using such results.

Most of the reports can provide specifications for relatively simple critical configurations. These can be readily calculated using standard computer methods and available cross-section data. Simple spherical, cylindrical, and slab geometries are available as well as more complex geometries and arrays and lattices of simple units (Fig. 2). We have included a number of references to calculational models that describe specific experimental configurations. Those attempting to use the bibliography as a basis for reference (benchmark) problems would be well advised to also obtain and study these calculational references to avoid pitfalls that others have already found.

The criticality state of these assemblies has usually been measured by conventional exponential, pulsed-neutron, and critical or subcritical techniques. Descriptions of these techniques can be found in the literature, using references given in the cited documents or in available texts.⁷ The median neutron energy for the measured systems varies from fast to thermal.

Table 1 includes the locations at which the cited experiments were done and the number of reports associated with the work at each location. The bibliography attempts to include references to all critical work. For this reason, abstracts and summaries of oral presentations at meetings have been included though the amount of data is usually insufficient to completely define a critical system. They do, however, point toward authors and work that could otherwise go unnoticed.

The authors welcome corrections, comments, or additions to this bibliography. These should be addressed to the authors at:

University of California
Lawrence Livermore Laboratory
P.O. Box 808, Mail Stop L-40
Livermore, California 94550
Telephone: (415) 422-7411
FTS: 532-7411

(a)

(b)

(c)

(d)

FIG. 2. Typical nuclear criticality experiments: (a) spherical metal assembly, (b) moderated array of metal cylinders, (c) mockup of a fast nuclear power reactor, and (d) array of fissile-solution cylinders.

TABLE 1. Sources of reports in this bibliography.

Reports	Source
<u>General sources</u>	
5	Bibliographies
27	General compilations of calculations
21	General descriptions of laboratories or compilations of experiments
<u>Experimental facilities</u>	
197	Oak Ridge
185	Hanford
140	Los Alamos
139	Argonne National Laboratory
61	Rocky Flats
57	United Kingdom
50	Livermore
38	France
34	Brookhaven National Laboratory
30	General Electric Company
26	Westinghouse
25	Atomics International
23	Savannah River
20	Germany
19	Babcock and Wilcox Company
16	USSR
11	Canada
11	General Atomics
7	Japan
6	Sweden
5	Alco Products
5	NASA, Lewis Research Center
4	Australia
4	Battelle Memorial Institute
4	Italy
4	Poland
3	Massachusetts Institute of Technology
3	University of Chicago
2	Aerojet General
2	Martin Corporation
2	Netherlands
1	Allis-Chalmers
1	AMF
1	Combustion Engineering
1	Cornell University
1	North American Aviation
1	Phillips Petroleum Company
1	Sandia
1	South Africa
1	Yugoslavia
1195	Total ^a

^aExceeds number of citations in this bibliography because some reports deal with experiments done at more than one facility.

HOW TO USE THE BIBLIOGRAPHY

We arranged this bibliography in three volumes to allow convenient and independent use:

Volume 1

Main listing of all citations, with abstracts, in ascending order of citation number.

Volume 2

Four alphabetic indexes, permitting visual lookup of pertinent citation numbers according to

Report number.
Publication date.
Experimental facility.
Author name.

Volume 3

A subject index in two concordances according to

Keyphrases from titles.
Keyterms from titles and abstracts.

The link among all alphabetic indexes and concordances is a unique, four-digit integer number assigned to each bibliographic citation. A perusal of the specific indexes in Volumes 2 and 3 permits lookup of this citation number and subsequent reading of the full bibliographic citation, including its abstract, in Volume 1, to establish relevancy.

The following specific guidelines are for each of the indexes and concordances.

The **report number index** is organized alphabetically by report number. A uniform format has been established for this field to permit a comprehensive, exact listing.

To permit the concise listing of citations according to their source of publication, e.g., certain proceedings, conferences, and journals, we used an abbreviated code to describe the report number. The citations in the indexes carry the terse notation; the corresponding full bibliographic citations in Volume 1 contain the expanded form. This is illustrated below:

Coded report number			Citation (ID) number
GENEVA-2, 12, 666-684	NATURAL URANIUM-GRAPHITE LATTICES	BACHER, P. / KOEHLIN, J. C. / DE MAZANCOURT, R. / TESTE DU BAILLER, A. / ZALESKI, C. P.	58-09-00 1950
GENEVA-2, 12, 747-762	RESEARCH EXPERIENCE WITH PLASTIC MODERATED CRITICAL ASSEMBLIES	JANKOWSKI, F. J.	58-09-00 739
GENEVA-3, 03, 241-247	INVESTIGATION ON SYSTEM WITH ZIRCONIUM HYDRIDE MODERATOR	PONOMAREV-STEPNOI, N. N. / SMIRNOV, O. N. / KULEVA, R. V.	64-09-00 693
GENEVA-3, 06, 124-136	FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS	THALGOTT, F. W. / LONG, J. K. / DAVEY, W. G. / KATO, W. Y. / CARPENTER, S. G. / MOREWITZ, H. A. / BEST, G. H.	64-09-00 1003

The **publication date index** has been standardized in a similar manner. The date is established in a consistent format by year, month, and day as (YY-MM-DD).

Date			Citation (ID) number
72-11-20	VALIDATION CHECKS OF THE "ANISN" AND "KENO" CODES BY CORRELATION WITH EXPERIMENTAL DATA.	HANDLEY, G. R. / HOPPER, C. M.	Y-1858 1844
72-12-00	CRITICALITY OF GRAPHITE- AND POLYETHYLENE-REFLECTED URANIUM(93.2)-METAL CYLINDERS AND ANNULI	MIHALCZO, J. T.	NSENAO, 49, 489-504 1966
73-00-00	PHYSICAL AND GEOMETRICAL PARAMETERS OF ANNA CRITICAL ASSEMBLIES. PART-2	MALEWSKI, S. / DABROWSKI, C.	INR-1456/9A/PR/A 1941

The **experimental facility (or site) index** permits identification of all reports according to where the experimental work was performed. For those facilities at which a large number of experiments were performed, the site also indicates the project associated with the work. For any one facility, the citations are listed chronologically, in the format shown below:

Citation (ID) number	Experimental facility		
	GENERAL ELECTRIC CO., SAN JOSE - SEFOR REACTOR		
1932	NOBLE, L. D. / MITZEL, F. / SARMA, B. / WINTZER, D. / LU, Y. S. / KESSLER, G. / PFLASTERER, G. R. / BECKER, R. A. / MANSUR, L.	GEAP-13588	70-03-00 RESULTS OF SEFOR ZERO POWER EXPERIMENTS.
	GENERAL ELECTRIC CO., VALLECITOS - LOW ENRICHED URANIUM OXIDE - WATER		
685	JAWOROWSKI, T. R. / ALINE, P. G. / KOSANKE, H. D.	APED-4236	63-07-15 CONTROL AUGMENTATION CRITICAL EXPERIMENTS
1476	WARZEK, F. G. / JOHNSTON, H. F.	TANSAO, 06, 219-220	63-11-00 CLUMPED LIGHT-WATER-MODERATED URANIUM DIOXIDE SUPERHEAT CRITICALS: PART 1, EXPERIMENTS
1477	PETERSEN, G. T.	TANSAO, 06, 220-221	63-11-00 CLUMPED LIGHT-WATER-MODERATED URANIUM DIOXIDE SUPERHEAT CRITICALS: PART 2, ANALYSES
	GERMANY - HEAVY WATER		
1496	KUCHLE, M.	IAEA-AMST.-1963, 2, 575-586	63-09-06 PULSED NEUTRON MEASUREMENTS ON A HEAVY WATER REACTOR AT ZERO ENERGY

The **author index** provides a chronological listing of all reports published by any author. The format of the citation here is the same as that used in the facility index.

To maximize the usefulness of the author index we have made the format for each author's name internally consistent; thus all reports by a particular author begin in one place in this index.

Date Author

BAKER, C. P.

1980	BAKER, C. P. / DAGHLIAN, H. K. / FRIEDLANDER, G. / HOLLOWAY, M. G. / KERST, D. W. / SCHREIBER, R. E.	LA-0134	44-09-04	WATER BOILER
1981	BAKER, C. P. / HOLLOWAY, M. G.	LA-0618	47-02-03	CRITICAL MASSES OF ENRICHED URANIUM HYDRIDES AND SOME RELATED MEASUREMENTS

BALDWIN, M. N.

700	ENGELDER, T. C. / SNIDOW, N. L. / CLARK, R. H. / BARKSDALE, C. E. / LEWIS, R. H. / BALDWIN, M. N.	BAW-1231	61-12-00	SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM CRITICAL EXPERIMENTS ON LATTICES MODERATED BY HEAVY WATER-WATER MIXTURES
628	ENGELDER, T. C. / CLARK, R. H. / BALDWIN, M. N. / DEROCHÉ, E. J. / FAIRBURN, G. T. / HALLAM, J. W.	BAW-1273	63-11-00	MEASUREMENTS AND ANALYSIS OF UNIFORM LATTICE OF SLIGHTLY ENRICHED URANIUM DIOXIDE MODERATED BY HEAVY WATER-WATER MIXTURES
1369	PETTUS, W. G. / BALDWIN, M. N. / FAIRBURN, G. T. / STERN, M. E.	BAW-3647-12	69-06-00	PHYSICS VERIFICATION PROGRAM PART-3 QUARTERLY TECHNICAL REPORT JANUARY - MARCH 1969
1368	PETTUS, W. G. / BALDWIN, M. N. / FAIRBURN, G. T. / STERN, M. E.	BAW-3647-14	69-09-00	PHYSICS VERIFICATION PROGRAM PART-3 QUARTERLY TECHNICAL REPORT APRIL - JUNE 1969
1905	BALDWIN, M. N. / STERN, M. E.	BAW-3647-17	70-06-00	PHYSICS VERIFICATION PROGRAM. PART-3, TASK 4. QUARTERLY TECHNICAL REPORT, JANUARY-MARCH 1970.

Also, this particular index contains at its end an abbreviated alphabetic listing that points to the *page number* of the respective index. This provides a concise overview for the available material.

The concordance on keyphrases in titles was derived by computer as a multi-term index of cogent expressions. Non-essential expressions and keyphrases were removed. This concordance also concludes with an abbreviated, alphabetic lookup table, giving the user a direct guide to the *page number* for desired subject keyphrases or keyterms.

Keyphrase	Citation (ID) number
WATER BOILERS	
44-09-04 BAKER, C. P. / DAGHLIAN, H. K. / FRIEDLANDER, G. / HOLLOWAY, M. G. / KERST, D. W. / SCHREIBER, R. E.	1980 WATER BOILER
45-09-27 GREULING, E.	454 THEORY OF WATER-TAMPED WATER BOILER
47-12-19 KING, L. D. P.	1982 CRITICAL ASSEMBLIES, CHAPTER 4, WATER BOILERS
WATER COOLED LATTICES	
64-06-00 BENTON, F. D.	716 MEASUREMENTS OF BUCKLINGS AND VOID EFFECTS IN HEAVY WATER MODERATED, ORGANIC OR WATER COOLED LATTICES OF URANIUM DIOXIDE ROD CLUSTERS

The concordance on keyterms in titles and abstracts is an innovation. The keyterms were selected from the computer-generated dictionary of all unique single terms derived from titles and abstracts. Though this index provides a broader field of terms, each term may be insufficient to locate all relevant articles.

Keyterm**Citation
(ID)
number****HEXAHYDRATE**

67-06-00 LLOYD, R. C. / CLAYTON, E. D.

896 INTERACTING ARRAYS OF CONTAINERS WITH URANIUM-233 SOLUTION**HFIR**

67-03-20 JOHNSON, E. B.

1151 CRITICAL LATTICES OF HIGH FLUX ISOTOPE REACTOR FUEL ELEMENTS

HI-C

65-06-00 BOYNTON, A. R.

843 EXPERIMENTAL THERMAL DISADVANTAGE FACTORS IN SOME VERY UNDERMODERATED 3 PERCENT ENRICHED WATER - URANIUM OXIDE LATTICES

65-12-00 BOYNTON, A. R. / PLUMLEE, K. E. /
REDMAN, W. C. / ROBINSON, W. R. /
STANFORD, G. S.

821 HIGH CONVERSION (HI-C) CRITICAL EXPERIMENT

66-06-00 BOYNTON, A. R. / PENNINGTON, E. M.

892 CRITICAL EXPERIMENTS AND CALCULATIONS IN SOME VERY UNDERMODERATED, SLIGHTLY ENRICHED, URANIUM OXIDE/WATER LATTICES

A word of caution on the use of these keyterm and keyphrase concordances: possibly, in our effort to keep the number of citations manageable, we have not included some terms that others might consider relevant. Also, some relevant terms simply could not be included due to the exceedingly large number of reports listed under the term. Such terms are, for example, "experiment", "critical", and "uranium". Also, for more than three decades, authors have not used a consistent terminology to describe their work. Examples are "Oralloy" for highly enriched uranium, "Tuballoy" for natural uranium, a "tamped" system for a reflected system, and "Perspex" in the United Kingdom for plexiglas or methyl methacrylate plastic. We did not consider it appropriate to standardize these terms since they reflect prevalent usage in certain time periods.

HOW WE CREATED THE BIBLIOGRAPHY BY COMPUTER

Starting in 1968, relevant reports have been collected at LLL in a library of criticality documents. This collection has been augmented through selective searching and retrieval of pertinent reports from the literature by LLL's Technical Information Department (TID). More recently, we have used the large computer-based information systems of the National Technical Information Service (NTIS) and of the U.S. Department of Energy (DOE/RECON) to obtain citations to the pertinent literature of criticality experiments. This search and retrieval especially pertains to RECON's Nuclear Science Abstracts (NSA) and its Energy Data Base (DOE/EDB). Keyboarding was carried out directly from marked-up documents.

We used the MASTER CONTROL database management system to create the databases, to verify and proof the text of citations, and to search interactively.^{8,9} The system also permits direct correlation with corresponding numerical data of criticality experiments and the printing of a variety of different report formats. Although interactive search and retrieval with MASTER CONTROL can provide immediate and up-to-date insight into the state of a particular type of a criticality experiment, or can provide the results of corresponding machine calculations, these three printed volumes can be used without a computer terminal. We have developed during the past 10 years a sophisticated set of postprocessing routines that take computer output generated by MASTER CONTROL and format it in a variety of fonts and options into camera-ready copy for printing.^{10,11} We used the high-resolution hardcopy cameras of the FR80 output devices, directly linked with LLL computers,* to create this criticality bibliography.

*OCTOPUS network of four CDC-7600s, two CDC-STARs, and a CRAY.

ACKNOWLEDGMENTS

This work has benefited from the encouragement and expert technical advice of Hugh C. Paxton (Los Alamos Scientific Laboratory), and Robert J. Howerton (LLL).

We acknowledge gratefully the assistance of many experimenters, especially A. Dixon Callihan, Jack H. Chalmers (United Kingdom), and Joseph T. Thomas. Editing and indexing of the bibliographic material was carried out by the authors, with the assistance of Frederick E. McMurphy, Ronald P. Koopman, and Barbara Mallon. The keyboarding of the citations was done, among others, with diligence and exactness by Beverly J. Bear and the late Adelle Larson. H. Leonard Fisher of TID executed the thorough search of the literature, manually and by computer. Bob Kuhn of the Computation Department wrote the postprocessing routines that permitted direct creation of the camera-ready copy. Larry Gottlieb of TID served as editor.

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11. R. W. Kuhn, K. W. Johnson, and H. Moll, *Post-Processing of MASTER CONTROL Output*, Lawrence Livermore Laboratory, Livermore, CA, UCID-17739 (1978).

MAIN LISTING

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1 ID-NUMBER ID-NUMBER

AUTHOR PAXTON, H. C.
 TITLE LOS ALAMOS CRITICAL-MASS DATA
 REPORT NUMBER..... LAMS-3067
 DATE PUBLISHED ... 64-05-06
 NSA-NUMBER 18:24349
 SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

TABULATED ARE CRITICAL MASSES OF SIMPLE SYSTEMS, WHICH HAVE BEEN MEASURED AT LOS ALAMOS THROUGH THE YEAR 1963.

INTRODUCTION - NUMEROUS LOS ALAMOS CRITICAL MASS DATA HAVE BEEN PUBLISHED ONLY AS POINTS ON CURVES, FREQUENTLY AFTER ADJUSTMENT TO "STANDARD" CONDITIONS (E.G., TO UNIFORM VALUES OF URANIUM-235 ENRICHMENT AND DENSITY), AND USUALLY WITHOUT INDICATION OF RELIABILITY. UNDER THESE CONDITIONS, ORIGINAL DATA TEND TO BECOME LOST. IT IS THE PURPOSE OF THIS COMPILATION TO RETRIEVE ORIGINAL CRITICAL MASSES AND TO GIVE SOME MEANS OF JUDGING THE QUALITY OF MEASUREMENTS.

INDEXES OF ACCURACY ARE PROBABLE ERROR, IF IT HAS BEEN ESTIMATED, THE MAXIMUM MASS OF FISSILE MATERIAL USED IN THE MEASUREMENT, OR THE MAXIMUM CENTRAL-SOURCE NEUTRON MULTIPLICATION ATTAINED. FOR NONHYDROGENOUS SYSTEMS A MULTIPLICATION OF 10 USUALLY CORRESPONDS TO A CORE MASS THAT IS 70 PERCENT TO 80 PERCENT OF CRITICAL, 20 CORRESPONDS TO 85 PERCENT TO 90 PERCENT OF THE CRITICAL MASS, 50 CORRESPONDS TO 93 PERCENT TO 97 PERCENT, AND 100 CORRESPONDS TO 96.5 PERCENT TO 98.5 PERCENT. GENERALLY, THE PROBABLE ERROR IN CRITICAL MASS IS ABOUT ONE-QUARTER OF THE DIFFERENCE BETWEEN THE CRITICAL MASS VALUE AND THE MAXIMUM MASS EMPLOYED. THIS ESTIMATE MAY BE VALID DOWN TO AN INDICATED PROBABLE ERROR OF 1 PERCENT TO 2 PERCENT, BEYOND WHICH THE PROBABLE ERROR IS USUALLY CONTROLLED BY THE PRECISION WITH WHICH THE COMPOSITION AND GEOMETRY OF THE SYSTEM CAN BE DESCRIBED. MAXIMUM MULTIPLICATION IS NOT A RELIABLE INDEX OF ACCURACY FOR HYDROGEN-MODERATED ASSEMBLIES BECAUSE OF THE SEVERE INFLUENCE OF NEUTRON-SPECTRAL DISTORTION.

NOT INCLUDED IN THIS COMPILATION ARE SEVERAL CRITICAL ASSEMBLIES THAT CANNOT BE DESCRIBED ADEQUATELY BY SIMPLE ENTRIES IN TABLES (E.G., ASSEMBLIES WITH NONUNIFORM CORES). ALSO OMITTED ARE A FEW CRITICAL MASS ESTIMATES FOR WHICH THE MAXIMUM MASS USED WAS LESS THAN THREE-QUARTERS OF THE CRITICAL VALUE. (AUTH).

2 ID-NUMBER ID-NUMBER 2

AUTHOR MIHALCZO, J. T.
 TITLE PROMPT-NEUTRON LIFETIME IN CRITICAL ENRICHED-URANIUM METAL CYLINDERS AND ANNULI
 REPORT NUMBER..... NSENAO, 20, 060-065
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 64-09-00
 NSA-NUMBER 18:28303
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

PROMPT-NEUTRON LIFETIMES HAVE BEEN DETERMINED FOR UNREFLECTED AND UNMODERATED CRITICAL ASSEMBLIES OF ENRICHED-URANIUM METAL (93.15 PERCENT URANIUM-235) IN CYLINDRICAL GEOMETRY. FIVE SOLID CYLINDERS RANGING IN DIAMETER FROM 7 TO 15 INCH AND THREE CYLINDRICAL ANNULI HAVING OUTSIDE DIAMETERS AS LARGE AS 15 INCH WERE ASSEMBLED TO DELAYED CRITICAL AND THEIR PROMPT-NEUTRON DECAY CONSTANTS MEASURED BY THE ROSSI-ALPHA TECHNIQUE. THE PROMPT-NEUTRON LIFETIMES WERE DETERMINED FROM THE MEASURED DECAY CONSTANTS AND EFFECTIVE DELAYED-NEUTRON FRACTIONS OBTAINED BY SN MULTIGROUP TRANSPORT-THEORY CALCULATIONS, WHICH PREDICTED THE MULTIPLICATION CONSTANTS OF ALL ASSEMBLIES TO WITHIN 0.5 PERCENT. FOR THE SOLID CYLINDERS THE LIFETIME VALUE IS 6.25 +/- 0.04 NSEC, WHICH, WITHIN THE LIMITS OF EXPERIMENTAL ERRORS, IS INDEPENDENT OF THE DIMENSIONS OF THE CYLINDERS AND AGREES WITH THE LIFETIME OF 6.2 +/- 0.1 NSEC OBTAINED FROM EARLIER PROMPT-NEUTRON DECAY-CONSTANT MEASUREMENTS WITH A URANIUM SPHERE (GODIVA I). FOR THE CYLINDRICAL ANNULI THE LIFETIME VARIED FROM 7.0 TO 8.0 NSEC. THE INCREASE IN THE LIFETIME VALUE OVER THAT OF THE SOLID CYLINDERS IS DUE TO THE TIME REQUIRED FOR NEUTRONS TO CROSS THE CENTER VOID. (AUTH).

3 ID-NUMBER ID-NUMBER

AUTHOR OLCOTT, R. N.
 TITLE HOMOGENEOUS HEAVY WATER MODERATED CRITICAL ASSEMBLIES. PART 1. EXPERIMENTAL
 REPORT NUMBER..... NSENAO, 01, 327-341
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 56-08-00
 NSA-NUMBER 10:11507
 SITE/PROGRAM LOS ALAMOS - URANYL FLUORIDE - HEAVY WATER

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

TEN CRITICAL ASSEMBLIES OF ENRICHED URANYL-FLUORIDE HEAVY-WATER SOLUTIONS HAVE BEEN STUDIED. IN SIX CASES, HEAVY WATER REFLECTORS SURROUNDED SOLUTIONS IN WHICH THE ATOMIC RATIO OF DEUTERIUM TO URANIUM-235 VARIED FROM 34 TO 430. THE REMAINING FOUR ASSEMBLIES WERE WITHOUT REFLECTOR AND THE DEUTERIUM URANIUM-235 RATIO RANGED FROM 230 TO 2080. ACTIVATION RATES WITHIN THE SYSTEMS WERE MEASURED FOR THE RESONANCE DETECTORS INDIUM, GOLD, PALLADIUM, AND MANGANESE AND FOR THE FISSION DETECTORS URANIUM-235, URANIUM-238, PLUTONIUM-239, AND URANIUM-233. (AUTH).

4 ID-NUMBER ID-NUMBER 4

AUTHOR PETERSON, R. E./ NEWBY, G. A.
 TITLE AN UNREFLECTED URANIUM-235 CRITICAL ASSEMBLY
 REPORT NUMBER..... NSENAO, 01, 112-125
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ..: 56-05-00
 NSA-NUMBER 10:10534
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

AN UNREFLECTED, SPHERICAL URANIUM-235 CRITICAL ASSEMBLY HAS BEEN IN OPERATION AT THE LOS ALAMOS SCIENTIFIC LABORATORY SINCE AUGUST, 1951. A REMOTELY CONTROLLED MECHANICAL SYSTEM IS USED TO ASSEMBLE SUBCRITICAL COMPONENTS OF THE SPHERE, AND REACTIVITY IS ADJUSTED WITH URANIUM-235 CONTROL RODS. THE MAXIMUM POWER LEVEL DURING SUSTAINED OPERATION IS ABOUT 1 KW. INVESTIGATIONS WITH THE ASSEMBLY INCLUDE STUDIES OF THE NEUTRON SPECTRUM, OBSERVATION OF THE CHANGES OF REACTIVITY PRODUCED BY INSERTING FOREIGN MATERIALS INTO THE ASSEMBLY, AND DETERMINATION OF PARAMETERS SUCH AS THE TEMPERATURE COEFFICIENT OF REACTIVITY. IN ADDITION, EXPERIMENTS AT REACTIVITIES ABOVE PROMPT CRITICAL HAVE BEEN CARRIED OUT. THE ASSEMBLY HAS ALSO BEEN USED AS A SOURCE OF SHORT, HIGH- INTENSITY BURSTS OF NEUTRONS IN THE STUDY OF DELAYED NEUTRONS FOLLOWING FISSION. (AUTH).

5 ID-NUMBER ID-NUMBER 5

AUTHOR WHITE, R. H.
 TITLE TOPSY, A REMOTELY CONTROLLED CRITICAL ASSEMBLY MACHINE
 REPORT NUMBER..... NSENAO, 01, 053-061
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ..: 56-03-00
 NSA-NUMBER 10:10532
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

A REMOTELY OPERATED FACILITY FOR THE STUDY OF REACTING METAL ASSEMBLIES WITH THICK REFLECTORS IS DESCRIBED. DESIGN OF THE ASSEMBLY MACHINE PERMITS ADAPTATION TO NUCLEAR COMPONENTS OF VARIOUS MATERIALS AND GEOMETRIES. DATA RESULTING FROM EXPERIMENTAL PROGRAMS ON THE BEHAVIOR OF REFLECTED CRITICAL ASSEMBLIES CAN BE APPLIED TO FAST REACTOR PROBLEMS. (AUTH).

6 ID-NUMBER ID-NUMBER 6

AUTHOR PLASSMANN, E. A./ WOOD, D. P.
 TITLE CRITICAL REFLECTOR THICKNESSES FOR SPHERICAL URANIUM-233 AND PLUTONIUM-239 SYSTEMS
 REPORT NUMBER..... NSENAO, 08, 615-620
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ..: 60-12-00
 NSA-NUMBER 15:6804
 SITE/PROGRAM LOS ALAMOS - URANIUM-233 METAL SPHERES ; LOS ALAMOS - PLUTONIUM METAL SPHERES

ABSTRACT

THE THICKNESS OF REFLECTORS REQUIRED FOR CRITICAL CONFIGURATIONS WITH SPHERES OF URANIUM-233 AND PLUTONIUM-239 HAVE BEEN ESTIMATED FROM MULTIPLICATION MEASUREMENTS OF NEARLY CRITICAL ASSEMBLIES. REFLECTOR MATERIALS EMPLOYED WERE URANIUM ENRICHED IN URANIUM-235, NORMAL URANIUM, BERYLLIUM AND TUNGSTEN ALLOY. CORRECTION OF THE EXPERIMENTAL DATA HAS BEEN ATTEMPTED TO GIVE "IDEALIZED" DIMENSIONS, I.E., A SOLID CORE IN INTIMATE CONTACT WITH ITS REFLECTOR MATERIAL. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

7 ID-NUMBER ID-NUMBER 7

AUTHOR HANSEN, G. E./ WOOD, D. P./ GEER, W. U.
 TITLE CRITICAL MASSES OF ENRICHED-URANIUM CYLINDERS WITH MULTIPLE REFLECTORS OF MEDIUM-Z ELEMENTS
 REPORT NUMBER..... NSENAO, 08, 588-594
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 60-12-00
 NSA-NUMBER 15:6602
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL CYLINDERS ; LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE ; LOS ALAMOS - URANIUM(93%) - LUCITE - POLYETHYLENE

ABSTRACT

CRITICAL MASSES HAVE BEEN MEASURED FOR ENRICHED-URANIUM-METAL CYLINDERS REFLECTED ON BOTH ENDS AND ON ONE END ONLY BY MULTIPLE LAYERS OF TWO AND THREE IF THE METALS COPPER, IRON, ZINC, NICKEL, AND STAINLESS STEEL. FOR OTHER MEASUREMENTS THE CORE WAS PARTIALLY MODERATED WITH GRAPHITE AND WITH POLYETHYLENE SO AS TO GIVE THE INFLUENCE OF DECREASED NEUTRON ENERGY UPON REFLECTOR SAVINGS OF THE MULTIPLE REFLECTORS. CRITICAL MASS VALUES WITH COMPOSITE REFLECTORS LESS THAN THE SIMPLE AVERAGES OF VALUES FOR THE ELEMENTS ALONE. THIS REDUCTION OF CRITICAL MASS, MOST PRONOUNCED FOR THE NICKEL- IRON REFLECTORS, IS PRIMARILY DUE TO THE FACT THAT THE SELF-SHIELDING OF THE SCATTERING RESONANCES IN MEDIUM-Z ELEMENTS IS APPRECIABLE WHEN ONE-ELEMENT REFLECTORS ARE USED, AND IS REDUCED WHEN TWO OR MORE OF THESE ELEMENTS ARE MIXED IN THE REFLECTORS. (AUTH).

8 ID-NUMBER ID-NUMBER 8

AUTHOR WOOD, D. P./ BYERS, C. C./ OSBORN, L. C.
 TITLE CRITICAL MASSES OF CYLINDERS OF PLUTONIUM DILUTED WITH OTHER METALS
 REPORT NUMBER..... NSENAO, 08, 578-587
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 60-12-00
 NSA-NUMBER 15:6601
 SITE/PROGRAM LOS ALAMOS - PLUTONIUM METAL CYLINDERS

ABSTRACT

CRITICAL MASSES OF 6-INCH DIAMETER CYLINDERS OF PLUTONIUM DILUTED IN VARIOUS VOLUME RATIOS WITH STEEL, ALUMINUM, THORIUM, AIR, AND DEPLETED URANIUM WERE DETERMINED. THE CORES WERE IN 0, 2, 4, 5, OR 7.5-INCH THICK URANIUM REFLECTORS AND IN 2, 4, 5, OR 7.5-INCH THICK THORIUM REFLECTORS. FROM THESE DATA, THE EQUIVALENT SPHERICAL CRITICAL MASSES OF PLUTONIUM HAVE BEEN ESTIMATED. AN APPENDIX GIVES REFLECTOR SAVINGS OF UNDILUTED PLUTONIUM FOR A VARIETY OF MATERIALS. (AUTH).

9 ID-NUMBER ID-NUMBER 9

AUTHOR HANSEN, G. E./ PAXTON, H. C./ WOOD, D. P.
 TITLE CRITICAL PLUTONIUM AND ENRICHED-URANIUM-METAL CYLINDERS OF EXTREME SHAPE
 REPORT NUMBER..... NSENAO, 08, 570-577
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 60-12-00
 NSA-NUMBER 15:6600
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL CYLINDERS

ABSTRACT

CRITICAL CONFIGURATIONS HAVE BEEN ESTABLISHED WITH ENRICHED URANIUM IN THE FORM OF SQUAT 15.0- INCH DIAMETER CYLINDERS AND ELONGATED 3.24-INCH DIAMETER CYLINDERS. THESE CORES WERE REFLECTED BY DEPLETED URANIUM, POLYETHYLENE, GRAPHITE, AND WATER. ALSO, THE SQUAT CYLINDER WAS UNREFLECTED AND REFLECTED BY BERYLLIUM OF VARIOUS THICKNESSES. CRITICAL SYSTEMS OF PLUTONIUM WERE SQUAT 6.0-INCH DIAMETER CYLINDERS AND ELONGATED 2.25-INCH DIAMETER CYLINDERS REFLECTED BY NORMAL URANIUM, GRAPHITE, WATER, AND IN ONE CASE, POLYETHYLENE. OBSERVED CRITICAL HEIGHTS AND DIAMETERS WERE CORRECTED TO CORRESPOND TO STANDARD ENRICHED-URANIUM AND PLUTONIUM DENSITIES AND CONCENTRATIONS. THESE ARE TABULATED ALONG WITH EFFECTIVE EXTRAPOLATION DISTANCES. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

10 ID-NUMBER ID-NUMBER 10

AUTHOR JARVIS, G. A./ LINENBERGER, G. A./ ORNDOFF, J. D./ PAXTON, H. C.
 TITLE TWO PLUTONIUM-METAL CRITICAL ASSEMBLIES
 REPORT NUMBER..... NSENAO, 08, 525-531
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 60-12-00
 NSA-NUMBER 15:17476
 SITE/PROGRAM LOS ALAMOS - PLUTONIUM METAL SPHERES

ABSTRACT

TWO PLUTONIUM-METAL CRITICAL ASSEMBLIES HAVE BEEN STUDIED AT THE PAJARITO SITE IN LOS ALAMOS. PART-I OF THIS ARTICLE DESCRIBES JEZEBEL, THE BARE PLUTONIUM ASSEMBLY, AND GIVES ITS OBSERVED CHARACTERISTICS ALONG WITH A FEW COMPARISONS WITH ENRICHED-URANIUM SYSTEMS. PART-II COVERS POPSY, A PLUTONIUM CORE IN A THICK NORMAL-URANIUM REFLECTOR. AS POPSY WAS RELATIVELY INFLEXIBLE - INTENDED ONLY FOR A PRELIMINARY SURVEY - ITS EXPERIMENTAL PROGRAM WAS MUCH LESS COMPLETE THAN THAT OF JEZEBEL. (AUTH).

11 ID-NUMBER ID-NUMBER 11

AUTHOR KLOVERSTROM, F. A./ DECK, R. M./ REYENGA, A. J.
 TITLE CRITICAL MEASUREMENTS ON NEAR-HOMOGENEOUS BERYLLIUM OXIDE-MODERATED, ENRICHED-URANIUM FUELED SYSTEMS
 REPORT NUMBER..... NSENAO, 08, 221-225
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 60-09-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) - BERYLLIUM OXIDE

ABSTRACT

A SERIES OF CRITICAL MEASUREMENTS ON UNREFLECTED SYSTEMS, FUELED BY THIN ENRICHED URANIUM (93. 2 PERCENT) FOILS, IS DESCRIBED. FUEL DENSITY IS VARIED BY USE OF DIFFERENT FOIL THICKNESSES AND SPACINGS BETWEEN FOILS. FIVE FUEL DENSITIES HAVE BEEN USED WHICH CORRESPOND TO ATOMIC BERYLLIUM OXIDE / URANIUM-235 RATIOS FROM 246 TO 7660. FOR THREE OF THESE RATIOS, THE FUEL FOIL THICKNESS WAS VARIED TO FIND EFFECTS OF SELF-SHIELDING AND FLUX DEPRESSION ON THE CRITICAL DIMENSIONS. (AUTH).

12 ID-NUMBER ID-NUMBER 12

AUTHOR GASIDLO, J. M./ LONG, J. K./ KEENEY, W. P.
 TITLE DOPPLER EFFECT MEASUREMENTS, SODIUM VOID COEFFICIENTS, AND CRITICAL STUDIES OF A 5000-LITER FAST POWER BREEDER REACTOR BY THE TWO-ZONE METHOD (ZPR-3 ASSEMBLY 43)
 REPORT NUMBER..... ANL-6838
 DATE PUBLISHED ... 64-05-00
 NSA-NUMBER 19:1864
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

ASSEMBLY 43 IS THE SECOND TWO-ZONE CORE BUILT IN THE ZPR-3 FACILITY. THE CENTRAL ZONE AND THE LOW-DENSITY AXIAL BLANKET WERE DESIGNED TO SIMULATE A LARGE POWER-BREEDER REACTOR. CRITICALITY WAS ACHIEVED BY AN ANNULAR DRIVER, WHILE AN INTERPOSED BUFFER MODIFIED THE SPECTRUM OF THE NEUTRONS DIFFUSING FROM THE DRIVER TO THE CENTRAL ZONE.

EXPERIMENTS INCLUDED SODIUM VOID COEFFICIENTS FOR CENTRAL SUBSTITUTIONS AND FOR FULL-LENGTH AXIAL MEASUREMENTS. OTHER REACTIVITY MEASUREMENTS INCLUDED CENTRAL REACTIVITY COEFFICIENTS AND CORE- LENGTH COLUMN SUBSTITUTIONS IN THE CENTRAL ZONE AND THE ANNULAR DRIVER. SPECTRAL INDICES WERE MEASURED, AND REACTION-RATE TRAVERSES AND ACTIVATION EXPERIMENTS WERE PERFORMED. THE REACTIVITY CHANGE DUE TO THE DOPPLER EFFECT CAUSED BY HEATING A LARGE, DEPLETED, URANIUM OXIDE SAMPLE WAS ALSO DETERMINED IN THE EXPERIMENTAL PROGRAM.

THE EXPERIMENTAL RESULTS INDICATE THAT THE MEASUREMENTS CAN BE USED FOR CHECKING CALCULATIONS OF DILUTE FAST CORES, AS WELL AS EVALUATING THE TWO-ZONE EXPERIMENTAL TECHNIQUE. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

13 ID-NUMBER ID-NUMBER 13

AUTHOR KRUESI, F. E./ ERKMAN, J. O./ LANNING, D. D.
 TITLE CRITICAL MASS STUDIES OF PLUTONIUM SOLUTIONS
 REPORT NUMBER..... HW-24514 (DEL)
 DATE PUBLISHED ... 60-02-15
 NSA-NUMBER 14:16167
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

THE CHAIN REACTING CONDITIONS FOR PLUTONIUM NITRATE IN WATER SOLUTION HAVE BEEN EXAMINED EXPERIMENTALLY FOR A VARIETY OF SIZES OF SPHERES AND CYLINDERS. THE EFFECTS ON THE CRITICAL MASS OF THE DISPLACEMENT OF HYDROGEN AND THE ADDITION OF POISONS TO THE FUEL WERE MEASURED IN WATER TAMPED AND BARE REACTORS. IN THIS REPORT THE DATA OBTAINED IN THE INVESTIGATION IS PRESENTED GRAPHICALLY AND IN TABLES. SOME PRELIMINARY ANALYSIS HAS BEEN MADE YIELDING THE RESULTS:

- 1) THE ABSORPTION CROSS-SECTION OF PLUTONIUM-240 IS 925 +/- 200 BARNS AND.
- 2) THE MINIMUM CRITICAL MASS OF PLUTONIUM-239 IN WATER IS 510 GRAMS AT A CONCENTRATION OF ABOUT 33 GRAMS PER LITER. (AUTH).

14 ID-NUMBER ID-NUMBER 14

AUTHOR STRATTON, W. R.
 TITLE CRITICALITY DATA AND FACTORS AFFECTING CRITICALITY OF SINGLE HOMOGENEOUS UNITS
 REPORT NUMBER..... LA-3612
 DATE PUBLISHED ... 67-09-22
 NSA-NUMBER 21:44941
 SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THE CRITICAL PARAMETERS OF SINGLE HOMOGENEOUS UNITS ARE EXAMINED AND TABULATED. THE STUDY INCLUDES BOTH THEORETICAL AND EXPERIMENTAL RESULTS WHICH ARE COMPARED EXTENSIVELY IN ORDER TO ESTABLISH THE ACCURACY OF THE THEORETICAL METHOD. THE EXPERIMENTAL DATA ARE REDUCED TO STANDARD CONDITIONS TO FACILITATE THIS COMPARISON AND TO INVESTIGATE THE CONSISTENCY OF THE LARGE NUMBER OF CRITICAL EXPERIMENTS. GIVEN THE VALIDITY OF THE CALCULATIONAL SCHEME, THE VARIOUS AFFECTS OF DILUENTS (INCLUDING MODERATORS), REFLECTORS, DENSITY CHARGES, AND POISONS ARE STUDIED. FINALLY, BY APPLICATION OF THE THEORY, RESULTS ARE OBTAINED WHICH ARE INACCESSIBLE OR VERY DIFFICULT TO OBTAIN BY EXPERIMENTAL METHODS. (AUTH).

15 ID-NUMBER ID-NUMBER 15

AUTHOR COONFIELD, D. C./ TUCK, G./ CLARK, H. E./ ERNST, B. B.
 TITLE CRITICAL MASSES OF STEEL-MODERATED, ENRICHED URANIUM METAL ASSEMBLIES WITH COMPOSITE STEEL-OIL REFLECTORS
 REPORT NUMBER..... RFP-1033
 DATE PUBLISHED ... 67-11-07
 NSA-NUMBER 22:3896
 SITE/PROGRAM ROCKY FLATS - URANIUM(93%) METAL - SPHERES

ABSTRACT

CRITICAL MASSES HAVE BEEN DETERMINED, EXPERIMENTALLY AND CALCULATED, FOR ENRICHED URANIUM METAL SPHERICAL ASSEMBLIES, MODERATED INTERNALLY WITH A SPHERE OF MILD STEEL OF RADIUS 8.01 CENTIMETERS. THE ASSEMBLIES WERE REFLECTED WITH VARIOUS THICKNESSES OF MILD STEEL FOLLOWED BY AN EFFECTIVELY INFINITE AMOUNT OF OIL. AN IRREGULARITY WAS NOTED IN THE GRAPH OF THE EXPERIMENTAL AND CALCULATED CRITICAL MASSES AS A FUNCTION OF REFLECTOR STEEL THICKNESS. (AUTH).

16 ID-NUMBER ID-NUMBER 16

AUTHOR CHALMERS, J. H.
 TITLE HANDBOOK OF EXPERIMENTAL CRITICALITY DATA.. (PART-2, CHAPTERS 5 AND 6).
 REPORT NUMBER..... AHSB(S) HANDBOOK-5, PART-2
 DATE PUBLISHED ... 68-00-00
 NSA-NUMBER 10:11507

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

THE LITERATURE OF CRITICAL SIZE MEASUREMENTS IS EXTENSIVE AND CAN BE CONFUSING. THE SAME MEASUREMENT MAY BE REPORTED IN A NUMBER OF PLACES AND THERE MAY SOMETIMES BE VARIATION IN DETAIL IN THE DIFFERENT ACCOUNTS. ACCESS TO PAPERS AND REPORTS CAN ALSO BE DIFFICULT AND WILL DEPEND ON THE LIBRARY FACILITIES AVAILABLE. TO ESTABLISH WHAT MEASUREMENTS HAVE BEEN MADE IN A PARTICULAR AREA OF INTEREST, AND TO FIND DETAILED AND AUTHORITATIVE ACCOUNTS OF THE MEASUREMENTS CAN, THEREFORE, BE A TIME-CONSUMING EXERCISE. NEVERTHELESS THIS MATERIAL IS THE BASIC DATA OF CRITICALITY AND THE CRITICALITY SPECIALIST MUST HAVE RECOURSE TO IT FROM TIME TO TIME. FOR INSTANCE, HE MAY NEED TO CHECK A CALCULATIONAL METHOD AND ANY ASSOCIATED NUCLEAR DATA AGAINST REFERENCE EXPERIMENTS OR A PARTICULAR CRITICALITY CLEARANCE MAY DEPEND ON A DETAILED COMPARISON OF PARAMETERS.

IT WAS FELT, THEREFORE, THAT A NEED EXISTED FOR A COMPILATION OF DATA IN RELATIVELY DETAILED FORM REFERENCE TO WHICH COULD TAKE THE PLACE, AT LEAST IN THE FIRST INSTANCE, OF REFERENCE TO THE ORIGINAL LITERATURE. IT IS HOPED THAT THE PRESENT HANDBOOK WHICH IS TO BE PUBLISHED IN THREE PARTS, GOES AT LEAST SOME WAY TO MEETING THIS NEED.

IN COMPILING THE HANDBOOK REFERENCE HAS BEEN MADE, WHEREVER TO THE PRIMARY ACCOUNT OF THE CRITICAL MEASUREMENTS REPORTED AND ASSEMBLIES ARE DESCRIBED IN AS CLOSE APPROXIMATION AS POSSIBLE TO THE ACTUAL ASSEMBLIES ON WHICH MEASUREMENTS WERE MADE, (THUS, SUBSEQUENT SHAPE CHANGES, HOMOGENISATION ETC., HAVE BEEN IGNORED). THIS IS NOT TO SAY HOWEVER, THAT LATER ACCOUNTS OF AN EXPERIMENT HAVE NOT SOMETIMES PROVIDED USEFUL ADDITIONAL INFORMATION. MANY EXCELLENT REVIEW ARTICLES AND HANDBOOKS ALREADY EXIST IN THE CRITICALITY FIELD PROVIDING GENERALISED GUIDANCE AND DATA CORRELATIONS FOR MORE OR LESS SIMPLIFIED SYSTEMS. IT IS IN NO WAY THE AIM OF THIS HANDBOOK TO REPLACE THESE, RATHER IT IS TO SUPPLEMENT THEM FOR THE CRITICALITY SPECIALIST BY COLLECTING AND ASSIMILATING INTO TABULAR FORM, CONVENIENT FOR QUICK REFERENCE, THE DETAILED RESULTS ON WHICH THEY ARE FOUNDED AND ON WHICH SIMILAR CORRELATIONS CAN BE BASED IN THE FUTURE.

IT IS INTENDED THAT THE HANDBOOK SHOULD INCLUDE ONLY DATA FOR SYSTEMS WHICH ARE RELATIVELY "CLEAN" AND WHERE IT IS CLEAR THAT THE MEASUREMENTS WERE SUFFICIENTLY PAINSTAKING AND THE SYSTEM WAS CARRIED CLOSE ENOUGH TO CRITICAL FOR THE RESULT TO BE ACCURATE. WITH THIS PROVISIO IT IS BELIEVED THAT THE HANDBOOK IS REASONABLY COMPREHENSIVE SO FAR AS MATERIAL GENERALLY AVAILABLE UP TO ABOUT THE BEGINNING OF THE 1964 GENEVA CONFERENCE IS CONCERNED.

PERHAPS THE MOST DIFFICULT PROBLEM IN COMPILING THE HANDBOOK HAS BEEN THE ALLOCATION OF THE DATA INTO TABLES. DETERMINING THE LENGTH AND COMPLEXITY OF THE TABLES. GENERALLY THE ALLOCATIONS HAVE BEEN MADE AS A COMPROMISE BETWEEN A DESIRE TO ASSOCIATE RESULTS FOR COMPARABLE AND RELATED SYSTEMS AND THE NEED TO AVOID TABLES WHICH ARE SO COMPLEX AS TO BE DIFFICULT TO READ. (AUTH).

17 ID-NUMBER ID-NUMBER 17

AUTHOR RALSTON, H. R.

TITLE CRITICAL PARAMETERS OF SPHERICAL SYSTEMS OF ALPHA-PHASE PLUTONIUM
REFLECTED BY BERYLLIUM

REPORT NUMBER..... UCRL-5349

DATE PUBLISHED ... 58-09-10

NSA-NUMBER 13:7624

SITE/PROGRAM LIVERMORE - ALPHA PLUTONIUM SPHERES

ABSTRACT

THE CRITICAL THICKNESSES OF BERYLLIUM REFLECTORS WERE DETERMINED FOR FIVE ALPHA-PHASE PLUTONIUM SPHERES WITH MASSES OF 2.472, 3.217, 3.933, 4.664, AND 5.426 KG. A DESCRIPTION OF THE MEASURING TECHNIQUES AND EXPERIMENTAL APPARATUS IS GIVEN. (AUTH).

18 ID-NUMBER ID-NUMBER 18

AUTHOR KIRSCHBAUM, A. J./ SCHWAGER, J. E./ KLOVERSTROM, F. A./ GILBERT, W. S.

TITLE STUDIES OF ENRICHED-URANIUM GRAPHITE SYSTEMS

REPORT NUMBER..... UCRL-5043

DATE PUBLISHED ... 57-12-10

SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

A PROGRAM OF BASIC NEUTRONIC STUDIES HAS BEEN CARRIED OUT ON GRAPHITE-MODERATED, ENRICHED- URANIUM SYSTEMS. EFFORTS HAVE BEEN MADE TO MAKE THE ASSEMBLIES APPROXIMATELY AS CLOSELY AS POSSIBLE AN IDEAL SYSTEM WHICH WOULD BE HOMOGENEOUS AND UNREFLECTED, WITH NO EXTRANEOUS MATERIAL IN THE CORE. THE IDEAL SYSTEM IS APPROACHED BY THE USE OF 0.001-INCH AND 0.002-INCH ENRICHED (93.25 PERCENT) URANIUM FOILS INTERMIXED WITH 0.500-INCH GRAPHITE BLOCKS. APPROXIMATELY CUBICAL CORES WERE BUILT UP ON THE TOP OF A SPECIAL LOW-MASS TABLE FOUR FEET ABOVE THE FLOOR. THE CONTROL AND SAFETY RODS FITTED INTO FOUR 12 INCH X 0.5 INCH SLOTS AND LEFT APPROXIMATELY 180 GRAMS OF ALUMINUM PER INCH OF CORE HEIGHT WHEN ALL RODS WERE WITHDRAWN.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

WITH THIS SYSTEM CORES WITH CARBON-TO-URANIUM RATIOS OF 300:1, 600:1, 1200:1 AND 2400:1 HAVE BEEN INVESTIGATED. DUE TO THE LUMPING OF THE FUEL INTO FOILS, THE EFFECTIVE LOADINGS DIFFER FROM THE ACTUAL LOADINGS AND HAVE BEEN DETERMINED TO BE 675:1, 1379:1 AND 2586:1. THE 300:1 DATA IS BEING REDUCED AND WILL BE PRESENTED. OTHER CORRECTIONS HAVE BEEN MADE FOR THE VOIDS WHICH ADMIT THE CONTROL AND SAFETY RODS AND FOR THE EFFECT OF ROOM-RETURNED NEUTRONS. THE CORRECTED DELAYED CRITICAL BUCKLINGS ARE GIVEN IN THE FOLLOWING TABLE. THE QUANTITY $E(1)$ IS THE SINGLE ENERGY AT WHICH THE FISSIONS ARE ASSUMED TO TAKE PLACE IN A SIMPLE MODIFIED FERMI AGE THEORY. IT IS SEEN THAT THE SYSTEMS BECOME PROGRESSIVELY MORE THERMALIZED, BUT EVEN THE 2586:1 SYSTEM CANNOT BE TREATED AS A THERMAL REACTOR.

MEASUREMENTS HAVE BEEN MADE ON A LIMITED NUMBER OF SYSTEMS REFLECTED ON TWO AND FOUR SIDES. RESULTS WILL BE PRESENTED FOR BERYLLIUM REFLECTORS ON THE 300:1 AND 2400:1 SYSTEMS AND FOR GRAPHITE ON THE 1200:1 SYSTEM.

IT IS ANTICIPATED THAT RESULTS WILL BE AVAILABLE FOR UNREFLECTED 4800:1 AND 9600:1 SYSTEMS. THESE MEASUREMENTS SHOULD EXTEND THE WORK INTO THE REGION OF WELL THERMALIZED SYSTEMS. (AUTH).

19 ID-NUMBER ID-NUMBER 19

AUTHOR JARVIS, G. A./ LINENBERGER, G. A./ PAXTON, H. C.

TITLE PLUTONIUM-METAL CRITICAL ASSEMBLIES

REPORT NUMBER.... LA-2044 (DEL)

DATE PUBLISHED ... 56-10-17

NSA-NUMBER 15:17476

SITE/PROGRAM LOS ALAMOS - PLUTONIUM METAL SPHERES

ABSTRACT

THE TWO PLUTONIUM-METAL CRITICAL ASSEMBLIES THAT HAVE BEEN STUDIED AT PAJARITO SITE ARE JEZEBEL, BARE PLUTONIUM, AND POPSY, A PLUTONIUM CORE IN A THICK NORMAL URANIUM REFLECTOR. THESE ASSEMBLIES AND THEIR PROPERTIES ARE DESCRIBED. (AUTH).

20 ID-NUMBER ID-NUMBER 20

AUTHOR STONE, S. P./ LINGENFELTER, R. E.

TITLE NEUTRON DIFFUSION THEORY PROGRAMS AND THEIR APPLICATION TO SIMPLE CRITICAL SYSTEMS

REPORT NUMBER.... UCRL-5913

DATE PUBLISHED ... 60-03-00

NSA-NUMBER 14:15204

SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS - CALCULATIONS

ABSTRACT

INTRODUCTION: THE LAWRENCE RADIATION LABORATORY OF THE UNIVERSITY OF CALIFORNIA HAS DEVELOPED A SERIES OF REACTOR NEUTRONIC PROGRAMS FOR AN IBM 709 DATA PROCESSING SYSTEM. THIS PAPER PRESENTS A BRIEF OUTLINE OF THESE CODES AND INCLUDES THE RESULTS OF ONE- AND TWO-DIMENSIONAL DIFFUSION CALCULATIONS USED TO INTERPRET DATA FROM A SERIES OF ENRICHED-URANIUM BERYLLIUM-OXIDE MODERATED CRITICAL MEASUREMENTS. THESE WERE PERFORMED FOR THE SPECIFIC PURPOSE OF EVALUATING THE COMPUTER PROGRAMS.

THE TIME-INDEPENDENT NEUTRON DIFFUSION THEORY CRITICALITY CODES ARE 9ZOOM, A ONE-DIMENSIONAL MULTIGROUP PROGRAM, AND 9ANGIE, A TWO-DIMENSIONAL MULTIGROUP PROGRAM. A SERIES OF CODES, NAMED SOPHIST, ARE DESCRIBED WHICH PREPARE NEUTRONIC INPUT DATA FOR THE CRITICALITY CODES. EXAMPLES OF MODIFICATION OF THE DATA TO ACCOUNT FOR DISADVANTAGE FACTORS, ANISOTROPIC SCATTERING AND FOR THE (N, 2N) REACTION OF BERYLLIUM-9 ARE GIVEN.

THE CRITICAL ASSEMBLIES INCLUDE BARE AND GRAPHITE-REFLECTED SYSTEMS, USING ATOMIC BERYLLIUM OXIDE/URANIUM-235 RATIOS FROM 247/1 TO 7660/1, ARRANGED IN SIMPLE ONE- AND TWO-DIMENSIONAL RECTANGULAR PARALLELEPIPED ARRAYS. ALL OF THE ASSEMBLIES UTILIZED HETEROGENEOUS ARRANGEMENTS OF MODERATOR AND THIN URANIUM FOILS. THESE SYSTEMS ARE NOT TRULY THERMAL AND ARE IN A RANGE WHERE CRITICAL MASS IS EXTREMELY SENSITIVE TO SIZE.

THE CONSTANTS USED IN THE MULTIGROUP (18 ENERGY GROUPS WERE USED) CALCULATIONS ARE PRESENTED IN TABULAR FORM. CERTAIN PROBLEMS ARE USED AS TEST EXAMPLES TO SHOW SENSITIVITIES TO MESH SPACING, EXTRAPOLATION PARAMETERS AND SELF-SHIELDING FACTORS.

THE RESULTS OF THE DIFFUSION CALCULATIONS OF THE CRITICAL MASS ARE WITHIN 10 PERCENT OF EXPERIMENTAL VALUES. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

21 ID-NUMBER ID-NUMBER 21

AUTHOR MIHALCZO, J. T./ LYNN, J. J.
 TITLE NEUTRON MULTIPLICATION EXPERIMENTS WITH ENRICHED URANIUM METAL IN SLAB GEOMETRY
 REPORT NUMBER..... ORNL-CF-61-04-33
 DATE PUBLISHED ... 61-04-10
 NSA-NUMBER 15:18649
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL SLABS

ABSTRACT

CRITICAL THICKNESS OF URANIUM METAL SLABS ENRICHED TO 93.15 PERCENT IN THE URANIUM-235 ISOTOPE HAVE BEEN OBTAINED BY A TECHNIQUE INVOLVING SOURCE-NEUTRON MULTIPLICATION COUNTING. SUBCRITICAL ASSEMBLIES OF METAL SLABS WERE CONSTRUCTED TO WITHIN, IN MOST CASES, 95 PERCENT OF CRITICAL MASS, AND THE RESULTING RECIPROCAL MULTIPLICATION CURVES EXTRAPOLATED TO CRITICAL THICKNESSES. SLAB DIMENSIONS RANGED FROM 5 X 5 INCH TO 25 X 25 INCH, AND THICKNESSES OF INFINITE SLABS HAVE BEEN EXTRAPOLATED FROM THE DATA. PLEXIGLAS, IN THICKNESSES FROM 0 TO 6 INCH, BERYLLIUM AND GRAPHITE SERVED AS NEUTRON REFLECTORS. PREVIOUS WORK WITH URANIUM-PLEXIGLAS LATTICES HAS BEEN EXTENDED TO LATTICE DENSITIES OF 0.33 AND 0.50, THE LATTER BEING THE LIMITING DENSITY UNDER THE CONDITIONS OF THE EXPERIMENT.

INTRODUCTION: THE DETERMINATION OF CRITICAL DIMENSIONS OF BOTH INDIVIDUAL UNITS AND ARRAYS OF UNITS OF FISSIONABLE MATERIAL, IN SIMPLE SHAPES AND WITH MINIMAL INTERFERENCE FROM SUPPORTS, ETC., HAS BEEN A CONTINUING PROGRAM AT OAK RIDGE NATIONAL LABORATORY. IN THE EXPERIMENTS PRESENTLY REPORTED, URANIUM METAL SLABS, ENRICHED TO 93.15 PERCENT IN URANIUM-235 AND RANGING IN AREA FROM 5 X 5 INCH TO 25 X 25 INCH, WERE ASSEMBLED, AND ALTHOUGH NOT MADE CRITICAL PRODUCED SUFFICIENT SOURCE NEUTRON MULTIPLICATION TO ALLOW QUITE PRECISE ESTIMATION OF THE CRITICAL THICKNESS. NEUTRON REFLECTION WAS ACCOMPLISHED WITH PLEXIGLAS, IN THICKNESSES FROM 0 TO 6 INCH ALSO INCLUDED ARE PRELIMINARY RESULTS FROM GRAPHITE- AND BERYLLIUM- REFLECTED EXPERIMENTS, NOT YET CONCLUDED.

THE RESULTS OF THESE EXPERIMENTS PROVIDE GUIDANCE IN THE DEVELOPMENT OF METHODS OF REACTOR ANALYSIS AND CONFIRMATION OF ANALYTIC PREDICTIONS, AND ARE VALUABLE IN ESTABLISHING SAFETY LIMITS FOR PRODUCTION AND FABRICATION PROCEDURES. OF PARTICULAR INTEREST IS THE THICKNESS OF A CRITICAL SLAB HAVING AN EFFECTIVELY INFINITE AREA. THE WORK IS CLOSELY RELATED TO THAT AT LOS ALAMOS SCIENTIFIC LABORATORY WITH CRITICAL CYLINDERS OF 93.4 PERCENT URANIUM-235 ENRICHED URANIUM METAL AS LARGE AS 15 INCH IN DIAMETER.

MEASUREMENTS WITH ARRAYS OF 1-INCH-THICK, 8- X 10-INCH SLABS OF URANIUM, SEPARATED AND REFLECTED WITH 1-INCH-THICK PLEXIGLAS, HAVE BEEN REPORTED PREVIOUSLY. LATTICE DENSITIES (THE RATIO OF FISSIONABLE UNIT VOLUME TO UNIT CELL VOLUME) RANGED IN THESE EXPERIMENTS FROM 0.024 TO 0.06. EXTENSION OF THESE DATA TO LATTICE DENSITIES OF FROM 0.33 TO 0.50 IS REPORTED BELOW. (AUTH).

22 ID-NUMBER ID-NUMBER 22

AUTHOR KLOVERSTROM, F. A./ KRAFT, D. E.
 TITLE CRITICAL MEASUREMENTS ON NEAR-HOMOGENEOUS, BERYLLIUM OXIDE-MODERATED, ORALLOY-FUELED SYSTEMS
 REPORT NUMBER..... UCRL-5369 PT. 2
 DATE PUBLISHED ... 60-07-11
 NSA-NUMBER 15:2066
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

ABSTRACT

A SERIES OF BERYLLIUM OXIDE-MODERATED, ORALLOY-FUELED, GRAPHITE-REFLECTED REACTORS ARE DESCRIBED. PERTURBATIONS WERE INTRODUCED BY INSERTING VARIOUS MATERIALS INTO BASIC REACTOR CONFIGURATIONS AND OBSERVING THEIR EFFECT ON THE CRITICAL DIMENSIONS OF THE REACTOR. THE REACTORS HAD FUEL DENSITIES WHICH CORRESPONDED TO ATOMIC BERYLLIUM OXIDE / URANIUM-235 RATIOS OF 247 AND 493. (AUTH).

23 ID-NUMBER ID-NUMBER 23

AUTHOR WOOD, D. P./ PENA, B.
 TITLE CRITICAL MASS MEASUREMENTS OF ORALLOY AND PLUTONIUM CORES IN SPHERICAL ALUMINUM REFLECTORS
 REPORT NUMBER..... LAMS-2579
 DATE PUBLISHED ... 61-11-02
 NSA-NUMBER 16:934
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES ; LOS ALAMOS - PLUTONIUM METAL SPHERES

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE THICKNESSES OF SPHERICAL ALUMINUM REFLECTORS REQUIRED TO BRING APPROXIMATELY 38 KG ORALLOY AND 11 KG PLUTONIUM SPHERES TO DELAYED CRITICAL HAVE BEEN DETERMINED. (AUTH).

24 ID-NUMBER ID-NUMBER 24

AUTHOR HOOGTERP, J. C.

TITLE CRITICAL MASSES OF GRAPHITE-TAMPED HETEROGENEOUS ORALLOY-GRAPHITE SYSTEMS

REPORT NUMBER.... LA-1732

DATE PUBLISHED ... 54-05-19

NSA-NUMBER 11:12571

SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE

ABSTRACT

CRITICAL MASS MEASUREMENTS ON GRAPHITE-TAMPED, HETEROGENEOUS ORALLOY-GRAPHITE SYSTEMS HAVE BEEN MADE AS A SAFETY GUIDE FOR CERTAIN ORALLOY CASTING PROCEDURES. VARIOUS CONCENTRATIONS WERE OBTAINED BY ALTERNATELY STACKING 10.5 INCH DIAMETER ORALLOY AND GRAPHITE PLATES. IN THE RELATION:

ORALLOY CRITICAL MASS = CONSTANT * (FRACTION OF ORALLOY IN THE CORE VOLUME)^{1/(N-1)} VALUES FOR THE EXPONENT, N, IN THE NEIGHBORHOOD OF 0.70 WERE OBTAINED. (AUTH).

25 ID-NUMBER ID-NUMBER 25

AUTHOR FINKE, R. G.

TITLE PRELIMINARY RESULTS OF HIGH-TEMPERATURE BARE URANIUM-235-CARBON CRITICAL ASSEMBLY MEASUREMENTS

REPORT NUMBER.... UCRL-6504

DATE PUBLISHED ... 61-06-06

NSA-NUMBER 16:1195

SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

THE INFLUENCE OF TEMPERATURE UPON THE CRITICAL BUCKLING OF BARE GRAPHITE ASSEMBLIES WITH VARIOUS CARBON-TO-URANIUM-235 MOLAR RATIOS HAS BEEN MEASURED. A RANGE OF CARBON/URANIUM-235 RATIO FROM 1185:1 TO 21,690:1 WAS COVERED, FOR TEMPERATURES BETWEEN 45 DEGREES F AND 1205 DEGREES F. PRELIMINARY RESULTS INDICATE THAT THE FRACTIONAL RATE OF CHANGE OF CRITICAL BUCKLING WITH CORE TEMPERATURE VARIES MONOTONICALLY WITH CARBON/URANIUM-235 RATIO BY A FACTOR OF FIVE OVER THE FACTOR- OF-EIGHTEEN RANGE IN GROSS CARBON/URANIUM-235 RATIO. THIS QUANTITY APPEARS TO APPROACH ASYMPTOTICALLY A VALUE NEAR 2 PERCENT PER 100 DEGREE F AT VERY HIGH CARBON/URANIUM-235 RATIOS. (AUTH).

26 ID-NUMBER ID-NUMBER 26

AUTHOR HANSEN, G. E./ HOOGTERP, J. C./ ORNDOFF, J. D./ PAXTON, H. C.

TITLE BERYLLIUM-REFLECTED, GRAPHITE-MODERATED CRITICAL ASSEMBLIES

REPORT NUMBER.... LA-2141

DATE PUBLISHED ... 57-10-11

NSA-NUMBER 12:562

SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE

ABSTRACT

COLLECTED IN THIS REPORT ARE DATA ON PROPERTIES OF THREE SETS OF CYLINDRICAL BERYLLIUM- REFLECTED, GRAPHITE-MODERATED CRITICAL ASSEMBLIES THAT HAVE BEEN SET UP IN THE HONEYCOMB MACHINE. THE FIRST SET WAS PRIMARILY TO ESTABLISH CHARACTERISTICS AS FUNCTIONS OF CARBON/ORALLOY ATOMIC RATIO OF CORE WITH NEARLY CONSTANT REFLECTOR THICKNESS. FISSION RATES WERE MAPPED WITH ORALLOY FOILS, AND REACTIVITY CONTRIBUTIONS OF SOME FOREIGN MATERIALS WERE MEASURED.

THE SECOND SET CONSISTED OF THREE ASSEMBLIES WITH FIXED CORE TO DETERMINE THE EFFECT OF REDISTRIBUTING REFLECTOR FROM THE ENDS OF THE CYLINDRICAL WALL. THIS SERIES WAS REQUESTED BY LASL T- DIVISION TO PROVIDE CHECKS FOR A TWO-DIMENSIONAL DIFFUSION CODE. FLUX DISTRIBUTIONS IN THE BASIC FULLY-REFLECTED ASSEMBLY WERE MAPPED EXTENSIVELY WITH BARE AND WITH CADMIUM-SHIELDED FOILS OF ORALLOY, GOLD, AND INDIUM.

THE THIRD SET WAS TO ESTABLISH THE MINIMUM-VOLUME CORE AT CARBON/ORALLOY APPROXIMATELY 350 THAT COULD BE MADE CRITICAL WITH AVAILABLE BERYLLIUM. INFLUENCES OF END REFLECTOR AND OF A BERYLLIUM ISLAND WERE CHECKED.

IN THE FINAL SECTION IS DESCRIBED A SCHEME FOR CONVERTING THE SIMPLER ASSEMBLIES TO EQUIVALENT SPHERICAL SYSTEMS.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE CONVERTED EXPERIMENTAL DATA, THEN, ARE COMPARED WITH RESULTS OF A SERIES OF S4 (SPHERICAL) CRITICAL-MASS COMPUTATIONS. (AUTH).

27 ID-NUMBER ID-NUMBER 27

AUTHOR KLOVERSTROM, F. A.
 TITLE SPHERICAL AND CYLINDRICAL PLUTONIUM CRITICAL MASSES
 REPORT NUMBER.... UCRL-4957
 DATE PUBLISHED ... 57-09-00
 NSA-NUMBER 12:4770
 SITE/PROGRAM LIVERMORE - ALPHA PLUTONIUM SPHERES

ABSTRACT

EXPERIMENTS TO DETERMINE CRITICAL MASSES OF DELTA-PHASE PLUTONIUM CYLINDERS OF THREE DIAMETERS WITH THIN METALLIC REFLECTORS ARE REPORTED. CRITICAL REFLECTOR THICKNESS MEASUREMENTS WERE MADE WITH TWO SPHERICAL PLUTONIUM CORES. THE CYLINDRICAL AND SPHERICAL DATA ARE COMBINED TO YIELD SHAPE FACTORS FOR THE SPHERES FOR URANIUM-238 AND BERYLLIUM REFLECTION (AUTH).

29 ID-NUMBER ID-NUMBER 29

AUTHOR LANE, R. C./ PERKINS, O. J. E.
 TITLE MEASUREMENTS OF THE CRITICAL MASS OF 37.5 PERCENT ENRICHED URANIUM IN REFLECTORS OF WOOD, CONCRETE, POLYETHYLENE AND WATER
 REPORT NUMBER.... AWRE-NR-1/66
 DATE PUBLISHED ... 66-02-00
 NSA-NUMBER 20:16721
 SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - URANIUM(30,37.5,46%) METAL

ABSTRACT

THIS REPORT DESCRIBES THE EXPERIMENTAL ARRANGEMENTS USED IN ATLAS, A VERTICAL ASSEMBLY MACHINE, FOR MEASUREMENT OF THE CRITICAL MASS OF 37.5 PERCENT ENRICHED URANIUM IN REFLECTORS OF WOOD, CONCRETE, POLYETHYLENE AND WATER. DATA OBTAINED ARE REPORTED AND DISCUSSED. (AUTH).

30 ID-NUMBER ID-NUMBER 30

AUTHOR MIHALCZO, J. T.
 TITLE PROMPT NEUTRON DECAY IN A TWO-COMPONENT ENRICHED URANIUM METAL CRITICAL ASSEMBLY
 REPORT NUMBER.... ORNL-TM-0470
 DATE PUBLISHED ... 63-01-11
 NSA-NUMBER 17:15069
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL SLABS

ABSTRACT

CRITICAL EXPERIMENTS IN WHICH THE 8 X 10 INCH SURFACES OF TWO URANIUM (93.2 WT PERCENT URANIUM-235) METAL SLABS WERE SEPARATED FROM 0 TO 5 INCH HAVE SHOWN THAT THE NEUTRON FLIGHT TIME ACROSS THE GAP BETWEEN THE TWO SLABS SIGNIFICANTLY AFFECTS THE PROMPT NEUTRON DECAY CONSTANT IN THE CRITICAL ASSEMBLY. THE PROMPT NEUTRON DECAY CONSTANT, MEASURED BY THE ROSSI-ALPHA TECHNIQUE, VARIED FROM 1.07E6 PER SECOND TO ABOUT 8.8E5 PER SECOND OVER THIS SEPARATION RANGE. EXPRESSIONS FOR THE PROMPT NEUTRON LIFETIME IN CRITICAL ASSEMBLIES WITH LARGE GAPS ARE DEVELOPED AND A PROPOSED CALCULATIONAL METHOD IS INDICATED. THE DEPENDENCE OF CRITICAL SLAB THICKNESS ON SEPARATION OF THE TWO SLABS IS GIVEN. (AUTH).

32 ID-NUMBER ID-NUMBER 32

AUTHOR KISTNER, G./ MIHALCZO, J. T.
 TITLE CRITICAL EXPERIMENTS FOR THE REPETITIVELY PULSED REACTOR SORA
 REPORT NUMBER.... ORNL-4263
 DATE PUBLISHED ... 68-06-00
 NSA-NUMBER 22:35605
 SITE/PROGRAM OAK RIDGE - SORA REACTOR (FAST, PULSED, NAK)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

A SERIES OF STATIC CRITICAL EXPERIMENTS HAS BEEN PERFORMED ON AN ACCURATE MOCKUP OF THE SORA REACTOR. SORA IS A SODIUM-POTASSIUM, I.E., NAK-COOLED, REPETITIVELY PULSED FAST REACTOR WHICH WILL BE USED AS A HIGH INTENSITY NEUTRON SOURCE FOR TIME-OF-FLIGHT EXPERIMENTS. THE REACTIVITY OF THIS REACTOR IS VARIED BY A MOVABLE REFLECTOR. THOSE PARAMETERS WHICH ARE RELATED TO THE KINETICS OF THE REACTOR HAVE BEEN INVESTIGATED THOROUGHLY IN THE CRITICAL EXPERIMENTS. THEY HAVE BEEN MEASURED FOR BERYLLIUM AND FOR IRON REFLECTORS OF SEVERAL SIZES AND FOR VARIOUS CORE AND FIXED REFLECTOR CONFIGURATIONS.

THE TOTAL REACTIVITY OF THE MOVABLE REFLECTORS VARIED FROM 3.7 DOLLARS FOR AN 11-CM-WIDE IRON REFLECTOR TO 12 DOLLARS FOR A 26.2-CM-WIDE BERYLLIUM REFLECTOR. THE REACTIVITY OF THE MOVABLE REFLECTOR AS A FUNCTION OF ITS POSITION HAS BEEN SHOWN TO HAVE A PARABOLIC DEPENDENCE ON POSITION CHARACTERIZED BY THE PARAMETER ALPHA(X) WHICH VARIED FROM 4 TO 9.9 CENTS/CM². THE PROMPT NEUTRON TIME DECAY IS DESCRIBED BY A FAST DECAY CONSTANT WHICH VARIED BETWEEN 0.30 AND 0.55 PER MICROSECOND AND A SLOW DECAY CONSTANT WHICH VARIED BETWEEN 0.05 AND 0.10 PER MICROSECOND. THE CRITICAL MASSES FOR THE VARIOUS EXPERIMENTS WAS BETWEEN 50.3 TO 57.3 KILOGRAMS OF URANIUM ENRICHED TO 93.2 WT PERCENT URANIUM-235. USING SPACE INDEPENDENT NEUTRON KINETICS WITH ONE DELAYED NEUTRON GROUP, IT HAS BEEN SHOWN THAT WITH A 24-CM-HIGH, 7-CM-THICK, 21-CM-WIDE BERYLLIUM REFLECTOR THE ASSEMBLY WILL PRODUCE PULSES APPROXIMATELY 50 MICROSECONDS WIDE AT HALF MAXIMUM POWER WITH A PEAK-TO-MINIMUM POWER RATIO OF APPROXIMATELY 4000. (AUTH).

33 ID-NUMBER ID-NUMBER 33

AUTHOR PINCOCK, G. D./ KUNZE, J. F./ WOOD, R. E./ HYLAND, R. E.

TITLE CAVITY REACTOR ENGINEERING MOCKUP CRITICAL EXPERIMENT

REPORT NUMBER.... NASA-CR-72409

DATE PUBLISHED ... 68-05-22

SITE/PROGRAM GENERAL ELECTRIC CO., IDAHO - CAVITY REACTOR

ABSTRACT

INTRODUCTION: FOR THE PAST TWO YEARS, THE GENERAL ELECTRIC COMPANY HAS BEEN PERFORMING A NUMBER OF CAVITY REACTOR CRITICAL EXPERIMENTS FOR THE LEWIS RESEARCH CENTER OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AND THESE EXPERIMENTS ARE CURRENTLY IN OPERATION AT THE NATIONAL REACTOR TESTING STATION IN IDAHO. PREVIOUS REACTOR EXPERIMENTS HAVE BEEN REPORTED INCLUDING VARIOUS CONFIGURATIONS FUELED WITH SOLID URANIUM SHEETS 0.0025 CM (0.001 INCH) THICK AS WELL AS ACTUAL GASEOUS URANIUM HEXAFLUORIDE TO FUEL THE REACTORS.

DURING THE PAST SIX MONTHS, THREE MAJOR CONFIGURATIONS HAVE BEEN TESTED. THESE ARE AS FOLLOWS:

1. A STAINLESS STEEL LINED CAVITY WITH 2.0E21 ATOMS/CC HYDROGEN IN THE VOID REGION BETWEEN THE ACTIVE CORE AND CAVITY WALL. POLYETHYLENE 2 HYDROGENS PER CARBON WAS USED TO MOCKUP THE HYDROGEN PROPELLANT THAT WOULD BE PRESENT IN AN OPERATING REACTOR.

2. A STAINLESS STEEL LINED CAVITY WITH VARIABLE HYDROGEN DENSITY IN THE OUTER PORTION OF THE FUELED REGION AND IN THE VOID BETWEEN THE ACTIVE CORE AND CAVITY WALL. POLYETHYLENE AND POLYSTYRENE 1 HYDROGEN PER CARBON WERE USED TO MOCKUP HYDROGEN. THIS CONFIGURATION SIMULATED THE HYDROGEN DENSITY VARIATION THAT WOULD BE EXPECTED IN A HIGH TEMPERATURE CAVITY.

3. A STAINLESS STEEL LINED CAVITY WITH AN ANNULUS OF MTR TYPE FUEL PLATES IN THE RADIAL REFLECTOR. THE USE OF FUEL IN THE REFLECTOR IS AN ATTEMPT TO REDUCE THE CRITICAL MASS WITHIN THE CAVITY, AND THEREFORE, REDUCE THE PRESSURE REQUIREMENTS.

THESE EXPERIMENTS HAVE PRODUCED CRITICAL MASS AND RELATED DATA TO FURTHER EVALUATE THE CAVITY REACTOR CONCEPT. THESE CONFIGURATIONS HAVE PROVIDED MODELS FOR CORRELATION OF COMPUTER CALCULATIONS AND EXPERIMENTAL RESULTS, AND PROVIDED INSIGHT INTO THE DIFFICULTIES OF PERFORMING ADEQUATE CALCULATIONS ON THESE SYSTEMS. (AUTH).

34 ID-NUMBER ID-NUMBER 34

AUTHOR KINNEY, W. E./ MIHALCZO, J. T.

TITLE OAK RIDGE NATIONAL LABORATORY FAST BURST REACTOR: CRITICAL EXPERIMENTS AND CALCULATIONS

REPORT NUMBER.... ORNL-CF-61-08-71

DATE PUBLISHED ... 61-08-24

NSA-NUMBER 16:1263

SITE/PROGRAM OAK RIDGE - ORNL FAST BURST REACTOR (FBR) - HEALTH PHYSICS RESEARCH REACTOR (HPRR)

ABSTRACT

CRITICAL MASSES AND VOID COEFFICIENTS OF REACTIVITY OF THREE UNMODERATED, UNREFLECTED ASSEMBLIES, AND THE CRITICAL MASSES OF TEN UNMODERATED, REFLECTED ASSEMBLIES HAVE BEEN DETERMINED AT THE OAK RIDGE NATIONAL LABORATORY CRITICAL EXPERIMENT FACILITY TO SUPPORT THE DESIGN OF AN UNMODERATED AND UNREFLECTED RESEARCH REACTOR CAPABLE OF PRODUCING AN INTENSE BURST OF FAST NEUTRONS. MULTIGROUP AND ONE-GROUP TRANSPORT THEORY CALCULATIONS, AS WELL AS PERTURBATION THEORY CALCULATIONS, HAVE BEEN PERFORMED TO PREDICT THE RESULTS OF THE EXPERIMENTS WITH THE UNREFLECTED ASSEMBLIES.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE FAST BURST REACTOR IS FIRST BRIEFLY DESCRIBED, FOLLOWED BY A DISCUSSION OF THE EXPERIMENTS. THE CALCULATIONAL METHODS ARE CONSIDERED NEXT AND FINALLY THE RESULTS OF BOTH EXPERIMENT AND CALCULATION ARE PRESENTED AND COMPARED. (AUTH).

36 ID-NUMBER ID-NUMBER 36

AUTHOR ORNDOFF, J. D./ PAXTON, H. C.
 TITLE MEASUREMENTS OF UNTAMPED ORALLOY ASSEMBLY
 REPORT NUMBER..... LA-1209
 DATE PUBLISHED ... 64-01-27
 NSA-NUMBER 18:40212
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

THE CHARACTERISTICS OF AN UNTAMPED PSEUDOSPHERICAL ORALLOY ASSEMBLY (ABOUT 98 PERCENT CRITICAL) WERE SURVEYED. ROSSI ALPHA VALUES WERE DETERMINED AT TWO DIFFERENT NEUTRON MULTIPLICATIONS. RELATIVE FISSION RATES IN ORALLOY AND TUBALLOY WERE MEASURED AS A FUNCTION OF RADIUS, AND REACTIVITY CONTRIBUTIONS PER GRAM-ATOM OF ORALLOY, PLUTONIUM, TUBALLOY, LEAD, SILVER, COPPER, AND BORON-10 WERE OBTAINED AT VARIOUS POSITIONS. RESULTS ARE CONSIDERABLY LESS RELIABLE THAN CORRESPONDING DATA FOR ASSEMBLIES OPERABLE AT DELAYED CRITICAL. (AUTH).

37 ID-NUMBER ID-NUMBER 37

AUTHOR PAXTON, H. C.
 TITLE BARE CRITICAL ASSEMBLIES OF ORALLOY AT INTERMEDIATE CONCENTRATIONS OF URANIUM-235
 REPORT NUMBER..... LA-1671
 DATE PUBLISHED ... 60-02-29
 NSA-NUMBER 14:7986
 SITE/PROGRAM LOS ALAMOS - CYLINDERS OF MIXED DISKS OF URANIUM(93%) AND URANIUM(.75%)

ABSTRACT

BARE CYLINDRICAL CRITICAL ASSEMBLIES WERE CONSTRUCTED OF STACKED PLATES OF FULLY ENRICHED ORALLOY AND TUBALLOY. PROPORTIONS WERE ADJUSTED TO GIVE AVERAGE URANIUM-235 CONCENTRATIONS OF 53.6 PERCENT, 37.7 PERCENT, AND 29.0 PERCENT. APPROXIMATE RELATIONS BETWEEN CRITICAL PARAMETERS AND URANIUM-235 CONCENTRATION (C) ARE:

1. CRITICAL MASS (TOTAL URANIUM, CORRECTED TO SPHERE) = $K \cdot C \cdot (-1.71)$.
2. ROSSI ALPHA = $K \cdot C \cdot (0.92)$.
3. TOTAL FISSION IN URANIUM-235/TOTAL FISSION IN URANIUM-238 = $K \cdot C \cdot (-0.60)$.
4. TOTAL FISSION IN URANIUM-237/TOTAL FISSION IN URANIUM-238 = $K \cdot C \cdot (-0.29)$. (AUTH).

38 ID-NUMBER ID-NUMBER 38

AUTHOR JOSEPHSON, V./ PAINE, R. W. / WOODWARD, L. L.
 TITLE ORALLOY SHAPE FACTOR MEASUREMENTS
 REPORT NUMBER..... LA-1155 (DEL)
 DATE PUBLISHED ... 52-08-08
 NSA-NUMBER 12:3898
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL CYLINDERS

ABSTRACT

MEASUREMENTS HAVE BEEN MADE AT THE PAJARITO REMOTE CONTROL LABORATORY TO DETERMINE THE EFFECT OF CHANGE OF SHAPE ON SYSTEM REACTIVITY FOR ORALLOY CYLINDERS. SYSTEMS TESTED INCLUDE CYLINDRICAL CONFIGURATIONS WITH VARIOUS HEIGHT-TO-DIAMETER RATIOS RANGING FROM SLABS TO RODS. EACH SYSTEM REACTIVITY IS REFERRED TO THAT OF A SPHERE IN THE SAME TAMPERS. REACTIVITY TESTS WERE MADE ON BARE (UNTAMPED) ORALLOY CONFIGURATIONS, AS WELL AS ON SYSTEMS IN TUBALLOY TAMPERS 1.12 INCH, 1.87 INCH, AND 8.0 INCH THICK. THE AMOUNT OF REACTIVITY CHANGE ASSOCIATED WITH A PARTICULAR CYLINDER HEIGHT-TO- DIAMETER RATIO IS FOUND TO BE A FUNCTION OF TAMPERS THICKNESS, AND IS GREATEST FOR VERY THIN TAMPERS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

39 ID-NUMBER ID-NUMBER 39

AUTHOR PETERSON, R. E. / NEWBY, G. A.
 TITLE LADY GODIVA: AN UNREFLECTED URANIUM-235 CRITICAL ASSEMBLY
 REPORT NUMBER..... LA-1614
 DATE PUBLISHED ... 53-09-00
 NSA-NUMBER 11:13953
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

A SPHERICAL, UNREFLECTED URANIUM-235 CRITICAL ASSEMBLY (52.6 KG) HAS BEEN IN OPERATION SINCE AUGUST, 1951. A REMOTELY-CONTROLLED MECHANICAL SYSTEM IS USED TO ASSEMBLE SUBCRITICAL COMPONENTS OF THE SPHERE, AND REACTIVITY IS ADJUSTED WITH URANIUM-235 CONTROL RODS POSITIONED IN THE SPHERE. THE MAXIMUM POWER LEVEL DURING SUSTAINED OPERATION IS ABOUT 1 KILOWATT. IN ADDITION TO INVESTIGATIONS OF THE NEUTRON SPECTRUM OF THE ASSEMBLY, OBSERVATION OF THE CHANGES OF REACTIVITY PRODUCED BY INSERTING FOREIGN MATERIALS INTO THE ASSEMBLY, AND THE DETERMINATION OF PARAMETERS SUCH AS THE TEMPERATURE COEFFICIENT OF REACTIVITY, STUDIES HAVE BEEN MADE OF THE BEHAVIOR OF THE ASSEMBLY AT REACTIVITIES ABOVE PROMPT CRITICAL. (AUTH).

40 ID-NUMBER ID-NUMBER 40

AUTHOR CHALMERS, J. H./ ABBEY, F.
 TITLE HANDBOOK OF EXPERIMENTAL CRITICALITY DATA (PART-1, CHAPTERS 1 - 4)
 REPORT NUMBER..... AHSB(S) HANDBOOK-5, PART-1
 DATE PUBLISHED ... 67-00-00
 NSA-NUMBER 22:22799
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

THE LITERATURE OF CRITICAL SIZE MEASUREMENTS IS EXTENSIVE AND CAN BE CONFUSING, THE SAME MEASUREMENT MAY BE REPORTED IN A NUMBER OF PLACES AND THERE MAY SOMETIMES BE VARIATION IN DETAIL IN THE DIFFERENT ACCOUNTS. ACCESS TO PAPERS AND REPORTS CAN ALSO BE DIFFICULT AND WILL DEPEND ON THE LIBRARY FACILITIES AVAILABLE. TO ESTABLISH WHAT MEASUREMENTS HAVE BEEN MADE IN A PARTICULAR AREA OF INTEREST, AND TO FIND DETAILED AND AUTHORITATIVE ACCOUNTS OF THE MEASUREMENTS CAN, THEREFORE, BE A TIME-CONSUMING EXERCISE. NEVERTHELESS THIS MATERIAL IS THE BASIC DATA OF CRITICALITY AND THE CRITICALITY SPECIALIST MUST HAVE RECOURSE TO IT FROM TIME TO TIME. FOR INSTANCE, HE MAY NEED TO CHECK A CALCULATIONAL METHOD AND ANY ASSOCIATED NUCLEAR DATA AGAINST REFERENCE EXPERIMENTS OR A PARTICULAR CRITICALITY CLEARANCE MAY DEPEND ON A DETAILED COMPARISON OF PARAMETERS.

IT WAS FELT, THEREFORE, THAT A NEED EXISTED FOR A COMPILATION OF DATA IN RELATIVELY DETAILED FORM REFERENCE TO WHICH COULD TAKE THE PLACE, AT LEAST IN THE FIRST INSTANCE, OF REFERENCE TO THE ORIGINAL LITERATURE. IT IS HOPED THAT THE PRESENT HANDBOOK WHICH IS TO BE PUBLISHED IN THREE PARTS, GOES AT LEAST SOME WAY TO MEETING THIS NEED.

IN COMPILING THE HANDBOOK REFERENCE HAS BEEN MADE, WHEREVER POSSIBLE, TO THE PRIMARY ACCOUNT OF THE CRITICAL MEASUREMENTS REPORTED AND ASSEMBLIES ARE DESCRIBED IN AS CLOSE APPROXIMATION AS POSSIBLE TO THE ACTUAL ASSEMBLIES ON WHICH MEASUREMENTS WERE MADE, (THUS, SUBSEQUENT SHAPE CHANGES, HOMOGENISATION ETC., HAVE BEEN IGNORED). THIS IS NOT TO SAY HOWEVER, THAT LATER ACCOUNTS OF AN EXPERIMENT HAVE NOT SOMETIMES PROVIDED USEFUL ADDITIONAL INFORMATION. MANY EXCELLENT REVIEW ARTICLES AND HANDBOOKS ALREADY EXIST IN THE CRITICALITY FIELD PROVIDING GENERALISED GUIDANCE AND DATA CORRELATIONS FOR MORE OR LESS SIMPLIFIED SYSTEMS. IT IS IN NO WAY THE AIM OF THIS HANDBOOK TO REPLACE THESE, RATHER IT IS TO SUPPLEMENT THEM FOR THE CRITICALITY SPECIALIST BY COLLECTING AND ASSIMILATING INTO TABULAR FORM, CONVENIENT FOR QUICK REFERENCE, THE DETAILED RESULTS ON WHICH THEY ARE FOUNDED AND ON WHICH SIMILAR CORRELATIONS CAN BE BASED IN THE FUTURE.

IT IS INTENDED THAT THE HANDBOOK SHOULD INCLUDE ONLY DATA FOR SYSTEMS WHICH ARE RELATIVELY "CLEAN" AND WHERE IT IS CLEAR THAT THE MEASUREMENTS WERE SUFFICIENTLY PAINSTAKING AND THE SYSTEM WAS CARRIED CLOSE ENOUGH TO CRITICAL FOR THE RESULT TO BE ACCURATE. WITH THIS PROVISIO IT IS BELIEVED THAT THE HANDBOOK IS REASONABLY COMPREHENSIVE SO FAR AS MATERIAL GENERALLY AVAILABLE UP TO ABOUT THE BEGINNING OF THE 1964 GENEVA CONFERENCE IS CONCERNED.

PERHAPS THE MOST DIFFICULT PROBLEM IN COMPILING THE HANDBOOK HAS BEEN THE ALLOCATION OF THE DATA INTO TABLES, DETERMINING THE LENGTH AND COMPLEXITY OF THE TABLES. GENERALLY THE ALLOCATIONS HAVE BEEN MADE AS A COMPROMISE BETWEEN A DESIRE TO ASSOCIATE RESULTS FOR COMPARABLE AND RELATED SYSTEMS AND THE NEED TO AVOID TABLES WHICH ARE SO COMPLEX AS TO BE DIFFICULT TO READ. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

41 ID-NUMBER ID-NUMBER 41

AUTHOR ORNDOFF, J. D./ PAXTON, H. C./ HANSEN, G. E.
 TITLE CRITICAL MASSES OF ORALLOY AT REDUCED CONCENTRATIONS AND DENSITIES
 REPORT NUMBER..... LA-1251
 DATE PUBLISHED ... 51-06-23
 SITE/PROGRAM LOS ALAMOS - VARIABLE DENSITY URANIUM(93%) SYSTEMS

ABSTRACT

FROM PAJARITO MEASUREMENTS ON ORALLOY CORES OF VARIOUS DENSITIES AND CONCENTRATIONS IN AN 8 INCH THICK TUBALLOY TAMPER, RELATIONS BETWEEN CRITICAL MASS AND ORALLOY DENSITY AND CONCENTRATION ARE OBTAINED. THE ORALLOY CRITICAL MASS IS APPROXIMATELY PROPORTIONAL TO $\rho^{0.75} \cdot (C^{0.75})$ FOR DENSITIES RANGING FROM 50 PERCENT TO 100 PERCENT OF NORMAL AND 25 CONCENTRATIONS FROM 47 PERCENT TO 94 PERCENT. RESULTS ARE COMPARED WITH PREDICTIONS BASED ON CURRENT VALUES OF URANIUM-235 AND URANIUM-238 CROSS SECTIONS. (AUTH).

42 ID-NUMBER ID-NUMBER 42

AUTHOR BIERMAN, S. R./ HESS, G. M.
 TITLE MINIMUM CRITICAL URANIUM-235 ENRICHMENT OF HOMOGENEOUS HYDROGENOUS URANYL NITRATE
 REPORT NUMBER..... ORNL-CDC-05
 DATE PUBLISHED ... 68-06-00
 SITE/PROGRAM HANFORD - URANYL(2-3%) NITRATE IN WATER

ABSTRACT

A SERIES OF EXPERIMENTS WITH 2.14 AND 2.26 WT. PERCENT URANIUM-235 ENRICHED URANYL NITRATE WAS PERFORMED IN THE PHYSICAL CONSTANTS TEST REACTOR (PCTR) AT THE PACIFIC NORTHWEST LABORATORY TO DETERMINE THE MINIMUM CRITICAL URANIUM-235 ENRICHMENT FOR HOMOGENEOUS HYDROGENOUS URANYL NITRATE AND TO OBSERVE THE REACTIVITY EFFECT OF NEUTRON MODERATION ON THESE LOW ENRICHED URANIUM MATERIALS. THE MINIMUM CRITICAL ENRICHMENT WAS DETERMINED TO BE 2.104 ± 0.010 WT PERCENT URANIUM-235 AT AN OPTIMUM HYDROGEN/URANIUM ATOMIC RATIO OF 7.6. OPTIMUM NEUTRON MODERATION OCCURRED, WITH $K(\infty)$ VALUES OF 1.013 AND 1.04, AT HYDROGEN/URANIUM ATOMIC RATIOS OF 8.0 ± 1.0 AND 9.3 ± 0.5 , RESPECTIVELY, FOR THE 2.14 AND 2.26 WT PERCENT ENRICHED URANYL NITRATE. VALUES OF $K(\infty)$ GREATER THAN UNITY WERE OBSERVED FOR HYDROGEN/URANIUM RATIOS BETWEEN 6 AND 10.5 FOR THE 2.14 WT PERCENT ENRICHMENT AND BETWEEN 4 AND 15 FOR THE 2.26 WT PERCENT ENRICHMENT. (AUTH).

43 ID-NUMBER ID-NUMBER 43

AUTHOR ZIMMERMAN, E. L.
 TITLE A GRAPHITE MODERATED CRITICAL ASSEMBLY, CA-4
 REPORT NUMBER..... Y-0881 (DEL)
 DATE PUBLISHED ... 52-12-07
 NSA-NUMBER 11:14016
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

AN ESSENTIALLY BARE GRAPHITE MODERATED CRITICAL ASSEMBLY HAVING DIMENSIONS OF 51.0 INCH X 51.0 INCH X 44.11 INCH AND A CRITICAL MASS OF 52.48 KG OF URANIUM-235 WAS CONSTRUCTED AT THE ORNL CRITICAL EXPERIMENTS FACILITY. USING A VALUE FOR THE BUCKLING, B^2 , OF $0.0018628 \text{ CM}^{-2}$ AND EXTRAPOLATION DISTANCE OF 2 CM, A MULTIGROUP CALCULATION FOR THE ASSEMBLY GAVE AN EFFECTIVE MULTIPLICATION OF 0.9912. THE SELF-SHIELDING FACTOR DUE TO LUMPING OF THE FUEL IN 0.01 INCH DISCS WAS MEASURED AND FOUND TO BE 0.94 ± 0.04 COMPARED TO A CALCULATED VALUE 0.95. VALUES OF 0.15 EV FOR THE MEAN FISSION ENERGY AND 27.66 PERCENT FOR THE FRACTION OF FISSIONS IN THE THERMAL GROUP WERE CALCULATED.

CORE REMOVAL TYPE CONTROL RODS WERE CALIBRATED BY THE "ROD-DROP" METHOD AND BY THE OBSERVATION OF STABLE REACTOR PERIODS. THE FORM OF THE CONTROL ROD CALIBRATIONS CURVES INDICATE A CONTRIBUTION DUE TO NEUTRON STREAMING IN THE VOID FORMED BY WITHDRAWING THE ROD AS WELL AS THE EXPECTED COSINE SQUARED DISTRIBUTION. A COMPARISON USING A FLAT STRIP OF CADMIUM AS A POISON ROD, WHICH LEFT ESSENTIALLY NO VOID WHEN REMOVED, SHOWED GOOD AGREEMENT WITH A COSINE SQUARED SENSITIVITY CURVE.

THE LOSS IN REACTIVITY AS A FUNCTION OF THE SEPARATION OF SECTIONS OF THE ASSEMBLY SHOWED A LOSS OF MULTIPLICATION OF 0.00635 DUE TO A GAP 0.3 INCH WIDE, IN FAIR AGREEMENT WITH A RECENT CALCULATION, BUT APPROXIMATELY DOUBLE THE VALUE CALCULATED BY AN EARLIER METHOD.

BARE INDIUM AND CADMIUM COVERED INDIUM FOILS WERE EXPOSED IN VARIOUS PARTS OF THE ASSEMBLY TO OBSERVE THE FLUX DISTRIBUTION BOTH MACROSCOPICALLY AND MICROSCOPICALLY. POWER DISTRIBUTIONS WERE OBSERVED BY MEANS OF ALUMINUM CATCHER FOILS IN CONTACT WITH THE URANIUM. AND EXPERIMENT SHOWED THE CATCHER FOIL MEASUREMENTS TO BE INSENSITIVE TO THE NEUTRON SPECTRUM. COMPARISON BETWEEN FISSION RATES OF BARE, CADMIUM COVERED, AND CADMIUM-INDIUM COVERED FUEL DISCS GAVE VALUES OF THE RATIO ((FISSION RATE) BARE)/((FISSION RATE)/CADMIUM COVERED) BETWEEN 2.1 AND 2.6 COMPARED TO A CALCULATED AVERAGE

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

VALUE WAS 2.98. THE OBSERVED VALUES OF THE RATIO ((FISSION RATE)BARE)/((FISSION RATE) /CADMIUM AND INDIUM COVERED) VARIED BETWEEN 3.4 AND 3.9, WHILE THE CALCULATED VALUE WAS 2.98. THE VARIATION IN OBSERVED RATIOS WAS DUE TO THE 3 INCH GRAPHITE REFLECTOR ON FOUR SIDES OF THE ASSEMBLY. (AUTH).

44 ID-NUMBER ID-NUMBER 44

AUTHOR TANNER, C. J./ ANDREWS, D. G.
 TITLE BUCKLING MEASUREMENTS IN A HEAVY WATER SUPERLATTICE
 REPORT NUMBER.... TANSO, 11, 252-253
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED .. 68-06-00
 NSA-NUMBER 22:33047
 SITE/PROGRAM CANADA, CHALK RIVER NUCLEAR LABORATORIES - HEAVY WATER LATTICES

ABSTRACT

THIS PAPER DESCRIBES PART OF A SERIES OF EXPERIMENTS PERFORMED IN THE HEAVY WATER CRITICAL FACILITY ZED-2 LOCATED AT CHALK RIVER NUCLEAR LABORATORIES OF A.E.C.L. THE PURPOSE OF THESE EXPERIMENTS WAS TO MEASURE SOME LATTICE PARAMETERS OF A 1 TO 1 'SUPERLATTICE', THAT IS, ONE IN WHICH FUEL ELEMENTS OF ONE KIND ALTERNATE IN A REGULAR PATTERN WITH THOSE OF ANOTHER KIND. (AUTH).

45 ID-NUMBER ID-NUMBER 45

AUTHOR MAGNUSON, D. W.
 TITLE CRITICAL EXPERIMENTS WITH ENRICHED URANIUM METAL-POLYETHYLENE, -PLEXIGLAS, AND -TEFLON MIXTURES
 REPORT NUMBER.... ORNL-TM-2082
 DATE PUBLISHED .. 68-02-00
 NSA-NUMBER 22:16289
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) - POLYETHYLENE SLABS

ABSTRACT

REFLECTED AND UNREFLECTED CRITICAL EXPERIMENTS WERE PERFORMED AT HYDROGEN/URANIUM-235 ATOMIC RATIOS FROM 0 TO 5 IN RECTANGULAR GEOMETRY WITH LAYERS OF ENRICHED URANIUM AND POLYETHYLENE. BASE DIMENSIONS OF THE ASSEMBLIES WERE 5 X 10 AND 10 X 10 INCH IN SOME UNREFLECTED EXPERIMENTS. THE METAL WAS INTERLEAVED WITH PLEXIGLAS AND WITH TEFLON AT ONLY THE LATTER BASE DIMENSIONS. HETEROGENEITY EFFECTS WERE FOUND TO BE SMALL FROM EXPERIMENTS ASSEMBLED FROM THE SAME OR APPROXIMATELY THE SAME MATERIALS BUT WITH DIFFERENT LAYER THICKNESSES. VALUES OF K(EFF), CALCULATED WITH THE KENO MONTE CARLO CODE, ARE IN EXCELLENT AGREEMENT WITH THE EXPERIMENTAL VALUES. BY EQUATING GEOMETRICAL BUCKLINGS FOR RECTANGULAR AND SPHERICAL GEOMETRY, THESE DATA WERE CONVERTED TO CRITICAL MASSES FOR SPHERES. COMPARISONS OF THE EXPERIMENTAL VALUES WERE MADE TO THE CRITICAL MASSES CALCULATED BY THE ANISN TRANSPORT CODE FOR HOMOGENEOUS SPHERES. (AUTH).

48 ID-NUMBER ID-NUMBER 48

AUTHOR PINCOCK, G. D./ KUNZE, J. F.
 TITLE CAVITY REACTOR CRITICAL EXPERIMENT VOLUME-II
 REPORT NUMBER.... NASA-CR-72415, GESP-35
 DATE PUBLISHED .. 68-05-31
 NSA-NUMBER 23:2084
 SITE/PROGRAM GENERAL ELECTRIC CO., IDAHO - CAVITY REACTOR

ABSTRACT

THIS REPORT IS THE SECOND VOLUME PERTAINING TO CAVITY REACTOR CRITICAL EXPERIMENTS PERFORMED AT THE NATIONAL REACTOR TESTING STATION. THIS VOLUME DESCRIBES EXPERIMENTS WITH A FULL GASEOUS CORE OF URANIUM HEXAFLUORIDE AND THE MOCKUP EXPERIMENTS USING SHEET FUEL. ALL THE PRIOR AND CURRENT CAVITY REACTOR EXPERIMENTS WERE CONDUCTED USING SHEET FUEL. THE GASEOUS CORE EXPERIMENTS DESCRIBED IN THIS REPORT WERE DESIGNED TO EVALUATE THE ADEQUACY OF THE SHEET FUEL MOCKUPS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

49 ID-NUMBER ID-NUMBER 49

AUTHOR FOX, J. K./ GILLEY, L. W./ CALLIHAN, A. D.
 TITLE CRITICAL MASS STUDIES, PART-9: AQUEOUS URANIUM-235 SOLUTIONS (CONTINUED)
 REPORT NUMBER..... ORNL-2367
 DATE PUBLISHED ... 58-03-04
 NSA-NUMBER 12:6550
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

EXPERIMENTS HAVE BEEN PERFORMED TO DETERMINE THE CONDITIONS UNDER WHICH AQUEOUS SOLUTIONS OF URANIUM ENRICHED TO 93.2 PERCENT IN THE URANIUM-235 ISOTOPE CAN BE MADE CRITICAL. THE SOLUTIONS, WHICH HAD HYDROGEN/URANIUM-235 ATOMIC RATIOS VARYING BETWEEN 27.1 TO 74.6, WERE CONTAINED BOTH IN WATER-REFLECTED AND UNREFLECTED ALUMINUM OR STAINLESS STEEL CYLINDERS WITH AND WITHOUT CADMIUM WRAPPINGS. THE EXPERIMENTS VARIED FROM THE USE OF A SINGLE VESSEL TO INTERACTING ARRAYS OF SEVEN VESSELS.

IN ONE GROUP OF EXPERIMENTS, ARRAYS OF ALUMINUM CYLINDERS HAVING PARALLEL AXES AND CONTAINING A SOLUTION WITH AN HYDROGEN/URANIUM-235 ATOMIC RATIO OF 44.3 WERE TESTED. IN THESE IT WAS FOUND THAT A HEXAGONAL ARRAY OF SEVEN (ONE IN THE CENTER) WATER-REFLECTED, CADMIUM-WRAPPED 6-INCH-DIA CYLINDERS WOULD BE SUBCRITICAL AT ANY SOLUTION HEIGHT WITH AN EDGE-TO-EDGE SPACING OF THE CYLINDERS GREATER THAN 2 INCH A SIMILAR ARRAY OF UNREFLECTED 8-INCH-DIA CYLINDERS REQUIRED A SPACING OF ABOUT 18 INCH THREE UNREFLECTED 8-INCH-DIA CYLINDERS ARRANGED IN THE GEOMETRY OF AN EQUILATERAL TRIANGLE REQUIRED AN EDGE-TO-EDGE SPACING OF ABOUT 9 INCH A WATER-REFLECTED CADMIUM-WRAPPED 8-INCH-DIA CYLINDER BECAME CRITICAL AT A HEIGHT OF APPROXIMATELY 24.5 INCH WATER-REFLECTED 6-INCH-DIA CYLINDERS ARRANGED IN STRAIGHT-LINE ARRAYS WERE EFFECTIVELY ISOLATED AT EDGE-TO-EDGE SPACINGS GREATER THAN 12 INCH TWO UNREFLECTED 8-INCH-DIA CYLINDERS REQUIRED A SPACING OF 3 INCH TO REMAIN SUBCRITICAL AT ANY HEIGHT. WHEN THREE WATER-REFLECTED 8-INCH-DIA CYLINDERS WERE ARRANGED IN AN ISOSCELES-TRIANGLE GEOMETRY, IT WAS FOUND THAT THE COMMON CRITICAL HEIGHT WAS ESSENTIALLY CONSTANT FOR VERTEX ANGLES GREATER THAN 90 DEG. AS WOULD BE EXPECTED, IT WAS FOUND THAT THE ANGULAR DEPENDENCE WAS MUCH GREATER IN AN UNREFLECTED SYSTEM.

IN A SECOND GROUP OF EXPERIMENTS THE CRITICAL PARAMETERS OF SOLUTIONS CONTAINED IN SINGLE ALUMINUM AND STAINLESS STEEL CYLINDERS WERE INVESTIGATED. EXTRAPOLATION OF DATA FOR EXPERIMENTS WITH SOLUTIONS IN WATER-REFLECTED ALUMINUM CYLINDERS CONFIRMS EARLIER EXPERIMENTS WHICH INDICATED THAT CYLINDERS WITH DIAMETERS LESS THAN 5.5 INCH WOULD NOT BECOME CRITICAL. A 6-INCH-DIA WATER- REFLECTED STAINLESS STEEL CYLINDER CONTAINING A SOLUTION WITH A RATIO OF 44.3 BECAME CRITICAL AT A HEIGHT OF 118.4 CM. THE RESULTS OF EXPERIMENTS WITH UNREFLECTED CYLINDERS INDICATED THAT 8.76 INCH IS VERY NEAR THE CRITICAL DIAMETER OF AN INFINITELY HIGH UNREFLECTED ALUMINUM CYLINDER CONTAINING A SOLUTION WITH AN HYDROGEN/URANIUM-235 ATOMIC RATIO OF 44.3; THE CORRESPONDING DIAMETER OF A STAINLESS STEEL CONTAINER IS BETWEEN 8.5 AND 8.76 INCH THE CRITICAL PARAMETERS OF WATER-REFLECTED VESSELS OF ANNULAR CYLINDRICAL GEOMETRY WERE ALSO STUDIED. SINGLE VESSELS WERE TESTED WITH THE REGIONS INSIDE THE ANNULI FILLED WITH WATER OR AIR, WITH AND WITHOUT A CADMIUM LINING. THE CRITICAL PARAMETERS OF SOLUTIONS IN "Y" AND "CROSS" GEOMETRIES WERE ALSO INVESTIGATED. IN A FINAL GROUP OF EXPERIMENTS THE NEUTRON REFLECTOR PROPERTIES OF FURFURAL, CONCRETE, CARBON AND FIREBRICK WERE COMPARED WITH THOSE OF WATER. (AUTH).

50 ID-NUMBER ID-NUMBER 50

AUTHOR PAXTON, H. C./ THOMAS, J. T./ CALLIHAN, A. D./ JOHNSON, E. B.
 TITLE CRITICAL DIMENSIONS OF SYSTEMS CONTAINING URANIUM-235, PLUTONIUM-239, AND URANIUM-233
 REPORT NUMBER..... TID-07028
 DATE PUBLISHED ... 64-06-00
 NSA-NUMBER 18:30958
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

INTRODUCTION: THIS REPORT IS A COMPILATION OF MANY CRITICAL DATA OBTAINED FROM EXPERIMENTS PERFORMED IN SEVERAL LABORATORIES SINCE 1945. IT SUPPLEMENTS THE NUCLEAR SAFETY GUIDE [REPORT TID- 7016 (REV.1)] AND SHOWS THE BASES OF THE RECOMMENDATIONS THAT APPEAR IN THE GUIDE. IN ADDITION, THIS COMPILATION CAN EXTEND THE SPECIFICATIONS OF THE GUIDE TO CONDITIONS NOT EXPLICITLY COVERED. ALTHOUGH SOME OF THESE DATA WERE COLLECTED IN EARLIER SUMMARIES BY PAXTON AND GRAVES AND BY PAXTON , THE QUANTITY OF INFORMATION AND ITS RAPID INCREASE DEMAND A MORE CURRENT AND INCLUSIVE COLLECTION FOR EFFECTIVE APPLICATION.

THAT THE DATA ARE CRITICAL VALUES MUST BE EMPHASIZED. SINCE NO SAFETY FACTORS ARE INCLUDED, THESE VALUES ARE NOT DIRECTLY APPLICABLE TO PRACTICAL PROBLEMS. INFORMATION FOR GUIDANCE IN THE SAFE DESIGN OF EQUIPMENT TO HANDLE THE THREE COMMON FISSILE MATERIALS HAS BEEN PUBLISHED IN THE NUCLEAR SAFETY GUIDE AND IN THE HANDBOOK OF NUCLEAR SAFETY . SEVERAL OTHER AUTHORS HAVE SPECIFIED CONDITIONS FOR UNIQUE PROCESSES WITH A PARTICULAR MATERIAL .

EXPERIMENTS OF SEVERAL TYPES WHICH CONTRIBUTE RESULTS APPLICABLE TO NUCLEAR DESIGN AND TO SAFETY PROBLEMS HAVE BEEN DESCRIBED BY CALLIHAN . OF THESE EXPERIMENTS, CRITICAL MEASUREMENTS WITH MATERIALS OF INTEREST WHICH ARE MADE CHAIN-REACTING IN DESIRED CONFIGURATIONS YIELD INFORMATION OF GREATEST USEFULNESS AND ACCURACY. IN INSTANCES WHERE IT IS NOT POSSIBLE TO CONSTRUCT CRITICAL ASSEMBLIES BECAUSE OF SAFETY REQUIREMENTS OF THE EQUIPMENT OR THE ENVIRONMENT, THE CONFIGURATION OF THE MATERIAL, AN INADEQUATE INVENTORY, OR THE NATURE OF THE MATERIAL ITSELF, INFORMATION MAY BE OBTAINED FROM ASSEMBLIES WHICH ARE NOT CRITICAL. THESE YIELD SUBCRITICAL DIMENSIONS THAT ARE USEFUL DIRECTLY IN MANY PRACTICAL APPLICATIONS, AND, IN SOME CASES, THE MEASUREMENTS CAN BE EXTRAPOLATED TO APPROXIMATE CRITICAL DIMENSIONS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

CRITICAL PARAMETERS CAN ALSO BE DERIVED FROM INFORMATION GLEANED FROM THE SPATIAL DISTRIBUTION OF NEUTRONS IN A SUBCRITICAL ASSEMBLY. IN THESE EXPERIMENTS, CALLED EXPONENTIAL EXPERIMENTS, A BULK OF THE MATERIAL OF INTEREST IS PLACED PROXIMATE TO A SOURCE OF NEUTRONS.

IN STILL ANOTHER METHOD, KNOWN AS REPLACEMENT EXPERIMENTS, THE NUCLEAR PROPERTIES OF A SAMPLE OF A MATERIAL ARE COMPARED TO THOSE OF A "STANDARD" MATERIAL THROUGH OBSERVATION OF THE EFFECT ON THE REACTIVITY OF A CRITICAL ASSEMBLY OF THE SUBSTITUTION OF ONE SAMPLE FOR THE OTHER. MANY MORE FUNDAMENTAL, INTENSIVE PROPERTIES OF MATERIALS AND OF NEUTRONS, SUCH AS CROSS SECTIONS AND THE NEUTRON YIELD IN THE FISSION PROCESS, OBTAINABLE IN A WIDE VARIETY OF EXPERIMENTS, CONTRIBUTE INDIRECTLY TO THE PREDICTION OF CRITICAL CONDITIONS THROUGH THE APPLICATION OF NUCLEAR REACTOR THEORY. THESE BASIC NUCLEAR PROPERTIES HAVE BEEN USED IN THEORETICAL ANALYSES TO BRIDGE SOME GAPS IN THE DATA.

THE COMPILATION AND CORRELATION OF DATA FROM MANY MEASUREMENTS IN MANY LABORATORIES REQUIRE A CERTAIN AMOUNT OF NORMALIZATION OR REDUCTION TO COMMON TERMS. IN SOME CASES, FOR EXAMPLE, THE EFFECTS OF VARIATIONS IN GEOMETRY OR IN DENSITY ON THE RESULTS FROM DIFFERENT GROUPS OF EXPERIMENTS MUST BE REMOVED. THE MANNER IN WHICH THESE ALTERATIONS ARE MADE IS DESCRIBED IN THE DISCUSSION OF PARTICULAR SETS OF DATA. DIFFERENCES IN NORMALIZATION METHODS MAY HAVE INTRODUCED SLIGHT APPARENT INCONSISTENCIES IN A FEW OF THE VALUES OF CRITICAL DIMENSIONS.

A CURSORY EXAMINATION OF THE CONTENTS OF THIS COMPILATION WILL REVEAL MANY AREAS IN WHICH CRITICAL DATA ARE INSUFFICIENT TO ALLOW COMPLETE ANALYSES OF ALL PROBLEMS IN THIS SPECIALIZED FIELD OF SAFETY. MANY OF THESE DEFICIENCIES ARE DUE TO THE ABSENCE OF DATA AND EMPHASIZE THE NEED FOR FURTHER EXPERIMENTATION. TO A LESSER DEGREE THE DEFICIENCIES ARE DUE TO THE PROBLEMS OF TIMING INHERENT IN ANY ATTEMPTED COMPREHENSIVE SURVEY. FREQUENT REVISIONS OF THIS COMPILATION ARE NECESSARY TO PRESENT USEFUL INFORMATION AS IT BECOMES AVAILABLE. (AUTH).

51 ID-NUMBER ID-NUMBER 51

AUTHOR FINKE, R. G./ GOLDBERG, E./ REYNOLDS, H. L./ GRAMMENS, G.
 TITLE SUMMARY REPORT ON A HIGH-TEMPERATURE BERYLLIUM-OXIDE CRITICAL EXPERIMENT
 REPORT NUMBER.... UCRL-6329
 DATE PUBLISHED ... 61-03-21
 NSA-NUMBER 17:4255
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

ABSTRACT

AN EXPERIMENTAL VERIFICATION OF MULTIGROUP CALCULATIONS OF CRITICAL DIMENSIONS AS A FUNCTION OF TEMPERATURE OF A BERYLLIUM-OXIDE-MODERATED, ENRICHED-URANIUM-FUELED ASSEMBLY HAS BEEN MADE USING HOT BOX, A HIGH-TEMPERATURE CRITICAL FACILITY.

A DECREASE IN BUCKLING OF 2.5 PERCENT WAS REQUIRED TO COMPENSATE FOR AN INCREASE IN CORE TEMPERATURE FROM 90 DEGREES TO 955 DEGREES F FOR A BARE EQUIVALENT CORE WITH AN EFFECTIVE BERYLLIUM OXIDE DENSITY OF 2.86 GRAMS/CC AND A GROSS BERYLLIUM OXIDE / URANIUM-235 MOLAR RATIO OF ABOUT 550 TO 1. THE REACTIVITY CHANGE WAS WITHIN 5 PERCENT OF THE CHANGE PREDICTED BY THE ZOOM MULTIGROUP, MULTIREGION, ONE-DIMENSIONAL DIFFUSION CODE FOR AN EQUIVALENT CORE CONFIGURATION.

AN OVERALL AVERAGE TEMPERATURE COEFFICIENT OF REACTIVITY OF $-0.48/100$ DEGREES F WAS MEASURED FOR THE TEMPERATURE RANGE STUDIED, AND A NUCLEAR TEMPERATURE COEFFICIENT OF $-0.34/100$ DEGREES F WAS DEDUCED. (AUTH).

54 ID-NUMBER ID-NUMBER 54

AUTHOR REYNOLDS, H. L./ WALTER, C. E.
 TITLE HOT BOX - A HIGH-TEMPERATURE CRITICAL FACILITY
 REPORT NUMBER.... UCRL-5483
 DATE PUBLISHED ... 59-03-30
 NSA-NUMBER 13:23069
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

ABSTRACT

INTRODUCTION: THE BEHAVIOR OF THERMAL NEUTRONS IN MODERATORS CAN BE VERY COMPLEX. AN IMPROVEMENT OVER CONSIDERING THE MODERATOR ATOMS AS STATIONARY CAN BE MADE BY A MODEL ASSUMING THE MODERATOR TO CONSIST OF A MAXWELL-BOLTZMANN GAS AT ROOM TEMPERATURE. FURTHER IMPROVEMENTS CONSIST OF CONSIDERING THE CRYSTALLINE BINDING EFFECTS ON THE ATOMS IN THE MODERATOR LATTICE. THIS BINDING REDUCES THE ENERGY LOSS OF THE NEUTRONS IN THE MODERATOR AND AFFECTS THE SCATTERING CROSS SECTIONS. RECENTLY MEASUREMENTS HAVE BEEN STARTED ON THE ENERGY LOSS AND SCATTERING CROSS SECTIONS FOR NEUTRONS WITH ENERGIES BELOW 1 EV IN A VARIETY OF MODERATORS.

WITH THE OBVIOUS IMPORTANCE OF HIGH TEMPERATURE REACTORS TO REACTOR TECHNOLOGY, AN INTEGRAL STUDY OF THE BEHAVIOR OF REACTORS AND REACTOR MODERATORS AT HIGH TEMPERATURE IS REQUIRED. THE "HOT BOX" HIGH-TEMPERATURE CRITICAL FACILITY IS A DEVICE TO MAINTAIN ZERO NUCLEAR POWER REACTORS AND ASSEMBLIES AT ELEVATED TEMPERATURES TO STUDY THE NUCLEAR PROPERTIES OF SUCH SYSTEMS.

IN ALL ESSENTIALS THE FACILITY WILL DUPLICATE THE USUAL CRITICAL ASSEMBLY FACILITY EXCEPT THAT IT WILL BE CONTAINED IN A LARGE OVEN OR ENCLOSURE WHICH CAN BE ELEVATED IN TEMPERATURE WITH A SELECTED ATMOSPHERE. URANIUM FOILS TOGETHER

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

WITH BLOCKS OF MODERATING MATERIAL WILL BE ASSEMBLED ON A TABLE AT ROOM TEMPERATURE AND THEN RAISED TO HIGHER TEMPERATURES AS A UNIT.

SUCH A FACILITY WILL BECOME MANDATORY WHEN REACTORS UTILIZING SOLID HOMOGENEOUS FUEL-MODERATOR MATERIAL ARE CONSTRUCTED. ANY REACTOR INVOLVING HIGH POWER WILL BE DESIGNED TO BE A CERTAIN SIZE AT A CALCULATED URANIUM LOADING. IT HAS BEEN FOUND THAT CALCULATIONS OF CRITICAL MASSES EVEN AT ROOM TEMPERATURE CAN BE GREATLY IN ERROR. THE ADDITIONAL COMPLICATIONS OF HIGH TEMPERATURE AND TEMPERATURE GRADIENTS WILL INCREASE THE ERRORS. ONCE THE MODERATOR IS FUELED THE LOADING CANNOT BE CHANGED. THEREFORE, TO OBTAIN THE PROPER AMOUNT OF FUEL SEVERAL LOADINGS MAY BE REQUIRED, EACH TIME USING NEW FUEL AND CORE MATERIAL, WITH THE CONSEQUENT LOSS OF MATERIALS AND TIME. WITH THE PROPOSED FACILITY, REACTORS COULD BE DUPLICATED ALMOST EXACTLY, USING FOILS INSTEAD OF THE FINAL FUEL LOADED MATERIAL AND THE CRITICAL MASS AT HIGH TEMPERATURE DETERMINED TO WITHIN A FEW PERCENT. AT THE SAME TIME LOADINGS COULD BE VARIED TO OBTAIN THE REQUIRED POWER DISTRIBUTIONS USING TEMPERATURE DISTRIBUTIONS WHICH WILL OCCUR IN THE ACTUAL DEVICE. ALTHOUGH THE MAXIMUM TEMPERATURE OF 1200 DEGREES FAHRENHEIT IS LESS THAN MAY BE DESIRED FOR SOME APPLICATIONS, IT IS SUFFICIENTLY HIGH TO OBTAIN THE DESIRED NEUTRONIC INFORMATION. NEUTRON CROSS SECTIONS FOR MOST MATERIALS OF CONCERN ARE PROPORTIONAL TO $T^{-(0.5)}$ AND, THEREFORE, THE NEUTRONIC BEHAVIOR OF THE REACTOR WILL CHANGE IN PROPORTION TO $T^{-(0.5)}$. AT 1200 DEGREES FAHRENHEIT THE CROSS SECTIONS HAVE ALREADY DECREASED BY A FACTOR OF 1.8. CALCULATIONS WILL ALLOW EXTRAPOLATION TO HIGHER TEMPERATURES WITH GOOD ACCURACY. AN IBM 704 CODE NAMED "ZOOM", HAS BEEN CONSTRUCTED TO ALLOW SUCH CALCULATIONS. THE "HOT BOX" MEASUREMENTS WILL ALLOW NORMALIZATION OF THIS CODE.

IN SUMMARY, THE PURPOSE OF "HOT BOX" IS THE MEASUREMENT OF THE BEHAVIOR OF ENRICHED REACTORS AT ELEVATED TEMPERATURES WHICH WILL ALLOW THE NORMALIZATION OF EXISTING CALCULATION TECHNIQUES AND ALLOW A BETTER UNDERSTANDING OF NEUTRON BEHAVIOR AT AND NEAR THERMAL ENERGIES. (AUTH):

55 ID-NUMBER ID-NUMBER 55

AUTHOR KLOVERSTROM, F. A./ KOMOTO, T. T.

TITLE PULSED NEUTRON SOURCE STUDIES OF GRAPHITE-ENRICHED URANIUM SYSTEMS

REPORT NUMBER.... UCRL-5477

DATE PUBLISHED ... 59-02-05

NSA-NUMBER 13:47315

SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

A PULSED NEUTRON SOURCE STUDY OF UNREFLECTED, NEAR-HOMOGENEOUS, GRAPHITE-ENRICHED-URANIUM SYSTEMS HAS BEEN CARRIED OUT IN CONJUNCTION WITH A CRITICALITY MEASUREMENTS PROGRAM. THE NEUTRON POPULATION IN A SUBCRITICAL SYSTEM, FOLLOWING INJECTION OF A BURST OF NEUTRONS, DECREASES EXPONENTIALLY. THE DECAY CONSTANT OF THIS DECREASE IS THE MEASURED QUANTITY IN THE PULSED SOURCE EXPERIMENTS. THE VALUE OF THE DECAY CONSTANT HAS BEEN FOUND FOR SEVERAL BUCKLINGS NEAR CRITICAL FOR EACH OF FIVE FUEL CONCENTRATIONS. THE EXPERIMENTAL TECHNIQUES ARE DESCRIBED, AND THE VARIATION OF THE DECAY CONSTANT WITH BUCKLING AND FUEL CONCENTRATION IS QUALITATIVELY DISCUSSED. (AUTH).

56 ID-NUMBER ID-NUMBER 56

AUTHOR BENGSTON, J./ CAROTHERS, J. E./ KLOVERSTROM, F. A./ KOMOTO, T. T./ PASSELL, L./ SIMMONS, B. E./ BOHL, L. S./ LUCKOW, W. K./ CHURCHILL, S. W./ BRUNSON, G. S./ KAUFMANN, S. G./ MC MAHON, J. P.

TITLE PROMPT NEUTRON DECAY CONSTANTS OF MULTIPLYING SYSTEMS

REPORT NUMBER.... UCRL-5159

DATE PUBLISHED ... 58-03-25

NSA-NUMBER 12:15074

SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

IN A MULTIPLYING SYSTEM THAT IS BELOW PROMPT CRITICAL, THE NEUTRON POPULATION IN THE ABSENCE OF DELAYED NEUTRON PRECURSORS WOULD DECAY AS $e^{-(\alpha \cdot T)}$ AFTER A NORMAL MODE HAS BEEN ESTABLISHED, WHERE α IS THE PROMPT NEUTRON DECAY CONSTANT. THIS CONSTANT HAS BEEN MEASURED BY THREE DIFFERENT TECHNIQUES: THE PULSED NEUTRON METHOD, THE ROSSI- α METHOD, AND A RELATED METHOD ORIGINALLY DEvised BY FEYNMAN TO MEASURE THE MEAN SQUARE NUMBER OF NEUTRONS EMITTED PER THERMAL FISSION. THESE TECHNIQUES HAVE BEEN APPLIED TO A NUMBER OF DIFFERENT SYSTEMS, AND THE RELATIVE ADVANTAGES OF THE THREE METHODS ARE RELATED TO THE PROMPT NEUTRON LIFETIME AND MULTIPLICATION CONSTANT OF A PARTICULAR ASSEMBLY. THE PROMPT NEUTRON DECAY CONSTANT, BY WHATEVER METHOD MEASURED, HAS AT LEAST TWO USES IN THE STUDY OF MULTIPLYING ASSEMBLIES. FIRST, ITS USE PROVIDES A RELATIVELY SIMPLE MEASURE OF REACTIVITY DIFFERENCES WITHOUT THE USE OF THE INHOUR EQUATION. IN PARTICULAR, IT ENABLES DIRECT DETERMINATION OF THE MASS DIFFERENCE BETWEEN DELAYED AND PROMPT CRITICAL. SECOND, α CAN BE CALCULATED DIRECTLY FROM MULTIGROUP REACTOR CODES, AND THUS SERVES AS AN ADDITIONAL EXPERIMENTAL TEST OF THE VALIDITY OF SUCH CALCULATIONS. FURTHER, KNOWLEDGE OF THE EFFECTIVE DELAYED NEUTRON FRACTION IN A SYSTEM, $\beta(\text{EFFECTIVE})$ AND THE α AT DELAYED CRITICAL ENABLES US TO CALCULATE THE PROMPT NEUTRON LIFETIME DIRECTLY. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

57 ID-NUMBER ID-NUMBER 57

AUTHOR MORTON, J. R./ PIOWATY, J. M./ PETRUZZI, J. ✓ GARDNER, L. L.
 TITLE A STUDY OF BERYLLIUM OXIDE MODERATED CRITICAL ASSEMBLIES CONTAINING
 VARIOUS METAL ABSORBERS
 REPORT NUMBER.... UCRL-7686
 DATE PUBLISHED ... 64-02-05
 NSA-NUMBER 19:10490
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

ABSTRACT

REACTIVITY WORTHS OF VARIOUS METAL PLATES WERE MEASURED IN A QUASI-HOMOGENEOUS ENRICHED URANIUM-BERYLLIUM OXIDE SUBCRITICAL ASSEMBLY BY MEANS OF THE PULSED NEUTRON METHOD. THE MATERIALS STUDIED INCLUDED NICKEL, IRON, COBALT, GOLD, HASTELLOY R-235, AND RENE-41. THE EQUIVALENCES WERE DETERMINED BETWEEN THE VARIOUS ABSORBERS AND FUELED CORE MATERIAL. BASED UPON THE MEASUREMENTS IT WAS CONCLUDED THAT THE PROMPT LIFETIME (L-STAR) IS RELATIVELY INSENSITIVE TO MASSIVE LOCALIZED ABSORBERS. (AUTH).

58 ID-NUMBER ID-NUMBER 58

AUTHOR BENSON, G. M./ FOX, R. H.
 TITLE ROOM TEMPERATURE CRITICAL MEASUREMENTS ON THORIUM-LOADED, GRAPHITE-
 MODERATED, ORALLOY-FUELED SYSTEMS
 REPORT NUMBER.... UCRL-6901
 DATE PUBLISHED ... 62-06-30
 NSA-NUMBER 17:40280
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

FOR THE PAST TWO YEARS A SERIES OF EXPERIMENTS HAVE BEEN PERFORMED ON GRAPHITE, URANIUM-235, THORIUM CRITICAL ASSEMBLIES. THESE ARE PART OF A STUDY, BEING CONDUCTED HERE, OF THE CHARACTERISTICS OF LONG-LIFE, HIGH-TEMPERATURE, GAS-COOLED REACTORS. BECAUSE OF THE VERY LONG LIFE OF SOME OF THE REACTORS BEING STUDIED, RATHER ACCURATE KNOWLEDGE IS REQUIRED OF THORIUM RESONANCE ABSORPTION IN GRAPHITE-MODERATED HOMOGENEOUS REACTORS. THE PRESENT THORIUM RESONANCE PARAMETER DATA FOR THE FOUR LOWEST RESONANCES (WHICH CONTRIBUTE OVER 40 PERCENT TO THE TOTAL RESONANCE ABSORPTION) LIST GAMMA(GAMMA) VALUES OF 30 +/- 10 MV, OR AN UNCERTAINTY OF OVER 30 PERCENT. PAST EXPERIMENTAL RESULTS HAVE BEEN OBTAINED BY DANGER COEFFICIENT METHODS, BY EXPONENTIAL EXPERIMENTS, AND BY FAST CHOPPER METHODS. IT APPEARED THAT CONSIDERABLE IMPROVEMENT IN ACCURACY WOULD RESULT FROM THE USE OF A CRITICAL ASSEMBLY. IN THIS WAY, LARGE AMOUNTS OF THORIUM COULD BE INCORPORATED IN THE EXPERIMENT, GIVING A LARGE SIGNAL. ALSO, THE NEUTRON SPECTRUM WOULD CLOSELY APPROXIMATE THE SPECTRUM IN AN ACTUAL POWER REACTOR. FINALLY, USE OF A DIFFERENCE TECHNIQUE, AS DESCRIBED BELOW, WOULD REMOVE MOST OF THE USUAL SOURCES OF ERROR INHERENT IN THE INTERPRETATION OF CRITICAL EXPERIMENTS. (AUTH).

59 ID-NUMBER ID-NUMBER 59

AUTHOR MORTON, J. R./ SHON, F. J./ WEIRICH, T. F./ GARDNER, L. L.
 TITLE REACTIVITY EFFECTS OF VARIOUS REFLECTORS ON NEAR-HOMOGENEOUS, BERYLLIUM
 OXIDE MODERATED, ORALLOY-FUELED SYSTEMS
 REPORT NUMBER.... UCRL-6729
 DATE PUBLISHED ... 62-01-02
 NSA-NUMBER 16:18622
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

ABSTRACT

MEASUREMENTS WERE MADE OF THE REACTIVITY CHANGES CAUSED BY REFLECTORS OF VARIOUS MATERIALS ON BERYLLIUM OXIDE MODERATED, URANIUM-235 FUELED SUBCRITICAL SYSTEMS WITH A MODERATOR-TO-FUEL RATIO OF 247. THE REFLECTOR MATERIALS INCLUDED ALUMINUM, STEEL, COPPER, BRASS, TYPE 304 STAINLESS STEEL, NICKEL, RENE-41, HASTELLOY R-235, AND BERYLLIUM OXIDE. THE PULSED NEUTRON TECHNIQUE WAS USED. THE DATA ARE TABULATED IN TERMS OF THE SUBCRITICAL TIME CONSTANT AS A FUNCTION OF REFLECTOR THICKNESS AND SURFACE DENSITY. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

60 ID-NUMBER ID-NUMBER 60

AUTHOR FINKE, R. G./ GOLDBERG, E./ REYNOLDS, H. L./ GRAMMENS, G.
 TITLE A COOLED-REFLECTOR, HOT-BERYLLIUM-OXIDE-CORE CRITICAL EXPERIMENT
 REPORT NUMBER.... UCRL-6673
 DATE PUBLISHED ... 61-10-27
 NSA-NUMBER 17:3960
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

ABSTRACT

A HIGH-TEMPERATURE CRITICAL EXPERIMENT INVOLVING A URANIUM-235-BERYLLIUM OXIDE CORE AND A COOLED GRAPHITE REFLECTOR HAS BEEN PERFORMED IN THE HOT BOX HIGH-TEMPERATURE CRITICAL FACILITY. THE INFLUENCE OF CORE AND REFLECTOR TEMPERATURES UPON REACTIVITY AND POWER DISTRIBUTION WAS EXAMINED. FOR A CORE WITH A GROSS BERYLLIUM OXIDE / URANIUM-235 RATIO OF 556/1 AND WITH THICK GRAPHITE SLABS ON TWO SIDES, THE REACTIVITY SHOWED NO DEPENDENCE ON THE REFLECTOR TEMPERATURE SUFFICIENT TO BE DISTINGUISHED FROM EXPERIMENTAL UNCERTAINTIES. A GROSS TEMPERATURE COEFFICIENT OF REACTIVITY, BASED ON CORE TEMPERATURE, OF ABOUT $-0.30/100$ DEGREES F WAS OBSERVED. THE POWER DENSITY AT THE EDGE OF THE CORE (ADJACENT TO THE COOLED REFLECTOR) DEGRADED BY ONLY 5 PERCENT, FOR THE SAME TOTAL POWER, AS THE CORE WAS HEATED FROM ROOM TEMPERATURE TO 1200 DEGREES F WITH THE REFLECTOR KEPT AT 200 DEGREES F. (AUTH).

61 ID-NUMBER ID-NUMBER 61

AUTHOR REYNOLDS, H. L.
 TITLE CRITICAL MEASUREMENTS AND CALCULATIONS FOR ENRICHED-URANIUM GRAPHITE-MODERATED SYSTEMS
 REPORT NUMBER.... UCRL-5175
 DATE PUBLISHED ... 58-03-31
 NSA-NUMBER 12:15123
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

ALTHOUGH NATURAL URANIUM, GRAPHITE-MODERATED SYSTEMS HAVE RECEIVED EXTENSIVE TREATMENT IN THE PAST, LITTLE CONSIDERATION HAS BEEN GIVEN TO ENRICHED-URANIUM, GRAPHITE-MODERATED SYSTEMS. ZIMMERMAN HAS REPORTED CRITICAL MEASUREMENTS ON A SINGLE ENRICHED-URANIUM, GRAPHITE-MODERATED, GRAPHITE-REFLECTED SYSTEM. THIS PAPER PRESENTS THE EXPERIMENTAL RESULTS OF THE ABOVE LABORATORIES ON A VARIETY OF ENRICHED-URANIUM, GRAPHITE-MODERATED SYSTEMS, BOTH WITH AND WITHOUT REFLECTORS. ALSO INCLUDED ARE THE RESULTS OF THE MULTIGROUP TRANSPORT, AND ONE- AND TWO-DIMENSIONAL DIFFUSION CALCULATIONS USED TO INTERPRET THE DATA.

IN GENERAL THE UCRL SYSTEMS WERE BARE OR ONE-DIMENSIONAL IN ORDER TO SIMPLIFY THE ANALYSIS. EFFORTS WERE MADE TO OBTAIN SYSTEMS AS CLOSE AS POSSIBLE TO AN IDEALIZED SYSTEM CONTAINING ONLY A HOMOGENEOUS MIXTURE OF MODERATOR AND FUEL WITH ALL EXTRANEOUS FACTORS REMOVED. THE LASL EXPERIMENTS WERE CARRIED OUT WITH MORE COMPLEX GEOMETRIES APPROACHING MORE CLOSELY POTENTIAL REACTOR SYSTEMS. ALL OF THE ASSEMBLIES UTILIZED HETEROGENEOUS ARRANGEMENTS OF MODERATOR AND THIN URANIUM FOILS.

THE BARE SYSTEMS RANGE IN CARBON-TO-URANIUM ATOMIC RATIOS (CARBON/URANIUM) FROM 300/1 TO 2500/1. THESE SYSTEMS ARE NOT TRULY THERMAL AND ARE IN A RANGE WHERE CRITICAL MASS IS EXTREMELY SENSITIVE TO SIZE OR BUCKLING. EXPERIMENTS WERE PERFORMED FOR THESE SYSTEMS TO DETERMINE ACCURATELY THE EFFECTS OF EXTRANEOUS FACTORS SUCH AS ROOM RETURN, CONTROL-ROD VOID SPACES, NONHOMOGENEITY OF FUEL LOADING, MODERATOR BLOCK POROSITIES AND POISON CONTENT. THE REFLECTORS INCLUDE GRAPHITE AND BERYLLIUM IN ONE-, TWO-, AND THREE-DIMENSIONAL ARRANGEMENTS.

THE CONSTANTS USED IN THE MULTIGROUP CALCULATIONS ARE PRESENTED IN TABULAR FORM. EIGHTEEN ENERGY GROUPS WERE USED. THE SAME CONSTANTS WERE USED IN THE TRANSPORT AND DIFFUSION CALCULATIONS TO ALLOW COMPARISON OF THE TWO METHODS OF CALCULATION. (AUTH).

62 ID-NUMBER ID-NUMBER 62

AUTHOR PIOWATY, J. M./ MORTON, J. R./ GARDNER, L. L.
 TITLE COUPLING EFFECTS OF HAFNIUM CONTROL RODS IN A NEAR-HOMOGENEOUS, BERYLLIUM-OXIDE-MODERATED, ORALLOY-FUELED SYSTEM
 REPORT NUMBER.... UCRL-7262
 DATE PUBLISHED ... 63-02-27
 NSA-NUMBER 17:20826
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

TWO SERIES OF MEASUREMENTS WERE MADE TO EXAMINE THE COUPLING EFFECTS OF HAFNIUM CONTROL RODS. FROM TWO TO FIVE RODS WERE USED. THESE MEASUREMENTS WERE PERFORMED ON A BERYLLIUM-OXIDE-MODERATED, URANIUM-235-FUELED SYSTEM WITH A BERYLLIUM/URANIUM-235 MOLAR RATIO OF 247. THE PULSED NEUTRON TECHNIQUE WAS USED. (AUTH).

63 ID-NUMBER ID-NUMBER 63

AUTHOR DONALDSON, R. E./ BROWN, W. K.
 TITLE CRITICAL-MASS DETERMINATIONS OF LEAD-REFLECTED SYSTEMS
 REPORT NUMBER..... UCRL-5255
 DATE PUBLISHED ... 58-06-09
 NSA-NUMBER 13:2087
 SITE/PROGRAM LIVERMORE - URANIUM(93%) METAL

ABSTRACT

A SERIES OF EXPERIMENTALLY DETERMINED CRITICAL MASSES OF CYLINDRICAL AND SPHERICAL LEAD- REFLECTED ORALLOY SYSTEMS ARE PRESENTED. CRITICAL MASSES ARE GIVEN FOR TWO ORALLOY CORE SIZES IN BOTH CASES AND ALSO FOR REFLECTED AND UNREFLECTED ENDS IN THE CYLINDRICAL CASE. EXPERIMENTAL METHODS ARE DESCRIBED AND A PHOTOGRAPH OF THE ASSEMBLY MACHINE IS INCLUDED. (AUTH).

64 ID-NUMBER ID-NUMBER 64

AUTHOR BARTON, D. M./ BERNARD, W./ HANSEN, G. E.
 TITLE CRITICAL MASSES OF COMPOSITES OF ORALLOY AND PLUTONIUM-239-PLUTONIUM-240
 IN FLATTOP GEOMETRY
 REPORT NUMBER..... LAMS-2489
 DATE PUBLISHED ... 61-04-12
 NSA-NUMBER 15:16407
 SITE/PROGRAM LOS ALAMOS - PLUTONIUM METAL SPHERES

ABSTRACT

THREE CRITICAL PLUTONIUM-ENRICHED URANIUM COMPOSITES WITH PLUTONIUM OF DIFFERENT PLUTONIUM-240 CONTENT ARE DESCRIBED. IN THESE SYSTEMS ONE GRAM OF PLUTONIUM-240 IS EQUIVALENT TO ABOUT 0.63 GRAMS OF PLUTONIUM-239 AND THE ANALYSIS IS PRESENTED WHICH TRANSLATES THIS DATUM TO (NU-BAR) (PLUTONIUM- 240, 2 MEV) = 3.32 +/- 0.14 NEUTRONS EMITTED PER PLUTONIUM-240 FISSION INDUCED BY A 2 MEV NEUTRON. (AUTH).

65 ID-NUMBER ID-NUMBER 65

AUTHOR BOULY, J. C./ CAIZERGUES, R./ DEILGAT, E./ HOUELLE, M./ LECORCHE, P.
 TITLE CRITICAL EXPERIMENTS WITH HOMOGENEOUS SOLUTIONS OF PLUTONIUM -
 EXPERIMENTAL RESULTS - THEORETICAL INTERPRETATIONS
 REPORT NUMBER..... CEA-R-3367
 DATE PUBLISHED ... 67-12-00
 NSA-NUMBER 22:25078
 SITE/PROGRAM FRANCE - PLUTONIUM AND URANIUM SOLUTIONS

ABSTRACT

SUMMARY: THIS REPORT GROUPS TOGETHER A SERIES OF EXPERIMENTAL AND THEORETICAL STUDIES ON CYLINDERS AND PLATES OF SOLUTION TRIED OUT AT THE VALDUC CENTRE.

- A) COMPARISON OF THE THEORETICAL AND EXPERIMENTAL RESULTS OBTAINED ON CRITICAL HEIGHTS OF SOLUTIONS.
- B) STUDY OF THE EFFECT OF NITROGEN, INTRODUCED IN THE FORM OF THE NITRATE ION, ON THE REACTIVITY OF FISSION MEDIA.
- C) STUDY OF THE EFFECT OF PLUTONIUM-240 ON THE REACTIVITY OF THESE MEDIA. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

66 ID-NUMBER ID-NUMBER 66

AUTHOR HARRISON, J. R./ SMITH, M. F./ CLARKE, W. G./ MILLS, A. M./ DYSON, J. A.
 TITLE CRITICAL ASSEMBLIES WITH HEAVY WATER SOLUTIONS OF URANYL FLUORIDE (H.A.Z.E. L.) - PART-2, PHYSICS
 REPORT NUMBER.... AERE-R/R-2703
 DATE PUBLISHED ... 58-11-00
 NSA-NUMBER 13:16103
 SITE/PROGRAM UNITED KINGDOM, HARWELL - URANYL(46%)FLUORIDE IN HEAVY WATER

ABSTRACT

DETAILS ARE GIVEN OF A SERIES OF CRITICAL ASSEMBLIES AND FLUX MEASUREMENTS UNDERTAKEN IN H.A.Z. E.L. USING 46 PERCENT URANIUM-235 AS URANIUM DIOXIDE DIFLUORIDE IN HEAVY WATER IN CYLINDRICAL GEOMETRY. THE FISSILE CONCENTRATIONS INVESTIGATED WERE IN THE RANGE 1939 - 6722 DEUTERIUM/URANIUM(FLUORIDE), AND IN THE GEOMETRY CONSIDERED (2 FOOT DIAMETER STEEL CYLINDER), THE CRITICAL HEIGHTS WERE IN THE RANGE 70 - 200 CM. THE MINIMUM CRITICAL MASS WAS 1.768 KM OF URANIUM-235 OCCURRING AT A CONCENTRATION OF 4687 DEUTERIUM/URANIUM(FLUORIDE).

PART-I OF THIS REPORT A.E.R.E. CE/R-2624 GIVES FULL DETAILS OF THE FUEL SYSTEM AND PART III A. E.R.E. R/R 2731 IS A THEORETICAL ANALYSIS OF THE RESULTS. (AUTH).

67 ID-NUMBER ID-NUMBER 67

AUTHOR CARTER, C./ LANG, P. K. H./ MYATT, G.
 TITLE CRITICAL ASSEMBLIES WITH HEAVY WATER SOLUTIONS OF URANYL FLUORIDE (H.A.Z.E. L.) - PART-3, THEORETICAL ANALYSIS
 REPORT NUMBER.... AERE-R/R-2731
 DATE PUBLISHED ... 59-07-00
 NSA-NUMBER 14:810
 SITE/PROGRAM UNITED KINGDOM, HARWELL - URANYL(46%)FLUORIDE IN HEAVY WATER

ABSTRACT

MULTIGROUP DIFFUSION THEORY HAS BEEN USED TO ANALYSE THE CRITICAL SIZE AND NEUTRON FLUX MEASUREMENTS OBTAINED WITH URANYL FLUORIDE - HEAVY WATER HOMOGENEOUS CRITICAL ASSEMBLIES. IT IS FOUND THAT TWO GROUP THEORY IS INADEQUATE TO EXPLAIN THE EXPERIMENTAL DATA, BUT A REASONABLY GOOD CORRELATION CAN BE MADE WITH A SIX GROUP THEORY. ALTERNATIVELY, TWO GROUP THEORY CAN BE ADJUSTED TO FIT THE DATA BY USING AN ARTIFICIALLY HIGH SLOWING DOWN AREA FOR HEAVY WATER. (AUTH).

68 ID-NUMBER ID-NUMBER 68

AUTHOR SCHWAGER, J. E./ KLOVERSTROM, F. A./ GILBERT, W. S.
 TITLE CRITICAL MEASUREMENTS ON INTERMEDIATE-ENERGY GRAPHITE-URANIUM-235 SYSTEMS
 REPORT NUMBER.... UCRL-5006
 DATE PUBLISHED ... 57-11-15
 NSA-NUMBER 12:11005
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

A SYSTEM FOR THE MEASUREMENT OF NEAR-HOMOGENEOUS CARBON-URANIUM-235 CRITICAL MASSES IS DESCRIBED. CORES ARE CONSTRUCTED WITH THIN, ENRICHED-URANIUM FOILS SPACED BETWEEN GRAPHITE BLOCKS. FUEL DENSITY IS VARIABLE BY USE OF DIFFERENT FOIL THICKNESSES AND SPACINGS. REACTIVITY IS CONTROLLED BY BORON RODS. STANDARD REACTOR INSTRUMENTATION PERMITS CRITICAL OPERATION AT LOW POWER. RESULTS OF CRITICAL MEASUREMENTS ON UNREFLECTED SYSTEMS HAVING ATOMIC CARBON/URANIUM-235 RATIOS OF 670, 1380, AND 2590 ARE GIVEN. THIN REFLECTORS OF GRAPHITE AND BERYLLIUM WERE ALSO USED. CORRECTIONS FOR SELF-SHIELDING IN THE FUEL FOILS AND SYSTEMATIC ERRORS ARE DESCRIBED. (AUTH).

69 ID-NUMBER ID-NUMBER 69

AUTHOR KIRSCHBAUM, A. J.
 TITLE STUDIES OF ENRICHED URANIUM GRAPHITE REACTOR SYSTEMS
 REPORT NUMBER.... UCRL-4983-T
 DATE PUBLISHED ... 57-11-01
 NSA-NUMBER 13:3973
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THIS PAPER PRESENTS THE RESULTS TO DATE OF A BASIC NEUTRONIC STUDIES PROGRAM AT UCRL ON ENRICHED URANIUM GRAPHITE MODERATED REACTOR SYSTEMS. THE PURPOSE OF THIS PROGRAM IS TWOFOLD. FIRST TO SUPPLY VALID CRITICAL DATA TO BE USED IN NORMALIZING SEVERAL MULTIGROUP CODES THAT ARE BEING DEVELOPED ON THE COMPUTING MACHINES AT LIVERMORE. SECOND, TO DEVELOP ADDITIONAL EXPERIMENTAL TECHNIQUES THAT WILL SUPPLY DATA FOR FURTHER CHECKS ON THE ACCURACY OF THE CALCULATIONAL TECHNIQUES. PULSED SOURCE MEASUREMENTS APPEAR TO PROVIDE MUCH ADDITIONAL DATA USEFUL IN CODE CHECKING AND IN EVALUATING AND UNDERSTANDING THE NEUTRONICS OF A REACTOR CORE.

THIS PAPER WILL PRESENT THE CRITICAL MASS AND TIME BEHAVIOR RAW DATA. THE RESULTS OF CHECKS FOR SYSTEMATIC ERRORS, THE REDUCTION OF SOME OF THE DATA TO CORRESPOND TO AN IDEALIZED SYSTEM, AND COMPARISON OF THE DATA WITH A NAIVE BUT SIMPLE THEORY WILL BE GIVEN. MOST OF THE DATA IS FOR BARE SYSTEMS, HOWEVER, THE RAW DATA FOR SEVERAL CARBON AND BERYLLIUM REFLECTED SYSTEMS IS GIVEN ALSO. (AUTH).

70 ID-NUMBER ID-NUMBER 70

AUTHOR CAROTHERS, J. E.

TITLE CRITICAL MASS MEASUREMENTS ON GRAPHITE URANIUM-235 SYSTEMS

REPORT NUMBER..... UCRL-4880

DATE PUBLISHED ... 57-04-11

NSA-NUMBER 11:10293

SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

MEASUREMENTS HAVE BEEN MADE ON PSEUDO-CYLINDRICAL GRAPHITE-ENRICHED URANIUM UNREFLECTED SYSTEMS. THESE MEASUREMENTS INCLUDE BOTH CRITICAL MASS DETERMINATIONS AND TIME DEPENDENT MEASUREMENTS USING A PULSED NEUTRON SOURCE TO DRIVE THE ASSEMBLIES. (AUTH).

71 ID-NUMBER ID-NUMBER 71

AUTHOR CALLIHAN, A. D./ CRONIN, D. F./ FOX, J. K./ MORFITT, J. W.

TITLE CRITICAL MASS STUDIES, PART-5

REPORT NUMBER..... K-0643

DATE PUBLISHED ... 50-06-30

NSA-NUMBER 11:11007

SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

AN INVESTIGATION HAS BEEN MADE OF THE CONDITIONS UNDER WHICH AQUEOUS SOLUTIONS OF ENRICHED URANYL NITRATE BECOME CRITICAL IN RIGHT CYLINDRICAL REACTORS.

A COMPARISON WAS MADE OF THE NEUTRON REFLECTIVITY OF STAINLESS STEEL BISMUTH SUBCARBONATE BOTH DRY AND AS A WATER SLURRY, AQUEOUS SOLUTIONS OF NATURAL URANYL NITRATE AND PHOSPHORIC ACID. THE MATERIALS TESTED, WITH THE EXCEPTION OF DRY BISMUTH SUBCARBONATE, WERE ABOUT AS EFFECTIVE REFLECTORS AS WATER. DRY BISMUTH SUBCARBONATE WAS CONSIDERABLY LESS EFFECTIVE.

THE FREE NITROGEN CONTENT OF THE NITRATE SOLUTION AND THE ADDITION OF PHOSPHORIC ACID AND METALLIC BISMUTH TO THE REACTOR CORE WERE AMONG THE VARIABLES STUDIED. NITRIC AND PHOSPHORIC ACID WHEN INTRODUCED INTO THE CORE MATERIAL WERE EFFECTIVELY MILD POISONS WHEN COMPARED WITH AQUEOUS SOLUTIONS AT THE SAME HYDROGEN TO URANIUM-235 RATIO. BISMUTH WAS INTRODUCED INTO THE CORE AS AN ARRAY OF ALUMINUM CLAD BISMUTH RODS. THE CRITICAL MASS OF THIS ARRAY WAS ONLY SLIGHTLY LESS THAN THAT MEASURED WHEN THE BISMUTH WAS REPLACED BY A SIMILAR ARRAY OF VOIDS. (AUTH).

72 ID-NUMBER ID-NUMBER 72

AUTHOR LANE, R. C.

TITLE MEASUREMENTS OF THE CRITICAL PARAMETERS OF UNDERMODERATED URANIUM-HYDROGEN MIXTURES AT INTERMEDIATE ENRICHMENTS

REPORT NUMBER..... IAEA-STOCK.-1965, 177-191

CONFERENCE SYMPOSIUM ON CRITICALITY CONTROL OF FISSILE MATERIALS HELD BY THE INTERNATIONAL ATOMIC ENERGY AGENCY AT STOCKHOLM, 1-5 NOVEMBER 1965

DATE PUBLISHED ... 65-11-00

NSA-NUMBER 20:35687

SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - URANIUM(30,37.5,46%) METAL

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE CRITICAL SIZE OF INTIMATE MIXTURES OF 30 PERCENT ENRICHED URANIUM OXIDE AND WAX WITH HYDROGEN/URANIUM-235 IN THE RANGE 8 TO 80 AND OF 37.5 PERCENT ENRICHED URANIUM METAL, AS USED IN ZEBRA, WERE ESTIMATED BY EXTRAPOLATION FROM HIGH MULTIPLICATION ASSEMBLIES. THE CORES WERE CONSTRUCTED IN RECTANGULAR GEOMETRY FROM SMALL BLOCKS TO FACILITATE STACKING CHANGES. REFLECTORS INCLUDED POLYETHYLENE, PERSPEX, CONCRETE AND WOOD. THE EFFECT OF OTHER REFLECTORS WAS ESTIMATED BY REPLACEMENT OF ONE FACE OF AN OTHERWISE POLYETHYLENE-REFLECTED NEAR-CUBE BY THE MATERIAL OF INTEREST. EVIDENCE IS GIVEN THAT CRITICAL MASSES DERIVED BY THIS METHOD ARE CORRECT TO WITHIN 5 PERCENT, EVEN WHEN THE SPECTRUM OF NEUTRONS RETURNED TO THE CORE FROM THE REPLACEMENT FACE IS MARKEDLY DIFFERENT FROM THE REMAINDER OF THE REFLECTOR. DENSITY EXPONENTS WERE ESTIMATED FROM MEASUREMENTS WITH LOW DENSITY BLOCKS, AND ONE CARBON DILUTION EXPONENT IS REPORTED. THE CRITICAL SIZE OF HALF-REFLECTED CORES IS OF INTEREST TO THE CRITICALITY ASSESSOR. THE PARAMETERS OBTAINED FROM A NEAR-CUBE AND A LONG PIPE SUGGEST THAT THEIR DIMENSIONS ARE THE ARITHMETIC MEAN OF THOSE OF BARE AND COMPLETELY REFLECTED CORES OF THE SAME SHAPE. THE NEUTRON INTERACTION BETWEEN PARTIALLY REFLECTED CORES CAN BE GREATER THAN THAT FOR THE UNIFORMLY REFLECTED CASE. TO CHECK THE MAGNITUDE OF THIS EFFECT, TWO IDENTICAL CORES WERE REFLECTED ON ALL BUT THE ADJOINING FACES BY POLYETHYLENE, AND THEIR CRITICAL SEPARATION DETERMINED. THE MEASUREMENT WAS THEN REPEATED WITH THE CORES FULLY REFLECTED, OR WITH THE POLYETHYLENE FILLING ONLY THE SPACE BETWEEN THE REFLECTOR, LEAVING FREE SPACE BETWEEN THE CORES. CADMIUM SHEET IN CONJUNCTION WITH A MODERATOR IS COMMONLY USED AS A MEANS OF ABSORBING NEUTRONS IN TRANSPORT AND STORAGE APPLICATIONS. SELECTED ASSEMBLIES WERE BUILT WITH A LAYER OF CADMIUM SHEET BETWEEN CORE AND REFLECTOR TO ESTIMATE ITS EFFECT ON CRITICAL SIZE. (AUTH).

73 ID-NUMBER ID-NUMBER 73

AUTHOR MC TAGGART, M. H./ GOODFELLOW, H./ PATERSON, W. J./ WEALE, J. W.
 TITLE INTERIM REPORT ON URANIUM-FUELED VERA REACTOR EXPERIMENTS
 REPORT NUMBER.... AWRE-R5/66
 DATE PUBLISHED .. 66-07-00
 NSA-NUMBER 20:42671
 SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - VERA FAST REACTOR

ABSTRACT

THESE EXPERIMENTS FORM PART OF A SERIES DESIGNED TO OBTAIN INFORMATION AGAINST WHICH THE NUCLEAR DATA FOR URANIUM-235 AND URANIUM-238 CAN BE CHECKED OVER THE ENERGY RANGE 10 TO 500 KEV. SEVEN FAST REACTOR ASSEMBLIES ARE DESCRIBED. ALL THE CORES CONTAINED URANIUM-235 AND GRAPHITE, AND SOME ALSO CONTAINED URANIUM-238 AND HYDROGEN. DETAILED MEASUREMENTS WERE MADE ON FOUR OF THE ASSEMBLIES BUT FOR THE OTHER THREE ASSEMBLIES THE CRITICAL MASSES ONLY WERE MEASURED. COMPARISONS WITH CALCULATIONS ARE NOT INCLUDED EXCEPT WHERE THEY ARE NECESSARY TO CLARIFY THE EXPERIMENTAL RESULTS. (AUTH).

74 ID-NUMBER ID-NUMBER 74

AUTHOR HIROTA, J./ KATSURAGI, S./ KUROI, H./ KOINUMA, R./ ISHIGURO, Y.
 TITLE ANALYSIS OF THE ENRICHED-URANIUM HEAVY-WATER HOMOGENEOUS SYSTEM
 REPORT NUMBER.... ATOMIC ENERGY SOC. OF JAPAN, 5, 1, 14-22
 DATE PUBLISHED .. 63-00-00
 NSA-NUMBER 17:15431
 SITE/PROGRAM JAPAN - URANYL(20%)SULFIDE - HEAVY WATER

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS HAS BEEN CONDUCTED ON A SYSTEM IN WHICH HEAVY WATER SOLUTIONS OF URANYL-SULFATE WITH A URANIUM-235 ENRICHMENT OF ABOUT 20 PERCENT ARE SURROUNDED BY A HEAVY WATER REFLECTOR. THE DEUTERIUM TO URANIUM-235 ATOMIC RATIOS IN THE SOLUTIONS RANGED FROM 7,200 TO 1,600.

IN THEORETICAL ANALYSIS OF THE SYSTEM, LEAKAGE OF FAST NEUTRONS FROM THE CORE AND COMPETITION OF THE LEAKAGE WITH RESONANCE ABSORPTION IN THE CORE ARE RATHER IMPORTANT. THEREFORE, THE RESONANCE ESCAPE PROBABILITY WAS DEFINED RIGOROUSLY AND A MULTI-GROUP MODEL WAS APPLIED TO FAST AND EPITHERMAL NEUTRONS. THE GROUP CONSTANTS WERE DETERMINED BY AVERAGING OVER A SPECTRUM WHICH WAS CALCULATED BY THE GREULING-GOERTZEL APPROXIMATION.

THE AGREEMENT BETWEEN THE THEORETICAL AND EXPERIMENTAL RESULTS ARE SATISFACTORY EXCEPT THOSE FOR PERTURBATION TERMS. THE DISCREPANCIES IN THE EFFECTIVE MULTIPLICATION FACTORS DO NOT EXCEED 1 PERCENT. THE SPATIAL DISTRIBUTIONS OF THERMAL AND IN-RESONANCE NEUTRON FLUXES ARE WELL REPRODUCED BY THE PRESENT THEORY. AGREEMENT OF THE THEORETICAL CADMIUM RATIOS WITH EXPERIMENTAL VALUES INDICATED THAT THE EFFECTS DUE TO THE LEAKAGE OF FAST NEUTRONS FROM THE CORE ARE TREATED ADEQUATELY. (AUTH).

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

75 ID-NUMBER ID-NUMBER 75

AUTHOR MC ENHILL, J. J./ WEALE, J. W.
 TITLE INTEGRAL EXPERIMENTS ON FAST SYSTEMS OF PLUTONIUM, URANIUM AND THORIUM
 REPORT NUMBER.... IAEA-VIENNA-1961, 253-262
 DATE PUBLISHED ... 61-08-00
 NSA-NUMBER 16:26522
 SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - URANIUM(30,37.5,46%) METAL
 ABSTRACT

THE PAPER DESCRIBES TWO TYPES OF INTEGRAL EXPERIMENT WHICH HAVE BEEN UNDERTAKEN TO PROVIDE EXPERIMENTAL CHECKS ON NUCLEAR DATA AND METHODS OF CALCULATION.

THE FIRST CONSISTS OF A CYLINDRICAL ASSEMBLY OF MATERIAL WITH A POINT SOURCE OF DEUTERIUM- DEUTERIUM OR DEUTERIUM-TRITIUM NEUTRONS AT ITS CENTRE. THE NEUTRON FLUX AND VARIOUS REACTION RATES IN THE CYLINDER MATERIAL ARE MEASURED AS A FUNCTION OF POSITION. RESULTS OBTAINED ARE COMPARED WITH CALCULATION. EXPERIMENTAL RESULTS FOR NATURAL URANIUM AND THORIUM ARE PRESENTED.

THE SECOND TYPE OF EXPERIMENT IS A LOW-POWER EXPERIMENTAL REACTOR OF SIMPLE REGULAR GEOMETRY AND APPROXIMATELY HOMOGENEOUS COMPOSITION. HOLES CAN BE PROVIDED AS REQUIRED FOR THE INSERTION OF COUNTERS OR PERTURBATION SAMPLES. THE CORE COMPOSITION IS ADJUSTED BY THE ADDITION OF A MODERATOR TO PROVIDE A NEUTRON SPECTRUM WHICH TESTS THE NUCLEAR DATA IN THE ENERGY REGION OF INTEREST. MEASUREMENTS ARE MADE OF THE NEUTRON-ENERGY SPECTRUM AND VARIOUS REACTION RATES AND PERTURBATION CROSS-SECTIONS AS A FUNCTION OF POSITION IN THE REACTOR AND THE RESULTS ARE COMPARED WITH COMPUTER CALCULATIONS. RESULTS ARE PRESENTED FOR A SYSTEM CONSISTING OF A CORE OF URANIUM-235 AND GRAPHITE SURROUNDED BY A NATURAL-URANIUM REFLECTOR. (AUTH).

76 ID-NUMBER ID-NUMBER 76

AUTHOR FOX, J. K./ GILLEY, L. W.
 TITLE PRELIMINARY REPORT OF CRITICAL EXPERIMENTS IN SLAB GEOMETRY
 REPORT NUMBER.... ORNL-CF-56-7-148
 DATE PUBLISHED ... 56-07-30
 NSA-NUMBER 12:2070
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER
 ABSTRACT

THE CRITICAL PARAMETERS OF AQUEOUS URANIUM DIOXIDE DIFLUORIDE SOLUTIONS ENRICHED TO ABOUT 90 PERCENT IN URANIUM-235 IN VARIOUS ARRAYS OF INTERACTING SLAB GEOMETRIES HAVE BEEN DETERMINED FOR A SINGLE CONCENTRATION. SINCE THREE NOMINALLY 3-INCH-THICK ALUMINUM SLAB VESSELS AND ONE NOMINALLY 6- INCH-THICK ALUMINUM SLAB VESSEL WERE AVAILABLE, A NUMBER OF CONFIGURATIONS COULD BE ARRANGED FOR STUDY.

IN ONE GROUP OF EXPERIMENTS THE CRITICAL SOLUTION HEIGHT WAS DETERMINED AS A FUNCTION OF SIDE- TO-SIDE SEPARATION OF VARIOUS CONFIGURATIONS OF SLABS, BOTH BARE AND WATER-REFLECTED, EXCEPT FOR THE TOP, TO A HEIGHT EQUAL TO THE CRITICAL SOLUTION HEIGHT.

THE CRITICAL SOLUTION HEIGHT IN A NOMINALLY 6-INCH-THICK ALUMINUM SLAB WAS MEASURED AS A FUNCTION OF THE SEPARATION OF THE SLAB AND A 48 X 48 X 0.5-INCH-THICK STEEL PLATE. THE RESULTS OF THIS EXPERIMENT GAVE AN INDICATION OF THE EFFECTS ON THE CRITICAL HEIGHT BEING MEASURED OF THE WALLS OF THE 9.5-FOOT-DIA. STEEL TANK IN WHICH SOME OF THE EXPERIMENTS WERE PERFORMED.

IN ONE GROUP OF EXPERIMENTS, PLEXIGLAS WAS USED TO REPLACE THE FIRST INCH OF WATER REFLECTOR ON THE TWO OUTER SIDES OF TWO 3-INCH- THICK SLABS SEPARATED 4 INCH EDGE-TO-EDGE. PLEXIGLAS WAS ALSO USED TO REPLACE THE FIRST INCH OF WATER BETWEEN TWO 3-INCH THICK SLABS AT SEPARATIONS OF 2 AND 4 INCHES.

THE CRITICAL HEIGHTS OF A NOMINALLY 6-INCH-THICK ALUMINUM SLAB WERE USED AS THE SENSITIVE PARAMETERS IN MEASURING THE RELATIVE EFFECTIVENESS OF TWO COMMON INSULATING MATERIALS AS A NEUTRON REFLECTOR. THE CRITICAL HEIGHT WAS DETERMINED AS A FUNCTION OF THICKNESS OF INSULATION ON THE TWO FACES OF THE SLAB. (AUTH).

77 ID-NUMBER ID-NUMBER 77

AUTHOR GRAVES, G. A./ PAXTON, H. C.
 TITLE CRITICAL MASSES OF ORALLOY ASSEMBLIES
 REPORT NUMBER.... NUCLEONICS, 15, 090-092
 JOURNAL NUCLEONICS
 DATE PUBLISHED ... 57-06-00
 NSA-NUMBER 11:9185
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES ; LOS ALAMOS - URANIUM(93%) METAL

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

CYLINDERS

ABSTRACT

NUCLEAR-SAFETY DATA FROM CRITICAL EXPERIMENTS TELL THE EFFECTS OF REFLECTION, SHAPE, DENSITY, CONCENTRATION, AND DILUTION ON ENRICHED-URANIUM CONFIGURATION. ONE CAN ALSO DRAW SOME CONCLUSIONS CONCERNING PLUTONIUM AND URANIUM-233. (AUTH).

79 ID-NUMBER ID-NUMBER 79

AUTHOR CALLIHAN, A. D./ CRONIN, D. F./ FOX, J. K./ MACKLIN, R. L./ MORFITT, J. W.

TITLE CRITICAL MASS STUDIES, PART-4

REPORT NUMBER..... K-0406

DATE PUBLISHED ... 49-11-28

NSA-NUMBER 11:11006

SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

SOME EXPLORATORY EXPERIMENTS ARE REPORTED DESCRIBING THE CONDITIONS UNDER WHICH ENRICHED URANIUM, CONTAINED IN AQUEOUS SOLUTIONS OF URANYL FLUORIDE, BECOMES CRITICAL IN TWO RIGHT CYLINDRICAL REACTORS HAVING PARALLEL AXES. VALUES OF THE HEIGHT OF SOLUTION AND THE CRITICAL MASS HAVE BEEN OBTAINED FOR REACTORS WITH DIAMETERS RANGING FROM 5 TO 20 INCHES. DATA WERE OBTAINED AT FOUR CHEMICAL CONCENTRATIONS CORRESPONDING TO HYDROGEN/URANIUM-235 ATOMIC RATIOS VARYING BETWEEN 30 AND 330 AND WITH REACTOR SEPARATIONS UP TO 50 CM. IN SOME OF THE EXPERIMENTS, THE REACTORS WERE SUBMERGED IN A WATER BATH WHILE OTHERS WERE DONE WITH NO REFLECTOR.

THE CRITICAL MASS OF UNENCLOSED TWO REACTOR SYSTEM WAS FOUND TO DEPEND UPON THE DISTANCE BETWEEN THE COMPONENTS WHEN THEY WERE SEPARATED EVEN AS MUCH AS 50 CM. HOWEVER, THE MASS IN EACH WAS THEN MORE THAN 90 PERCENT OF THAT REQUIRED TO MAKE IT SINGLY CRITICAL.

INTERPOSITION OF WATER BETWEEN TWO REACTORS REDUCED THEIR INTERACTION DUE TO THE ATTENUATION OF THE NEUTRON FLUX BY HYDROGEN. TWO WATER ENCLOSED REACTORS WHICH COULD BE MADE SINGLY CRITICAL WHEN APPROXIMATELY EQUILATERAL WERE FOUND TO BE EFFECTIVELY ISOLATED WHEN SEPARATED 15 CM OR MORE. TWO, WHICH COULD NOT BE MADE INDIVIDUALLY CRITICAL, WERE ISOLATED BY A SEPARATION OF A FEW CENTIMETERS. THOSE WERE SINGLY CRITICAL AT HEIGHTS LARGE COMPARED TO THEIR DIAMETERS SHOWED APPARENT INTERACTION AT MORE THAN 20 CM SPACING. THE EFFECT IS ATTRIBUTED TO THE EQUIVALENCE OF A FEW INTERACTION NEUTRONS IN THE TWO COMPONENT SYSTEM AND THE RELATIVELY LARGE QUANTITY OF URANIUM WHICH MUST BE PLACED AT THE END OF LONG REACTORS TO PRODUCE SMALL INCREASES IN REACTIVITY.

THE SMALLEST MASS ACCUMULATED AT CRITICALITY IN THESE EXPERIMENTS WAS 680 GM URANIUM-235 CONTAINED IN EACH OF TWO WATER ENCLOSED REACTORS TEN INCHES IN DIAMETER WITH SIDES IN CONTACT, EACH FILLED TO A HEIGHT OF 16.9 CM. THE CHEMICAL CONCENTRATION OF THE FUEL CORRESPONDED TO AN HYDROGEN/URANIUM-235 ATOMIC RATIO OF 329. (AUTH).

80 ID-NUMBER ID-NUMBER 80

AUTHOR MC YEAN, R. L./ AMUNDSON, P. I./ BRUNSON, G. S./ GASIDLO, J. M.

TITLE CRITICAL STUDIES OF A SMALL URANIUM CARBIDE FUELED REACTOR WITH A BERYLLIUM REFLECTOR (ZPR-3 ASSEMBLY 40)

REPORT NUMBER..... ANL-6713

DATE PUBLISHED ... 63-04-00

NSA-NUMBER 17:29826

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

A SMALL, LIGHTWEIGHT, URANIUM CARBIDE FUELED REACTOR WITH A BERYLLIUM REFLECTOR SURROUNDING THE CORE WAS MOCKED UP AS ASSEMBLY 40. IT WAS DETERMINED THAT THE PRESENCE OF BERYLLIUM IN THE AXIAL AND RADIAL REFLECTORS DID NOT ENDANGER THE SAFE LOADING AND OPERATION OF THE CRITICAL ASSEMBLY.

THE ACTUAL EXPERIMENT CONSISTED OF DETERMINATION OF THE CRITICAL MASS, MEASUREMENT OF THE REACTIVITY COEFFICIENTS FOR A LARGE NUMBER OF FISSILE AND NONFISSILE MATERIALS, THE PERFORMANCE OF RADIAL AND AXIAL FISSION TRAVERSES, AND MEASUREMENT OF CENTRAL FISSION RATIOS. THE EFFECTIVENESS OF THE RADIAL BERYLLIUM REFLECTOR AS A CONTROL MECHANISM WAS DETERMINED AND THE ROSSI-ALPHA WAS MEASURED. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

81 ID-NUMBER ID-NUMBER 81

AUTHOR GEMMELL, W.
 TITLE A SERIES OF SIMPLE DILUTE FAST REACTOR ASSEMBLIES
 REPORT NUMBER..... TRG-301(D)
 DATE PUBLISHED ... 62-05-30
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

SOME SIMPLE ASSEMBLIES CONTAINING 9.3 PERCENT URANIUM-235 AND A SINGLE DILUENT HAVE BEEN STUDIED. THEIR EXPERIMENTAL PROPERTIES ARE TABULATED AND COMPARED.

A COMPARISON OF CALCULATED AND EXPERIMENTAL DETAIL ON THE BASIS OF THREE COMMONLY USED FAST REACTOR CROSS-SECTION SETS IS GIVEN. (AUTH).

82 ID-NUMBER ID-NUMBER 82

AUTHOR GASIDLO, J. M./ LONG, J. K./ MC VEAN, R. L.
 TITLE CRITICAL STUDIES OF A DILUTE FAST REACTOR CORE (ZPR-3 ASSEMBLY 31)
 REPORT NUMBER..... ANL-6338
 DATE PUBLISHED ... 61-10-00
 NSA-NUMBER 16:931
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

CRITICAL STUDIES WERE PERFORMED ON A DILUTE, METALLIC, FAST REACTOR CORE. THE FUEL WAS 38.6 PERCENT ENRICHED URANIUM AND REDUCED-DENSITY ALUMINUM WAS USED TO SIMULATE SODIUM COOLANT. THE MEASURED CRITICAL MASS WAS 463 KG OF URANIUM-235 IN A 425 LITER CORE. THE MAIN PART OF THE EXPERIMENTAL PROGRAM CONSISTED OF MEASUREMENTS OF THE STANDARD FISSION RATIOS, A NUMBER OF CENTRAL REACTIVITY COEFFICIENTS, AND THE PROMPT NEUTRON LIFETIME. AN ADDITIONAL SERIES OF EXPERIMENTS WAS PERFORMED TO OBTAIN THE WORTHS OF ALUMINUM, ALUMINUM OXIDE, AND SODIUM AT VARIOUS RADIAL POSITIONS IN THE CORE. (AUTH).

83 ID-NUMBER ID-NUMBER 83

AUTHOR AMUNDSON, P. I./ GEMMELL, W./ LONG, J. K./ MC VEAN, R. L.
 TITLE CRITICAL STUDIES OF URANIUM-STEEL AND URANIUM-STEEL-SODIUM FAST REACTOR CORES (ZPR-3 ASSEMBLIES 32 AND 33)
 REPORT NUMBER..... ANL-6690
 DATE PUBLISHED ... 63-02-00
 NSA-NUMBER 17:19551
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

THE REPORT DESCRIBES CRITICAL STUDIES OF TWO FAST REACTOR CORES: ONE CONTAINS URANIUM AND STEEL, THE OTHER CONTAINS URANIUM, STEEL, AND SODIUM. EXPERIMENTAL RESULTS ARE GIVEN FOR FISSION RATIO, CENTRAL AND EDGE REACTIVITY COEFFICIENTS, FUEL BUNCHING, AVERAGE PROMPT NEUTRON LIFETIME, AND DISTRIBUTED WORTH MEASUREMENTS. (AUTH).

84 ID-NUMBER ID-NUMBER 84

AUTHOR HANSEN, G. E./ HOOGERP, J. C./ ORNDOFF, J. D./ PAXTON, H. C.
 TITLE CRITICAL ASSEMBLIES OF GRAPHITE AND ENRICHED URANIUM WITH BERYLLIUM REFLECTORS
 REPORT NUMBER..... AECU-3604
 DATE PUBLISHED ... 57-11-12
 NSA-NUMBER 13:3975
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE

III. BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

COLLECTED IN THIS REPORT ARE DATA ON PROPERTIES OF THREE SETS OF CYLINDRICAL BERYLLIUM- REFLECTED, GRAPHITE-MODERATED CRITICAL ASSEMBLIES. THE FIRST SET WAS PRIMARILY TO ESTABLISH CHARACTERISTICS AS FUNCTIONS OF CARBON/ORALLOY ATOMIC RATIO OF CORE WITH NEARLY CONSTANT REFLECTOR THICKNESS. FISSION DISTRIBUTIONS WERE DETERMINED.

THE SECOND SET CONSISTED OF THREE ASSEMBLIES WITH FIXED CORE TO DETERMINE THE EFFECT OF REDISTRIBUTING REFLECTOR FROM THE ENDS TO THE CYLINDRICAL WALL. THIS SERIES WAS DONE TO PROVIDE THE LOS ALAMOS SCIENTIFIC LABORATORY'S THEORETICAL DIVISION CHECKS FOR A TWO-DIMENSIONAL DIFFUSION CODE. FLUX DISTRIBUTIONS IN THE UNIFORMLY-REFLECTED ASSEMBLY WERE MAPPED EXTENSIVELY WITH BARE AND CADMIUM-SHIELDED FOILS OF ORALLOY, GOLD, AND INDIUM.

THE THIRD SET WAS TO ESTABLISH THE MINIMUM-VOLUME CORE AT CARBON/ORALLOY EQUAL TO 350 THAT COULD BE MADE CRITICAL WITH AVAILABLE BERYLLIUM. EXPERIMENTAL CRITICAL DATA CONVERTED TO EQUIVALENT SPHERICAL SYSTEMS ARE COMPARED WITH RESULTS OF S4 CALCULATIONS. (AUTH).

85 ID-NUMBER ID-NUMBER 85

AUTHOR HUBER, R. J./ LONG, J. K./ MC VEAN, R. L./ GASIDLO, J. M.

TITLE CRITICAL STUDIES OF A DILUTE CARBIDE FAST REACTOR (CORE ZPR-3 ASSEMBLY 34)

REPORT NUMBER..... ANL-6401

DATE PUBLISHED ... 61-05-00

NSA-NUMBER 15:31489

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

CRITICAL STUDIES WERE MADE WITH A SIMULATED, LARGE, DILUTE POWER REACTOR HAVING URANIUM CARBIDE AS FUEL. THE URANIUM IN THE CORE WAS 30.7 PERCENT ENRICHED, AND THE ATOMIC RATIO OF URANIUM TO CARBON WAS 0.946. THE CRITICAL MASS WAS 503.01 KG URANIUM-235 AND THE CRITICAL VOLUME 574.47 LITERS. CENTRAL REACTIVITY COEFFICIENTS, EFFECTIVE FISSION CROSS-SECTION RATIOS, HETEROGENEITY EFFECTS, REACTIVITY WORTH OF DISTRIBUTED MATERIALS, FOIL IRRADIATIONS, AND THE AVERAGE PROMPT NEUTRON LIFETIME WERE MEASURED. MULTIGROUP CALCULATIONS USING THE YIFAH, OKRENT, AND MOLDAUER CROSS-SECTION SET OVERESTIMATE K FOR THE CRITICAL CONFIGURATION BY 4.7 PERCENT. (AUTH).

86 ID-NUMBER ID-NUMBER 86

AUTHOR AMUNDSON, P. I./ HESS, A. L./ KEENEY, W. P./ LONG, J. K./ MC VEAN, R. L.

TITLE CRITICAL STUDIES OF A DILUTE OXIDE FAST REACTOR CORE (ZPR-3 ASSEMBLY 30)

REPORT NUMBER..... ANL-6337

DATE PUBLISHED ... 61-05-00

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

THE REPORT DESCRIBES CRITICAL STUDIES OF A FAST REACTOR CORE CONTAINING A SIMULATED OXIDE FUEL HAVING AN OXYGEN/URANIUM ATOMIC RATIO OF 1/1. CALCULATED AND EXPERIMENTAL CRITICAL MASSES ARE COMPARED. EXPERIMENTAL RESULTS ARE GIVEN FOR FISSION RATIO, CENTRAL REACTIVITY COEFFICIENT, FUEL BUNCHING, AND DISTRIBUTED WORTH MEASUREMENTS. (AUTH).

87 ID-NUMBER ID-NUMBER 87

AUTHOR GWIN, R./ MEE, W. T.

TITLE CRITICAL ASSEMBLIES OF URANIUM METAL

REPORT NUMBER..... Y-1248

DATE PUBLISHED ... 59-03-26

NSA-NUMBER 13:15208

SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

DATA ON CRITICAL ASSEMBLIES OF FISSIONABLE URANIUM METALS ARE SUMMARIZED. EMPIRICAL STUDIES ARE MADE FOR SPECIFIC REFLECTORS AND GEOMETRIES TO DETERMINE THE FEASIBILITY OF EXTRAPOLATING THESE DATA FOR CONDITIONS CONCERNING NUCLEAR SAFETY PROBLEMS. ALSO INCLUDED ARE THE INFLUENCES ON CRITICAL SYSTEMS BY VARIOUS REFLECTORS, URANIUM-235 ISOTOPIC ENRICHMENT, DENSITY, AND SMALL METAL PIECES HOMOGENEOUSLY DISTRIBUTED IN WATER. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

88 ID-NUMBER ID-NUMBER 88

AUTHOR HANSEN, G. E./ WOOD, D. P.
 TITLE PRECISION CRITICAL-MASS DETERMINATIONS FOR ORALLOY AND PLUTONIUM IN
 SPHERICAL TUBALLOY TAMPERS
 REPORT NUMBER..... LA-1358
 DATE PUBLISHED ... 52-02-01
 NSA-NUMBER 18: 40213
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES ; LOS ALAMOS - PLUTONIUM METAL
 SPHERES

ABSTRACT

THIS REPORT GIVES THE RESULTS OF PRECISION DELAYED-CRITICAL-MASS MEASUREMENTS ON HIGH-DENSITY AND HIGH URANIUM-235 CONCENTRATION ORALLOY CORES CLOSE TAMPED IN SPHERICAL TUBALLOY SHELLS. THE SIX CRITICAL MASS POINTS OBTAINED ENABLE ONE TO PLOT A RELIABLE CRITICAL MASS, MC, VERSUS TUBALLOY TAMPER THICKNESS CURVE. THE RESULTS FOR ORALLOY (93.9 PERCENT), $\rho = 18.75$ GM/CC ARE: FOR TUBALLOY THICKNESSES OF 0, 0.695, 1.76, 3.525, 3.925, AND 9.0 INCHES THE ORALLOY CRITICAL MASS IS 51.9, 36.2, 26.5, 20.5, 19.75, AND 17.35 KG, RESPECTIVELY.

IN ADDITION, THE CRITICAL MASS, MC, OF PLUTONIUM IN A TUBALLOY TAMPER THICKNESS OF 4.603 INCHES WAS MEASURED AND FOUND TO BE ABOUT 6.28 KG. (AUTH).

89 ID-NUMBER ID-NUMBER 89

AUTHOR PAXTON, H. C./ GRAVES, G. A.
 TITLE CRITICAL MASSES OF FISSIONABLE METALS AS BASIC NUCLEAR SAFETY DATA
 REPORT NUMBER..... LA-1958
 DATE PUBLISHED ... 56-05-00
 NSA-NUMBER 12:1139
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES ; LOS ALAMOS - PLUTONIUM METAL
 SPHERES ; LOS ALAMOS - URANIUM-233 METAL SPHERES

ABSTRACT

DATA ON CRITICAL CONFIGURATIONS OF FISSIONABLE METALS ARE SUMMARIZED IN A FORM EMPHASIZING THE INFLUENCE OF CONDITIONS COMMONLY OF CONCERN IN NUCLEAR SAFETY QUESTIONS. ALTHOUGH THE BULK OF THE DATA IS DERIVED FROM EXPERIMENTS WITH URANIUM METAL ENRICHED, USUALLY TO ABOUT 90 WEIGHT PERCENT URANIUM-235, I.E., ORALLOY, THERE ARE ENOUGH DATA FOR PLUTONIUM AND URANIUM-233 TO ESTABLISH SOME GENERAL RELATIONS ABOUT THEIR CRITICALITY RELATIVE TO URANIUM. THE SPECIFIC INFORMATION INCLUDES THE INFLUENCES EXERTED UPON CRITICAL MASS BY VARIOUS REFLECTORS, BY SHAPE OF THE FISSIONABLE MATERIAL, BY VARIATIONS IN URANIUM-235 CONCENTRATION, BY VARIATIONS IN MATERIAL DENSITY, AND BY GRAPHITE AND HYDROGENOUS DILUENTS. (AUTH).

92 ID-NUMBER ID-NUMBER 92

AUTHOR HANSEN, G. E./ WOOD, D. P./ PENA, B.
 TITLE REFLECTOR SAVINGS OF MODERATING MATERIALS ON LARGE DIAMETER URANIUM SLABS,
 ENRICHED TO 93.2 PERCENT IN URANIUM-235
 REPORT NUMBER..... LAMS-2744
 DATE PUBLISHED ... 62-10-08
 NSA-NUMBER 16:32261
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL CYLINDERS

ABSTRACT

THIS REPORT COVERS CRITICAL MASS MEASUREMENTS OF 15.0 INCH AND 21.0 INCH DIAMETER URANIUM CYLINDERS, ENRICHED TO 93.2 PERCENT IN URANIUM-235, UNREFLECTED AND REFLECTED ON ONE AND/OR TWO FACES BY CARBON AND THE HYDROGENOUS MATERIALS WATER, POLYETHYLENE, PARAFFIN, AND LUCITE. (AUTH).

94 ID-NUMBER ID-NUMBER 94

AUTHOR SMITH, J. C./ ATKINSON, H./ MC TAGGART, M. H.
 TITLE THEORETICAL AND EXPERIMENTAL ANALYSIS OF REACTION RATE DISTRIBUTION IN THE
 DOUNREAY FAST REACTOR
 REPORT NUMBER..... TRG REPORT 1384(D)
 DATE PUBLISHED ... 66-10-00

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM: UNITED KINGDOM, DOUNREAY - DOUNREAY FAST REACTOR (DFR)

ABSTRACT

DURING INITIAL COMMISSIONING OF D.F.R. AN EXTENSIVE PROGRAMME OF PHYSICS MEASUREMENTS WAS CARRIED OUT AT LOW POWER, SUBSTANTIALLY CONFIRMING THE DESIGN PREDICTIONS. SINCE THAT TIME THE REACTOR HAS BEEN MODIFIED TO IMPROVE ITS PERFORMANCE AS AN IRRADIATION FACILITY, PRINCIPALLY BY INCREASING THE ENRICHMENT OF THE FUEL AND BY SUBSTITUTING NICKEL FOR NATURAL URANIUM IN THE BLANKET ADJACENT TO THE CORE. A SHORT PROGRAMME OF FLUX AND REACTION RATE MEASUREMENTS EARLY IN 1965 SHOWED SERIOUS DISCREPANCIES BETWEEN THEORETICAL PREDICTIONS AND EXPERIMENTAL OBSERVATION.

THE SUCCESS OF EARLIER THEORETICAL TREATMENT SUGGESTED THAT THE CAUSE OF THE FAILURE TO DEAL SATISFACTORILY WITH THE MODIFIED REACTOR MUST LIE IN INCORRECT DATA FOR NICKEL. AN EXTENSIVE PROGRAMME OF CALCULATIONS WAS UNDERTAKEN USING MORE UP-TO-DATE CROSS-SECTION SETS NOTABLY THE FD2 THIRTY-THREE GROUP SET BASED ON THE ALDERMASTON/WINFRITH DATA FILE AND THE RUSSIAN TWENTY-SIX GROUP SET OF ABAGYAN ET AL. THESE SHOWED CONSIDERABLY BETTER AGREEMENT THAN HAD BEEN OBTAINED WITH THE YOM SIXTEEN GROUP SET; BUT DISCREPANCIES BETWEEN THEORY AND EXPERIMENT STILL REMAINED.

AT THIS STAGE IT COULD NOT BE CLEARLY SEEN TO WHAT EXTENT THE DISCREPANCIES BETWEEN THEORY AND EXPERIMENT WERE DUE TO INADEQUACIES OF NUCLEAR DATA AND THE USE OF A DIFFUSION THEORY CODE OR TO THE NECESSARY GEOMETRICAL SIMPLIFICATIONS MADE IN ADAPTING A TWO-DIMENSIONAL CODE TO THE PROBLEM. IT WAS THEREFORE DECIDED TO CONSTRUCT ON THE VERA ASSEMBLY MACHINE AT A.W.R.E. ALDERMASTON AN ASSEMBLY WHICH WOULD APPROXIMATE TO D.F.R. IN SIZE, CRITICAL MASS AND SPECTRUM BUT WOULD BE FREE OF THE DETAILED GEOMETRICAL COMPLEXITIES OF D.F.R. AND WOULD AT THE SAME TIME ALLOW ACCESS FOR EXPERIMENTAL MEASUREMENT TO REGIONS WHERE THE CORRESPONDING POSITIONS IN D.F.R. WERE ONLY ACCESSIBLE TO RELATIVELY INACCURATE ACTIVATION TECHNIQUES.

AN ACCOUNT OF THE MEASUREMENTS MADE IN D.F.R. AND VERA IS PRESENTED AND THE THEORETICAL INTERPRETATION IS DISCUSSED. (AUTH).

95 ID-NUMBER ID-NUMBER 95

AUTHOR: RALSTON, H. R.

TITLE: CRITICAL MASSES OF SPHERICAL SYSTEMS OF ORALLOY REFLECTED IN BERYLLIUM

REPORT NUMBER....: UCRL-4975

DATE PUBLISHED ..: 57-10-10

NSA-NUMBER: 12:8226

SITE/PROGRAM: LIVERMORE - URANIUM(93%) METAL

ABSTRACT

THE CRITICAL THICKNESS OF BERYLLIUM REFLECTOR WAS DETERMINED FOR ORALLOY, I.E., URANIUM ENRICHED TO 93.17 PERCENT IN URANIUM-235, SPHERES RANGING FROM 10.765 KG TO 32.654 KG. FOUR POINTS WHICH WERE DETERMINED BY OTHER EXPERIMENTERS WERE NORMALIZED TO THE DATA AND ARE INCLUDED IN THE CURVES. (AUTH).

97 ID-NUMBER ID-NUMBER 97

AUTHOR: NEUER, J. J.

TITLE: CRITICAL ASSEMBLY OF URANIUM METAL AT AN AVERAGE URANIUM-235 CONCENTRATION OF 16-1/4 PERCENT

REPORT NUMBER....: LA-2085

DATE PUBLISHED ..: 57-01-28

NSA-NUMBER: 14:7987

SITE/PROGRAM: LOS ALAMOS - CYLINDERS OF MIXED DISKS OF URANIUM(93%) AND URANIUM(.75%)

ABSTRACT

A URANIUM METAL CRITICAL ASSEMBLY CONSISTED OF A 15 INCH DIAMETER CORE WITH AN AVERAGE URANIUM- 235 CONTENT OF 16.25 PERCENT, SURROUNDED BY A 3 INCH THICK NATURAL URANIUM REFLECTOR. THE CRITICAL MASS WAS 692 KG OF CORE MATERIAL. (AUTH).

98 ID-NUMBER ID-NUMBER 98

AUTHOR: HANSEN, G. E./ PAXTON, H. C./ WOOD, D. P.

TITLE: CRITICAL MASSES OF ORALLOY IN THIN REFLECTORS

REPORT NUMBER....: LA-2203

DATE PUBLISHED ..: 58-07-16

NSA-NUMBER: 12:12893

SITE/PROGRAM: LOS ALAMOS - URANIUM(93%) METAL SPHERES ; LOS ALAMOS - URANIUM(93%) METAL CYLINDERS

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

CRITICAL MASSES HAVE BEEN MEASURED FOR 5.25 INCH DIAMETER ORALLOY CYLINDERS IN 0.5 AND 1 INCH THICK REFLECTORS OF BERYLLIUM, GRAPHITE, MAGNESIUM, ALUMINUM, TITANIUM, MILD STEEL, COPPER, TUNGSTEN ALLOY, TUBALLOY, NICKEL, COBALT, MOLYBDENUM, ALUMINUM TRIOXIDE, MOLYBDENUM CARBIDE, AND POLYTHENE. THESE RESULTS HAVE BEEN CONVERTED TO THE EQUIVALENT SPHERICAL CRITICAL MASSES OF ORALLOY AND COMPARED TO YIELD CONSISTENT TRANSPORT CROSS SECTIONS FOR THE REFLECTOR MATERIALS.

IN ADDITION, CRITICAL MASSES OF ORALLOY SPHERES IN APPROXIMATELY 2 AND 4 INCH THICK SPHERICAL REFLECTORS OF TUNGSTEN ALLOY, IRON, NICKEL, NICKEL-SILVER, COPPER, ZINC, THORIUM, BERYLLIUM, BERYLLIUM OXIDE, CARBON, AND TUBALLOY HAVE BEEN DETERMINED. (AUTH).

99 ID-NUMBER ID-NUMBER 99

AUTHOR HORST, K. M.
 TITLE SOUTHWEST EXPERIMENTAL FAST OXIDE REACTOR DEVELOPMENT PROGRAM
 REPORT NUMBER..... GEAP-04594
 DATE PUBLISHED ... 64-07-00
 NSA-NUMBER 19:10540
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

THIS REPORT SUMMARIZES THE WORK CONDUCTED ON THE SEFOR RESEARCH AND DEVELOPMENT PROGRAM WHICH IS PERFORMED UNDER CONTRACT WITH THE UNITED STATES ATOMIC ENERGY COMMISSION. THE REPORT COVERS THE FIRST QUARTER OF WORK BEGINNING MARCH 25, 1964 AND ENDING JUNE 26, 1964.

SEFOR (SOUTHWEST EXPERIMENTAL FAST OXIDE REACTOR) IS A 20 MWT FAST SODIUM COOLED REACTOR WITH CHARACTERISTICS SIMILAR TO THE LARGE, SOFT-SPECTRUM FAST BREEDER REACTORS FUELED WITH MIXED PLUTONIUM DIOXIDE URANIUM-238 DIOXIDE, WHICH STUDIES INDICATE THE POTENTIAL FOR PRODUCING LOW COST POWER. SEFOR WILL BE USED TO OBTAIN PHYSICS AND ENGINEERING DATA AT FUEL COMPOSITIONS, TEMPERATURES, AND CRYSTALLINE STATES CHARACTERISTIC OF POWER REACTOR OPERATING CONDITIONS. SEFOR IS PARTICULARLY DESIGNED FOR THE SYSTEMATIC DETERMINATION OF THE DOPPLER COEFFICIENT OF REACTIVITY AT TEMPERATURES UP TO THE VICINITY OF FUEL MELTING.

THE SEFOR PROJECT CONSISTS OF TWO MAJOR PARTS: THE DESIGN AND CONSTRUCTION OF THE REACTOR FACILITY AND THE RELATED RESEARCH AND DEVELOPMENT PROGRAM. FUNDS FOR THE DESIGN AND CONSTRUCTION OF THE FACILITY ARE BEING PROVIDED BY THE SOUTHWEST ATOMIC ENERGY ASSOCIATES (A GROUP OF SEVENTEEN INVESTOR-OWNED UTILITY COMPANIES LOCATED IN THE SOUTH AND SOUTHWEST OF THE UNITED STATES), TOGETHER WITH THE KARLSRUHE LABORATORY OF WEST GERMANY, EURATOM AND THE GENERAL ELECTRIC COMPANY.

THE UNITED STATES ATOMIC ENERGY COMMISSION IS SUPPORTING THE RESEARCH AND DEVELOPMENT PROGRAM. THE RESEARCH AND DEVELOPMENT PROGRAM CONSISTS OF TWO PHASES:

PHASE-I - PRE-OPERATIONAL RESEARCH AND DEVELOPMENT.

PHASE-II - THE REACTOR TEST PROGRAM AFTER THE START OF REACTOR OPERATION.

PHASE-I WILL LAST APPROXIMATELY THREE YEARS. THIS REPORT DESCRIBES THE INITIAL WORK PERFORMED. (AUTH).

100 ID-NUMBER ID-NUMBER 100

AUTHOR KLÖVERSTROM, F. A./ DECK, R. M./ REYENGA, A. J.
 TITLE CRITICAL MEASUREMENTS ON NEAR-HOMOGENEOUS BERYLLIUM OXIDE-MODERATED, ORALLOY-FUELED SYSTEMS
 REPORT NUMBER..... UCRL-5369 PT.-1 REV.
 DATE PUBLISHED ... 59-07-01
 NSA-NUMBER 13:22212
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

ABSTRACT

A SERIES OF CRITICAL MEASUREMENTS ON UNREFLECTED SYSTEMS, FUELED BY THIN ORALLOY FOILS, IS DESCRIBED. FUEL DENSITY IS VARIED BY USE OF DIFFERENT FOIL THICKNESSES AND SPACINGS BETWEEN FOILS. FIVE FUEL DENSITIES HAVE BEEN USED WHICH CORRESPOND TO ATOMIC BERYLLIUM OXIDE / URANIUM-235 RATIOS FROM 246 TO 7660. FOR THREE OF THESE RATIOS, THE FUEL FOIL THICKNESS WAS VARIED TO FIND EFFECTS OF SELF-SHIELDING AND FLUX DEPRESSION ON THE CRITICAL DIMENSIONS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

101 ID-NUMBER ID-NUMBER 101

AUTHOR ZIMMERMAN, E. L.
 TITLE TWO BERYLLIUM-MODERATED CRITICAL ASSEMBLIES
 REPORT NUMBER..... ORNL-2201
 DATE PUBLISHED ... 58-10-20
 NSA-NUMBER 13:128
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) - BERYLLIUM

ABSTRACT

TWO UNREFLECTED CRITICAL ASSEMBLIES USING BERYLLIUM AS THE MODERATOR AND 93.4 PERCENT ENRICHED URANIUM METAL AS THE FUEL WERE BUILT TO PROVIDE A BASIS FOR THE EVALUATION OF CERTAIN REACTOR CALCULATIONAL PROCEDURES. CONTROL AND SAFETY RODS OF THE CORE-ELEMENT-REMOVAL TYPE WERE USED IN ORDER THAT THE FINAL ASSEMBLIES WOULD NOT BE COMPLICATED BY STRONG ABSORBER RODS. IN THE FIRST ASSEMBLY (CA-1), WHICH HAD OUTSIDE DIMENSIONS OF 21.0 X 21.0 X 23.3 INCH, THE 0.01-INCH-THICK URANIUM DISKS WERE SEPARATED BY 1-INCH-THICK BLOCKS OF BERYLLIUM, WHICH GAVE A BERYLLIUM/URANIUM-235 ATOMIC RATIO OF 390 AND A FUEL LOADING OF 18.08 KG OF URANIUM-235. THE EXTRAPOLATED VALUE OF K(EFF) FOR THE SYSTEM WAS 1.0054. IN THE SECOND ASSEMBLY (CA-18), WHICH HAD OUTSIDE DIMENSIONS OF 24.0 X 28.4 X 24.1 INCH, THE FUEL DISKS WERE SEPARATED BY 4-INCH-THICK BLOCKS OF BERYLLIUM, WHICH GAVE A BERYLLIUM/URANIUM-235 RATIO OF 1560 AND A FUEL LOADING OF 7.65 KG OF URANIUM-235. FOR THIS ASSEMBLY THE EXTRAPOLATED K(EFF) VALUE WAS 1.0020. THE OBSERVED URANIUM CADMIUM FRACTIONS IN THE TWO ASSEMBLIES WERE 0.46 AND 0.86, RESPECTIVELY.

A NUMBER OF MULTIGROUP CALCULATIONS WERE MADE TO EVALUATE THE EFFECTS OF VARIOUS CORRECTIONS AND ASSUMPTIONS. IT WAS CONCLUDED THAT THE CALCULATED NEUTRON MULTIPLICATION IS VERY SENSITIVE TO THE COMPETITION BETWEEN LEAKAGE AND SLOWING DOWN AT HIGH ENERGIES. A RANGE WHERE FUNDAMENTAL DATA ARE UNCERTAIN WITHOUT RESOLVING THE DETAILED NEUTRON BEHAVIORS IN THIS RANGE, A REASONABLE SELECTION OF DATA WITHIN EXPERIMENTAL UNCERTAINTIES WILL GIVE SATISFACTORY VALUES FOR SUCH QUANTITIES AS CRITICAL SIZE. (AUTH).

104 ID-NUMBER ID-NUMBER 104

AUTHOR FOX, J. K.
 TITLE COMPARISON OF ORNL CLEAN CRITICAL EXPERIMENTS WITH CALCULATIONS
 REPORT NUMBER..... IN-1120
 DATE PUBLISHED ... 67-09-00
 NSA-NUMBER 21:46944
 SITE/PROGRAM OAK RIDGE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES - CALCULATIONS

ABSTRACT

THE ACCURACY OF SEVERAL REACTOR CODES HAS BEEN DETERMINED FOR A VARIETY OF CRITICALITY PROBLEMS THAT ARE OF INTEREST IN CRITICALITY SAFETY. THIS WAS DONE BY COMPARISONS OF THE CALCULATIONS WITH DATA ON CLEAN CRITICAL EXPERIMENTS PERFORMED TO ORNL. ALL OF THE SYSTEMS STUDIED WERE MODERATED TO SOME DEGREE BY HYDROGEN. MOST OF THE COMPARISONS ARE WITH DATA ON HIGHLY ENRICHED URANIUM FUELED CORES, ALTHOUGH A FEW WERE WITH 2 TO 5 PERCENT ENRICHED FUELS. A FOUR-GROUP STRUCTURE WAS USED IN ALL CASES. TRANSPORT THEORY WAS USED ONLY FOR OBTAINING FLUX-WEIGHTED CROSS SECTIONS. THE TABULATED RESULTS INDICATE THAT WITH PROPERLY WEIGHTED CONSTANTS EIGENVALUE CALCULATIONS USING DIFFUSION THEORY AGREE WELL WITH EXPERIMENTS.

INTRODUCTION: IN ORDER TO EVALUATE AVAILABLE MACHINE CODES AT NRTS FOR THE SOLUTION OF CRITICALITY SAFETY PROBLEMS, A WIDE VARIETY OF COMPARISONS OF CALCULATED K(EFF) VALUES WITH ORNL CLEAN CRITICAL EXPERIMENTS HAS BEEN MADE. THE EXPERIMENTS USED FOR THESE COMPARISONS CAN BE DIVIDED INTO TWO GENERAL CLASSES: THOSE IN WHICH THE FUEL IS A HOMOGENEOUS SOLUTION AND THOSE IN WHICH THE FUEL IS IN THE FORM OF VARIOUS HETEROGENEOUS FUEL ELEMENTS. MOST OF THE COMPARISONS WERE MADE UTILIZING EXPERIMENTS IN WHICH THE FUEL WAS 93.2 PERCENT ENRICHED URANIUM-235. HOWEVER, EXPERIMENTS IN WHICH THE FUEL WAS 5.0 AND 2.0 PERCENT ENRICHED URANIUM-235 WERE ALSO USED. ONE EXPERIMENT IN WHICH THE FUEL WAS A SOLUTION OF URANIUM-233 WAS CALCULATED. THE EXPERIMENTS WERE ALL CONDUCTED AT ROOM TEMPERATURE. IN ALL OF THE EXPERIMENTS, REPORTED VALUES CORRESPOND TO CRITICAL SYSTEMS WITH ALL CONTROL RODS REMOVED.

FOR THE COMPARISONS WITH HOMOGENEOUS EXPERIMENTS, THE GEOMETRIES STUDIED INCLUDED SPHERES, CYLINDERS, AND SLABS. EXPERIMENTS WERE CHOSEN WITH SMALL, TRANSVERSE LEAKAGES IN MOST CASES. IN A NUMBER OF CASES, THE FUEL WAS IN THE FORM OF AN ANNULAR RING ABOUT A CENTRAL NONFUELED REGION. IN SOME CASES THE SYSTEMS WERE POISONED BY THE USE OF CADMIUM SHEETS. BOTH BARE AND WATER-REFLECTED EXPERIMENTS WERE CALCULATED TO EVALUATE HOW A GIVEN MODEL ACCOUNTS FOR THE REFLECTOR. THE SOLUTION EXPERIMENTS WERE USUALLY PERFORMED WITH RATHER CONCENTRATED FUEL (300 TO 400 GRAMS/LITER URANIUM-235); HOWEVER, IN SOME CASES MORE DILUTE FUELS WERE USED. FOR THE 2.0 PERCENT ENRICHED FUEL, A HOMOGENEOUS MIXTURE OF URANIUM TETRAFLUORIDE AND PARAFFIN WAX WAS REQUIRED TO OBTAIN A SUFFICIENT CONCENTRATION OF URANIUM-235. MOST OF THESE EXPERIMENTS WERE OF THE SINGLE BODY TYPE. HOWEVER, FOR THE EXPERIMENTS IN SLAB GEOMETRY, EXPERIMENTS WITH AS MANY AS THREE SLABS, PARALLEL IN WATER AT SEVERAL SEPARATION DISTANCES, WERE STUDIED IN ORDER TO EVALUATE INTERACTION EFFECTS ACROSS WATER GAPS.

THREE SERIES OF EXPERIMENTS USING 93-PERCENT-ENRICHED URANIUM FUEL ELEMENTS WERE CALCULATED. ELEMENTS 3 X 3 INCHES SQUARE WITH 24-INCH ACTIVE LENGTH WERE USED IN THE FIRST TWO SERIES OF COMPARISONS. IN THE FIRST SERIES, SPERT D ELEMENTS CONTAINING 307 GRAMS URANIUM-235 WERE USED; IN THE SECOND, BULK SHIELDING FACILITY, 168 GRAMS URANIUM-235 WERE USED. FOR A THIRD SERIES, TWO TYPES OF HTRE CIRCULAR ELEMENTS WERE USED. BOTH OF THESE CONTAINED MORE THAN ONE KILOGRAM OF URANIUM-235 PER ELEMENT IN ABOUT THE SAME VOLUME AS THE PREVIOUS ELEMENTS. THIS VERY HIGH LOADING IS DUE TO THE FACT THAT THE HTRE ELEMENTS WERE NOT DESIGNED TO OPERATE IN A WATER MODERATOR. IN THE SPERT D SERIES FOR SOME

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

EXPERIMENTS, VARYING AMOUNTS OF BORON WERE ADDED TO THE WATER WITH A SMALL AMOUNT OF URANYL NITRATE. IN THE HTRE SERIES, TWO CONCENTRATIONS OF URANYL NITRATE WERE ADDED TO A FEW EXPERIMENTS. IN EACH OF THESE SERIES OF EXPERIMENTS, THE CRITICAL NUMBER OF ELEMENTS IN SQUARE LATTICES AS A FUNCTION OF WATER GAP BETWEEN ELEMENTS WAS STUDIED. MOST OF THE ARRAYS WERE RECTANGULAR; HOWEVER, IN SOME CASES SINGLE AND MULTIPLE SLAB GEOMETRIES WERE UTILIZED IN ORDER TO STUDY GAP EFFECTS. (AUTH).

107 ID-NUMBER ID-NUMBER 107

AUTHOR MIHALCZO, J. T.
 TITLE REACTIVITY CALIBRATIONS AND FISSION-RATE DISTRIBUTIONS IN AN UNMODERATED, UNREFLECTED URANIUM-MOLYBDENUM ALLOY RESEARCH REACTOR
 REPORT NUMBER.... ORNL-TM-0189
 DATE PUBLISHED ... 62-05-10
 NSA-NUMBER 16:24949
 SITE/PROGRAM OAK RIDGE - ORNL FAST BURST REACTOR (FBR) - HEALTH PHYSICS RESEARCH REACTOR (HPRR)

ABSTRACT

ZERO-POWER CRITICAL EXPERIMENTS WITH AN UNMODERATED, UNREFLECTED RESEARCH REACTOR CONSTRUCTED OF 90 WEIGHT-PERCENT URANIUM (93.2 WEIGHT-PERCENT URANIUM-235 ENRICHED), 10 WEIGHT-PERCENT MOLYBDENUM ALLOY AND DESIGNED TO PRODUCE BURSTS OF FAST NEUTRONS HAVE BEEN COMPLETED. THE ASSEMBLY IS ESSENTIALLY OF 20.32-CM-DIA BY 23-CM-HIGH CYLINDER OF THE ALLOY AND CONTAINS 96.6 KG OF URANIUM- 235. THE REACTIVITY OF THE ASSEMBLY AND ITS MOVABLE PARTS HAVE BEEN CALIBRATED. THE TEMPERATURE COEFFICIENT OF REACTIVITY IS 0.31 CENTS/DEGREE CENTIGRADE. MEASURED FISSION-RATE DISTRIBUTIONS ARE COMPARED TO THOSE CALCULATED USING AN SN TRANSPORT THEORY CODE, TDC, IN THE S(4) APPROXIMATION. (AUTH).

108 ID-NUMBER ID-NUMBER 108

AUTHOR MC VEAN, R. L./ WEITZBERG, A./ KREMSER, J./ LERIDON, A. M./ LONG, J. K.
 TITLE CRITICAL STUDIES OF THE SOUTHWEST EXPERIMENTAL FAST OXIDE REACTOR (SEFOR) IN ZPR-3 (ASSEMBLY 47)
 REPORT NUMBER.... ANL-7248
 DATE PUBLISHED ... 67-03-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

ASSEMBLY 47 WAS AN ENGINEERING MOCKUP OF THE SOUTHWEST EXPERIMENTAL FAST OXIDE REACTOR (SEFOR) IN ZERO POWER REACTOR-3 (ZPR-3). THE CRITICAL-STUDIES PROGRAM IN ZPR-3 HAD SEVEN BASIC GOALS.

1. TO DETERMINE THE PLUTONIUM ENRICHMENT OF THE SEFOR FUEL.
2. TO VERIFY THE ADEQUACY OF THE REFLECTOR CONTROL STRENGTH.
3. TO DETERMINE THE REACTIVITY EFFECT OF A SIMULATED AXIAL THERMAL EXPANSION OF THE FUEL, SUCH AS WOULD OCCUR DURING A SEFOR TRANSIENT MEASUREMENT.
4. TO VERIFY THE EXISTENCE OF A NEGATIVE SEFOR DOPPLER COEFFICIENT.
5. TO DETERMINE THE REACTIVITY EFFECT OF THE LOSS OF SODIUM COOLANT.
6. TO CHECK THE ACCURACY OF THE PHYSICS MODEL OF SEFOR AND THE ACCURACY OF THE CALCULATIONAL TECHNIQUES EMPLOYED.
7. TO DETERMINE THE NEUTRON LIFETIME FOR THE SEFOR REACTOR.

BECAUSE OF THE DESIGN REQUIREMENT TO MINIMIZE THE EFFECTS OF AXIAL THERMAL EXPANSION, MEASUREMENTS WERE MADE IN THREE DIFFERENT CORE MOCKUPS. THE BASIC MEASUREMENTS WERE MADE IN THE ONE- SEGMENT, OR REFERENCE, CORE, AND SEVERAL OF THESE MEASUREMENTS WERE REPEATED IN MOCKUPS OF A TWO- SEGMENT FUEL-ELEMENT CORE LOADING AND A THREE-SEGMENT FUEL-ELEMENT CORE LOADING. (AUTH).

109 ID-NUMBER ID-NUMBER 109

AUTHOR SCHUSKE, C. L./ BELL, C. L./ BIDINGER, G. H./ SMITH, D. F.
 TITLE INDUSTRIAL CRITICALITY MEASUREMENTS ON ENRICHED URANIUM AND PLUTONIUM
 REPORT NUMBER.... RFP-0248
 DATE PUBLISHED ... 62-01-10
 NSA-NUMBER 16:9349
 SITE/PROGRAM ROCKY FLATS - PLUTONIUM METAL - SALT SYSTEMS ; ROCKY FLATS - URANIUM(93%)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

METAL - SPHERES ; ROCKY FLATS - SOLID UNITS IN FISSION SOLUTIONS

ABSTRACT

THIS REPORT CONTAINS A SERIES OF NEUTRON MULTIPLICATION MEASUREMENTS MADE ON SUB-CRITICAL SYSTEMS CONTAINING ENRICHED URANIUM AND PLUTONIUM.

THESE MEASUREMENTS INVOLVE BOTH AQUEOUS AND METAL SYSTEMS. (AUTH).

110 ID-NUMBER ID-NUMBER 110

AUTHOR THOMAS, J. T.

TITLE CRITICAL THREE-DIMENSIONAL ARRAYS OF NEUTRON-INTERACTING UNITS, PART-2 -
URANIUM METAL ENRICHED TO 93.2 PERCENT IN THE URANIUM-235 ISOTOPE

REPORT NUMBER..... ORNL-TM-0868

DATE PUBLISHED ... 64-07-00

NSA-NUMBER 18:30471

SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

CRITICALITY STUDIES WERE MADE OF THREE DIMENSIONAL ARRAYS OF URANIUM METAL CYLINDERS ENRICHED TO 93.2 WT PERCENT URANIUM-235. FOUR WEIGHT GROUPS OF UNITS, RANGING FROM 10.5 TO 26.2 KG OF URANIUM IN FIVE SIZES, WERE EMPLOYED TO DETERMINE THE CRITICAL SURFACE SEPARATION BETWEEN UNITS AS A FUNCTION OF THE NUMBER IN AN ARRAY. THE CRITICAL URANIUM DENSITY (THE RATIO OF THE MASS OF A UNIT TO THE VOLUME OF THE LATTICE CELL IT OCCUPIES IN A CRITICAL ARRAY) WAS OBSERVED TO DEPEND UPON A NUMBER OF FACTORS. CHANGES IN K(EFF) OF THE INDIVIDUAL UNITS, CAUSED BY ALTERING THEIR SHAPE, PRODUCED INVERSE CHANGES IN THE DENSITY, PROVIDED THE ARRAY SHAPE WAS UNCHANGED. THE DENSITY OF THE ARRAY VARIED WITH ITS SHAPE IN A MANNER SIMILAR TO THAT RESULTING FROM CORRESPONDING CHANGES IN A SINGLE CRITICAL UNIT. ADDITION OF AN HYDROGENOUS REFLECTOR REDUCED THE DENSITY OF THE ARRAY BY FACTORS MUCH GREATER THAN THOSE OBSERVED FOR SIMILAR REFLECTION OF A SINGLE CRITICAL UNIT. THE DENSITY WAS FOUND TO BE MINIMAL WHEN THE UNITS WERE SEPARATED BY AN HYDROGENOUS MODERATOR 4.9-CM THICK. THE SEPARATE EFFECTS OF MODERATION AND REFLECTION OF ARRAYS ARE NOT ADDITIVE. IN SEVERAL EXPERIMENTS IT WAS OBSERVED THAT AN ARRAY COMPRISED OF ONE HALF OF EACH OF TWO DIFFERENT CRITICAL ARRAYS WAS SUBCRITICAL. (AUTH).

111 ID-NUMBER ID-NUMBER 111

AUTHOR FOX, J. K./ GILLEY, L. W./ ROHRER, E. R.

TITLE CRITICAL MASS STUDIES, PART-8 AQUEOUS SOLUTIONS OF URANIUM-233

REPORT NUMBER..... ORNL-2143

DATE PUBLISHED ... 59-09-23

NSA-NUMBER 13:21043

SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

A SERIES OF EXPERIMENTS HAVE BEEN PERFORMED TO ESTABLISH THE CRITICAL PARAMETERS OF AQUEOUS SOLUTIONS OF URANYL NITRATE AND URANYL FLUORIDE IN WHICH THE URANIUM CONTAINED 98.7 PERCENT URANIUM-233. SOLUTIONS WERE MADE CRITICAL IN BOTH SPHERICAL AND CYLINDRICAL GEOMETRIES WITH PARAFFIN OR WATER AS A NEUTRON REFLECTOR AND, IN TWO INSTANCES, WITH NO REFLECTOR. THE URANIUM-233 CONCENTRATION VARIED FROM 30 TO 600 GRAMS/LITER. THE MINIMUM CRITICAL MASS OBSERVED WAS 590 GRAMS OF URANIUM-233 IN THE SOLUTION HAVING AN HYDROGEN/URANIUM-233 ATOMIC RATIO OF 419 OCCUPYING A 10.4- INCH-DIAMETER SPHERE. THE MINIMUM MEASURED VOLUME WAS 3.66 LITERS IN A 6.7-INCH EQUILATERAL CYLINDER CONTAINING A SOLUTION WITH AN HYDROGEN/URANIUM-233 ATOMIC RATIO OF 39.4. EXTRAPOLATED SOURCE NEUTRON MULTIPLICATION DATA INDICATE THAT A 5-INCH-DIAMETER CYLINDER CAN BE MADE CRITICAL IF REFLECTED, BUT A 4-INCH-DIAMETER CYLINDER WOULD BE SUBCRITICAL AT ALL MODERATIONS. IT WAS ALSO FOUND THAT 2.02 KG OF URANIUM-233 IN AN UNREFLECTED 10-INCH EQUILATERAL CYLINDER IS CRITICAL WITH A SOLUTION HAVING AN HYDROGEN/URANIUM-233 ATOMIC RATIO OF 154. AN UNREFLECTED SPHERE 12.6 INCH IN DIAMETER IS CRITICAL WITH 1.14 KG OF URANIUM-233 IN A SOLUTION WITH AN HYDROGEN/URANIUM-233 RATIO OF 381. EXTENSION OF THE DATA TO GEOMETRIES OTHER THAN THOSE USED EXPERIMENTALLY WAS MADE BY AN EMPIRICAL CALCULATION. (AUTH).

114 ID-NUMBER ID-NUMBER 114

AUTHOR GWIN, R./ MAGNUSON, D. W.

TITLE CRITICAL EXPERIMENTS FOR REACTOR PHYSICS STUDIES

REPORT NUMBER..... ORNL-CF-60-40-12

DATE PUBLISHED ... 60-09-16

NSA-NUMBER 14:26168

SITE/PROGRAM OAK RIDGE - URANIUM-233 SYSTEMS ; OAK RIDGE - URANYL(92%)SALTS - WATER

III. BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE THERMAL VALUE OF η -BAR FOR URANIUM-233 AND FOR URANIUM-235 HAS BEEN DETERMINED IN A SERIES OF EXPERIMENTS INVOLVING DIRECT COMPARISON OF THE CRITICAL PARAMETERS OF UNREFLECTED HOMOGENEOUS AQUEOUS SOLUTIONS OF THE TWO ISOTOPES. AUXILIARY EXPERIMENTS ESTABLISHING LIMITS OF ERROR, TESTING CERTAIN ASPECTS OF THE THEORETICAL MODEL EMPLOYED, AND EXPERIMENTALLY DETERMINING THE PARAMETERS IN THE CRITICAL EQUATION, HAVE BEEN PERFORMED. EXPERIMENTS PERFORMED WITH 27-INCH- DIAMETER AND 48-INCH-DIAMETER SPHERES, AND 5-FOOT-DIAMETER AND 9-FOOT-DIAMETER CYLINDERS HAVE YIELDED CONSISTENT VALUES OF η MEASUREMENTS OF THE NONLEAKAGE PROBABILITY IN CYLINDRICAL GEOMETRY HAVE GIVEN VALUES CONSISTENT WITH THOSE PREDICTED BY A TWO-GROUP MODEL IN WHICH THE THEORETICAL VALUE OF THE AGE WAS USED. WITHIN THE EXPERIMENTAL ERROR NO DIFFERENCES WERE FOUND IN THE AGES OF FISSION NEUTRONS FOR URANIUM-233 AND URANIUM-235.

THE AVERAGE THERMAL VALUES OF η DETERMINED ARE: η -BAR FOR URANIUM-233, 2.284 ± 0.015 AND η -BAR FOR URANIUM-235, 2.074 ± 0.015 . THE 2200 METERS/SECOND VALUES ARE THE SAME SINCE THE g - FACTORS FOR η ARE UNITY. (AUTH).

117 ID-NUMBER ID-NUMBER 117

AUTHOR KLOVERSTROM, F. A./ DECK, R. M./ REYENGA, A. J.

TITLE CRITICAL DIMENSIONS OF UNREFLECTED BERYLLIUM OXIDE SYSTEMS, FUELED BY THIN ORALLOY FOILS

REPORT NUMBER.... UCRL-5506

DATE PUBLISHED ... 59-03-03

NSA-NUMBER 13:17453

SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

ABSTRACT

A SERIES OF CRITICAL MEASUREMENTS ON UNREFLECTED PARALLELEPIPEDS BUILT OF ENRICHED (93.2 PERCENT) URANIUM FOILS AND BERYLLIUM OXIDE BLOCKS HAVE BEEN MADE FOR FIVE FUEL DENSITIES. THE OBJECT OF THIS PROGRAM WAS TO PROVIDE DATA FOR NORMALIZATION OF MACHINE CRITICALITY CALCULATIONS, AND THE SYSTEMS WERE THEREFORE MADE "CLEAN." THE ONLY MATERIAL PRESENT OTHER THAN BERYLLIUM OXIDE AND URANIUM IS A SMALL AMOUNT OF TEFLON (FOIL COATINGS) AND A STEEL DIAPHRAGM, THE EFFECT OF WHICH IS EXPERIMENTALLY DETERMINED.

THE ASSEMBLY MACHINE CONSISTS OF A HORIZONTAL 0.020-INCH STEEL DIAPHRAGM SUSPENDED ABOVE A VERTICALLY MOVING TABLE. THE MAJOR PORTION OF AN ASSEMBLY IS BUILT UP ON THE TABLE, THE REMAINDER ON THE DIAPHRAGM. THE TWO PARTS ARE ASSEMBLED REMOTELY BY LIFTING THE TABLE. DURING A MEASUREMENT, THE BASE DIMENSIONS OF A SYSTEM ARE FIXED. THE HEIGHT BEING THE VARIABLE. CRITICAL HEIGHTS ARE MEASURED BY EXTRAPOLATION OF INVERSE MULTIPLICATION CURVES. THE EFFECT OF THE DIAPHRAGM IS FOUND BY FINDING THE EFFECTS OF ADDITIONAL THICKNESSES OF STEEL; THESE ARE ESSENTIALLY EXTRAPOLATED TO ZERO DIAPHRAGM THICKNESS.

ORALLOY FOILS HAVING NOMINAL THICKNESSES OF 0.001 AND 0.002 INCH WERE USED. THESE WERE SANDWICHED BETWEEN 1-INCH THICK BERYLLIUM OXIDE BLOCKS, FORMING HORIZONTAL FOIL PLANES THROUGH THE SYSTEMS. OVERALL FUEL DENSITY IS VARIABLE BY CHANGING THE FOIL THICKNESS AND/OR SPACING. SEVERAL MEASUREMENTS HAVE BEEN MADE IN WHICH THE AVERAGE FUEL DENSITY IS KEPT CONSTANT WHILE THE FOIL THICKNESS IS CHANGED; THESE ARE INTENDED TO PROVIDE INFORMATION ON SELF-SHIELDING FLUX DEPRESSION EFFECTS.

THE THERMAL NEUTRON ABSORPTION CROSS SECTION PER BERYLLIUM OXIDE ATOM HAS BEEN FOUND TO BE 12 ± 2 MILLIBARN BY A PULSED NEUTRON SOURCE EXPERIMENT. THE RESULTS OBTAINED TO DATE ARE SUMMARIZED IN TABLE I. BERYLLIUM OXIDE/ URANIUM-235 REFERS TO THE RATIO OF THE NUMBERS OF BERYLLIUM OXIDE TO URANIUM-235 ATOMS ACTUALLY PRESENT IN THE ASSEMBLIES. THE BERYLLIUM OXIDE DENSITY IS 2.86 GRAMS/CUBIC CENTIMETER. CRITICAL HEIGHTS ARE ACCURATE TO WITHIN ± 0.2 INCH. (AUTH).

118 ID-NUMBER ID-NUMBER 118

AUTHOR KNAPP, W. G./ DOERNER, R. C.

TITLE PHYSICS MEASUREMENTS WITH MODIFIED DILUENT COMPOSITIONS IN TUNGSTEN-BASED, ALUMINUM-REFLECTED FAST REACTORS

REPORT NUMBER.... ANL-7207

DATE PUBLISHED ... 67-02-00

NSA-NUMBER 21:31996

SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-9 (FAST ROCKET)

ABSTRACT

INTRODUCTION: THE ARGONNE NATIONAL LABORATORY ZERO POWER REACTOR-9 (ZPR-9) PROGRAM HAS BEEN DEVOTED TO EXPERIMENTS IN SUPPORT OF THE METALLIC-CORE (FAST-REACTOR) NUCLEAR-ROCKET PROGRAM. TUNGSTEN HAS BEEN THE STRUCTURAL MATERIAL OF INTEREST TO THE PROGRAM. A PREVIOUS REPORT COVERED THE INITIAL EVALUATION OF THE TUNGSTEN CROSS-SECTION SET THROUGH CAREFULLY DESIGNED CRITICAL EXPERIMENTS IN ASSEMBLIES NO. 1 TO 4, INCLUSIVE.

THE PRESENT REPORT WILL ADOPT AN ASSEMBLY WITH A TYPICAL TUNGSTEN-DILUTED, NUCLEAR-ROCKET, METAL-FUELED COMPOSITION (ASSEMBLY NO. 6) AS A REFERENCE FOR STUDIES OF OTHER CORE DILUENT MATERIALS. IN ADDITION TO THE ASSEMBLIES NOT PREVIOUSLY REPORTED (ASSEMBLIES NO. 6, 4B, AND 5), TWO OF THE ORIGINAL FOUR ASSEMBLIES (NO. 3 AND 4) ARE INCLUDED AGAIN, IN THIS REPORT, THOUGH IN A LIMITED MANNER. IN COMBINATION WITH TUNGSTEN, EACH OF THE OTHER CORE DILUENT MATERIALS

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

(DEPLETED URANIUM IN ASSEMBLY NO. 3, TUNGSTEN IN ASSEMBLY NO. 4, TUNGSTEN-RHENIUM IN ASSEMBLY NO. 4B AND GRAPHITE IN ASSEMBLY NO. 5) HAD AN EFFECT ON THE CRITICAL PARAMETERS WHICH IS USED TO EVALUATE BOTH THE MODIFIED AND THE REFERENCE CORE.

A SUBSEQUENT REPORT WILL DEAL WITH MODERATOR-REFLECTED ASSEMBLIES, OXIDE CORES, AND CONTROL AND PROPELLANT EXPERIMENTS. (AUTH).

119 ID-NUMBER ID-NUMBER 119

AUTHOR DOERNER, R. C./ KNAPP, W. G./ ALMENAS, K. K./ KARAM, R. A.
 TITLE PHYSICS MEASUREMENTS IN TUNGSTEN-BASED, ALUMINUM-REFLECTED FAST REACTORS
 REPORT NUMBER..... ANL-7007
 DATE PUBLISHED ... 67-03-00
 NSA-NUMBER 21:30090
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-9 (FAST ROCKET)

ABSTRACT

INTRODUCTION: AN EXPERIMENTAL PHYSICS-NEUTRONICS STUDY OF MATERIALS AND DESIGN CONCEPTS FOR PROPOSED HIGH-TEMPERATURE FAST REACTORS HAS BEEN UNDERTAKEN IN SUPPORT OF THE ARGONNE NATIONAL LABORATORY ROCKET-DESIGN EFFORT. IN THE BASIC DESIGN, THE FUEL IS HIGHLY ENRICHED URANIUM-235, THE MAJOR DILUENT IS A TUNGSTEN-RHENIUM ALLOY, AND THE REFLECTOR MATERIAL IS A LIGHT METAL OR METAL OXIDE. INITIAL STUDIES HAVE CONCERNED SPECIFICALLY TUNGSTEN AS A DILUENT IN MODERATE-VOLUME (100- TO 300-LITER) FAST-REACTOR CORES AND ALUMINUM AS THE REFLECTOR. THIS REPORT SUMMARIZES THE RESULTS OF MEASUREMENTS MADE ON FOUR FAST CRITICAL EXPERIMENTS PERFORMED IN ZPR-9. A MAJOR OBJECTIVE OF THESE EXPERIMENTS WAS TO PROVIDE THE NECESSARY DATA FOR SELECTION OF A SINGLE, MULTIGROUP, TUNGSTEN CROSS-SECTION SET FROM THE SEVERAL GENERATED FOR THIS PROGRAM.

A SUITABLE REFERENCE FOR THESE STUDIES IS THE DEPLETED-URANIUM-DILUTED AND -REFLECTED REACTOR FIRST CONSTRUCTED AS ZPR-3 ASSEMBLY NO. 11. SUBSEQUENTLY, IT WAS RECONSTRUCTED AS ZPR-3 ASSEMBLY NO. 22 AND ZPR-6 ASSEMBLY NO. 1. THE CORE URANIUM-238 -TO- URANIUM-235 RATIO WAS 7:1, AND THE REACTOR CONSTRUCTION MATERIAL (MATRIX AND FUEL DRAWERS) WAS STAINLESS STEEL.

ZPR-9, A COUNTERPART OF ZPR-6, EXCEPT THAT THE ZPR-9 MATRIX AND FUEL DRAWERS ARE ALUMINUM, WAS USED FOR THESE STUDIES. FOUR FAST-REACTOR ASSEMBLIES WERE CONSTRUCTED AS PART OF THIS PROGRAM.

THE FIRST CORE STUDIED (ASSEMBLY NO. 1) WAS THE STANDARD 7:1 VOLUME RATIO OF URANIUM-238 TO URANIUM-235, WHICH DIFFERED FROM THE REFERENCE ASSEMBLY ONLY IN THE USE OF ALUMINUM AS THE REFLECTOR AND MATRIX STRUCTURE MATERIAL RATHER THAN A DEPLETED-URANIUM REFLECTOR AND A STAINLESS MATRIX. THESE STUDIES WERE OF PARTICULAR INTEREST IN EVALUATING THE EFFECTS OF ALUMINUM AS A REFLECTOR MATERIAL IN COMPARISON WITH THE BETTER-KNOWN DEPLETED-URANIUM REFLECTOR.

IN SUBSEQUENT REACTOR ASSEMBLIES, ONE-FOURTH, ONE-HALF, AND ALL OF THE URANIUM-238 DILUENT WERE HOMOGENEOUSLY REPLACED BY TUNGSTEN. THE COMPOSITIONS OF THESE ASSEMBLIES ARE GIVEN IN TABLE 6. IN ASSEMBLY NO. 4, LENGTHENING OF THE CORE AND INCREASED FUEL CONCENTRATION WERE NECESSARY TO ACHIEVE A REALISTIC CORE CONFIGURATION AS TUNGSTEN WAS ADDED.

STANDARD TECHNIQUES WERE USED IN THE MEASUREMENT OF CRITICAL GEOMETRY, ROSSI-ALPHA, AND CENTRAL FUEL AND MATERIAL WORTHS SO THAT TRENDS COULD BE DETECTED. THESE COULD BE COMPARED WITH TRENDS IN THE CALCULATED MODEL AS A FUNCTION OF VARYING TUNGSTEN CONTENT AND OTHER CORE-PARAMETER VARIATIONS. IN ADDITION TO THESE MEASUREMENTS, A LIMITED NUMBER OF CENTRAL-WORTH MEASUREMENTS WERE MADE ON BORON AND HYDROGENOUS SAMPLES TO EVALUATE THE EFFECT OF SAMPLE SIZE. IN ASSEMBLY NO. 4, THE CENTRAL-WORTH MEASUREMENTS OF ALUMINUM, RHENIUM, CARBON, AND TUNGSTEN WERE AUGMENTED BY MEASUREMENTS OF THE SPATIALLY DEPENDENT WORTH OF THESE MATERIALS IN THE ALUMINUM REFLECTOR. (AUTH).

120 ID-NUMBER ID-NUMBER 120

AUTHOR DOERNER, R. C./ KNAPP, W. G./ KARAM, R. A./ BUTLER, D. K.
 TITLE ZPR-9 ASSEMBLIES NO. 6-9 CRITICAL EXPERIMENTS
 REPORT NUMBER..... ANL-7208
 DATE PUBLISHED ... 67-03-00
 NSA-NUMBER 21:44930
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-9 (FAST ROCKET)

ABSTRACT

INTRODUCTION: A SERIES OF FAST CRITICAL ASSEMBLIES WAS STUDIED IN THE ARGONNE ZPR-9 FACILITY IN SUPPORT OF THE LABORATORY'S DESIGN EFFORT IN THE FAST-REACTOR, NUCLEAR-PROPULSION PROGRAM. HISTORICALLY, CRITICAL EXPERIMENTS HAVE BEEN USED TO PROVIDE ENGINEERING DESIGN PARAMETERS FOR A MOCKUP OR PROTOTYPE REACTOR. THIS APPROACH WAS NEITHER PRACTICAL NOR DESIRABLE IN THE ROCKET PROGRAM SINCE THE ENGINEERING WORK WAS DONE ESSENTIALLY SIMULTANEOUSLY WITH THE PHYSICS EFFORT. RATHER, AN ATTEMPT WAS MADE PRIMARILY TO PROVIDE INTEGRAL MEASUREMENTS AS CHECKPOINTS FOR CROSS-SECTION SETS THAT WERE GENERATED FOR THE PROGRAM AND, SECONDARILY, TO PROVIDE DATA TO TEST THE UTILITY OF SIMPLE, ONE-DIMENSIONAL, MULTIGROUP DIFFUSION THEORY IN THE PROGRAM. A MAJOR OBJECTIVE OF THE PRESENT REPORT IS TO PRESENT THE RESULTS OF A SERIES OF CRITICAL EXPERIMENTS EMPHASIZING THE IMPORTANT DIFFERENCES BETWEEN MEASUREMENTS MADE IN METAL- AND OXIDE-FUELED CORES AND BETWEEN ALUMINUM, ALUMINUM TRIOXIDE, AND BERYLLIUM OXIDE AS A REFLECTOR MATERIAL. THIS IS THE THIRD OF FOUR TOPICAL REPORTS DESCRIBING A TWO YEAR PROGRAM OF STUDY.

III. BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

STUDIES DIRECTED TOWARD AN EVALUATION OF TUNGSTEN CROSS SECTIONS RELATIVE TO URANIUM-238 (ASSEMBLIES NO. 1-4) HAVE BEEN REPORTED IN ANL-7007 AND ANL-7010.

FOUR ALUMINUM-REFLECTED ASSEMBLIES WERE STUDIED IN WHICH THE NEUTRONICALLY FAMILIAR URANIUM-238 DILUENT MATERIAL WAS GRADUALLY REPLACED BY INCREASING AMOUNTS OF TUNGSTEN. AS AN ANCHOR POINT FOR THESE MEASUREMENTS, THE CORE OF ASSEMBLY NO. 1 WAS THE EXTENSIVELY STUDIED 7:1 VOLUME RATIO OF A URANIUM-238 DILUENT MATERIAL TO URANIUM-235 FUEL, BUT HAVING AN ALUMINUM REFLECTOR. A COMPARISON OF DATA OBTAINED ON THESE ASSEMBLIES TO CORRESPONDING MEASUREMENTS IN THE REFERENCE REACTOR (ZPR-3 ASSEMBLIES NO. 11 AND 22; ZPR-6 ASSEMBLY NO. 1; 7:1 VOLUME RATIO OF URANIUM-238 DILUENT TO URANIUM-235 FUEL WITH A URANIUM-238 REFLECTOR) YIELDS SOME OF THE PERTINENT INFORMATION REGARDING THE NEUTRONICS OF THE ALUMINUM REFLECTOR, PARTICULARLY THE EFFECTS OF LARGE DOWNSCATTERING CHARACTERISTIC OF ALUMINUM. IN SUBSEQUENT ASSEMBLIES, ONE FOURTH, ONE HALF, AND ALL OF THE URANIUM-238 DILUENT MATERIAL WAS REPLACED BY TUNGSTEN. IN ADDITION TO A SET OF STANDARD MEASUREMENTS PERFORMED ON THESE SYSTEMS (CRITICAL MASS, ROSSI-ALPHA, CENTRAL FUEL, AND MATERIAL WORTHS), A LIMITED NUMBER OF STUDIES WERE MADE OF THE EFFECT OF SAMPLE SIZE ON THE REACTIVITY WORTH OF BORON AND OF HYDROGENOUS MATERIALS IN A FAST SPECTRUM.

MEASUREMENTS RELATED TO THE EFFECTS OF CHANGING CORE DILUENT COMPOSITIONS HAVE BEEN REPORTED IN ANL-7207 AND ANL-7110. IN THE SERIES OF ASSEMBLIES DISCUSSED IN THESE REPORTS, THE STANDARD MEASUREMENTS WERE REPEATED IN A VERY DENSE AND HEAVILY ABSORBING TUNGSTEN-RHENIUM-DILUTED CORE (ASSEMBLY NO. 4B); A MODERATELY DENSE TUNGSTEN-CARBON-DILUTED CORE WITH A FAIRLY SOFT SPECTRUM (ASSEMBLY NO. 5), AND A DILUTE CORE (ASSEMBLY NO. 6) TYPICAL OF ROCKET ENGINES WITH APPROXIMATELY 25 PERCENT POROSITY. ASSEMBLY NO. 6 IS USED AS A REFERENCE FOR THE STUDIES REPORTED IN THE PRESENT WORK. THE LAST REPORT OF THE SERIES WILL REVIEW MUCH OF THE ANALYTICAL EFFECT AND HOW IT RELATES TO THE EXPERIMENTAL MEASUREMENTS AS A WHOLE.

THE SECTIONS THAT FOLLOW DESCRIBE THE ASSEMBLIES AND PRESENT THE RESULTS OF THE BASIC EXPERIMENTS. MEASUREMENTS SPECIFICALLY RELATED TO THE CONTROL AND PROPELLANT PROBLEMS ARE GIVEN IN SECTION 3 AND 4. SECTIONS 5 AND 6, RESPECTIVELY, PRESENT THE SPATIALLY DEPENDENT REACTION RATES AND REACTIVITY TRAVERSES. SECTION 7 THEN DISCUSSES RESULTS OF THE MEASUREMENTS ACCORDING TO EXPERIMENT TYPE.

IN THE ASSEMBLIES STUDIED, ASSEMBLY NO. 6 WAS A URANIUM-235 METAL-FUELED (APPROXIMATELY 10 VOLUME%), TUNGSTEN-DILUTED (APPROXIMATELY 35 VOLUME%) CORE, HAVING AN ESSENTIALLY INFINITE ALUMINUM METAL REFLECTOR. THE CORE COMPOSITION OF ASSEMBLY NO. 7 WAS THE SAME, BUT THE REFLECTOR WAS CHANGED TO ALUMINUM TRIOXIDE. IN BOTH ASSEMBLIES, ABOUT 50 PERCENT OF THE CORE VOLUME CONSISTED OF 45 PERCENT DENSITY ALUMINUM. IN ASSEMBLY NO. 9, SUFFICIENT ALUMINUM TRIOXIDE REPLACED THE ALUMINUM DILUENT IN THE CORE TO GIVE A URANIUM/OXYGEN ATOM RATIO OF 1:2 IN ORDER TO SIMULATE AN OXIDE-FUELED, OXIDE-REFLECTED SYSTEM. IN THE LAST (CHRONOLOGICALLY) ASSEMBLY TO BE STUDIED IN THIS SERIES (ASSEMBLY NO. 8), THE OXIDE-FUELED CORE OF ASSEMBLY NO. 9 WAS SURROUNDED BY A NOMINAL 10-CM-THICK BERYLLIUM OXIDE REFLECTOR. IT WAS FOUND NECESSARY, IN THIS CASE, TO ISOLATE THE ASSEMBLY FROM ITS SURROUNDINGS BY A 40-CM-THICK, ALUMINUM METAL ISOLATION BLANKET. FOR SAFETY REASONS, THE 10-CM THICKNESS WAS CHOSEN TO LIMIT THE THERMAL POWER SPIKE AT THE CORE-REFLECTOR INTERFACE, AND AN ALUMINUM METAL AXIAL REFLECTOR WAS USED TO PROVIDE A NEGATIVE PROMPT POWER COEFFICIENT. TABLE 32 SUMMARIZES THE ASSEMBLIES STUDIED IN THIS REPORT. (AUTH).

121 ID-NUMBER ID-NUMBER 121

AUTHOR KARAM, R. A./ ANCARANI, A./ HELM, F./ KATO, W. Y./ MAIN, G. W./ RUSCH, G. K.

TITLE MEASURED PHYSICS PARAMETERS IN A ZONED FAST URANIUM CARBIDE CORE, ASSEMBLY 4Z

REPORT NUMBER.... ANL-7281

DATE PUBLISHED... 66-12-00

NSA-NUMBER 21:25711

SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6

ABSTRACT

SUMMARY: ASSEMBLY 4Z OF ZPR-6 WAS A ZONED CYLINDRICAL CORE WITH A CENTRAL REGION HAVING THE COMPOSITION OF A 2600-LITER CARBIDE CORE, ASSEMBLY 5. ASSEMBLY 4Z WAS DESIGNED SO THAT THE NEUTRON-ENERGY SPECTRUM AND THE IMPORTANCE SPECTRUM AT THE CENTER ARE THE SAME AS THOSE FOR ASSEMBLY 5. THE MAJOR OBJECTIVE ASSOCIATED WITH ZONED CORE IS TO TEST, IN CONJUNCTION WITH THE FULL-SCALE SYSTEM, HOW WELL REACTOR-PHYSICS PARAMETERS FOR ASSEMBLY 5 CAN BE PREDICTED FROM THE ZONED-CORE MEASUREMENTS.

THE FOLLOWING CONCLUSIONS MAY BE MADE ON THE BASIS OF THE EXPERIMENTAL RESULTS.

1. THE CRITICAL MASS (1101 KG) WAS PREDICTED WITHIN 1-2 PERCENT WITH SEVERAL DIFFERENT CROSS-SECTION SETS.
2. THE MEASURED NEUTRON-ENERGY SPECTRUM IS IN GENERAL AGREEMENT WITH THE CALCULATED SPECTRUM. SPECTRAL INDICES OBTAINED WITH FISSION RATIOS OF DIFFERENT MATERIALS ALSO SUPPORT THIS CONCLUSION.
3. FISSION-RATE TRAVERSES SHOWED THAT THE APPLICATION OF DIFFUSION THEORY TO ZONED CORES WITH NARROW REGIONS RESULTS IN SOFTER SPECTRA OF THE HIGH-ENERGY GROUPS. RESULTS FROM A TRANSPORT CODE, SNARG, WERE IN BETTER AGREEMENT WITH MEASUREMENTS.
4. ELMOE AVERAGING IS A VALUABLE TOOL FOR PRODUCING AVERAGED GROUP CROSS SECTIONS FOR THE ASYMPTOTIC SPECTRA, PROVIDED SUCH SPECTRA EXIST. ELMOE AVERAGING FOR A COMPOSITION OF A DRIVER ZONE PRODUCES CROSS SECTIONS CHARACTERISTIC OF A CORE OF THAT COMPOSITION, NOT IN THE CONFIGURATION OF THE DRIVER ZONE BUT IN SOME CONFIGURATION WHERE CRITICALITY IS ACHIEVED BY ITERATION ON BUCKLING. THE SUBSEQUENT USE OF SUCH CROSS SECTIONS IN A NARROW DRIVER ZONE, WHERE AN ASYMPTOTIC SPECTRUM CANNOT BE ACHIEVED, GIVES POOR APPROXIMATION OF THE TRUE SPECTRUM.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

5. WHEREAS THE SPATIAL DISTRIBUTION OF THE REAL FLUXES WAS BETTER PREDICTED WITH TRANSPORT THAN WITH DIFFUSION CALCULATIONS, THE OPPOSITE IS TRUE FOR THE IMPORTANCE OF FISSION NEUTRONS.

SUMMATION ((CHI)(PHI(DAGGER))).

THE REASONS FOR THIS ARE PRESENTLY UNDER INVESTIGATION.

6. THE SODIUM-VOID COEFFICIENT WAS FOUND TO BE POSITIVE (+2.3E-5 (DELTA(K)/K)/KG. AT THE CENTER OF ASSEMBLY 4Z. IT DECREASED AS A FUNCTION OF THE AXIAL DISTANCE FROM THE CENTER, AND ITS VALUE BECAME ZERO AT ABOUT 30 CM FROM THE CENTER AND NEGATIVE BEYOND THAT POINT. CALCULATIONS WITH FIRST-ORDER PERTURBATION THEORY WITH A ONE-DIMENSIONAL CODE OVERESTIMATE THE SODIUM-VOID COEFFICIENT BY ABOUT 60 PERCENT. DIFFERENCES IN K CALCULATIONS WITH AND WITHOUT THE SODIUM ARE IN AGREEMENT WITH MEASUREMENTS.

7. THE NORMALIZED DENOMINATOR OF THE PERTURBATION EXPRESSION FOR ASSEMBLY 4Z, AS OBTAINED FROM THE MEASURED QUANTITY.

SUMMATION ((CHI)(PHI(DAGGER))).

AND THE CALCULATED QUANTITY,

SUMMATION ((NU)(SIGMA(FISSION))(PHI)).

BY SNARG, WAS 6.772E5. THIS VALUE FOR ASSEMBLY 5 IS 6.500E5. THUS, THE PREDICTED VALUES FOR THE WORTH MEASUREMENTS AT THE CENTER OF ASSEMBLY 5 WILL BE 4 PERCENT GREATER THAN THOSE AT THE CENTER OF ASSEMBLY 4Z. (AUTH).

122 ID-NUMBER ID-NUMBER 122

AUTHOR PAXTON, H. C.

TITLE CRITICAL DATA FOR NUCLEAR SAFETY GUIDANCE

REPORT NUMBER..... LAMS-2415

DATE PUBLISHED ... 60-02-00

NSA-NUMBER 14:16168

SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THIS COLLECTION OF CRITICAL DATA IS INTENDED FOR THE CONVENIENCE OF THOSE WHO WISH TO EVALUATE NUCLEAR SAFETY PROBLEMS. IT IS MADE AVAILABLE IN THE PRESENT FORM PENDING CONSIDERATION AS A SUPPLEMENT TO IID-7016 (IDN-35), THE NUCLEAR SAFETY GUIDE. MAJOR SOURCES OF INFORMATION OUTSIDE OF THE LOS ALAMOS SCIENTIFIC LABORATORY ARE.

THE ARGONNE NATIONAL LABORATORY.

THE DOW CHEMICAL COMPANY, ROCKY FLATS PLANT.

GENERAL ELECTRIC COMPANY, HANFORD ATOMIC PRODUCTS OPERATION.

LAWRENCE RADIATION LABORATORY, LIVERMORE.

UNION CARBIDE CORPORATION, OAK RIDGE NATIONAL LABORATORY.

U K ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL.

U K ATOMIC WEAPONS RESEARCH ESTABLISHMENT, ALDERMASTON. (AUTH).

124 ID-NUMBER ID-NUMBER 124

AUTHOR WEBSTER, J. W./ JOHNSON, E. B.

TITLE CRITICALITY OF A SINGLE UNIT OF AQUEOUS URANYL FLUORIDE SOLUTION ENRICHED TO 5 PERCENT IN URANIUM-235

REPORT NUMBER..... ORNL-TM-1195

DATE PUBLISHED ... 65-07-23

NSA-NUMBER 20:12359

SITE/PROGRAM OAK RIDGE - URANYL(4.9%)FLUORIDE - WATER

ABSTRACT

AS A PART OF THE CONTINUING CRITICALITY PROGRAM WITH URANIUM ENRICHED TO 5 PERCENT IN URANIUM-235, A COMPARISON BETWEEN THEORY AND EXPERIMENT WAS MADE WITH REGARD TO THE CRITICALITY OF A VOLUME OF AQUEOUS URANYL OXYFLUORIDE SOLUTION (HYDROGEN/URANIUM-235 = 496) CONTAINED IN A THIN-WALLED STAINLESS STEEL CYLINDER. THE SOLUTION HAD A HEIGHT-TO-DIAMETER RATIO OF ABOUT 2.5, THUS MAKING THE END LEAKAGE REASONABLY SMALL COMPARED TO THE RADIAL LEAKAGE. COMPUTATIONS INDICATED THAT THE END LEAKAGE FROM THE FINITE SYSTEM CORRESPONDED TO ONLY 1.5 PERCENT REACTIVITY. ONE-DIMENSIONAL CALCULATIONS, WITH AN APPROXIMATE CORRECTION FOR END LEAKAGE, ARE THEREFORE VALID.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE CARLSON SN (DTF) CODE WITH THE HANSEN-ROACH 16-GROUP CROSS SECTIONS WAS USED FOR THE CALCULATION. THE COMPUTED MULTIPLICATION FACTOR OF 1.002 FOR THE CRITICAL SYSTEM LENDS FURTHER CONFIDENCE TO THE METHOD AND TO THE CROSS SECTION SET. (AUTH).

126 ID-NUMBER ID-NUMBER 126

AUTHOR DE VILLIERS, J. W. L.

TITLE SAFETY REPORT ON THE PELINDUNA CRITICAL EXPERIMENTS

REPORT NUMBER.... PEL-170

DATE PUBLISHED ... 68-02-00

SITE/PROGRAM SOUTH AFRICA - PELINDUNA CRITICAL EXPERIMENTS URANIUM(2%)METAL - HEAVY WATER

ABSTRACT

THIS REPORT DESCRIBES THE PELINDUNA-0 CRITICAL FACILITY WHICH IS UNDER CONSTRUCTION IN THE C- WING OF THE REACTOR ENGINEERING BUILDING OF THE ATOMIC ENERGY BOARDS LABORATORIES AT PELINDABA.

THE FIRST REACTOR SYSTEM TO BE INVESTIGATED IN THIS FACILITY IS ALSO DESCRIBED AND AN ASSESSMENT OF THE HAZARDS ASSOCIATED WITH THE PLANNED EXPERIMENTS IS GIVEN.

THE CORE OF THE FIRST SYSTEM WILL CONSIST OF 4 ELEMENTS OF THE PELINDUNA DESIGN, LOADED TO A MAXIMUM HEIGHT OF 2.1 METRES WITH 1 CM DIAMETER URANIUM METAL SPHERES ENRICHED TO 2 PERCENT IN URANIUM-235. THESE ELEMENTS WILL BE ARRANGED IN A SQUARE OR TRIANGULAR PATTERN AT VARIOUS LATTICE PITCHES IN HEAVY WATER INSIDE A 1.6 METER DIAMETER TANK. FOUR CONTROL RODS WILL BE PROVIDED. A 20 CM DIAMETER DUMP VALVE SERVES AS AN ADDITION SAFETY DEVICE.

ALTHOUGH THE PELINDUNA SYSTEM IS A HEAVY WATER MODERATED, SODIUM-COOLED REACTOR, NO SODIUM WILL BE ALLOWED IN THE CRITICAL FACILITY. THIS ENSURES A NEGATIVE TEMPERATURE COEFFICIENT, DUE MAINLY TO THE DOPPLER EFFECT IN THE FUEL.

THE DESIGN, CONSTRUCTION AND SAFETY INSTRUMENTATION FOR THE CRITICAL ASSEMBLY CONFORM TO GENERAL PRACTICE IN THE OPERATION OF CRITICAL ASSEMBLIES. THE REACTOR IS COMPLETELY SELF-LIMITING FOR A 1 POUND STERLING EXCESS REACTIVITY STEP WITH NO HAZARD TO THE GENERAL PUBLIC. THIS WILL PROBABLY ALSO APPLY FOR A 2 POUND STERLING STEP, WHILE THE PUBLIC HAZARD REMAINS EXTREMELY SMALL. (AUTH).

127 ID-NUMBER ID-NUMBER 127

AUTHOR STEVENS, L./ GOURDON, J.

TITLE CRITICAL MASS, ROD WORTH VALUES, AND REACTIVITY COEFFICIENTS FOR RAPSODIE

REPORT NUMBER.... CEA-R-3354

DATE PUBLISHED ... 67-10-00

NSA-NUMBER 22:12092

SITE/PROGRAM FRANCE - RAPSODIE

ABSTRACT

SUMMARY. - BESIDES A BRIEF GENERAL DESCRIPTION, THE REPORT CONTAINS A DESCRIPTION AND DISCUSSION OF THE AIMS, THE METHODS USED, AND THE RESULTS OF CRITICAL MASS, ROD WORTH AND STATIC REACTIVITY COEFFICIENT MEASUREMENTS ON THE RAPSODIE REACTOR. (AUTH).

128 ID-NUMBER ID-NUMBER 128

AUTHOR LANE, R. C./ PERKINS, O. J. E.

TITLE THE MEASUREMENT OF THE CRITICAL SIZE OF A HOMOGENEOUS MIXTURE OF PLUTONIUM AND NATURAL URANIUM OXIDES WITH POLYTHENE

REPORT NUMBER.... AWRE-0-32/68

DATE PUBLISHED ... 68-07-00

SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - URANIUM-PLUTONIUM OXIDES - POLYTHENE

ABSTRACT

THIS REPORT DESCRIBES THE MEASUREMENT OF THE CRITICAL SIZE OF A PLUTONIUM OXIDE/NATURAL URANIUM OXIDE/POLYTHENE MIXTURE IN RECTANGULAR GEOMETRY USING HOMOGENEOUS BLOCKS OF THE MATERIAL.

THE PLUTONIUM DENSITY WAS 0.950 GM/CC WITH A HYDROGEN/PLUTONIUM ATOMIC RATIO OF 18.6 AND A PLUTONIUM/URANIUM ATOMIC RATIO OF 0.335. THE PLUTONIUM CONTAINED 5.9 PERCENT OF PLUTONIUM-240.

THE SIDE OF A POLYTHENE-REFLECTED CRITICAL CUBE, ESTIMATED FROM THE RESULTS OF SIX ASSEMBLIES, IS 27.7 CM.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

CONTAINING 20.2 +/- 0.2 KGM OF PLUTONIUM. DETAILS OF THE MEASURED CRITICAL PARAMETERS CORRECTED TO 45 DEGREE CENTIGRADE ARE GIVEN IN TABLE-1.

TABLE-I (NOT SHOWN HERE).

THE EXPERIMENTAL ERRORS ON THESE MASSES AND VOLUMES ARE ESTIMATED TO HAVE A STANDARD DEVIATION OF +/- 0.6 PERCENT.

THE EFFECT OF REFLECTOR THICKNESS ON CRITICAL MASS WAS MEASURED, AND INDICATED THAT THIN HYDROGENOUS REFLECTORS ARE RELATIVELY INEFFICIENT AS COMPARED WITH THEIR EFFECT ON OTHER PLUTONIUM OR URANIUM ASSEMBLIES, AND THAT CADMIUM SHEET BETWEEN CORE AND REFLECTOR IS EQUIVALENT TO REDUCING THE REFLECTOR THICKNESS FROM 20 CM TO LESS THAN 2 CM. (AUTH).

130 ID-NUMBER ID-NUMBER 130

AUTHOR LLOYD, R. C.

TITLE SUMMARY LISTING OF SUBCRITICAL MEASUREMENTS OF HETEROGENEOUS WATER-URANIUM LATTICES MADE AT HANFORD

REPORT NUMBER..... HW-65552

DATE PUBLISHED ... 60-06-08

NSA-NUMBER 15:2064

SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

INTRODUCTION: EXPONENTIAL AND CRITICAL APPROACH TYPE MEASUREMENTS HAVE BEEN MADE TO DETERMINE THE CRITICAL MASS, MATERIAL BUCKLING, AND IN A FEW CASES, THE EXTRAPOLATION LENGTH FOR THE LATTICES. THIS REPORT ATTEMPTS TO LIST ALL MEASUREMENTS ON WATER-URANIUM HETEROGENEOUS LATTICES MADE TO DATE AT HANFORD. ALL LATTICES WERE WATER MODERATED HEXAGONAL ARRAYS LOADED WITH URANIUM OF ENRICHMENTS UP TO 3.1 PERCENT. (AUTH).

131 ID-NUMBER ID-NUMBER 131

AUTHOR ERNST, B. B./ RISLEY, G. G./ TUCK, G.

TITLE METAL PARTS TEST.. PUBLISHED IN NUCLEAR SAFETY RESEARCH AND DEVELOPMENT QUARTERLY PROGRESS REPORT FOR JULY, AUGUST, AND SEPTEMBER 1965, EDITED BY SCHUSKE, C. L.

REPORT NUMBER..... RFP-0684, 005-006

DATE PUBLISHED ... 66-02-04

SITE/PROGRAM ROCKY FLATS - URANIUM(93%) METAL - SPHERES

ABSTRACT

MULTIPLICATION MEASUREMENTS WERE MADE ON A SERIES OF ENRICHED URANIUM SPHERES. THE SPHERES WERE MADE UP OF MATCHING CONCENTRIC SHELLS. THE METAL SPHERES WERE INFINITELY REFLECTED BY OIL (TEXACO-522). (AUTH).

133 ID-NUMBER ID-NUMBER 133

AUTHOR COATES, M. S./ GAYTHER, D. B./ GOODE, P. D./ TRIPP, D. J.

TITLE TIME OF FLIGHT MEASUREMENTS OF THE NEUTRON SPECTRUM IN A SUBCRITICAL FAST REACTOR ASSEMBLY

REPORT NUMBER..... AERE-R5330

DATE PUBLISHED ... 68-01-00

NSA-NUMBER 23:2080

SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - VERA FAST REACTOR

ABSTRACT

THE NEUTRON ENERGY SPECTRUM AT THE CENTRE OF A SUB-CRITICAL VERA 7A ASSEMBLY HAS BEEN DETERMINED BY THE TIME OF FLIGHT METHOD IN THE RANGE 100 EV TO 4.8 MEV USING THE HARWELL 45 MEV ELECTRON LINEAR ACCELERATOR TO PROVIDE A PULSED SOURCE OF FAST NEUTRONS. THE SPECTRUM IN A SIMILAR ASSEMBLY HAS BEEN DETERMINED AT ALDERMASTON USING TIME OF FLIGHT MEASUREMENTS ON A SUB-CRITICAL SYSTEM AT ENERGIES BELOW 40 KEV AND PROTON RECOIL MEASUREMENTS ON THE CRITICAL SYSTEM AT HIGHER ENERGIES. COMPARISON WITH THE SHAPE OF THE PRESENT SPECTRUM SHOWS GOOD AGREEMENT BELOW 200 KEV BUT IF BOTH SPECTRA ARE NORMALIZED IN THIS REGION THE HARWELL MEASUREMENT SHOWS FEWER HIGH ENERGY NEUTRONS, THE DISCREPANCY BEING ABOUT 25 PERCENT IN THE REGION OF 1 MEV. PART OF THIS DIFFERENCE IS ATTRIBUTED TO THE DIFFERENT CRITICALITY CONDITIONS OF THE TWO MEASUREMENTS BUT THERE STILL REMAINS AN UNEXPLAINED DISCREPANCY AT HIGH ENERGIES. A DIFFUSION THEORY CALCULATION OF THE SPECTRUM IN A SPHERICAL EQUIVALENT OF THE ASSEMBLY APPEARS TO BE IN RATHER BETTER AGREEMENT WITH THE PRESENT MEASUREMENT THAN WITH THE ALDERMASTON MEASUREMENT. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

134 ID-NUMBER ID-NUMBER 134

AUTHOR JOSEPHSON, V.
 TITLE CRITICAL MASS MEASUREMENT ON ORALLOY IN TUBALLOY AND TUNGSTEN CARBIDE TAMPERS
 REPORT NUMBER.... LA-1114 (DEL)
 DATE PUBLISHED .. 54-05-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

ORALLOY CRITICAL-MASS MEASUREMENTS HAVE BEEN MADE IN TUBALLOY AND TUNGSTEN CARBIDE TAMPERS TO DETERMINE HOW THE CRITICAL MASS, $M(\text{SUBSCRIPT } C)$, VARIES WITH TAMPER, TAMPER THICKNESS, AND CORE CONFIGURATION. AN ATTEMPT HAS BEEN MADE TO FIND SOME CORRELATION BETWEEN THE EXPERIMENTAL RESULTS AND EXISTING THEORETICAL EQUATIONS PERTAINING TO THE TAMPER AND TAMPER-THICKNESS STUDIES. CALCULATIONS USING KNOWN CROSS-SECTION VALUES IN THESE THEORETICAL EQUATIONS DO NOT GIVE RESULTS CONSISTENT WITH EXPERIMENTAL DATA. (AUTH).

135 ID-NUMBER ID-NUMBER 135

AUTHOR MALLARY, E. C.
 TITLE ORALLOY CYLINDRICAL SHAPE FACTOR AND CRITICAL MASS MEASUREMENTS IN GRAPHITE, PARAFFIN, AND WATER TAMPERS
 REPORT NUMBER.... LA-1305
 DATE PUBLISHED .. 51-10-27
 NSA-NUMBER 12:1911
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES ; LOS ALAMOS - URANIUM(93%) METAL CYLINDERS

ABSTRACT

CRITICAL MASS OF AN ORALLOY (93.9 PERCENT URANIUM-235) SPHERE IN GRAPHITE IS GIVEN AS A FUNCTION OF GRAPHITE TAMPER THICKNESS. IT WAS SHOWN THAT ABOUT 20 INCHES OF GRAPHITE IS EFFECTIVELY INFINITE AND THAT THE ABOUT 17 INCHES USED HEREIN IS ABOUT 98 PERCENT INFINITE. CRITICAL MASS MEASUREMENTS OF ORALLOY (93.9 PERCENT URANIUM-235) SPHERES AND CYLINDERS OF DIFFERENT DIAMETERS ARE GIVEN FOR ABOUT 17 INCHES GRAPHITE TAMPER, FOR EFFECTIVELY INFINITE PARAFFIN TAMPER, AND FOR EFFECTIVELY INFINITE WATER TAMPER. FROM THESE MEASUREMENTS CYLINDRICAL SHAPE FACTORS WERE COMPUTED. BOTH SHAPE FACTORS AND CRITICAL MASSES ARE SHOWN IN FIGS. 22 AND 23 AS FUNCTIONS OF THE CRITICAL HEIGHT TO DIAMETER RATIO OF THE CYLINDERS. (AUTH).

136 ID-NUMBER ID-NUMBER 136

AUTHOR ISKENDERIAN, H./ BYERS, C. C.
 TITLE PHYSICS CALCULATIONS ON FOUR LOS ALAMOS GRAPHITE MODERATED CRITICAL ASSEMBLIES
 REPORT NUMBER.... TANSO, 01, 1, 149-150
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED .. 58-06-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE - CALCULATIONS

ABSTRACT

DIFFUSION THEORY CALCULATIONS WERE MADE ON FOUR LOS ALAMOS URANIUM-GRAPHITE CRITICAL ASSEMBLIES. THE DISADVANTAGE FACTOR VALUES WERE OBTAINED BY P-3 CALCULATIONS. THE CRITICAL BUCKLINGS WERE EVALUATED BY TWO GROUP DIFFUSION THEORY, BY ITERATION. TO ALLOW FOR THE FISSIONING OF EPITHERMAL NEUTRONS, THREE GROUP CALCULATIONS WERE MADE FOR THE EQUIVALENT BARE REACTORS. THE AGREEMENT BETWEEN THE CALCULATED AND EXPERIMENTAL LOADINGS WAS SATISFACTORY, ALLOWING FOR THE UNCERTAINTY IN THE IMPURITIES IN THE GRAPHITE USED.

139 ID-NUMBER ID-NUMBER 139

AUTHOR CARTER, R. E./ HINTON, J. C. / KING, L. D. P. / SCHREIBER, R. E.
 TITLE WATER TAMPER MEASUREMENTS
 REPORT NUMBER.... LA-0241
 DATE PUBLISHED .. 45-04-12
 SITE/PROGRAM LOS ALAMOS - URANYL SULFATE - WATER

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE CRITICAL MASS OF AN ENRICHED URANYL SULFATE SOLUTION IN A WATER TAMPER WAS DETERMINED TO BE 1200 +/- 50 GRAM. NO DIRECT MEASUREMENT WAS POSSIBLE BECAUSE OF INSUFFICIENT ENRICHED MATERIAL FOR THIS PURPOSE. THE ESTIMATE WAS MADE BY EXTRAPOLATING COUNTING RATE VERSUS GRAMS OF URANIUM-235 TO INFINITE COUNTING RATE. A LATTICE OF TUBALLOY DISKS SURROUNDING THE SPHERE WAS FOUND TO BE EQUIVALENT TO ABOUT 50 TO 100 GRAMS OF URANIUM-235. DISTRIBUTION MEASUREMENTS WERE MADE IN THE TAMPER FOR HIGH AND LOW ENERGY NEUTRONS AND IT WAS FOUND THAT IN GENERAL THE NEUTRON FLUX DECREASED EXPONENTIALLY WITH INCREASING DISTANCE. (AUTH).

140 ID-NUMBER ID-NUMBER 140

AUTHOR ALLRED, J. C./ BENDT, P. J./ PETERSON, R. E.
 TITLE CRITICAL MEASUREMENTS ON URANIUM TRIOXIDE IN PHOSPHORIC ACID SOLUTIONS
 (UO3-H3PO4)
 REPORT NUMBER.... NSENAO, 04, 498-500
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 58-09-00
 NSA-NUMBER 13:131
 SITE/PROGRAM LOS ALAMOS - URANYL PHOSPHATE - WATER

ABSTRACT

DURING THE COURSE OF HOMOGENEOUS REACTOR FUEL STUDIES, CRITICAL MEASUREMENTS WERE CARRIED OUT WITH SOLUTIONS OF URANIUM TRIOXIDE (93.5 PERCENT URANIUM-235) DISSOLVED IN 4.3 MOLAR PHOSPHORIC ACID. A BRIEF DESCRIPTION OF THESE MEASUREMENTS, THEIR RESULTS, AND AN EVALUATION OF SOME CALCULATIONS IS PRESENTED HERE. (AUTH).

141 ID-NUMBER ID-NUMBER 141

AUTHOR LINENBERGER, G. A./ ORNDOFF, J. D./ PAXTON, H. C.
 TITLE ENRICHED-URANIUM HYDRIDE CRITICAL ASSEMBLIES
 REPORT NUMBER.... NSENAO, 07, 044-057
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 60-01-00
 NSA-NUMBER 14:7988
 SITE/PROGRAM LOS ALAMOS - ENRICHED URANIUM HYDRIDE

ABSTRACT

CRITICAL ASSEMBLIES REPORTED HERE CONSIST OF APPROXIMATE SPHERES OF ENRICHED-URANIUM HYDRIDE COMPOSITION (APPROXIMATING URANIUM-TRIHYDRIDE IN 8-INCH THICK NORMAL URANIUM AND NICKEL REFLECTORS AND IN A URANIUM REFLECTOR WITH NICKEL LINER. DATA ARE OF THE FOLLOWING TYPES: (1) CRITICAL SIZES, (2) VALUES OF ROSSI ALPHA IN THE NEIGHBORHOOD OF DELAYED CRITICAL, (3) ACTIVATION RATES OF VARIOUS INTERNAL NEUTRON DETECTORS, AND (4) REACTIVITY COEFFICIENTS OF A VARIETY OF ELEMENTS. FROM THE REACTIVITY COEFFICIENTS AT VARIOUS RADIAL POSITIONS, CHANGES IN CRITICAL MASS CORRESPONDING TO SMALL CHANGES IN COMPOSITION AND DENSITY AND COMPUTED. (AUTH).

142 ID-NUMBER ID-NUMBER 142

AUTHOR PAXTON, H. C./ LINENBERGER, G. A.
 TITLE POLYTHENE-URANIUM-235 CRITICAL ASSEMBLY AND NEUTRON DISTRIBUTION STUDIES
 REPORT NUMBER.... LA-0749
 DATE PUBLISHED ... 49-11-01
 NSA-NUMBER 12:1643
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) - LUCITE - POLYETHYLENE

ABSTRACT

DELAYED CRITICAL BEHAVIOR WAS INVESTIGATED FOR AN ARRAY OF (0.5 INCH) * (0.5 INCH) * (0.5 INCH) POLYTHENE AND URANIUM-235 CUBES OF AVERAGE COMPOSITION OF 1 URANIUM TO 3.8 HYDROGENS TO 1.9 CARBONS IN AN 8 INCH THICK TUBALLOY TAMPER. THE PSEUDOSPHERE OF CRITICAL SIZE (2130 CM**3) CONTAINED 12.0 KG OF 94.5 PERCENT URANIUM-235. ROSSI TIME-SCALE MEASUREMENTS GAVE ALPHA = -0.36E4 AT DELAYED CRITICAL. ACTIVITY DISTRIBUTIONS FOR SULFUR, GOLD, URANIUM-235, AND URANIUM-238 SAMPLES WERE OBTAINED AS A FUNCTION OF RADIUS OF THE ASSEMBLY. APPRECIABLE LOCAL VARIATIONS IN NEUTRON SPECTRUM RESULTED FOR THE INHOMOGENEITY OF THE ACTIVE ARRAY. (AUTH)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

143 ID-NUMBER ID-NUMBER 143

AUTHOR HOOGERP, J. C.
 TITLE CRITICAL MASSES OF ORALLOY LATTICES IMMersed IN WATER
 REPORT NUMBER.... LA-2026
 DATE PUBLISHED ... 57-03-06
 NSA-NUMBER 14:18334
 SITE/PROGRAM LOS ALAMOS - URANIUM(94%) METAL - WATER LATTICES

ABSTRACT

A SOLID CUBE OF ORALLOY (94.3 PERCENT ENRICHMENT) BECOMES CRITICAL AT 24 KG WHEN IMMersed IN AN INFINITE WATER REFLECTOR. VARIOUS CRITICAL LATTICES HAVE BEEN OBTAINED BY DIVIDING THIS SOLID SHAPE INTO SMALL UNITS AND UNIFORMLY DISPERSING THEM (IN WATER) AT VARIOUS MEAN DENSITIES. FOR A GIVEN SIZE OF ORALLOY UNIT, THERE IS A MEAN DENSITY AT WHICH THE CRITICAL MASS IS MINIMUM. THE HYDROGEN-URANIUM ATOMIC RATIO (OPTIMUM) OF THE CORES WITH MINIMUM CRITICAL MASSES ARE:

ORALLOY UNIT DIMENSION ,HYDROGEN/URANIUM-(OPTIMUM) ,CRIT. MASS(M(SUB-C), MIN, KG):

1 INCH CUBE ,5.4 ,22.3 ,
 1/2 INCH CUBE ,15. ,14. ,
 1/8 BY 12 INCH ROD ,53. ,6.5 ,

THE OPTIMUM HYDROGEN-URANIUM ATOMIC RATIO FOR LATTICES WITH ORALLOY UNITS OF INTERMEDIATE SIZE CAN BE REASONABLY PREDICTED BY INTERPOLATION. MEASUREMENTS WITH NONUNIFORMLY DISPERSED ORALLOY DO NOT INDICATE A CRITICAL MASS BELOW THE MINIMUM OBSERVED WITH A UNIFORM LATTICE. MULTIPLICATION MEASUREMENTS WITH SILVER, GOLD, AND CADMIUM RODS INSERTED IN THE ORALLOY MATRIX HAVE YIELDED THE FOLLOWING EFFECTIVE CROSS-SECTION RATIOS:

$(\text{SIGMA}(\text{ABSORPTION, SILVER})) / (\text{SIGMA}(\text{ABSORPTION, GOLD})) = 0.86$, AND $(\text{SIGMA}(\text{ABSORPTION, CADMIUM})) / (\text{SIGMA}(\text{ABSORPTION, GOLD})) = 1.58$.

THESE VALUES ARE INDEPENDENT OF POSITION AND LATTICE SPACING FOR RANGE EXAMINED. (AUTH).

145 ID-NUMBER ID-NUMBER 145

AUTHOR ROHRER, E. R. / TUNNELL, W. C. / MAGNUSON, D. W.
 TITLE NEW CRITICAL EXPERIMENT MACHINES
 REPORT NUMBER.... ORNL-3193, 168
 DATE PUBLISHED ... 61-09-01
 NSA-NUMBER 16:3836
 SITE/PROGRAM OAK RIDGE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

TWO NEW CRITICAL-EXPERIMENT MACHINES WERE RECENTLY INSTALLED AND OPERATED IN THE OAK RIDGE CRITICAL EXPERIMENT FACILITY. BOTH DEVICES UTILIZE THE SPLIT-TABLE TECHNIQUE FOR COMBINING SUBCRITICAL AMOUNTS OF SOLID FISSIONABLE MATERIAL INTO CRITICAL ASSEMBLIES BY CONTROLS OPERATED IN A SHIELDED AREA.

ONE OF THE MACHINES IDENTIFIED AS THE CRITICALITY TESTING UNIT (CTU), WAS DESIGNED FOR CRITICAL EXPERIMENTS ON UNMODERATED METAL SYSTEMS WITH MINIMAL REFLECTION FROM THE SUPPORT STRUCTURE AND THE ROOM. EXISTING EQUIPMENT WAS NOT SUITED TO THIS TYPE OF PROGRAM BECAUSE OF THE LARGE MASS OF THE SUPPORTING MEMBERS AND THE SLOW SPEED OF SEPARATION, ESPECIALLY SINCE THE SEPARATION OF COMPONENTS IS THE ONLY SAFETY MECHANISM PROPOSED FOR THE SYSTEMS TO BE STUDIED.

157 ID-NUMBER ID-NUMBER 157

AUTHOR FELD, B. T. / SLOTIN, S. L.
 TITLE CRITICAL MASS OF A WATER TAMPED PLUTONIUM-239 SOLUTION
 REPORT NUMBER.... LA-0272
 DATE PUBLISHED ... 45-05-14
 SITE/PROGRAM LOS ALAMOS - PLUTONIUM NITRATE IN WATER

ABSTRACT

THIS EXPERIMENT WAS DESIGNED TO MEASURE THE CRITICAL MASS OF PLUTONIUM-239 IN SOLUTION, IN ORDER TO DETERMINE THE AMOUNT OF PLUTONIUM-239 THAT CAN BE HANDLED WITH SAFETY. TO CONTAIN THE SOLUTION, FOUR BOTTLES WITH CAPACITIES 2.25, 3.6, 7.7, AND 11.6 LITERS WERE USED. THESE WERE COMMERCIAL SODA-GLASS BOTTLES, AS NEARLY EQUILATERAL CYLINDERS AS COULD BE OBTAINED TO GIVE THE ABOVE RANGE OF CAPACITIES. EACH BOTTLE WAS PROVIDED WITH A CLOSURE CONTAINING A RE-ENTRANT

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

STEEL TUBE, WHICH EXTENDED TO THE CENTER OF THE BOTTLE. THIS TUBE SERVED AS A CHANNEL FOR A NEUTRON SOURCE AS WELL AS FOR A DETECTING CHAMBER. IN ADDITION, THE CLOSURE WAS PROVIDED WITH A CAPILLARY GAS LEAK AS AN OUTLET FOR THE DECOMPOSITION GASES GIVEN OFF FROM THE PLUTONIUM-239 SOLUTION.

THESE BOTTLES, WHEN FILLED WITH PLUTONIUM-239 SOLUTION, WERE PLACED AT THE CENTER OF A CYLINDRICAL TANK, 4.5 FEET IN DIAMETER AND 4.5 FEET HIGH. THIS TANK COULD BE FILLED WITH LOS ALAMOS WATER TO PROVIDE THE TAMPING.

162 ID-NUMBER ID-NUMBER 162

AUTHOR BECK, C. K./ CALLIHAN, A. D./ MORFITT, J. W./ MURRAY, R. L.

TITLE CRITICAL MASS STUDIES, PART-3

REPORT NUMBER.... K-0343

DATE PUBLISHED ... 49-04-19

NSA-NUMBER 11:13855

SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

THE CONDITIONS UNDER WHICH URANIUM-235, CONTAINED IN AQUEOUS SOLUTIONS OF URANYL FLUORIDE, BECOME CRITICAL IN RIGHT CYLINDRICAL ALUMINUM AND AND STAINLESS STEEL REACTORS, HAVE BEEN EXAMINED. THE URANIUM-235 CONTENT OF THE URANIUM WAS 93.4 PERCENT. VALUES OF THE CRITICAL MASSES OF URANIUM- 235 AND OF THE CORRESPONDING HEIGHTS OF THE SOLUTION IN THE REACTORS HAVE BEEN MEASURED AS FUNCTIONS OF THE CHEMICAL CONCENTRATION OF THE FUEL AND THE DIAMETER OF THE REACTORS. CONCENTRATIONS RANGED FROM 2.5 TO 43 PERCENT URANIUM-235 BY WEIGHT, CORRESPONDING TO HYDROGEN TO URANIUM-235 ATOMIC RATIOS FROM ABOUT 1000 TO 25, AND REACTOR DIAMETERS VARIED FROM 5.5 INCHES TO 20 INCHES. IT WAS POSSIBLE TO ENCLOSE THE REACTORS IN WATER IN ORDER TO OBSERVE THE EFFECT OF ADDING WATER REFLECTOR. A FEW DATA WERE OBTAINED WITH CADMIUM SHEET PLACED BETWEEN THE REACTOR AND THE REFLECTOR WATER.

THE DIAMETER OF THE LARGEST REACTOR WHICH COULD NOT BE MADE CRITICAL UNDER THE MOST FAVORABLE CONDITIONS OF THESE EXPERIMENTS WAS GREATER THAN 5.5 INCHES BUT LESS THAN 6 INCHES.. OMISSION OF THE WATER REFLECTOR INCREASED THIS DIAMETER TO 8 INCHES. THE MINIMUM CRITICAL MASS MEASURED WAS 893 GRAMS, CONTAINED IN A REACTOR 25.4 CENTIMETERS (10) INCHES) IN DIAMETER AND 22.4 CENTIMETERS HIGH WITH A CHEMICAL CONCENTRATION CORRESPONDING TO A HYDROGEN TO URANIUM-235 ATOMIC RATIO OF 329.

THE ABSENCE OF THE WATER REFLECTOR INCREASED THE CRITICAL MASS BY ABOUT 100 PERCENT; INTERPOSING CADMIUM BETWEEN THE REACTOR AND THE REFLECTOR WATER INCREASED THE CRITICAL MASS BY ABOUT 50 PERCENT.

THE RESULTS OBTAINED ARE TABULATED IN THE APPENDIX AND ARE SHOWN IN A NUMBER OF GRAPHS. NO ATTEMPT AT CORRELATION WITH THEORY IS MADE IN THIS REPORT. (AUTH).

163 ID-NUMBER ID-NUMBER 163

AUTHOR FOX, J. K. / GILLEY, L. W. / GWIN, R. / MAGNUSON, D. W.

TITLE CRITICAL PARAMETERS OF URANIUM-235 AND URANIUM-233 SOLUTION IN SIMPLE GEOMETRY

REPORT NUMBER.... ORNL-2842

DATE PUBLISHED ... 59-09-00

NSA-NUMBER 14:2804

SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER ; OAK RIDGE - URANIUM-233 SYSTEMS

ABSTRACT

THE MEASUREMENT OF THE CRITICAL PARAMETERS OF SOLUTIONS OF THE FISSIONABLE URANIUM ISOTOPES IN SIMPLE GEOMETRY HAS BEEN A CONTINUING PROGRAM FOR A NUMBER OF YEARS. THE DATA PRESENTED ARE AN EXTENSION OF PREVIOUSLY REPORTED EXPERIMENTS.

FOR THE URANIUM-235 EXPERIMENTS PERFORMED IN ALUMINUM CONTAINERS, AN AQUEOUS URANYL OXYFLUORIDE SOLUTION ENRICHED TO 93.2% IN URANIUM-235 WAS USED. THE URANIUM-235 SOLUTION IN THE STAINLESS STEEL CYLINDERS WAS AN AQUEOUS URANYL NITRATE SOLUTION ENRICHED TO 92.8% IN URANIUM-235. THE NITROGEN-TO-URANIUM ATOMIC RATIO WAS ABOUT 3.8. AN AQUEOUS URANYL NITRATE SOLUTION WAS ALSO USED FOR THE URANIUM-233 EXPERIMENTS. THE URANIUM CONTAINED 97.4% URANIUM-233 AND THE SOLUTION HAD A NITROGEN-TO-URANIUM ATOMIC RATIO OF 2.4.

THE VALUE OF THE CRITICAL HEIGHT REPORTED HEREIN FOR A 10-INCH-DIA WATER-REFLECTED ALUMINUM CYLINDER AT AN HYDROGEN:URANIUM-235 RATIO OF 49.5 IS IN DISAGREEMENT WITH THE PREVIOUSLY REPORTED VALUE. SINCE THE PRESENT VALUE IS CONSISTENT WITH OTHER DATA FOR THE 10-INCH-DIA CYLINDER, WHEREAS THE EARLIER VALUE IS NOT, IT IS FELT THAT THERE WAS AN UNACCOUNTED-FOR ERROR IN THE EARLIER EXPERIMENT.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

164 ID-NUMBER ID-NUMBER 164

AUTHOR FOX, J. K. / GILLEY, L. W. / GWIN, R. / THOMAS, J. T.
 TITLE CRITICAL PARAMETERS OF URANIUM SOLUTIONS IN SIMPLE GEOMETRY
 REPORT NUMBER..... ORNL-2609
 DATE PUBLISHED ... 58-10-29
 NSA-NUMBER 13:1464
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER ; OAK RIDGE - URANIUM-233 SYSTEMS

ABSTRACT

WHAT ARE BELIEVED TO BE THE BEST DATA DESCRIBING SOME RECENT MEASUREMENTS WITH SPHERES OF BOTH URANIUM-233 AND URANIUM-235 SOLUTIONS ARE GIVEN. THE LIMIT OF ACCURACY OF THE VOLUME IS +/- 0.5% AND OF THE CONCENTRATION AND MASS IS +/- 1% THESE DATA HAVE NOT BEEN CORRECTED FOR THE EFFECT OF THE TYPE 1100 ALUMINUM CONTAINERS.

165 ID-NUMBER ID-NUMBER 165

AUTHOR FOX, J. K./ GILLEY, L. W./ MARABLE, J. H.
 TITLE CRITICAL PARAMETERS OF A PROTON-MODERATED AND PROTON-REFLECTED SLAB OF URANIUM-235
 REPORT NUMBER..... NSEAO, 03. 694-697
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 58-06-00
 NSA-NUMBER 11:7810
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

THE CRITICAL THICKNESS OF PROTON MODERATED AND PROTON REFLECTED SLAB SHAPED VOLUMES OF AQUEOUS SOLUTIONS OF URANIUM DIOXIDE DIFLUORIDE ENRICHED TO 93.2 PERCENT IN URANIUM-235 WERE MEASURED AT CHEMICAL CONCENTRATIONS NEAR THAT REQUIRED FOR MINIMUM CRITICAL VOLUME. THESE DATA YIELD 1.76 +/- 0. 07 INCH AS THE MINIMUM CRITICAL THICKNESS OF AN INFINITE SLAB OF THE MATERIALS OF THE EXPERIMENT AT A CONCENTRATION OF 532 GRAMS URANIUM-235/LITER. THIS RESULT IS COMPARED WITH A THREE-GROUP TWO- REGION ANALYSIS OF THE INFINITE SLAB. (AUTH).

166 ID-NUMBER ID-NUMBER 166

AUTHOR NEELEY, V. I./ HANDLER, H. E.
 TITLE MEASUREMENT OF MULTIPLICATION CONSTANT FOR SLIGHTLY ENRICHED HOMOGENEOUS URANIUM TRIOXIDE - WATER MIXTURES AND MINIMUM ENRICHMENT FOR CRITICALITY
 REPORT NUMBER..... HW-70310
 DATE PUBLISHED ... 61-08-21
 NSA-NUMBER 16:13857
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

THE MINIMUM URANIUM-235 ENRICHMENT REQUIRED FOR CRITICALITY IN AN INFINITE HOMOGENEOUS SYSTEM OF URANIUM TRIOXIDE (URANIUM TRIOXIDE) AND WATER HAS BEEN DETERMINED FROM MEASUREMENTS OF K(INF) IN THE HANFORD PHYSICAL CONSTANTS TESTING REACTOR, (PCTR). THIS IS THE ENRICHMENT FOR WHICH K(INF) EQUAL TO OR LESS THAN UNITY IN AN AQUEOUS HOMOGENEOUS SYSTEM.

THE EXPERIMENTS CONSISTED OF K(INF) MEASUREMENTS AT URANIUM ENRICHMENTS OF 1.006, 1.070, AND 1. 159 WEIGHT PER CENT URANIUM-235 FOR HYDROGEN-TO-URANIUM ATOMIC RATIOS IN THE RANGE OF 3.5 - 7.5.

THE MINIMUM ENRICHMENT REQUIRED FOR CRITICALITY IN AN INFINITELY LARGE SYSTEM WITH A HOMOGENEOUS URANIUM TRIOXIDE-WATER MIXTURE WAS FOUND TO BE 1.034 +0.010 AND -0.009 WEIGHT PER CENT URANIUM-235. (AUTH).

167 ID-NUMBER ID-NUMBER 167

AUTHOR MIHALCZO, J. T./ LYNN, J. J.
 TITLE HOMOGENEOUS CRITICAL ASSEMBLIES OF 2% URANIUM-235-ENRICHED URANIUM TETRAFLUORIDE IN PARAFFIN
 REPORT NUMBER..... ORNL-3016
 DATE PUBLISHED ... 60-09-00
 NSA-NUMBER 15:7010
 SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE PROGRAM OF CRITICAL EXPERIMENTS WITH HOMOGENEOUS HYDROGEN-MODERATED ASSEMBLIES OF 2 PERCENT URANIUM-235 ENRICHED URANIUM TETRAFLUORIDE AND PARAFFIN REPORTED PREVIOUSLY HAS BEEN EXTENDED TO A MIXTURE WITH AN (HYDROGEN)/(URANIUM-235) ATOMIC RATIO OF 50:1. THIS MIXTURE CONTAINS 82 WEIGHT PERCENT URANIUM TETRAFLUORIDE AND HAS A URANIUM DENSITY OF 1.97 GRAMS/(CUBIC CENTIMETERS).

THE MINIMUM CRITICAL MASSES AND MINIMUM CRITICAL VOLUMES HAVE BEEN ESTABLISHED FOR BARE AND REFLECTED CYLINDERS AND PARALLELEPIPEDS ARE SHOWN ALONG WITH THOSE FOR PREVIOUS URANIUM TETRAFLUORIDE PARAFFIN MIXTURES. THE REFLECTOR MATERIAL WAS AN EFFECTIVELY INFINITE THICKNESS OF PARAFFIN OR OF PLEXIGLAS. (AUTH.).

168 ID-NUMBER ID-NUMBER 168

AUTHOR MIHALCZO, J. T./ MILLS, C. B.

TITLE CRITICALITY OF LOW ENRICHMENT URANIUM-235 IN HYDROGEN

REPORT NUMBER.... NSEAO, 11, 095-096

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 61-09-00

NSA-NUMBER 16:2405

SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN

ABSTRACT

THE SPHERICAL CRITICAL MASS AND RADIUS OF HOMOGENEOUS MIXTURES OF 1 TO 5 PERCENT URANIUM-235 ENRICHED URANIUM AND HYDROGEN ARE OF THEORETICAL INTEREST DUE TO THE LARGE EFFECT OF URANIUM-238 RESONANCE ABSORPTION ON THE NEUTRON MULTIPLICATION. RESONANCE INTEGRALS CONSISTENT WITH THE LOS ALAMOS MULTIGROUP DESCRIPTION OF NEUTRON CROSS SECTIONS USED FOR CRITICAL EXPERIMENT ANALYSIS HAVE RECENTLY BEEN COMPUTED BY G. I. BELL AS A FUNCTION OF SCATTERING CROSS SECTIONS PER URANIUM ATOM. THESE EFFECTIVE MULTIGROUP CROSS SECTIONS, ALONG WITH REACTOR CALCULATION METHODS AND RECENT ORNL EXPERIMENTS WITH 2 TO 5 PERCENT ENRICHED URANIUM HOMOGENEOUSLY DISTRIBUTED IN PARAFFIN AND IN WATER, MAKE IT POSSIBLE TO COORDINATE CALCULATIONAL METHODS AND EXPERIMENTS FOR THESE SYSTEMS. (AUTH)

169 ID-NUMBER ID-NUMBER 169

AUTHOR MIHALCZO, J. T./ NEELEY, V. I.

TITLE THE INFINITE MULTIPLICATION CONSTANT OF HOMOGENEOUS HYDROGEN-MODERATED 2.0 WEIGHT PERCENT URANIUM-235-ENRICHED URANIUM

REPORT NUMBER.... NSEAO, 13, 006-011

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 62-05-00

NSA-NUMBER 16:19673

SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN

ABSTRACT

THE INFINITE MEDIUM NEUTRON MULTIPLICATION FACTOR, K-INFINITY, OF A MIXTURE OF 92.1 WT PERCENT URANIUM TETRAFLUORIDE AND 7.9 WT PERCENT PARAFFIN HAS BEEN MEASURED BOTH IN THE PHYSICAL CONSTANTS TESTING REACTOR AT THE HANFORD ATOMIC PRODUCTS OPERATION AND IN CRITICAL EXPERIMENTS AT THE OAK RIDGE NATIONAL LABORATORY. THE DENSITY OF THE MIXTURE IS 4.5 GM/CC AND THE URANIUM-235 ENRICHMENT OF THE URANIUM IS 2.0 WT PERCENT, RESULTING IN AN HYDROGEN:URANIUM-235 ATOMIC RATIO OF 195. THE VALUES OF K-INFINITY FROM THE TWO EXPERIMENTS ARE 1.216 +/- 0.013 AND 1.197 +/- 0.015, RESPECTIVELY.

IN THE ANALYSIS OF THE CRITICAL EXPERIMENTS A TWO GROUP MODEL WAS ASSUMED FOR THE NONLEAKAGE PROBABILITY. THE NEUTRON AGE TO THERMAL WAS DETERMINED FROM BUCKLING PERTURBATION MEASUREMENTS AS 43.1 +/- 3.4 CM**2. THE CRITICAL BUCKLING WAS MEASURED TO BE (4344 +/- 65) E-6 CM**(-2), THE BARE EXTRAPOLATION DISTANCE 2.7 +/- 0.3CM, AND THE FAST FISSION FACTOR 1.039 +/- 0.004.

WITHIN THE EXPERIMENTAL ERROR, THE VALUES OF K-INFINITY FROM CRITICAL EXPERIMENTS AT ORNL AND FROM THE PCTR AT HAPD AGREE. (AUTH).

170 ID-NUMBER ID-NUMBER 170

AUTHOR SCHUSKE, C. L. / BINDER, G. H. / GOODWIN, A. / SMITH, D. F.

TITLE PLUTONIUM PLEXIGLAS ASSEMBLIES

REPORT NUMBER.... RFP-0178

DATE PUBLISHED ... 60-01-20

NSA-NUMBER 14:9911

SITE/PROGRAM ROCKY FLATS - PLUTONIUM METAL CYLINDERS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

NEUTRON MULTIPLICATION MEASUREMENTS WERE MADE ON TAMPED AND UNTAMPED CYLINDRICAL ASSEMBLIES. THE ASSEMBLIES CONSISTED OF PLUTONIUM METAL SHEET MODERATED WITH PLEXIGLAS. EXPERIMENTS WERE PERFORMED TO EVALUATE THE EFFECTS OF INHOMOGENEITY. (AUTH).

171 ID-NUMBER ID-NUMBER 171

AUTHOR BIDINGER, G. H./ SCHUSKE, C. L./ SMITH, D. F.

TITLE PLUTONIUM PLEXIGLAS ASSEMBLIES PART-2

REPORT NUMBER.... RFP-0190

DATE PUBLISHED ... 60-07-27

NSA-NUMBER 14:22263

SITE/PROGRAM ROCKY FLATS - PLUTONIUM METAL CYLINDERS

ABSTRACT

NEUTRON MULTIPLICATION MEASUREMENTS WERE MADE ON TAMPED AND UNTAMPED CYLINDRICAL ASSEMBLIES. THE ASSEMBLIES CONSISTED OF PLUTONIUM METAL SHEET MODERATED WITH PLEXIGLAS. EXPERIMENTS WERE PERFORMED TO EVALUATE THE EFFECTS OF INHOMOGENEITY. THIS WORK IS A CONTINUATION OF RFP-178 (IDN-170).

INTRODUCTION - NEUTRON MULTIPLICATION MEASUREMENTS WERE MADE ON CYLINDRICAL DISC ASSEMBLIES OF ALTERNATE LAYERS OF PLEXIGLAS AND PLUTONIUM SHEET. BOTH BARE AND TAMPED ASSEMBLIES WERE INVESTIGATED. HYDROGEN TO PLUTONIUM ATOMIC RATIOS WERE VARIED FROM APPROXIMATELY 19.6 TO 90 FOR THE TAMPED ARRAYS AND 19.4 TO 94 FOR THE UNTAMPED ARRAYS.

THE THICKNESS OF THE PLUTONIUM SHEET WAS VARIED IN ORDER TO STUDY THE EFFECTS OF INHOMOGENEITY AT VARIOUS HYDROGEN TO PLUTONIUM ATOMIC RATIOS.

AN ATTEMPT WAS ALSO MADE TO CONVERT THE EXPERIMENTAL DATA ON CYLINDRICAL ASSEMBLIES TO HOMOGENEOUS SPHERICAL ASSEMBLIES. (AUTH).

172 ID-NUMBER ID-NUMBER 172

AUTHOR MASTERSON, R. H./ WHITE, J. D./ POWELL, T. J.

TITLE THE LIMITING CRITICAL CONCENTRATIONS FOR PLUTONIUM-239 AND URANIUM-235 IN AQUEOUS SOLUTIONS

REPORT NUMBER.... HW-77089

DATE PUBLISHED ... 63-03-27

NSA-NUMBER 17:41724

SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

MEASUREMENTS WERE MADE WITH PLUTONIUM NITRATE SOLUTIONS AND URANYL FLUORIDE SOLUTIONS (93.15 PERCENT ENRICHED URANIUM DIOXIDE DIFLUORIDE) TO DETERMINE THE CONCENTRATION AT WHICH K(INF) EQUALS UNITY (THE LIMITING CRITICAL CONCENTRATION) FOR EACH OF THESE SOLUTIONS.

THE LIMITING CRITICAL CONCENTRATION FOR PLUTONIUM-239 IN AN AQUEOUS SOLUTION OCCURRED AT AN HYDROGEN TO PLUTONIUM RATIO OF 3392 +/- 100; THIS LIMITING RATIO CORRESPONDED TO A CONCENTRATION OF 8.0 +/- 0.3 GRAMS PLUTONIUM-239/LITER FOR THE SOLUTIONS USED IN THE EXPERIMENTS.

IN CONJUNCTION WITH THIS PLUTONIUM MEASUREMENT, THE LIMITING CRITICAL CONCENTRATION FOR URANIUM-235 IN AN AQUEOUS SOLUTION WAS MEASURED; THE RESULT (12.05 +/- 0.03 GRAMS URANIUM-235/LITER) WAS COMPARED TO A SIMILAR RESULT REPORTED BY THE OAK RIDGE NATIONAL LABORATORY. (AUTH).

175 ID-NUMBER ID-NUMBER 175

AUTHOR NEELEY, V. I./ BERBERET, J. A./ MASTERSON, R. H.

TITLE K(INF) OF THREE WEIGHT PERCENT URANIUM-235 ENRICHED URANIUM TRIOXIDE AND URANYL NITRATE HYDROGENOUS SYSTEMS

REPORT NUMBER.... HW-66882

DATE PUBLISHED ... 61-09-00

NSA-NUMBER 16:10807

SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE VALUE OF THE INFINITE MULTIPLICATION CONSTANT $K(\infty)$ HAS BEEN DETERMINED AS A FUNCTION OF THE HYDROGEN-TO-URANIUM (HYDROGEN/URANIUM) ATOMIC RATIO FOR 3.04 WEIGHT PERCENT URANIUM-235 ENRICHED URANIUM TRIOXIDE AND URANYL NITRATE HYDROGEN MODERATED HOMOGENEOUS SYSTEMS. THE WORK WAS DONE TO EVALUATE NUCLEAR SAFETY OF AND ESTABLISH OPERATIONAL LIMITS FOR SLIGHTLY ENRICHED HOMOGENEOUS SYSTEMS AND WAS PERFORMED IN THE HANFORD PHYSICAL CONSTANTS TESTING REACTOR.

THE AMOUNT OF THERMAL NEUTRON ABSORBER, COMMONLY REFERRED TO AS POISON, NECESSARY TO REDUCE THE VALUE OF $K(\infty)$ OF THESE SYSTEMS TO UNITY WAS ALSO OBTAINED DIRECTLY FROM THESE STUDIES. THIS VALUE IS OF INTEREST FOR PROCESSING REACTOR FUELS IN WHICH SOLUBLE POISONS WOULD BE USED FOR CRITICALITY CONTROL.

CURVES OF THE VALUE OF $K(\infty)$ AS A FUNCTION OF THE HYDROGEN/URANIUM ATOMIC RATIO FOR 3.04 WEIGHT PER CENT URANIUM-235 ENRICHED URANIUM TRIOXIDE AND URANYL NITRATE ARE SHOWN. THE CURVE OF $K(\infty)$ VERSUS HYDROGEN/URANIUM IS DETERMINED BY A LEAST SQUARES FIT TO THE EXPERIMENTAL DATA.

VALUES OF THE AMOUNT OF THERMAL POISON NECESSARY TO REDUCE $K(\infty)$ TO UNITY AS A FUNCTION OF THE HYDROGEN/URANIUM RATIO ARE TABULATED. (AUTH).

177 ID-NUMBER ID-NUMBER 177

AUTHOR TUCK, G.

TITLE ENRICHED URANIUM-METAL MEASUREMENTS, NO. 1

REPORT NUMBER..... RFP-0907

DATE PUBLISHED ... 67-07-26

NSA-NUMBER 21:38669

SITE/PROGRAM ROCKY FLATS - URANIUM(93%) METAL - SPHERES

ABSTRACT

THE CRITICAL MASSES OF OIL-REFLECTED AND MODERATED ENRICHED URANIUM(93.12) SPHERICAL AND HEMISPHERICAL SHELL ASSEMBLIES HAVE BEEN MEASURED AT INSIDE RADII OF 0, 4, 6.67, 8, AND 12 CENTIMETERS (CM). THE MEASUREMENTS ARE DESCRIBED AND COMPARED TO CALCULATED VALUES FOR SPHERICAL ASSEMBLIES. (AUTH).

180 ID-NUMBER ID-NUMBER 180

AUTHOR WHITE, R. H.

TITLE TOPSY, A REMOTELY CONTROLLED MACHINE FOR THE STUDY OF CRITICAL ASSEMBLIES

REPORT NUMBER..... LA-1579

DATE PUBLISHED ... 53-06-00

NSA-NUMBER 11:13164

SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

THIS REPORT DESCRIBES THE CONSTRUCTION, OPERATION, AND TYPICAL USES OF TOPSY, THE VERSATILE, REMOTELY CONTROLLED, CRITICAL ASSEMBLY MACHINE PAJARITO.

SECTION 1 COVERS THE MECHANICAL DESIGN OF THE MACHINE, AND THE HYDRAULIC AND ELECTRICAL OPERATION OF THE VARIOUS COMPONENTS.

SECTION 2 DESCRIBES HOW TOPSY IS USED FOR INVESTIGATING REACTING METAL ASSEMBLIES. PROCEDURES FOR ESTABLISHING A DELAYED CRITICAL CONFIGURATION AND OPERATION AT DELAYED CRITICAL ARE ILLUSTRATED FOR THE ORALLOY-TUBALLOY SYSTEM. ALSO INCLUDED ARE BRIEF DESCRIPTIONS OF ORALLOY-NICKEL, PLUTONIUM-TUBALLOY, AND LOW DENSITY AND CONCENTRATION ASSEMBLIES THAT HAVE BEEN MADE ON THE MACHINE. (AUTH).

181 ID-NUMBER ID-NUMBER 181

AUTHOR SCHUSKE, C. L. / GOODWIN, A. / BIDINGER, G. H. / SMITH, D. F.

TITLE INTERACTION OF TWO METAL SLABS OF PLUTONIUM IN PLEXIGLASS

REPORT NUMBER..... RFP-0174

DATE PUBLISHED ... 59-12-28

NSA-NUMBER 14:9910

SITE/PROGRAM ROCKY FLATS - PLUTONIUM METAL CYLINDERS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

INTRODUCTION: NEUTRON MULTIPLICATION MEASUREMENTS WERE PERFORMED ON TWO IDENTICAL FINITE METAL SLAB ASSEMBLIES SEPARATED AND REFLECTED BY PLEXIGLAS. THE PURPOSE OF THESE MEASUREMENTS WAS:

- (1) TO DETERMINE THE ISOLATION SEPARATION FOR TWO METAL SLABS IN A HYDROGENOUS MEDIUM, AND:
- (2) TO DETERMINE THE MODERATING EFFECT UPON TWO IDENTICAL INTERACTING SLABS SEPARATED BY A HYDROGENOUS MEDIUM. (AUTH).

182 ID-NUMBER ID-NUMBER 182

AUTHOR SCHUSKE, C. L./ SMITH, D. F./ BELL, C. L.
 TITLE PLEXIGLAS-REFLECTED ASSEMBLIES OF PLUTONIUM
 REPORT NUMBER..... RFP-0213
 DATE PUBLISHED ... 61-01-10
 NSA-NUMBER 15:9667
 SITE/PROGRAM ROCKY FLATS - PLUTONIUM METAL CYLINDERS

ABSTRACT

THIS REPORT CONTAINS A COMPILATION OF CRITICAL EXTRAPOLATIONS OF SUBCRITICAL NEUTRON MULTIPLICATION MEASUREMENTS MADE ON ASSEMBLIES OF PLUTONIUM METAL TAMPED WITH PLEXIGLAS.

IN ADDITION TO THIS COMPILATION THE REPORT ALSO PRESENTS RECENT DATA ON A 20-INCH X 20-INCH SLAB OF METAL, PLEXIGLAS TAMPED. A SIMPLE EMPIRICAL EQUATION OF THE FORM $(\text{SQRTF}(A) - \text{SQRTF}(A(\text{SUB-ZERO}))) \cdot (H - H(\text{SUB-ZERO})) = C$ WAS FOUND WHICH FITS THE DATA AND PREDICTS THE INFINITE SLAB AND CYLINDER DIMENSIONS.

A SERIES OF SUBCRITICAL MEASUREMENTS MADE ON PLUTONIUM METAL ASSEMBLIES PLEXIGLAS TAMPED ARE REPORTED. THIS REPORT ALSO CONTAINS A RECENT MEASUREMENT ON A 20-INCH X 20-INCH SLAB OF METAL PLEXIGLAS TAMPED. A TOTAL OF SEVEN EXPERIMENTAL VALUES WERE FOUND TO FIT (WITHIN THE EXPERIMENTAL ERROR) AN EMPIRICAL EQUATION OF THE FORM $(\text{SQRTF}(A) - 1.75) \cdot (H - 0.25) = 4.30$. THE CONSTANTS IN THE EQUATION ARE, $\text{SQRTF}(A(\text{SUB-ZERO})) = 1.75$, THE LENGTH OF A SIDE OF AN INFINITE CYLINDER OF SQUARE CROSS SECTION, $H(\text{SUB-ZERO}) = 0.25$, THE INFINITE SLAB THICKNESS AND $C = 4.30$ AN EMPIRICAL CONSTANT. THIS TYPE OF EQUATION WAS PREVIOUSLY FOUND TO FIT DATA FOR A VARIETY OF CASES RANGING FROM AQUEOUS SOLUTION SYSTEMS OF URANYL FLUORIDE TO URANIUM METAL TAMPED WITH WATER. (AUTH).

183 ID-NUMBER ID-NUMBER 183

AUTHOR BROWN, J. R./ NOORDHOFF, B. H./ BATESON, W. O.
 TITLE CRITICAL EXPERIMENTS ON A HIGHLY ENRICHED HOMOGENEOUS REACTOR
 REPORT NUMBER..... WAPD-128
 DATE PUBLISHED ... 55-05-00
 NSA-NUMBER 10:3151
 SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - URANIUM(93%) HOMOGENEOUS REACTOR

ABSTRACT

CRITICAL EXPERIMENTS WITH A HIGHLY ENRICHED HOMOGENEOUS REACTOR HAVE BEEN PERFORMED IN THE RANGE OF HYDROGEN/URANIUM-235 ATOMIC RATIOS FROM 1633 TO 1776. THE CYLINDRICAL CORE HAD A FIXED DIAMETER OF 36 INCHES AND HEIGHTS BETWEEN 23 AND 51 INCHES. AN AQUEOUS SOLUTION OF URANYL NITRATE WITH A URANIUM-235 ENRICHMENT GREATER THAN 90 PERCENT WAS USED. AN 8-INCH RADIAL WATER REFLECTOR WAS AVAILABLE.

MEASUREMENTS WERE MADE OF CRITICAL HEIGHTS AND OF THE REACTIVITY WORTH PER INCH AT THESE HEIGHTS AS FUNCTIONS OF THE HYDROGEN/URANIUM-235 ATOMIC RATIO. URANIUM-235 CRITICAL MASSES ARE LISTED. ADDITIONAL MEASUREMENTS WERE MADE TO DETERMINE THE CONTROL ROD WORTHS, THE TEMPERATURE COEFFICIENT OF REACTIVITY AND THE EFFECT OF THE RADIAL REFLECTOR. (AUTH).

184 ID-NUMBER ID-NUMBER 184

AUTHOR PAXTON, H. C.
 TITLE CORRELATIONS OF EXPERIMENTAL AND THEORETICAL CRITICAL DATA
 REPORT NUMBER..... LAMS-2537
 DATE PUBLISHED ... 61-03-00
 NSA-NUMBER 15:20051
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

CORRELATIONS OF COMPUTED AND EXPERIMENTAL CRITICAL DATA ARE DISCUSSED. THE SCOPE IS LIMITED TO FISSILE SYSTEMS THAT MAY BE APPROXIMATED BY SIMPLE DESCRIPTIONS. THE METHODS USED TO ADJUST DATA TO UNIFORM CONDITIONS ARE OUTLINED. THE REQUIREMENTS FOR COMPUTATION WHERE THE VALUES ARE INTENDED TO SUBSTITUTE FOR EXPERIMENTAL DATA IN NUCLEAR SAFETY GUIDANCE ARE DESCRIBED. COMPUTATIONAL METHODS USING DSN AND MULTIGROUP DIFFUSION TECHNIQUES ARE DISCUSSED. BOTH COMPUTED AND EXPERIMENTAL DATA ARE GIVEN FOR THE FOLLOWING: CRITICAL MASSES OF BARE SPHERES OF URANIUM WITH VARIOUS MODERATORS, CRITICAL MASSES AND VOLUMES OF HOMOGENEOUS WATER-MODERATED URANIUM SPHERES, CORE-DENSITY EXPONENTS FOR WATER REFLECTED-WATER MODERATED URANIUM-235 OR PLUTONIUM-239 SPHERES, CRITICAL DIAMETERS OF INFINITE CYLINDERS OF HOMOGENEOUS WATER-MODERATED URANIUM, CRITICAL THICKNESSES OF INFINITE SLABS OF HOMOGENEOUS WATER-MODERATED URANIUM, CRITICAL MASSES OF DELTA-PHASE PLUTONIUM MIXTURES WITH WATER AND PLEXIGLAS, INFLUENCE OF PLUTONIUM-240 ON CRITICAL MASS OF WATER-MODERATED PLUTONIUM SPHERES, CRITICAL DIAMETERS OF INFINITELY-LONG CYLINDERS AND CRITICAL THICKNESS OF INFINITE SLABS OF HOMOGENEOUS WATER-MODERATED PLUTONIUM-239, CRITICAL VOLUMES OF URANIUM-CARBON-WATER SYSTEMS, AND CRITICAL MASSES OF BARE SPHERES OF URANIUM DILUTED WITH OTHER METALS AND GRAPHITE. (M.C.G.).

185 ID-NUMBER ID-NUMBER 185

AUTHOR CLARKE, W. G./ HORTON, C. C./ SMITH, M. F.
 TITLE CRITICAL ASSEMBLIES OF AQUEOUS URANYL FLUORIDE SOLUTIONS.. PART 1:
 EXPERIMENTAL TECHNIQUES AND RESULTS
 REPORT NUMBER..... AERE-R/R-2051
 DATE PUBLISHED ... 56-09-20
 NSA-NUMBER 11:1313
 SITE/PROGRAM UNITED KINGDOM, HARWELL - URANYL(46%)FLUORIDE IN WATER

ABSTRACT

CRITICAL MASSES OF URANIUM-235 AND URANIUM-233 IN THE FORM OF URANYL FLUORIDE IN AQUEOUS SOLUTION HAVE BEEN MEASURED IN CYLINDRICAL GEOMETRY FOR A RANGE OF CONCENTRATIONS HYDROGEN/URANIUM(FISSILE) 250 TO 850. A CYLINDER RADIUS OF 15.21 CENTIMETER WAS USED WITH AN EFFECTIVELY INFINITE RADIAL WATER REFLECTOR. WHERE POSSIBLE ESTIMATES WERE MADE OF THE CRITICAL MASSES FOR THE SYSTEM UNREFLECTED AND ALSO FOR THE SYSTEM REFLECTED BUT WITH THE CADMIUM SHUT OFF SHEATH BETWEEN THE CORE AND REFLECTOR. FLUX MEASUREMENTS WERE MADE THROUGH THE SYSTEM IN AXIAL AND RADIAL DIRECTIONS AT ALL CONCENTRATIONS. THE EFFECT OF CHANGE OF TEMPERATURE ON THE SYSTEM OVER THE RANGE 15 DEGREE CENTIGRADE TO 90 DEGREE CENTIGRADE WAS OBSERVED FOR ALL CONCENTRATIONS.

AN ASSEMBLY FOR EACH ISOTOPE IN A VERY CONCENTRATED SOLUTION HYDROGEN/URANIUM-235 =60, HYDROGEN/URANIUM-233 = 32 WAS ALSO MADE IN A 6.35 CENTIMETER RADIUS CYLINDER BUT WAS NOT BROUGHT TO CRITICALITY.

PART II OF THIS REPORT WILL TREAT IN DETAIL THE CHEMICAL PREPARATION AND PROCESSING OF THE SOLUTIONS AND PART-III WILL BE A FULL DISCUSSION AND ANALYSIS OF THE RESULTS OBTAINED. (AUTH).

186 ID-NUMBER ID-NUMBER 186

AUTHOR NEUER, J. J./ STEWART, C. B.
 TITLE PRELIMINARY SURVEY OF URANIUM METAL EXPONENTIAL COLUMNS
 REPORT NUMBER..... LA-2023
 DATE PUBLISHED ... 56-10-31
 NSA-NUMBER 12:2121
 SITE/PROGRAM LOS ALAMOS - CYLINDERS OF MIXED DISKS OF URANIUM(93%) AND URANIUM(.75%)

ABSTRACT

REFLECTED CYLINDRICAL EXPONENTIAL COLUMNS OF BARE AND NATURAL URANIUM WERE CONSTRUCTED OF STACKED PLATES OF ORALLOY (93.4 PERCENT) AND TUBALLOY. AVERAGE CONCENTRATIONS OF URANIUM-235 RANGING FROM 0.72 PERCENT TO 9.18 PERCENT WERE INVESTIGATED. FLUX DISTRIBUTIONS, BUCKLING VALUES, AND SPECTRAL INDICES WERE OBTAINED. THE INDICATED URANIUM-235 CONCENTRATION FOR INFINITE CRITICAL MASS IS ABOUT 5.5 PERCENT. (AUTH).

187 ID-NUMBER ID-NUMBER 187

AUTHOR LLOYD, R. C./ CLAYTON, E. D./ SMITH, R. B./ NEELEY, V. I.
 TITLE CRITICALITY MEASUREMENTS OF HETEROGENEOUS 3.1 PERCENT ENRICHED URANIUM AND
 WATER SYSTEMS
 REPORT NUMBER..... HW-63576, 65-69
 DATE PUBLISHED ... 60-01-20
 NSA-NUMBER 14:20706
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE PROGRAM OF CRITICAL APPROACH AND EXPONENTIAL MEASUREMENTS OF 3.063 PERCENT ENRICHED URANIUM RODS IN LIGHT WATER WAS CONTINUED. CRITICAL MASSES, BUCKLING VALUES, AND SOME MEASURED EXTRAPOLATION LENGTH VALUES HAVE BEEN REPORTED FOR THREE ROD DIAMETERS (0.300, 0.600, 0.925 INCHES) IN PREVIOUS QUARTERLY REPORTS. MEASUREMENTS WERE MADE THIS QUARTER WITH RODS OF 0.175-INCH DIAMETER BY 23.5 INCHES IN LENGTH. THESE RODS WERE ENCASED WITH 0.025-INCH WALL LUCITE TUBES FOR INSERTION INTO HEXAGONAL LATTICE FRAMEWORKS. MEASUREMENTS WERE CARRIED OUT IN THE SAME MANNER AS DESCRIBED IN THE ABOVE MENTIONED REPORTS. ALL LATTICES WERE MODERATED AND COMPLETELY REFLECTED WITH LIGHT WATER. (AUTH).

188 ID-NUMBER ID-NUMBER 188

AUTHOR LLOYD, R. C./ CLAYTON, E. D./ JONES, B. L.
 TITLE CRITICAL APPROACH AND EXPONENTIAL MEASUREMENTS WITH 2.00 PERCENT ENRICHED URANIUM RODS IN LIGHT WATER
 REPORT NUMBER.... HW-66215, 30-33
 DATE PUBLISHED ... 60-07-20
 NSA-NUMBER 15:6996
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

A SERIES OF CRITICAL APPROACH AND EXPONENTIAL MEASUREMENTS WERE BEGUN FOR DETERMINING CRITICALITY PARAMETERS OF 2.00 PERCENT ENRICHED URANIUM RODS IN LIGHT WATER. THE DATA WILL BE USED FOR EVALUATING NUCLEAR SAFETY IN SUPPORT OF PROCESSING ENRICHED URANIUM FROM POWER REACTOR FUELS. MEASUREMENTS ARE TO BE MADE WITH TWO DIFFERENT FUEL ROD SIZES WHICH ARE 0.925 AND 0.600 INCHES IN DIAMETER. (AUTH).

189 ID-NUMBER ID-NUMBER 189

AUTHOR SCHUSKE, C. L./ ARTHUR, M. G./ SMITH, D. F.
 TITLE NEUTRON MULTIPLICATION MEASUREMENTS ON ORALLOY SLABS IMMERSSED IN SOLUTIONS. PART-1
 REPORT NUMBER.... RFP-0066
 DATE PUBLISHED ... 56-08-06
 NSA-NUMBER 12:2617
 SITE/PROGRAM ROCKY FLATS - SOLID UNITS IN FISSILE SOLUTIONS

ABSTRACT

A SERIES OF NEUTRON MULTIPLICATION MEASUREMENTS WERE MADE ON SLAB ASSEMBLIES OF ORALLOY METAL IMMERSSED IN WATER AND AQUEOUS SOLUTIONS OF URANYL NITRATE, URANYL NITRATE + CADMIUM NITRATE, AND CADMIUM NITRATE. THE URANIUM METAL AND URANYL NITRATE SOLUTIONS WERE ENRICHED TO APPROXIMATELY 90% URANIUM-235. (AUTH).

190 ID-NUMBER ID-NUMBER 190

AUTHOR SCHUSKE, C. L./ ARTHUR, M. G./ SMITH, D. F.
 TITLE NEUTRON MULTIPLICATION MEASUREMENTS ON ORALLOY SLABS IMMERSSED IN SOLUTION. PART-2
 REPORT NUMBER.... RFP-0069
 DATE PUBLISHED ... 56-10-25
 NSA-NUMBER 13:21
 SITE/PROGRAM ROCKY FLATS - SOLID UNITS IN FISSILE SOLUTIONS

ABSTRACT

THIS REPORT REVIEWS A SERIES OF SUB-CRITICAL EXPERIMENTS ON URANIUM METAL IMMERSSED IN WATER AND AQUEOUS SOLUTIONS OF URANYL NITRATE (URANIUM ENRICHMENT APPROX. 90 PERCENT). THIS WORK COVERS A HIGHER URANIUM-235 SOLUTION CONCENTRATION RANGE THAN THAT REPORTED IN RFP-66. THE RANGE FOR THESE EXPERIMENTS WAS 47.2 AND 156.6 GRAMS URANIUM-235/LITER OF SOLUTION. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

192 ID-NUMBER ID-NUMBER 192

AUTHOR NEELEY, V. I./ LLOYD, R. C./ CLAYTON, E. D.
 TITLE NEUTRON MULTIPLICATION MEASUREMENTS WITH PLUTONIUM-ALUMINUM ALLOY ROD IN LIGHT WATER
 REPORT NUMBER..... HW-70944
 DATE PUBLISHED ... 61-08-29
 NSA-NUMBER 16:4679
 SITE/PROGRAM HANFORD - PLUTONIUM RODS IN WATER

ABSTRACT

NEUTRON MULTIPLICATION AND EXPONENTIAL MEASUREMENTS WERE CONDUCTED WITH PLUTONIUM-ALUMINUM ALLOY FUEL ELEMENTS IN LIGHT WATER MODERATED LATTICES; A HEXAGONAL PATTERN WAS USED FOR THE LATTICES WHICH WERE FULLY WATER REFLECTED. THE CRITICAL MASS WAS DETERMINED FOR 24-INCH HIGH CYLINDERS BY NEUTRON MULTIPLICATION MEASUREMENTS. THE EXTRAPOLATION LENGTH AND BUCKLINGS FOR THE LATTICES WERE DETERMINED BY EQUATING THE BUCKLING EXPRESSION FROM THE EXPONENTIAL MEASUREMENTS TO THE BUCKLING EXPRESSION FOR THE CRITICAL SIZE AS DETERMINED FROM THE NEUTRON MULTIPLICATION MEASUREMENTS. THESE EQUATIONS WERE THEN SOLVED FOR THE EXTRAPOLATION LENGTH AND BUCKLING. THE CRITICAL MASS FOR SPHERICAL GEOMETRY WAS CALCULATED FROM THE MEASURED BUCKLING AND EXTRAPOLATION LENGTH.

THE MINIMUM CRITICAL MASS FOR THE ALUMINUM- 5WT% PLUTONIUM ALLOY RODS IN LIGHT WATER WAS 1.5 KG PLUTONIUM. THE MAXIMUM BUCKLING WAS, $11,300E-6 \text{ CM}^{-2}$. THE EFFECT ON THE CRITICAL MASS OF THE PLUTONIUM-240 (ABOUT 5 PERCENT) WAS DETERMINED FROM CALCULATIONS; THE RESULTS INDICATE THE CRITICAL MASS (INCLUDING ALL ISOTOPES) WOULD BE REDUCED BY ABOUT 8.2 PERCENT IN THE ABSENCE OF PLUTONIUM-240, OR TO 1.38 KG PLUTONIUM-239.

A CURVE OF THE CRITICAL MASS AND BUCKLING OBTAINED FROM THESE EXPERIMENTS IS SHOWN. THE VARIOUS DATA ARE TABULATED. (AUTH).

194 ID-NUMBER ID-NUMBER 194

AUTHOR BIDINGER, G. H./ SCHUSKE, C. L./ SMITH, D. F.
 TITLE NUCLEAR SAFETY EXPERIMENTS ON PLUTONIUM AND ENRICHED URANIUM HYDROGEN MODERATED ASSEMBLIES CONTAINING BORON
 REPORT NUMBER..... RFP-0201
 DATE PUBLISHED ... 60-07-07
 NSA-NUMBER 15:8270
 SITE/PROGRAM ROCKY FLATS - BORATED PLUTONIUM METAL CYLINDERS ; ROCKY FLATS - SOLUTIONS WITH RASCHIG RINGS

ABSTRACT

NEUTRON MULTIPLICATION MEASUREMENTS WERE MADE ON CYLINDRICAL ASSEMBLIES CONTAINING LAYERS OF PLUTONIUM METAL DISCS, PLEXIGLAS DISCS, AND BORON CARBIDE IMPREGNATED EPOLENE-N DISCS.

IN ADDITION TO THE ABOVE NUCLEAR SAFETY MEASUREMENTS, CURVES WERE DRAWN FOR A 42-INCH DIAMETER STAINLESS STEEL TANK CONTAINING AN AQUEOUS SOLUTION OF URANYL-NITRATE AND POISONED WITH PYREX RASCHIG RINGS.

ATTEMPTS WERE MADE TO CALCULATE SPHERE, INFINITE CYLINDER AND SLAB SHAPES FROM THE EXPERIMENTAL FINITE CYLINDRICAL ASSEMBLIES.(AUTH)

195 ID-NUMBER ID-NUMBER 195

AUTHOR SCHUSKE, C. L./ BIDINGER, G. H.
 TITLE NUCLEAR SAFETY MEASUREMENTS ON SYSTEMS CONTAINING BORON AND ENRICHED URANIUM
 REPORT NUMBER..... RFP-0246
 DATE PUBLISHED ... 61-08-00
 NSA-NUMBER 16:2622
 SITE/PROGRAM ROCKY FLATS - BORON/STAINLESS STEEL PLATES ; ROCKY FLATS - SOLUTIONS WITH RASCHIG RINGS

ABSTRACT

NEUTRON MULTIPLICATION MEASUREMENTS WERE MADE ON TWO TYPES OF ENRICHED URANIUM SYSTEMS CONTAINING BORON AS A NUCLEAR POISON. THEY ARE: (1) A 36-INCH DIAMETER PARTIALLY TAMPED TANK CONTAINING SPACED VERTICAL BORON-STAINLESS STEEL PLATES. (2) TAMPED AND UNTAMPED ASSEMBLIES OF URANYL-NITRATE SALTS AT LOW HYDROGEN MODERATION CONTAINING PYREX RASCHIG RINGS. ATTEMPTS WERE MADE TO CALCULATE SPHERE MASSES AND INFINITE CYLINDER AND SLAB SHAPES FROM THE EXPERIMENTAL DATA. THIS WORK REPRESENTS AN EXTENSION OF WORK REPORTED IN RFP-201.(AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

196 ID-NUMBER ID-NUMBER 198

AUTHOR GILLEY, L. W./ CRONIN, D. F./ HARNESS, V. G.
 TITLE BORON POISONING IN CRITICAL SLABS
 REPORT NUMBER..... ORNL-1715, 12
 DATE PUBLISHED ... 54-07-14
 NSA-NUMBER 10:1942
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

A SERIES OF EXPERIMENTS HAS BEEN INITIATED TO DETERMINE THE EFFECT OF PARTITIONING WITH BORON SLABS ON THE CRITICALITY OF A SLAB OF SOLUTION. THE MULTIPLYING MEDIA BEING STUDIED ARE BARE, AS WELL AS PARTIALLY WATER-REFLECTED, AQUEOUS SOLUTIONS OF URANYL FLUORIDE IN WHICH THE URANIUM HAS BEEN ENRICHED 93.3% WITH URANIUM-235

197 ID-NUMBER ID-NUMBER 197

AUTHOR KOUTS, H. / SHER, R.
 TITLE EXPERIMENTAL STUDIES OF SLIGHTLY ENRICHED URANIUM, WATER-MODERATED LATTICES
 REPORT NUMBER..... BNL-00486
 DATE PUBLISHED ... 57-09-00
 NSA-NUMBER 13:125
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - SLIGHTLY ENRICHED URANIUM - WATER LATTICES

ABSTRACT

INTRODUCTION: THE EXPERIMENTAL REACTOR PHYSICS PROGRAM AT BROOKHAVEN HAS FOR THE PAST FEW YEARS BEEN GIVEN MAINLY TO A STUDY OF URANIUM-WATER LATTICES. THE PURPOSE OF THIS UNDERTAKING HAS NOT BEEN TO PROVIDE DIRECT DESIGN PARAMETERS FOR PRESSURIZED WATER REACTOR CORES. RATHER, IT HAS BEEN THE INTENT TO DEVELOP A BODY OF EXPERIMENTAL DATA WHICH CAN BE COMPARED WITH THE RESULTS OF CALCULATIONAL SCHEMES. SUCH WORK SHOULD HELP TO IMPROVE THE THEORETICAL TREATMENTS TO A POINT WHERE DESIGN CALCULATIONS OF PRACTICAL PRESSURIZED WATER REACTOR CORES CAN BE CARRIED OUT WITH CONFIDENCE.

THE FIRST PHASE OF THIS PROGRAMMATIC STUDY DEVOTED TO THE STATIC PROPERTIES OF CLEAN, COLD, ROD-FUELED ASSEMBLIES, IS NEARLY FINISHED. THIS WORK HAS CONSISTED OF MEASUREMENTS OF AS MANY FEATURES OF THE NEUTRON ECONOMY AS POSSIBLE, FOR A VARIETY OF FUEL ROD SIZES AND ENRICHMENTS AND LATTICE SPACINGS.

THE RESULTS OF THESE EXPERIMENTS HAVE BEEN REPORTED PREVIOUSLY IN INTERNAL MEMORANDA AND TALKS AT MEETINGS, ALSO, A FAIRLY COMPLETE ACCOUNT OF THE MEASUREMENTS DONE WITH 0.600-INCH AND 0.750- INCH-DIAMETER RODS WAS GIVEN AT THE GENEVA CONFERENCE IN 1955.

IN THE COURSE OF COLLECTING DATA FOR REPORTS ON OTHER ROD SIZES, IT HAS BEEN DECIDED, FOR SEVERAL REASONS, THAT THESE OLDER RESULTS SHOULD BE REPUBLISHED. MOST OF THE QUANTITIES HAVE BEEN REMEASURED SINCE 1955. THE ACCURACY OF SOME HAS THUS BEEN IMPROVED, AND THEIR VALUES HAVE CHANGED SLIGHTLY. SOME SYSTEMATIC ERRORS HAVE BEEN REMOVED, NOTABLY FROM THE k MEASUREMENT AND FROM A FEW DETERMINATIONS OF B_{eff} . THE RESONANCE CAPTURE EXPERIMENTS, BEGUN IN 1954, HAS LED TO ONLY TENTATIVE RESULTS BY 1955, AND SO WERE NOT REPORTED IN GENEVA. THESE ARE NOW FINISHED, AND THEIR IMPLICATIONS MUST BE INCLUDED IN ANY COMPLETE ANALYSIS OF THIS WORK. FINALLY, A COMPLETE REPORT ON ALL BNL ROD MEASUREMENTS, GIVING ALL FINAL RESULTS IN ONE PLACE, OUGHT TO BE USEFUL. THIS IS PART 1 OF THE FINAL REPORT.

EARLY REPORTS GAVE RESULTS AS INTERPRETED THROUGH THE FOUR-FACTOR FORMULA. THIS PRACTICE IS STILL FOLLOWED HERE; BUT ALSO THE MORE BASIC DATA ARE PRESENTED IN A FORM SUITABLE FOR USE WITH MULTIGROUP INTERPRETATIONS, BECAUSE THE DESIGN CALCULATIONS FOR POWER REACTORS REQUIRE A DEPARTURE FROM FOUR-FACTOR METHODS. TEMPERATURE COEFFICIENTS, BURNOUT, AND STABLE FISSION PRODUCT BUILD-UP ALL LEAD TO NEUTRON MULTIPLICATION WHICH VARIES FROM CELL TO CELL. FURTHERMORE, IT HAS BECOME STANDARD PRACTICE TO DESIGN NONUNIFORMITY INTO THE REACTOR CORE AT THE BEGINNING, FOR FLUX FLATTENING, POWER FLATTENING, OR OTHER ENGINEERING REASONS (E.G. THE PWR SEED CORE.) THEREFORE EVEN HETEROGENEOUS CORES ARE THESE DAYS DESIGNED BY MULTIGROUP METHODS.

ON THE OTHER HAND, THERE IS A WIDE DIFFERENCE IN THE MULTIGROUP METHODS USED AT DIFFERENT LABORATORIES. THEREFORE, ALTHOUGH THIS REPORT IS DIRECTED TOWARD USE IN CONNECTION WITH SUCH THEORETICAL METHODS, NO ATTEMPT IS MADE TO CARRY OUT THE CONNECTION HERE TO ANY GREAT EXTENT.

THE SCOPE OF PART 1 OF THIS REPORT IS 15 LATTICES OF 0.600-INCH-DIAMETER URANIUM RODS. THREE FUEL ENRICHMENTS WERE USED; THESE HAS NOMINAL URANIUM-235 CONTENTS OF 1.0 PERCENT, 1.15 PERCENT, AND 1.3 PERCENT. TABLE 1 GIVES ACTUAL ENRICHMENTS, ATOM DENSITIES, ETC. FOR THE FUEL.

FIVE RATIOS OF WATER-TO-URANIUM VOLUMES WERE STUDIED WITH EACH FUEL ENRICHMENT. TABLE 2 LISTS THE PERTINENT GEOMETRICAL DATA ON THESE LATTICES. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

198 ID-NUMBER ID-NUMBER 198

AUTHOR ARNOLD, W. H. /
 TITLE CRITICAL MASSES AND LATTICE PARAMETERS OF WATER-URANIUM DIOXIDE CRITICAL
 EXPERIMENTS: A COMPARISON OF THEORY AND EXPERIMENT
 REPORT NUMBER.... YAEC-152
 DATE PUBLISHED ... 59-11-00
 NSA-NUMBER 14:17270
 SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - YANKEE REACTOR - URANIUM DIOXIDE -
 WATER

ABSTRACT

THIS REPORT DESCRIBES A SEMI-EMPIRICAL METHOD OF PERFORMING LATTICE CALCULATIONS IN URANIUM DIOXIDE - WATER CORES WHICH WAS DEVELOPED UNDER THE YANKEE RESEARCH AND DEVELOPMENT PROGRAM, AND WHICH HAS BEEN USED IN THE DESIGN OF YANKEE CORE 1. CALCULATED RESULTS USING THIS METHOD GIVE CLOSE AGREEMENT WITH EXPERIMENTAL RESULTS, PRESENTED HERE, FROM THE WESTINGHOUSE BETTIS TRX FACILITIES, FROM THE YANKEE AND BR-3 CRITICAL EXPERIMENTS PERFORMED AT THE WESTINGHOUSE ATOMIC POWER DEPARTMENT, AND FROM A CRITICAL EXPERIMENT PERFORMED BY BABCOCK AND WILCOX FOR THE NSS SAVANNAH.

ALTHOUGH THE SEMI-EMPIRICAL METHOD GIVES ADEQUATE AGREEMENT, ANOTHER SYSTEM OF CALCULATION IS PRESENTED WHICH USES THE MUFT CODE AND HAS A SOMEWHAT FIRMER THEORETICAL JUSTIFICATION. IT SHOULD PROVE VALUABLE IN THE DESIGN OF FUTURE CORES. (AUTH).

199 ID-NUMBER ID-NUMBER 199

AUTHOR GOODWIN, A. / SCHUSKE, C. L.
 TITLE PLUTONIUM GRAPHITE ASSEMBLIES - PART-2
 REPORT NUMBER.... RFP-0158
 DATE PUBLISHED ... 59-08-10
 NSA-NUMBER 14:6844
 SITE/PROGRAM ROCKY FLATS - PLUTONIUM GRAPHITE SYSTEMS

ABSTRACT

NEUTRON MULTIPLICATION MEASUREMENTS WERE MADE ON A NUMBER OF CYLINDRICAL ASSEMBLIES OF PLUTONIUM AND GRAPHITE DISCS. S-N CALCULATIONS WERE MADE ON HOMOGENEOUS MIXTURES OF PLUTONIUM AND GRAPHITE WITH VARYING CARBON/PLUTONIUM RATIOS AND VARYING REFLECTOR THICKNESS. (AUTH).

200 ID-NUMBER ID-NUMBER 200

AUTHOR GOODWIN, A. / SCHUSKE, C. L.
 TITLE PLUTONIUM GRAPHITE ASSEMBLIES
 REPORT NUMBER.... RFP-0123
 DATE PUBLISHED ... 58-09-29
 NSA-NUMBER 13:20016
 SITE/PROGRAM ROCKY FLATS - PLUTONIUM GRAPHITE SYSTEMS

ABSTRACT

NEUTRON MULTIPLICATION MEASUREMENTS WERE MADE ON CYLINDRICAL DISC ASSEMBLIES CONSTRUCTED OF ALTERNATE LAYERS OF GRAPHITE 0.5 INCH THICK AND PLUTONIUM METAL SHEET. THE NUMBER OF INDIVIDUAL SHEETS OF METAL PER LAYER OF GRAPHITE WAS VARIED FROM ONE TO SIX.

SOLID CYLINDRICAL SLABS OF METAL, GRAPHITE END REFLECTED, WERE ALSO CONSTRUCTED FROM MULTIPLE LAYERS OF THE METAL SHEET. THE END REFLECTOR THICKNESSES RANGED FROM 0.5 INCH TO 2 INCHES.

MULTIGROUP AGE THEORY (40 TO 50 GROUPS) AND THE LASL S-4 TRANSPORT CODE USING 16 ENERGY GROUPS WERE EMPLOYED TO CHECK THE EXPERIMENTAL MASS EXTRAPOLATIONS OF SEVERAL ARRAYS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

201 ID-NUMBER ID-NUMBER 201

AUTHOR BRUNA, J. G./ BRUNET, J. P./ CAIZERGUES, R./ CLOUET D'ORVAL, C./ KREMSER, J./ LECLERC, J./ VERRIERE, P.
 TITLE CRITICALITY EXPERIMENT ON A PLUTONIUM SOLUTION, EXPERIMENTAL RESULTS
 REPORT NUMBER.... CEA-2274
 DATE PUBLISHED ... 63-00-00
 NSA-NUMBER 17:41723
 SITE/PROGRAM FRANCE - PLUTONIUM AND URANIUM SOLUTIONS

ABSTRACT

INTRODUCTION: NEUTRON MULTIPLICATION MEASUREMENTS WERE MADE ON CYLINDRICAL DISC ASSEMBLIES CONSTRUCTED OF ALTERNATE LAYERS OF GRAPHITE 0.5 INCH THICK AND PLUTONIUM METAL SHEET. THE NUMBER OF INDIVIDUAL SHEETS OF METAL PER LAYER OF GRAPHITE WAS VARIED FROM ONE TO SIX.

SOLID CYLINDRICAL SLABS OF METAL, GRAPHITE END REFLECTED, WERE ALSO CONSTRUCTED FROM MULTIPLE LAYERS OF THE METAL SHEET. THE END REFLECTOR THICKNESSES RANGED FROM 0.5 INCH TO 2 INCH. MULTIGROUP AGE THEORY (40 TO 50 GROUPS) AND THE LASL S-4 TRANSPORT CODE USING 16 ENERGY GROUPS WERE EMPLOYED TO CHECK THE EXPERIMENTAL MASS EXTRAPOLATIONS OF SEVERAL ARRAYS. (AUTH).

204 ID-NUMBER ID-NUMBER 204

AUTHOR MIHALCZO, J. T./ LYNN, J. J./ SCOTT, D./ CONNOLLY, W. C.
 TITLE PRELIMINARY REPORT ON 2% URANIUM-235-ENRICHED URANIUM TETRAFLUORIDE/PARAFFIN CRITICAL ASSEMBLIES
 REPORT NUMBER.... ORNL-CF-59-4-120
 DATE PUBLISHED ... 59-04-22
 NSA-NUMBER 13:15206
 SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS WITH BLOCKS OF 2% URANIUM-235 ENRICHED URANIUM- TETRAFLUORIDE/PARAFFIN HAS BEEN INITIATED AT THE ORNL CRITICAL EXPERIMENTS FACILITY. THUS FAR ASSEMBLIES WITH HYDROGEN TO URANIUM-235 ATOMIC RATIOS OF 195 AND 294 HAVE BEEN BUILT IN PARALLELEPIPEDAL AND SIMULATED CYLINDRICAL GEOMETRIES, BOTH REFLECTED AND UNREFLECTED. FROM THE RESULTS THE MINIMUM CRITICAL MASSES FOR REFLECTED SPHERES HAVE BEEN DETERMINED TO BE 16.3 AND 8.5 KG OF URANIUM-235 FOR FUEL MIXTURES WITH HYDROGEN TO URANIUM-235 ATOMIC RATIOS OF 195 AND 294, RESPECTIVELY. THE MINIMUM CRITICAL MASSES FOR UNREFLECTED SPHERES OF THESE TWO FUEL MIXTURES ARE 24. 3 AND 12.7 KG OF URANIUM-235, RESPECTIVELY.(AUTH).

205 ID-NUMBER ID-NUMBER 205

AUTHOR FOX, J. K./ GILLEY, L. W.
 TITLE CRITICAL EXPERIMENTS WITH AQUEOUS SOLUTIONS OF URANIUM-235
 REPORT NUMBER.... ORNL-2081, 61
 DATE PUBLISHED ... 56-11-05
 NSA-NUMBER 11:1618
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

A NUMBER OF EXPERIMENTS HAVE BEEN PERFORMED TO DETERMINE THE CRITICAL CONDITIONS FOR VESSELS CONTAINING HIGHLY ENRICHED URANIUM IN WATER SOLUTIONS OF URANYL FLUORIDE. THEY INCLUDE EXPERIMENTS WITH SINGLE CYLINDRICAL CONTAINERS OF STAINLESS STEEL AND ALUMINUM AND EXPERIMENTS WITH INTERACTING ARRAYS OF ALUMINUM CYLINDERS. IN ADDITION, THE EFFECT OF SOME NEUTRON REFLECTOR MATERIALS ON THE CRITICAL PARAMETERS OF CYLINDRICAL REACTORS HAS BEEN STUDIED.

206 ID-NUMBER ID-NUMBER 206

AUTHOR THOMAS, J. T.
 TITLE CRITICAL THREE DIMENSIONAL ARRAYS OF NEUTRON-INTERACTING UNITS
 REPORT NUMBER.... ORNL-TM-0719
 DATE PUBLISHED ... 63-10-01
 NSA-NUMBER 18:2565

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

AS MANY AS 125 FIVE-LITER UNITS OF CONCENTRATED AQUEOUS URANYL NITRATE SOLUTION WERE ASSEMBLED IN CRITICAL ARRAYS. THE SOLUTION, AT A CONCENTRATION OF 415 GRAM OF URANIUM PER LITER, AND HAVING A SPECIFIC GRAVITY OF 1.555, WAS CONTAINED IN RIGHT CIRCULAR CYLINDERS OF METHACRYLATE PLASTIC HAVING A 0.64-CM-THICK WALL. THE URANIUM-235 CONTENT OF THE URANIUM WAS 92.6 WEIGHT PERCENT. THE DEPENDENCE OF THE NUMBER OF UNITS REQUIRED FOR CRITICALITY AS A FUNCTION OF THE SPACING HAS BEEN DETERMINED.

208 ID-NUMBER ID-NUMBER 208

AUTHOR SCHUSKE, C. L./

TITLE TWO EXPERIMENTAL SUBCRITICAL ARRAYS OF PLUTONIUM NITRATE SOLUTION

REPORT NUMBER.... RFP-0325

DATE PUBLISHED ... 63-08-26

NSA-NUMBER 17:34719

SITE/PROGRAM ROCKY FLATS - SOLUTIONS WITH RASCHIG RINGS ; ROCKY FLATS - PLUTONIUM SOLUTIONS

ABSTRACT

SUBCRITICAL MEASUREMENTS ON AN ARRAY OF 5 INCH DIAMETER TANKS AND A SINGLE 30 INCH DIAMETER RASCHIG RING TANK FILLED WITH PLUTONIUM NITRATE ARE DESCRIBED.

210 ID-NUMBER ID-NUMBER 210

AUTHOR MIHALCZO, J. T./ LYNN, J. J.

TITLE MULTIPLICATION MEASUREMENTS WITH HIGHLY ENRICHED URANIUM METAL SLABS

REPORT NUMBER.... ORNL-CF-59-7-87

DATE PUBLISHED ... 59-07-27

NSA-NUMBER 13:19051

SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL SLABS

ABSTRACT

A SERIES OF NEUTRON MULTIPLICATION MEASUREMENTS WITH ARRAYS OF 1 BY 8 BY 10 INCH SLABS OF 93. 4% URANIUM-235-ENRICHED URANIUM METAL HAVE BEEN MADE TO PROVIDE DATA FROM WHICH SAFETY CRITERIA FOR THE STORAGE OF THESE FISSILE UNITS CAN BE ESTABLISHED. EACH SLAB CONTAINED 22.9 KG OF URANIUM-235. A MAXIMUM OF 125 UNITS WAS ASSEMBLED. THE ARRAYS STUDIED WERE CUBIC LATTICES OF THE UNITS AND WERE USUALLY PARALLELEPIPEDAL IN SHAPE. ARRAYS WERE BOTH UNMODERATED AND PLEXIGLAS-MODERATED AND WERE SURROUNDED IN MOST CASES BY A 1-INCH-THICK PLEXIGLAS REFLECTOR. THE LATTICE DENSITIES (RATIO OF FISSILE UNIT VOLUME TO LATTICE CELL VOLUME) WERE BETWEEN 0.023 AND 0.06. UNMODERATED LATTICES WITH A DENSITY OF 0.06 WOULD REQUIRE 145 +/- 5 UNITS FOR CRITICALITY, WHILE THOSE WITH A DENSITY OF 0. 023 WOULD REQUIRE 350 +/- 30 UNITS. IN LATTICES IN WHICH THE FISSILE UNITS ARE SEPARATED BY 1 INCH OF PLEXIGLAS, APPROXIMATELY 27 UNITS WOULD BE REQUIRED FOR A CRITICAL ARRAY WITH A LATTICE DENSITY OF 0.023. DISTRIBUTING FOAMGLAS (CONTAINING 2% BORON) THROUGHOUT A MODERATED ARRAY INCREASED THE CRITICAL NUMBER OF FISSILE UNITS BY A FACTOR OF 5, WHILE STYROFOAM HAD A SMALL EFFECT.(AUTH).

214 ID-NUMBER ID-NUMBER 214

AUTHOR LOFTHOUSE, J. H. / PINCOCK, G. D. / KUNZE, J. F. / WOOD, R. E. / HYLAND, R. E.

TITLE CAVITY REACTOR CRITICAL EXPERIMENT

REPORT NUMBER.... TANSO, 09, 340

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 66-10-00

NSA-NUMBER 21:8063

SITE/PROGRAM GENERAL ELECTRIC CO., IDAHO - CAVITY REACTOR

ABSTRACT

A CRITICAL EXPERIMENT IS BEING PERFORMED ON A REACTOR CONSISTING OF A CYLINDRICAL MODERATOR TANK WITH A CENTRAL CAVITY CONTAINING DILUTE URANIUM. CRITICAL MASSES, POWER DISTRIBUTIONS, REACTIVITY WORTHS OF MOCKUP HEAT SHIELDS, HOLES IN THE MODERATOR TANK, AND THE EFFECTS OF VARYING FUEL DISTRIBUTION ARE BEING STUDIED. THE REFLECTOR THICKNESS AND THE CAVITY SIZE ARE SUBSTANTIALLY LARGER THAN THOSE IN EARLY EXPERIMENTS OF THIS TYPE (REF 1,2), AND THE FUEL, INSTEAD OF LINING THE CAVITY WALL, HAS BEEN DISPERSED THROUGHOUT THE SPECIFIED VOLUME OF THE CAVITY IN THE FORM OF 0.001-INCH-THICK SHEET MATERIAL.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

A PRELIMINARY EXPERIMENT WAS PERFORMED IN A SMALL (7.67 LITER) CAVITY CONTAINER PLACED IN A RELATIVELY ISOTROPIC THERMAL FLUX OF A CONVENTIONAL REACTOR. A GASEOUS (URANIUM HEXAFLUORIDE) CAVITY WAS COMPARED WITH A UNIFORM DISPERSION OF THE ABOVE-MENTIONED FUEL SHEETS (93.2 PERCENT URANIUM-235). FOR EQUIVALENT REACTIVITIES, THE URANIUM-235 MASS IN THE FUEL SHEETS WAS 6 PERCENT GREATER THAN IN THE GAS, AND THIS VALUE IS APPROXIMATELY THE SAME AS THE THERMAL-FLUX SELF-SHIELDING EFFECT FOR SUCH FUEL SHEETS. (AUTH).

215 ID-NUMBER ID-NUMBER 215

AUTHOR HYLAND, R. E. / PINCOCK, G. D. / KUNZE, J. F. / WOOD, R. E.

TITLE EXPERIMENTAL RESULTS FROM LARGE CAVITY REACTOR CRITICAL

REPORT NUMBER.... TANSO, 10, 008-009

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED .. 67-06-00

NSA-NUMBER 21:38696

SITE/PROGRAM GENERAL ELECTRIC CO., IDAHO - CAVITY REACTOR

ABSTRACT

VARIOUS FUEL (93.2 PERCENT URANIUM-235) ARRANGEMENTS HAVE BEEN MOCKED UP IN A LARGE CAVITY REACTOR CRITICAL EXPERIMENT AT THE IDAHO TEST STATION. THE CAVITY REACTOR, WITH OVERALL DIMENSION OF 12-FT DIAM AND 10-FT LONG, CONTAINS A CYLINDRICAL CAVITY 4-FT LONG BY 6-FT DIAM AND IS SURROUNDED BY 35 INCH OF HEAVY WATER (0.22 PERCENT LIGHT WATER). THE FUEL IN FOIL (0.001-INCH THICK) IS DISPERSED IN THE CAVITY IN VARIOUS PATTERNS REPRESENTING FLOWING FUEL AS IN A GAS-CORE REACTOR POWERPLANT CONCEPT. A PREVIOUS REPORT PRESENTED DATA COVERING THE UNIFORMLY DISTRIBUTED FUEL EXPERIMENT. THE RESULTS TO BE COVERED IN THIS PAPER ARE AN EXTENSION OF THOSE RESULTS TO DETERMINE CRITICAL MASSES, FLUX AND POWER SHAPES, AND COMPARISONS WITH A GASEOUS SYSTEM. THE AREAS OF INVESTIGATION ARE INDICATED IN TABLE I. (AUTH).

216 ID-NUMBER ID-NUMBER 216

AUTHOR PINCOCK, G. D. / KUNZE, J. F.

TITLE CAVITY REACTOR CRITICAL EXPERIMENT

REPORT NUMBER.... NASA-CR-72234

DATE PUBLISHED .. 67-09-00

NSA-NUMBER 22:3881

SITE/PROGRAM GENERAL ELECTRIC CO., IDAHO - CAVITY REACTOR

ABSTRACT

A SERIES OF EXPERIMENTS WERE CONDUCTED AT THE IDAHO TEST STATION ON A LARGE "CAVITY" REACTOR CONSISTING OF A CAVITY 183 CM IN DIAMETER OF 122 CM LONG SURROUNDED BY 91 CM OF HEAVY WATER. THE CAVITY WAS FUELED WITH URANIUM-235. MEASUREMENTS WERE MADE ON VARIOUS CONFIGURATIONS, INCLUDING SUCH VARIATIONS AS FUEL DIAMETER AND SHAPE, BERYLLIUM BAFFLES IN THE REFLECTOR AND INSERTION OF VARIOUS STRUCTURAL AND OPERATING MATERIALS CHARACTERISTIC OF A NUCLEAR ROCKET REACTOR. (AUTH).

217 ID-NUMBER ID-NUMBER 217

AUTHOR MASSON, L. S. / PINCOCK, G. D. / KUNZE, J. F. / WOOD, R. E. / HYLAND, R. E.

TITLE CAVITY REACTOR GAS-CORE CRITICAL EXPERIMENTS

REPORT NUMBER.... TANSO, 10, 419-420

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED .. 67-11-00

NSA-NUMBER 22:6086

SITE/PROGRAM GENERAL ELECTRIC CO., IDAHO - CAVITY REACTOR

ABSTRACT

PREVIOUS CRITICAL EXPERIMENTS INVOLVING THE GASEOUS CAVITY REACTOR CONCEPT HAVE USED METAL FOILS OR GRAPHITE-URANIUM RODS TO SIMULATE THE GAS IN THE CAVITY. ON MAY 17, 1967, AN ACTUAL GASEOUS (URANIUM HEXAFLUORIDE) CORE CONFIGURATION WAS MADE CRITICAL, AND SUBSEQUENT MEASUREMENTS WERE MADE TO COMPARE THE RESULTS FROM THE REAL GAS CONFIGURATION WITH THOSE FROM A MOCKUP FOIL CONFIGURATION OF THE IDENTICAL DIMENSIONS. THE GASEOUS FUEL WAS CONTAINED INSIDE AN ALUMINUM TANK WITH A DIAMETER OF 122 CM AND A LENGTH OF 109 CM. THE SURROUNDING MODERATOR-REFLECTOR TANK WAS A CYLINDER WITH AN INSIDE DIAMETER OF 183 CM AND A LENGTH OF 122 CM AND AN OUTSIDE DIAMETER OF 366 CM AND LENGTH OF 305 CM. THE TANK WAS FILLED WITH HEAVY WATER TO A NOMINAL THICKNESS OF 89 CM AND CONTAINED A 10.2-CM-THICK BERYLLIUM SLAB IN THE HEAVY WATER SPACED 6.7 CM FROM THE CAVITY WALL. THE REACTOR ASSEMBLY WAS AS SHOWN. THE PRIOR MOCKUP CRITICAL EXPERIMENT WAS PERFORMED USING 0.0025-CM- THICK SHEET URANIUM METAL DISPERSED THROUGHOUT THE FUELED VOLUME AND SUPPORTED ON ALUMINUM SCREENS. IN BOTH EXPERIMENTS, THE FUEL WAS 93 PERCENT ENRICHED IN URANIUM-235. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

227 ID-NUMBER ID-NUMBER 227

AUTHOR LINENBERGER, G. A. / LOWRY, L. L.
 TITLE NEUTRON DETECTOR TRAVERSES IN THE TOPSY AND GODIVA CRITICAL ASSEMBLIES
 REPORT NUMBER..... LA-1653
 DATE PUBLISHED ... 54-04-00
 NSA-NUMBER 11:13954
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

NEUTRON DETECTOR TRAVERSES OF THE UNTAMPED ORALLOY (GODIVA) AND THE TUBALLOY- OR NICKEL-TAMPED ORALLOY (TOPSY) METAL CRITICAL ASSEMBLIES HAVE BEEN OBTAINED BY COUNTING THE FOLLOWING TYPES OF RADIATION:

- 1) GAMMA-ACTIVITY OF URANIUM-235 AND URANIUM-238 FISSION PRODUCTS.
- 2) FISSION FRAGMENTS OF NEPTUNIUM-237 IN A SPIRAL CHAMBER.
- 3) AND BETA-ACTIVITY OF GOLD AND SULFUR.

AT A FEW POSITIONS WITHIN THE ASSEMBLIES, AND FOR THE URANIUM-235 FISSION SPECTRUM, CROSS SECTION RATIOS OF A NUMBER OF PAIRS OF FISSIONABLE ISOTOPES WERE DETERMINED BY MEANS OF A COMPARISON FISSION CHAMBER.(AUTH).

229 ID-NUMBER ID-NUMBER 229

AUTHOR DOMINEY, J. R./ LANE, R. C./ THOMAS, A. F.
 TITLE CRITICAL MASS MEASUREMENTS WITH THIN DISCS OF 45.5 PERCENT ENRICHED URANIUM
 REPORT NUMBER..... AWRE-NR/A-1/62
 DATE PUBLISHED ... 62-03-00
 SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - URANIUM(30,37.5,46%) METAL

ABSTRACT

INTRODUCTION: EXPERIMENTAL VALUES OF CRITICAL MASSES OF NEAR ISOMETRIC CYLINDERS OR SPHERES OF URANIUM OF VARIOUS ENRICHMENTS HAVE BEEN PUBLISHED. THE SAFETY EVALUATION OF CERTAIN MANUFACTURING PROCESSES A KNOWLEDGE OF THE CRITICAL MASSES OF NON-ISOMETRIC CYLINDERS OR SLABS IS REQUIRED. ACCORDINGLY, USING A SUPPLY OF 45 PERCENT ENRICHED URANIUM, WHICH BECAME AVAILABLE FOR A SHORT PERIOD, A SERIES OF MEASUREMENTS WAS MADE AT AWRE, ALDERMASTON ON THE CRITICAL HEIGHTS OF CYLINDERS OF H/D RATIOS BETWEEN 0.08 AND 0.63.

THIS REPORT DESCRIBES THESE MEASUREMENTS AND CONSTANTS ARE DEDUCED CORRELATING THE EXPERIMENTAL DATA, BY MEANS OF THE EQUAL GEOMETRICAL BUCKLING CONVERSION, WHICH, AT LEAST, ENABLE VALUES OF CRITICAL MASSES OF CYLINDERS WITHIN THE EXPERIMENTAL RANGE OF H/D VALUES TO BE COMPUTED QUICKLY AND TOLERABLY ACCURATELY. (AUTH.).

230 ID-NUMBER ID-NUMBER 230

AUTHOR MIHALCZO, J. T.
 TITLE PROMPT NEUTRON LIFETIME IN HYDROGEN-MODERATED URANIUM(3) CRITICAL ASSEMBLIES
 REPORT NUMBER..... ORNL-3360, 37-38
 DATE PUBLISHED ... 62-09-00
 NSA-NUMBER 17:12763
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL SLABS

ABSTRACT

PROMPT-NEUTRON DECAY CONSTANTS IN UNREFLECTED AND REFLECTED DELAYED-CRITICAL PARALLELEPIPEDS OF A HOMOGENEOUS MIXTURE OF URANIUM TETRAFLUORIDE AND PARAFFIN WERE DETERMINED BY THE PULSED- NEUTRON TECHNIQUE. THE FUEL MIXTURE HAD A DENSITY OF 4.5 GRAM/CC AND CONTAINED 92 WEIGHT PERCENT URANIUM TETRAFLUORIDE IN WHICH THE URANIUM-235 ENRICHMENT OF THE URANIUM WAS 3 PERCENT. THE HYDROGEN/URANIUM-235 ATOMIC RATIO WAS 133. THE REFLECTOR WAS A 15-CM THICKNESS OF PARAFFIN CARBON(25)-HYDROGEN(52) WITH A DENSITY OF 0.93 GRAM/CC.

NEUTRON BURSTS FOR THESE EXPERIMENTS WERE PRODUCED BY A 150-KV COCKCROFT-WALTON ACCELERATOR IN WHICH DEUTERONS WERE ELECTROSTATICALLY DEFLECTED ON AND OFF A TRITIUM TARGET. THE DETECTORS USED WERE BORON TRIFLUORIDE COUNTERS, PROTON RECOIL TYPE SCINTILLATORS, AND SODIUM-IODIDE SCINTILLATORS. THE DECAY CONSTANT ALPHA WAS DETERMINED FROM 256-CHANNEL TIME ANALYZER DATA BY A NONLINEAR LEAST- SQUARES FITTING OF THE EQUATIONS A NONLINEAR LEAST-SQUARES FITTING OF THE EQUATION $Y=B(SUB1)+B(SUB2) \cdot EXP \cdot (-ALPHA \cdot TIME)$. THE RESULTS, GIVEN IN TABLE 3.3.1, WERE OBTAINED BY COUNTING EITHER NEUTRONS OR PROMPT GAMMA RAYS. (AUTH.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

234 ID-NUMBER ID-NUMBER 234

AUTHOR CRONIN, D. F./ CALLIHAN, A. D.
 TITLE CRITICAL MASS STUDIES, PART 7 AQUEOUS URANIUM SLURRIES
 REPORT NUMBER..... ORNL-1726
 DATE PUBLISHED ... 54-06-17
 NSA-NUMBER 11:9865
 SITE/PROGRAM OAK RIDGE - URANIUM(93%)TRIOXIDE - WATER (SLURRIES)

ABSTRACT

A SERIES OF EXPERIMENTS HAS BEEN PERFORMED WITH AQUEOUS SLURRIES OF URANIUM TRIOXIDE, ENRICHED TO 93% IN URANIUM-235, AND A PRELIMINARY STUDY OF THE NUCLEAR STABILITY OF CRITICAL AND NEAR CRITICAL SUSPENSIONS. THE SLURRIES WERE CONTAINED IN A 12 INCH DIAMETER CYLINDER AND WERE MIXED BY A CENTRALLY LOCATED VARIABLE SPEED STIRRER IN A MANNER GIVING SMALL SURFACE DISTURBANCES. CRITICAL MASSES WERE MEASURED AT CONCENTRATIONS RANGING FROM 40 TO 300 GRAMS URANIUM PER LITER AT SEVERAL STIRRER SPEEDS.(AUTH).

235 ID-NUMBER ID-NUMBER 235

AUTHOR CALLIHAN, A. D. / CRONIN, D. F. / FOX, J. K. / MORFITT, J. W. / ROHRER, E. R. / WILLIAMS, D. V. P.
 TITLE CRITICAL MASS STUDIES, PART-6
 REPORT NUMBER..... Y-0801 (DEL.)
 DATE PUBLISHED ... 51-08-00
 NSA-NUMBER 15:2068
 SITE/PROGRAM OAK RIDGE - URANIUM SLUGS - WATER (HANFORD FUEL ELEMENTS)

ABSTRACT

THE EXPERIMENTS WERE PERFORMED TO DETERMINE SAFE HANDLING CONDITIONS FOR P-10 ALLOY SLUGS. THE DATA SHOW THAT 90 ENHANCED SLUGS IS THE MAXIMUM SAFE NUMBER USING LIGHT WATER AS MODERATOR AND REFLECTOR. USING A MIXED REFLECTOR OF LIGHT WATER AND HANFORD NATURAL URANIUM SLUGS WITH LIGHT WATER MODERATOR, THE MAXIMUM SAFE NUMBER OF ENRICHED SLUGS IS REDUCED TO 47 WHEN THE RATIO OF NATURAL SLUGS TO ENHANCED SLUGS IS 108/9. FOR A RATIO OF NATURAL SLUGS TO ENRICHED SLUGS OF 38/9, THE MAXIMUM SAFE NUMBER IS 55.

ADDITIONAL TESTS WERE MADE TO CONFIRM THE NUCLEAR SAFETY OF A PROPOSED LEAD-LINED SHIPPING CONTAINER WHEN FILLED WITH ENRICHED SLUGS. (AUTH).

236 ID-NUMBER ID-NUMBER 236

AUTHOR NEELEY, V. I./ CLAYTON, E. D. / LLOYD, R. C.
 TITLE NEUTRON MULTIPLICATION MEASUREMENTS WITH PLUTONIUM-ALUMINUM ALLOY RODS IN LIGHT WATER
 REPORT NUMBER..... TANSO, 03, 292-293
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 60-06-00
 NSA-NUMBER 15:7003
 SITE/PROGRAM HANFORD - PLUTONIUM RODS IN WATER

ABSTRACT

A SERIES OF NEAR CRITICAL AND EXPONENTIAL EXPERIMENTS HAVE BEEN PERFORMED WITH NATURAL WATER MODERATED ASSEMBLIES OF PLUTONIUM-ALUMINUM ALLOY RODS IN ORDER TO ESTABLISH BASES FOR NUCLEAR SAFETY SPECIFICATIONS FOR HANDLING AND STORAGE OF THIS KIND OF FISSILE MATERIAL.

THE FUEL ELEMENTS WERE PLUTONIUM-ALUMINUM ALLOY RODS OF 5 WT% PLUTONIUM CONTENT. THESE RODS WERE 24 INCH LONG AND 0.506 INCH IN DIAMETER. THEY WERE CLAD IN 0.030-INCH ZIRCALOY-2 WITH 0.020 AND 0.125-INCH THICK END-CAPS CORRESPONDING TO A ZIRCONIUM/PLUTONIUM ATOMIC RATIO OF 31.92 AND AN ALUMINUM-PLUTONIUM ATOMIC RATIO OF 168.20. EACH ROD CONTAINED ABOUT 11 GRAMS OF PLUTONIUM. THE PLUTONIUM CONTAINED 5 WT% PLUTONIUM-240. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

238 ID-NUMBER ID-NUMBER 238

AUTHOR LLOYD, R. C. / SMITH, R. B.
 TITLE CRITICALITY MEASUREMENTS ON HETEROGENEOUS 3.1 PERCENT ENRICHED URANIUM -
 WATER SYSTEMS
 REPORT NUMBER..... HW-57861
 DATE PUBLISHED ... 58-10-20
 NSA-NUMBER 13:9472
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

THE DESIGN OF EFFICIENT SYSTEMS FOR PROCESSING SPENT POWER REACTOR FUEL ELEMENTS REQUIRES INFORMATION ON THE CRITICAL MASSES OF THE URANIUM INVOLVED. TO OBTAIN SOME OF THE NEEDED INFORMATION, APPROACH-TO-CRITICAL TYPE EXPERIMENTS ARE BEING CARRIED OUT WITH LIGHT WATER MODERATED AND REFLECTED HEXAGONAL LATTICES OF ENRICHED SOLID FUEL ELEMENTS; THE URANIUM-235 CONTENT IS 3.063 PERCENT BY WEIGHT.

EXPERIMENTS WERE PLANNED FOR FUEL ELEMENTS OF 0.925, 0.600, AND 0.300 INCHES O.D. WITH VARIOUS LATTICE SPACINGS. THUS FAR, EXPERIMENTS USING THE 0.925-INCH O.D. FUEL ELEMENTS AT FIVE LATTICE SPACINGS HAVE BEEN COMPLETED AND THE RESULTS ARE REPORTED HERE. FOR FUEL ELEMENTS OF THIS DIAMETER, APPROACH EXPERIMENTS WERE SEPARATELY MADE FOR EACH OF TWO DIFFERENT FUEL COLUMN LENGTHS, 16 AND 24 INCHES RESPECTIVELY.

239 ID-NUMBER ID-NUMBER 239

AUTHOR LLOYD, R. C. / SMITH, R. B. / CLAYTON, E. D.
 TITLE CRITICALITY MEASUREMENTS OF HETEROGENEOUS 3.1 PERCENT ENRICHED URANIUM -
 WATER SYSTEMS
 REPORT NUMBER..... HW-59126
 DATE PUBLISHED ... 59-01-20
 NSA-NUMBER 13:12770
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

THE PROGRAM OF CRITICAL MASS MEASUREMENTS WITH 3.063 PER CENT ENRICHED URANIUM RODS IN LIGHT WATER WAS CONTINUED. MEASUREMENTS FOR THE LARGEST OF THE THREE ROD DIAMETERS FOR WHICH THE EXPERIMENTS WERE PLANNED, 0.925, 0.600, AND 0.300 INCHES, WERE PREVIOUSLY COMPLETED AND REPORTED.

THE CRITICAL APPROACH MEASUREMENTS OF THE 0.600-INCH DIAMETER RODS HAVE NOW BEEN COMPLETED AND ARE HERE REPORTED.

THE BARE URANIUM FUEL SLUGS WERE ENCASED IN 0.031-INCH WALL LUCITE TUBES FOR INSERTION IN THE LATTICE FRAMEWORKS. THE LATTICE WAS SUBMERGED IN TAP WATER WHICH MODERATED AND COMPLETELY REFLECTED THE SYSTEM. THE REFLECTOR WAS COMPLETED ON BOTH ENDS BY PLASTIC SLUGS (EIGHT INCHES LONG) LOADED ABOVE AND BELOW THE FUEL IN EACH TUBE.

THE APPROACHES WERE AGAIN CARRIED TO 96 PER CENT OF THE EXTRAPOLATED CRITICAL LOADING. THE REPORTED CRITICAL LOADING WAS OBTAINED FROM A LEAST SQUARES FIT TO THE MULTIPLICATION DATA FROM ABOUT 85 PER CENT OF THE CRITICAL LOADING. THE POISONING EFFECT OF THE SOURCE, ITS HOLDER, AND SAFETY ROD GUIDE TUBES WAS DETERMINED IN TERMS OF THE EQUIVALENT NUMBER OF FUEL RODS. THIS CORRECTION WAS APPLIED TO THE EXTRAPOLATED CRITICAL LOADING TO GIVE THE NUMBER FUEL RODS WHICH WOULD BE CRITICAL IN A CLEAN LATTICE.

240 ID-NUMBER ID-NUMBER 240

AUTHOR LLOYD, R. C. / CLAYTON, E. D. / SMITH, R. B.
 TITLE CRITICALITY MEASUREMENTS OF HETEROGENEOUS 3.1 PERCENT ENRICHED URANIUM -
 WATER SYSTEM
 REPORT NUMBER..... HW-62727
 DATE PUBLISHED ... 59-10-20
 NSA-NUMBER 14:10872
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

THE PROGRAM OF CRITICAL APPROACH AND EXPONENTIAL MEASUREMENTS OF 3.063 PER CENT ENRICHED URANIUM RODS IN LIGHT WATER WAS CONTINUED. CRITICAL MASSES HAVE BEEN REPORTED FOR THREE ROD DIAMETERS (0.300, 0.600 AND 0.925-INCH) IN PREVIOUS REPORTS. A DISCUSSION AND SOME MEASUREMENT VALUES OF EXTRAPOLATION LENGTHS (REFLECTOR SAVINGS) WERE GIVEN IN THE PREVIOUS QUARTERLY REPORT. ADDITIONAL VALUES OF THE EXTRAPOLATION LENGTHS ARE NEEDED FOR MORE ACCURATELY CALCULATING CRITICAL GEOMETRIES AND CRITICAL MASSES FOR OTHER THAN THE MEASURED CONFIGURATIONS. TO DETERMINE THESE VALUES, FURTHER CALCULATIONS AND MEASUREMENTS (EXPONENTIAL AND CRITICAL APPROACH) WERE MADE FOR 0.300 AND 0.600-INCH DIAMETER RODS. EXPONENTIAL EXPERIMENTS WERE MADE WITH 32-INCH LENGTH RODS AND CRITICAL APPROACH MEASUREMENTS WITH 16-

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

AND 32-INCH LENGTH RODS. THE EXTRAPOLATION LENGTH WAS CALCULATED BY FORCING THE BUCKLING VALUE TO BE EQUAL FROM THE EXPONENTIAL AND CRITICAL APPROACH MEASUREMENTS BY ADJUSTMENT OF THE EXTRAPOLATION LENGTH.

241 ID-NUMBER ID-NUMBER 241

AUTHOR BECK, C. K. / CALLIHAN, A. D. / MURRAY, R. L.
 TITLE CRITICAL MASS STUDIES, PART 1
 REPORT NUMBER.... A-4716
 DATE PUBLISHED .. 47-06-00
 NSA-NUMBER 12:963
 SITE/PROGRAM OAK RIDGE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

USING 1108 ONE-INCH CUBES OF MOCK-UP URANIUM HEXAFLUORIDE, CONTAINING 54 KG OF URANIUM-235 MADE FROM URANIUM TETRAFLUORIDE (95% ISOTOPIC CONCENTRATION OF URANIUM-235) AND (CF₂)N, AND SIMILAR HYDROGENOUS CUBES OF (CH₂)N, IN VARIOUS PROPORTIONS AND UNDER VARIOUS CONDITIONS OF ACCUMULATION (ALL RELEVANT TO CONDITIONS IN THE K-25 PLANT), 26 ASSEMBLIES WERE BUILT TO CRITICALITY AND 4 OTHER ASSEMBLIES WERE BUILT WHICH DID NOT BECOME CRITICAL. FROM THESE EXPERIMENTS, AT LEAST SOME INFORMATION WAS OBTAINED ON THE EFFECT ON CRITICAL MASS OF (1) AMOUNT OF INTERMIXED HYDROGEN, (2) UNIFORMITY OF HYDROGEN-URANIUM MIXING, (3) DENSITY, (4) GEOMETRY, (5) SHIELDING OR REFLECTOR MATERIALS AROUND THE ACCUMULATION.

244 ID-NUMBER ID-NUMBER 244

AUTHOR STEWART, H. B. / GAVIN, G. B.
 TITLE ACTIVATION EXPERIMENTS IN THE KAPL PRELIMINARY PILE ASSEMBLIES
 REPORT NUMBER.... KAPL-329, PART 1.
 DATE PUBLISHED .. 50-09-20
 NSA-NUMBER 10:6410
 SITE/PROGRAM GENERAL ELECTRIC CO., KNOLLS ATOMIC POWER LABORATORY - PRELIMINARY PILE ASSEMBLY (PPA)

ABSTRACT

IN ORDER TO OBTAIN A PRELIMINARY KNOWLEDGE OF THE CHARACTERISTICS OF REACTORS HAVING A NEUTRON SPECTRUM PREDOMINANTLY IN THE INTERMEDIATE ENERGY RANGE, A NUMBER OF EXPERIMENTS HAVE BEEN CONDUCTED ON SEVERAL CRITICAL ASSEMBLIES WHICH WERE DESIGNED TO HAVE THE SAME GENERAL FEATURES AS THE CONTEMPLATED KAPL REACTOR. THE RESULTS OF SOME OF THE ACTIVATION EXPERIMENTS WHICH HAVE BEEN CONDUCTED ON THESE PRELIMINARY PILE ASSEMBLIES WILL BE SUMMARIZED IN THREE REPORTS AS FOLLOWS:

PART I EXPERIMENTAL PROCEDURES.

PART II RESULTS OF POWER DISTRIBUTION AND NEUTRON FLUX EXPERIMENTS FOR PPA-2, -3, -4, AND -5.

PART III ALPHA EXPERIMENTS IN PPA-5.

247 ID-NUMBER ID-NUMBER 247

AUTHOR NONE
 TITLE A SAFETY ANALYSIS OF THE OAK RIDGE CRITICAL EXPERIMENTS FACILITY
 REPORT NUMBER.... ORNL-TM-0349, REV. 1
 DATE PUBLISHED .. 67-00-00
 NSA-NUMBER 17:4742
 SITE/PROGRAM OAK RIDGE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THIS MEMORANDUM DESCRIBES THE CRITICAL EXPERIMENTS FACILITY, LOCATED IN THE Y-12 AREA OF OAK RIDGE, WITH PARTICULAR REFERENCE TO THE SAFETY FEATURES OF BOTH THE LABORATORY ITSELF AND THE PROCEDURES ESTABLISHED FOR THE EXPERIMENTS CONSTITUTING THE SPECIALIZED USE FOR WHICH THE LABORATORY WAS CONSTRUCTED. A PERTINENT FACTOR IN EVALUATING THE SAFETY FEATURES IS THE ABSENCE OF A SIGNIFICANT INVENTORY OF FISSION PRODUCTS IN EXPERIMENTAL MATERIALS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

249 ID-NUMBER ID-NUMBER 249

AUTHOR MILLS, C. B.
 TITLE REFLECTOR MODERATED REACTORS
 REPORT NUMBER..... NSENAO, 13, 301-305
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 62-08-00
 NSA-NUMBER 16:28441
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) - BERYLLIUM

ABSTRACT

THE COMPLETE SPATIAL SEPARATION OF MODERATOR AND URANIUM FUEL BEARING REGIONS ARE SHOWN BY EXPERIMENT TO RESULT IN CRITICAL REACTORS WITH LOW CRITICAL MASS AND RELATIVELY UNIFORM FISSIONING DENSITY. STUDIES OF SEVERAL OF THESE EXPERIMENTS TO ESTABLISH THE ACCURACY OF A NUMERICAL METHOD OF CALCULATION (SNG) FOR THIS CLASS OF PROBLEMS SHOW GOOD CORRESPONDENCE BETWEEN THEORY AND EXPERIMENT. THIS METHOD IS THEN USED FOR A USEFUL SURVEY OF CRITICAL MASS AND URANIUM-235 ATOMIC DENSITY AS A FUNCTION OF GEOMETRY FOR THE BEST MODERATORS, DEUTERIUM OXIDE AND BERYLLIUM. (AUTH).

250 ID-NUMBER ID-NUMBER 250

AUTHOR RAFFETY, S. J./ MIHALCZO, J. T.
 TITLE HOMOGENEOUS CRITICAL ASSEMBLIES OF 2 AND 3 PERCENT ENRICHED URANIUM IN PARAFFIN
 REPORT NUMBER..... Y-DR-014
 DATE PUBLISHED ... 69-05-02
 SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN

ABSTRACT

A SERIES OF CLEAN CRITICAL EXPERIMENTS HAS BEEN PERFORMED WITH HOMOGENEOUS MIXTURES OF FINELY DIVIDED URANIUM(2)-TETRAFLUORIDE OR URANIUM(3)-TETRAFLUORIDE DISPERSED IN PARAFFIN WITH HYDROGEN/URANIUM-235 ATOMIC RATIOS VARYING FROM 133 TO 972. THE ASSEMBLIES WERE CONSTRUCTED IN RECTANGULAR GEOMETRY AND MINIMUM CRITICAL MASSES AND VOLUMES IN CYLINDRICAL AND SPHERICAL GEOMETRIES WERE OBTAINED FROM BUCKLING CONVERSIONS. THE MINIMUM CRITICAL SPHERICAL VOLUMES OF A URANIUM(2)-TETRAFLUORIDE-PARAFFIN MIXTURE WHEN UNREFLECTED AND REFLECTED WITH AN EFFECTIVELY INFINITE HYDROGENOUS REFLECTOR ARE 199 AND 138 LITERS, RESPECTIVELY AND THE MINIMUM CRITICAL URANIUM-235 MASSES ARE 7.5 AND 5.4 KG, RESPECTIVELY ARE 7.5 AND 5.4 KG, RESPECTIVELY. THE EXPERIMENTS WITH THE URANIUM(3)-TETRAFLUORIDE-PARAFFIN MIXTURES WERE NOT EXTENSIVE ENOUGH TO DETERMINE EXPERIMENTALLY THE VALUES AT OPTIMUM MODERATION BUT TRANSPORT THEORY CALCULATIONS INDICATE THAT THE UNREFLECTED AND REFLECTED MINIMUM CRITICAL VOLUMES ARE ABOUT 93 AND 57 LITERS, RESPECTIVELY, AND THAT THE MINIMUM CRITICAL MASSES ARE ABOUT 4.1 AND 2.7 KILOGRAMS OF URANIUM-235, RESPECTIVELY.

CADMIUM RATIOS AT THE CENTER OF THE CRITICAL ASSEMBLIES HAVE BEEN MEASURED FOR GOLD, INDIUM- ALUMINUM ALLOY, 10 WEIGHT PERCENT URANIUM(93)-ALUMINUM ALLOY AND URANIUM(93) METAL FOILS. MEASUREMENTS OF THE URANIUM-238 TO URANIUM-235 FISSION RATIO INDICATED THAT IN SOME ASSEMBLIES AS MUCH AS 6.5 PERCENT OF THE FISSIONS OCCURRED IN URANIUM-238. PROMPT NEUTRON DECAY CONSTANTS, ALPHA = BETA (EFFECTIVE)/L, WERE MEASURED IN REFLECTED AND UNREFLECTED DELAYED-CRITICAL ASSEMBLIES OF SEVERAL FUEL MIXTURES BY THE PULSED NEUTRON TECHNIQUE AND THE INFINITE MEDIUM NEUTRON MULTIPLICATION FACTOR, K(INF) FOR THE VARIOUS FUEL MIXTURES WAS INFERRED FROM HEIGHT PERTURBATION MEASUREMENTS.

TRANSPORT THEORY CALCULATIONS OF K(INF) AND K(EFF) HAVE BEEN MADE USING VARIOUS CROSS SECTION SETS. THE RESULTS INDICATE THAT THE RESONANCE ABSORPTION CROSS SECTIONS FOR URANIUM-238 MAY BE TOO LARGE. (AUTH).

254 ID-NUMBER ID-NUMBER 254

AUTHOR FINKE, R. G./ GOLDBERG, E./ REYNOLDS, H. L./ GRAMMENS, G.
 TITLE HIGH TEMPERATURE BERYLLIUM-OXIDE CRITICAL EXPERIMENTS
 REPORT NUMBER..... TANSO, 03, 334-335
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 60-12-00
 NSA-NUMBER 17:4255
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

ABSTRACT

THE EFFECT OF TEMPERATURE ON THE CRITICAL DIMENSIONS OF A BERYLLIUM-OXIDE MODERATED ASSEMBLY HAS BEEN DETERMINED AT THE HOT BOX HIGH TEMPERATURE CRITICAL FACILITY AT THE NEVADA TEST SITE. THE TEMPERATURE RANGE BETWEEN ROOM TEMPERATURE AND 950 DEGREES FARENHEIT WAS STUDIED.

THE OVEN AND SUPPORTING EQUIPMENT, AND THE ORALLOY FUEL FOILS WERE THE SAME AS FOR THE EARLIER GRAPHITE EXPERIMENTS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE 6 INCH X 6 INCH X 1 INCH BERYLLIUM OXIDE BLOCKS WERE STACKED ON SPACERS FIVE INCHES ABOVE THE 2 1/2 INCH THICK GRAPHITE BASE-SEAL LAYER WHICH COVERED THE SUPPORTING LOW-MASS TABLE. THE DENSITY OF THE BERYLLIUM OXIDE WITHIN THE DIMENSIONS OF A BLOCK WAS 2.86 GRAMS/CM³. PULSED NEUTRON MEASUREMENTS ESTABLISHED THE THERMAL ABSORPTION CROSS SECTION IN THE BERYLLIUM OXIDE TO BE 7 +/- 4 MB PER MOLECULE. EACH LAYER WAS MADE UP OF FOUR BLOCKS VERTICALLY AND FOUR BLOCKS Laterally TO GIVE NOMINALLY 24 INCH X 24 INCH FOR THE CROSS-SECTION DIMENSIONS OF THE BERYLLIUM ASSEMBLY. THE LONGITUDINAL DIMENSION WAS ADJUSTED TO APPROACH CRITICALITY BY CHANGING THE NUMBER OF LAYERS. (AUTH.).

255 ID-NUMBER ID-NUMBER 255

AUTHOR GOLDBERG, E. / FINKE, R. G. / REYNOLDS, H. L.
 TITLE HIGH TEMPERATURE GRAPHITE CRITICAL EXPERIMENTS
 REPORT NUMBER..... TANSO, 03, 071-072
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 60-06-00
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

THE HIGH TEMPERATURE CRITICAL ASSEMBLY FACILITY AT NEVADA TEST SITE ALLOWS THE PERFORMANCE OF EXPERIMENTS AT TEMPERATURES RANGING FROM ROOM TEMPERATURE TO 1200 DEGREES F. THE PRESENT PAPER WILL DISCUSS A SERIES OF CRITICAL EXPERIMENTS INVOLVING A GRAPHITE MODERATOR WITH URANIUM-235 AS FUEL, AT VARIOUS TEMPERATURES UP TO 1190 DEGREES F. (AUTH.).

256 ID-NUMBER ID-NUMBER 256

AUTHOR GOLDBERG, E. / KLOVERSTROM, F. A. / KRAFT, D. E.
 TITLE CRITICAL EXPERIMENTS INVOLVING GAPS IN SIMPLE CONFIGURATIONS
 REPORT NUMBER..... TANSO, 03, 331-332
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 60-12-00
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

A SERIES OF CRITICAL ASSEMBLY EXPERIMENTS HAVE BEEN PERFORMED TO DETERMINE THE NEUTRONIC EFFECT OF GAPS IN SIMPLE CONFIGURATIONS. IN ONE SERIES, THE GAP IS LOCATED IN THE MEDIAN PLANE OF A BARE RECTANGULAR PARALLELEPIPED. IN THE OTHER, A GAP SEPARATES A CORE FROM ITS SIDE REFLECTOR. PROCUREMENT OF DATA WHICH COULD BE COMPARED TO PREDICTIONS REGARDING GAPS, AND DEVELOPMENT OF SATISFACTORY COMPUTATIONAL TECHNIQUES WERE THE MAIN REASONS FOR THE EXPERIMENTS. IN ADDITION THE DATA MAY PROVIDE VALUES FOR REFLECTOR SAVINGS IN SEVERAL CASES.

THE FIRST SERIES INVOLVED BERYLLIUM OXIDE AS A MODERATOR AND ENRICHED URANIUM, I.E. 93.2 PERCENT URANIUM-235 AS FUEL. THE FUEL LOADING WAS BERYLLIUM OXIDE: URANIUM-235 = 49.3:1 AND THE FOIL THICKNESS AND SPACING WAS FOUR MILS PER INCH. THE BERYLLIUM DENSITY WAS 2.86 GRAMS/CC. THE FACILITY AND EXPERIMENTAL DETAILS ARE DISCUSSED ELSEWHERE. THE RESULTS ARE GIVEN IN TABLE I. NO CONTROL VANE ASSEMBLY WAS PRESENT. (AUTH.).

257 ID-NUMBER ID-NUMBER 257

AUTHOR LINGENFELTER, R. E.
 TITLE CRITICALITY CALCULATIONS OF BERYLLIUM OXIDE-MODERATED ENRICHED URANIUM SYSTEMS
 REPORT NUMBER..... NSEAO, 08, 226-232
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 60-09-00
 NSA-NUMBER 15:2308
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS - CALCULATIONS

ABSTRACT

CRITICALITY CALCULATIONS HAVE BEEN PERFORMED ON A SERIES OF UNREFLECTED BERYLLIUM-OXIDE- URANIUM ASSEMBLIES MADE AT THE LAWRENCE RADIATION LABORATORY. THE CALCULATIONS WERE DONE WITH THE ONE-DIMENSIONAL, MULTIGROUP DIFFUSION CODE ZOOM. IN ADDITION TO DETERMINING THE GENERAL RELIABILITY OF THE CODE INPUT CONSTANTS, STUDIES WERE MADE OF URANIUM-FOIL SELF-SHIELDING CORRECTIONS AND THE BERYLLIUM(N,2N) REACTION. (AUTH.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

258 ID-NUMBER ID-NUMBER 258

AUTHOR CHALMERS, J. H.
 TITLE HANDBOOK OF EXPERIMENTAL CRITICALITY DATA PART 3
 REPORT NUMBER..... AHSB(S) HANDBOOK-5, PART-3
 DATE PUBLISHED ... 68-00-00
 NSA-NUMBER 22:22799
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

THE LITERATURE OF CRITICAL SIZE MEASUREMENTS IS EXTENSIVE AND CAN BE CONFUSING. THE SAME MEASUREMENT MAY BE REPORTED IN A NUMBER OF PLACES AND THERE MAY SOMETIMES BE VARIATION IN DETAIL IN THE DIFFERENT ACCOUNTS. ACCESS TO PAPERS AND REPORTS CAN ALSO BE DIFFICULT AND WILL DEPEND ON THE LIBRARY FACILITIES AVAILABLE. TO ESTABLISH WHAT MEASUREMENTS HAVE BEEN MADE IN A PARTICULAR AREA OF INTEREST, AND TO FIND DETAILED AND AUTHORITATIVE ACCOUNTS OF THE MEASUREMENTS CAN, THEREFORE, BE A TIME-CONSUMING EXERCISE. NEVERTHELESS THIS MATERIAL IS THE BASIC DATA OF CRITICALITY AND THE CRITICALITY SPECIALIST MUST HAVE RECOURSE TO IT FROM TIME TO TIME. FOR INSTANCE, HE MAY NEED TO CHECK A CALCULATIONAL METHOD AND ANY ASSOCIATED NUCLEAR DATA AGAINST REFERENCE EXPERIMENTS OR A PARTICULAR CRITICALITY CLEARANCE MAY DEPEND ON A DETAILED COMPARISON OF PARAMETERS.

IT WAS FELT, THEREFORE, THAT A NEED EXISTED FOR A COMPILATION OF DATA IN RELATIVELY DETAILED FORM REFERENCE TO WHICH COULD TAKE THE PLACE, AT LEAST IN THE FIRST INSTANCE, OF REFERENCE TO THE ORIGINAL LITERATURE. IT IS HOPED THAT THE PRESENT HANDBOOK WHICH IS TO BE PUBLISHED IN THREE PARTS, GOES AT LEAST SOME WAY TO MEETING THIS NEED.

IN COMPILING THE HANDBOOK REFERENCE HAS BEEN MADE, WHEREVER POSSIBLE, TO THE PRIMARY ACCOUNT OF THE CRITICAL MEASUREMENTS REPORTED AND ASSEMBLIES ARE DESCRIBED IN A CLOSE APPROXIMATION AS POSSIBLE TO THE ACTUAL ASSEMBLIES ON WHICH MEASUREMENTS WERE MADE, (THUS, SUBSEQUENT SHAPE CHANGES, HOMOGENISATION ETC., HAVE BEEN IGNORED). THIS IS NOT TO SAY HOWEVER, THAT LATER ACCOUNTS OF AN EXPERIMENT HAVE NOT SOMETIMES PROVIDED USEFUL ADDITIONAL INFORMATION. MANY EXCELLENT REVIEW ARTICLES AND HANDBOOKS ALREADY EXIST IN THE CRITICALITY FIELD PROVIDING GENERALISED GUIDANCE AND DATA CORRELATIONS FOR MORE OR LESS SIMPLIFIED SYSTEMS. IT IS IN NO WAY THE AIM OF THIS HANDBOOK TO REPLACE THESE: RATHER IT IS TO SUPPLEMENT THEM FOR THE CRITICALITY SPECIALIST BY COLLECTING AND ASSIMILATING INTO TABULAR FORM, CONVENIENT FOR QUICK REFERENCE, THE DETAILED RESULTS ON WHICH THEY ARE FOUNDED AND ON WHICH SIMILAR CORRELATIONS CAN BE BASED IN THE FUTURE.

IT IS INTENDED THAT THE HANDBOOK SHOULD INCLUDE ONLY DATA FOR SYSTEMS WHICH ARE RELATIVELY "CLEAN" AND WHERE IT IS CLEAR THAT THE MEASUREMENTS WERE SUFFICIENTLY PAINSTAKING AND THE SYSTEM WAS CARRIED CLOSE ENOUGH TO CRITICAL FOR THE RESULT TO BE ACCURATE. WITH THIS PROVISIO IT IS BELIEVED THAT THE HANDBOOK IS REASONABLY COMPREHENSIVE SO FAR AS MATERIAL GENERALLY AVAILABLE UP TO ABOUT THE BEGINNING OF THE 1964 GENEVA CONFERENCE IS CONCERNED.

PERHAPS THE MOST DIFFICULT PROBLEM IN COMPILING THE HANDBOOK HAS BEEN THE ALLOCATION OF THE DATA INTO TABLES, DETERMINING THE LENGTH AND COMPLEXITY OF THE TABLES. GENERALLY THE ALLOCATIONS HAVE BEEN MADE AS A COMPROMISE BETWEEN A DESIRE TO ASSOCIATE RESULTS FOR COMPARABLE AND RELATED SYSTEMS AND THE NEED TO AVOID TABLES WHICH ARE SO COMPLEX AS TO BE DIFFICULT TO READ. (AUTH).

267 ID-NUMBER ID-NUMBER 267

AUTHOR CERUTTI, B. C./ LICHTENBERGER, H. V./ OKRENT, D./ RICE, R. E./ THALGOTT, F. W.
 TITLE ZPR-3, ARGONNE'S FAST CRITICAL FACILITY
 REPORT NUMBER..... NSENAO, 01, 126-134
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 56-05-00
 NSA-NUMBER 10:3226
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

AN UNMODERATED CHAIN-REACTING SYSTEM, THE ZPR-3 ZERO POWER, FAST CRITICAL FACILITY, HAS BEEN PUT INTO OPERATION AT THE NATIONAL REACTOR TESTING STATION IN IDAHO, AS PART OF THE ARGONNE NATIONAL LABORATORY'S PROGRAM TO ESTABLISH THE FEASIBILITY OF THE GENERATION OF ECONOMIC ELECTRIC POWER BY A FAST POWER BREEDER. THE FIRST REACTOR BUILT IN THE TWO-HALF ASSEMBLY MACHINE WAS A RECTANGULAR PARALLELEPIPED WITH A CRITICAL MASS OF 142.4 KG OF URANIUM-235 AND A CORE COMPOSITION ROUGHLY THAT OF THE PROPOSED EXPERIMENTAL BREEDER REACTOR II. THIS WAS THE FIRST OF A SERIES OF FUNDAMENTAL AND APPLIED EXPERIMENTS PLANNED FOR THE FACILITY. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

273 ID-NUMBER ID-NUMBER 273

AUTHOR REYNOLDS, H. L.
 TITLE CRITICAL MEASUREMENTS AND CALCULATIONS FOR ENRICHED-URANIUM GRAPHITE-MODERATED SYSTEMS
 REPORT NUMBER..... GENEVA-2, 12, 632-642
 CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958
 DATE PUBLISHED ... 58-09-00
 NSA-NUMBER 12:15123
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS ; LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE ; LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE

ABSTRACT

ALTHOUGH NATURAL URANIUM GRAPHITE-MODERATED SYSTEMS HAVE RECEIVED EXTENSIVE TREATMENT IN THE PAST, LITTLE CONSIDERATION HAS BEEN GIVEN TO ENRICHED URANIUM, GRAPHITE-MODERATED SYSTEMS. ZIMMERMAN HAS REPORTED CRITICAL MEASUREMENTS ON A SINGLE ENRICHED URANIUM, GRAPHITE-MODERATED, GRAPHITE-REFLECTED SYSTEM. THIS PAPER PRESENTS THE EXPERIMENTAL RESULTS OF THE ABOVE LABORATORIES ON A VARIETY OF ENRICHED URANIUM, GRAPHITE-MODERATED SYSTEMS, BOTH WITH AND WITHOUT REFLECTORS. ALSO INCLUDED ARE THE RESULTS OF THE MULTIGROUP TRANSPORT AND ONE- AND TWO-DIMENSIONAL DIFFUSION CALCULATIONS USED TO INTERPRET THE DATA.

IN GENERAL THE UCRL SYSTEMS WERE BARE OR ONE-DIMENSIONAL IN ORDER TO SIMPLIFY THE ANALYSIS. EFFORTS WERE MADE TO OBTAIN SYSTEMS AS CLOSE AS POSSIBLE TO AN IDEALIZED SYSTEM CONTAINING ONLY A HOMOGENEOUS MIXTURE OF MODERATOR AND FUEL WITH ALL EXTRANEOUS FACTORS REMOVED. THE LASL EXPERIMENTS WERE CARRIED OUT WITH MORE COMPLEX GEOMETRIES APPROACHING MORE CLOSELY POTENTIAL REACTOR SYSTEMS. ALL OF THE ASSEMBLIES UTILIZED HETEROGENEOUS ARRANGEMENTS OF MODERATOR AND THIN URANIUM FOILS.

THE BARE SYSTEMS RANGE IN CARBON-TO-URANIUM ATOMIC RATIOS (C/U) FROM 300/1 TO 2500/1. THESE SYSTEMS ARE NOT TRULY THERMAL AND ARE IN A RANGE WHERE CRITICAL MASS IS EXTREMELY SENSITIVE TO SIZE OR BUCKLING. EXPERIMENTS WERE PERFORMED FOR THESE SYSTEMS TO DETERMINE ACCURATELY THE EFFECTS OF EXTRANEOUS FACTORS SUCH AS ROOM RETURN, CONTROL-ROD VOID SPACES, NONHOMOGENEITY OF FUEL LOADING, MODERATOR BLOCK POROSITIES AND POISON CONTENT. THE REFLECTORS INCLUDE GRAPHITE AND BERYLLIUM IN ONE-, TWO- AND THREE-DIMENSIONAL ARRANGEMENTS.

THE CONSTANTS USED IN THE MULTIGROUP CALCULATIONS ARE PRESENTED IN TABULAR FORM. EIGHTEEN ENERGY GROUPS WERE USED. THE SAME CONSTANTS WERE USED IN THE TRANSPORT AND DIFFUSION CALCULATIONS TO ALLOW COMPARISON OF THE TWO METHODS OF CALCULATION. (AUTH).

279 ID-NUMBER ID-NUMBER 279

AUTHOR MOLBERT, M./ SAUVE, A./ HOUELLE, M./ DEILGAT, E.
 TITLE CRITICALITY EXPERIMENTS WITH ANNULAR CYLINDERS CONTAINING PLUTONIUM SOLUTIONS
 REPORT NUMBER..... CEA-2495
 DATE PUBLISHED ... 64-00-00
 NSA-NUMBER 18:34494
 SITE/PROGRAM FRANCE - PLUTONIUM AND URANIUM SOLUTIONS

ABSTRACT

PRELIMINARY RESULTS ARE GIVEN FROM CRITICALITY ANALYSIS OF ANNULAR CYLINDERS CONTAINING PLUTONIUM SOLUTIONS. RESULTS ARE PLOTTED FOR CYLINDERS WITH LIGHT WATER REFLECTORS, CADMIUM SCREENS, AND PLUTONIUM CONCENTRATIONS OF 42.3 TO 104.1 G/L. (R.E.U.).

280 ID-NUMBER ID-NUMBER 280

AUTHOR ITHURRALDE, M. F./ KREMSER, J./ LECLERC, J./ LOMBARD, C./ MOREAU, J. / ROBIN, C.
 TITLE INTERPRETATION OF CRITICALITY EXPERIMENTS ON HOMOGENEOUS SOLUTIONS OF PLUTONIUM AND URANIUM
 REPORT NUMBER..... CEA-R-2488
 DATE PUBLISHED ... 64-08-00
 NSA-NUMBER 19:678
 SITE/PROGRAM FRANCE - PLUTONIUM AND URANIUM SOLUTIONS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

CRITICALITY EXPERIMENTS ON SOLUTIONS OF FISSIONABLE MATERIALS WERE CARRIED OUT IN TANKS OF VARIOUS GEOMETRIES (CYLINDER, ISOLATED ANNULAR CYLINDER, INTERACTING ANNULAR CYLINDERS); THE REFLECTION CONDITIONS WERE ALSO VARIED (WITHOUT REFLECTION, SEMI-REFLECTION AND TOTAL REFLECTION BY WATER). THE RANGE OF THE CONCENTRATIONS STUDIED IS RATHER LARGE (18.8 TO 104 GMS/LITER). THE INTERPRETATION OF THESE EXPERIMENTS WAS UNDERTAKEN IN ORDER TO RESOLVE THE PROBLEMS OF THE INDUSTRIAL USE OF HOMOGENEOUS PLUTONIUM AND URANIUM SOLUTIONS. SEVERAL METHODS, THE FIELDS OF APPLICATION OF WHICH ARE DIFFERENT, WERE USED: DIFFUSION METHOD, TRANSPORT METHOD, AND MONTE CARLO METHOD. (AUTH).

281 ID-NUMBER ID-NUMBER 281

AUTHOR BRETON, D./ LECORCHE, P./ CLOUET D'ORVAL, C./ CAIZERGUES, R./ MOREAU, J./
SOLLIER, G.

TITLE CRITICALITY STUDIES

REPORT NUMBER.... CEA-R-2653

DATE PUBLISHED ... 64-00-00

NSA-NUMBER 18:37866

SITE/PROGRAM FRANCE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THE STUDIES UNDERTAKEN ON CRITICALITY DEAL WITH EXPERIMENTS ON SOLUTIONS OF FISSIONABLE MATTER, AS WELL AS WITH THE DEVELOPMENT OF METHODS OF CALCULATION APPLICABLE TO THESE EXPERIMENTS.

THE EXPERIMENTS WERE CARRIED OUT ON CYLINDERS, ANNULAR CONTAINERS AND PLATES (ISOLATED OR INTERACTING) UNDER VARIOUS CONDITIONS OF CONCENTRATION AND REFLECTION.

AT THE SAME TIME, VARIOUS METHODS OF CALCULATION (DIFFUSION, TRANSPORT, MONTE CARLO) WERE DEVELOPED AND THE RESULTS COMPARED WITH THOSE OF THE EXPERIMENTS. THESE METHODS CAN BE USED IN THE TREATMENT OF INDUSTRIAL PROBLEMS.

282 ID-NUMBER ID-NUMBER 282

AUTHOR CAIZERGUES, R./ FIEGEL, A./ ITHURRALDE, M. F.

TITLE INTERPRETATION OF EXPERIMENTAL RESULTS OBTAINED AT THE VALDUC CRITICALITY
STATION

REPORT NUMBER.... IAEA-STOCK.-1965, 249-266

CONFERENCE SYMPOSIUM ON CRITICALITY CONTROL OF FISSIONABLE MATERIALS HELD BY THE
INTERNATIONAL ATOMIC ENERGY AGENCY AT STOCKHOLM, 1-5 NOVEMBER 1965

DATE PUBLISHED ... 65-11-00

NSA-NUMBER 20:35689

SITE/PROGRAM FRANCE - PLUTONIUM AND URANIUM SOLUTIONS

ABSTRACT

INTERPRETATION OF EXPERIMENTAL RESULTS OBTAINED AT THE VALDUC CRITICALITY STATION. MEASUREMENTS OF CRITICAL PARAMETERS (CONCENTRATIONS AND HEIGHTS OF SOLUTION, CRITICAL MASSES) HAVE BEEN CARRIED OUT AT THE CRITICALITY STATION WITH DIFFERENT TYPES OF CONTAINERS: TO IMPROVE AND EXTEND THE SAFETY STANDARDS APPLICABLE TO INSTALLATIONS PROCESSING FISSIONABLE MATERIALS; TO COMPARE THE MEASUREMENTS WITH CALCULATED RESULTS; AND TO DEVELOP SIMPLE METHODS OF CALCULATION THAT CAN BE USED TO ARRIVE AT EXPERIMENTAL DATA AND EXTRAPOLATE THEM TO CASES NOT STUDIED HITHERTO. AQUEOUS SOLUTIONS OF PLUTONIUM NITRATE SERVE FOR EXAMPLES, AND THE FOLLOWING POINTS ARE TREATED: (A) COMPARISON OF CALCULATED WITH EXPERIMENTAL RESULTS, THE CALCULATED RESULTS BEING OBTAINED BY IDC AND ALCI PROGRAMMES; DISCUSSION OF REASONS FOR DIVERGENCE WITH EXPERIMENTAL DATA. (B) ILLUSTRATIONS OF THE PRACTICAL RELEVANCE OF THE EXPERIMENTS, WITH EXAMPLES INVOLVING PLATE-TYPE AND ANNULAR CONTAINERS. (C) EXTRAPOLATION OF SOME EXPERIMENTAL RESULTS WITH THE AID OF SIMPLE THEORETICAL CALCULATIONS.

283 ID-NUMBER ID-NUMBER 283

AUTHOR CLAYTON, E. D./ RICHEY, C. R./ LLOYD, R. C./ BIERMAN, S. R./ CARTER, L. L.

TITLE CRITICALITY STUDIES WITH PLUTONIUM SOLUTIONS

REPORT NUMBER.... BNWL-SA-0232

DATE PUBLISHED ... 66-00-00

NSA-NUMBER 20:29471

SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

III. BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

A SERIES OF CRITICALITY EXPERIMENTS WERE PERFORMED WITH PLUTONIUM (4.6 PERCENT PLUTONIUM-240) NITRATE SOLUTION IN STAINLESS STEEL SPHERES OF 11.5-, 14-, AND 15.2-INCH DIAMETER REFLECTORS OF WATER, CONCRETE, PARAFFIN, AND STAINLESS STEEL WERE USED - EXPERIMENTS WERE ALSO PERFORMED ON THE 15.2-INCH SPHERE UNREFLECTED. THE SPHERES WERE MADE CRITICAL WITH PLUTONIUM CONCENTRATIONS VARYING FROM 24 TO 435 G PLUTONIUM/LITER AND MOLARITY VARYING FROM 0.2 TO 7.7. THE MINIMUM CRITICAL VOLUMES FOR PLUTONIUM (NITRATE 3)4 IN WATER CONTAINING 4.6 PERCENT PLUTONIUM-240 WERE DETERMINED TO BE ABOUT 22 AND 11 LITERS, RESPECTIVELY, FOR BARE AND REFLECTED SPHERES AT A CONCENTRATION OF 175 G PLUTONIUM/LITER. THE EFFECT OF A 0.030-INCH CADMIUM SHELL OR A 4-INCH AIR CAP BETWEEN THE REFLECTOR AND THE VESSEL REDUCED THE REFLECTOR WORTH TO THAT OF A NOMINAL REFLECTOR (1-INCH OF WATER OR LESS) FOR THE CONCENTRATIONS OF PLUTONIUM MEASURED. COMPARISONS WERE MADE BETWEEN EXPERIMENTAL AND THEORETICAL RESULTS USING MULTIGROUP DIFFUSION THEORY. (AUTH).

285 ID-NUMBER ID-NUMBER 285

AUTHOR BRUNA, J. G./ BRUNET, J. P./ CAIZERGUES, R./ CLOUET D'ORVAL, C./ KREMSER, J. /TELLIER, H./ VERRIERE, P.
 TITLE ALECTO - EXPERIMENTAL RESULTS WITH HOMOGENEOUS CRITICAL SYSTEMS OF PLUTONIUM-239, URANIUM-235, AND URANIUM-233.
 REPORT NUMBER.... CEA-R-2814
 DATE PUBLISHED .. 65-00-00
 NSA-NUMBER 20:3369
 SITE/PROGRAM FRANCE - PLUTONIUM AND URANIUM SOLUTIONS

ABSTRACT

THE RESULTS OF THE HOMOGENEOUS CRITICAL EXPERIMENTS ALECTO, MADE ON PLUTONIUM-239, URANIUM-235, AND URANIUM-233 ARE GIVEN. AFTER A BRIEF DESCRIPTION OF THE EQUIPMENT, THE CRITICAL MASSES FOR CYLINDERS OF DIAMETERS VARYING FROM 25 TO 42 CMS ARE GIVEN AND COMPARED WITH OTHER VALUES (FOREIGN RESULTS, CRITICALITY GUIDE). EXPERIMENTS RELATING TO CROSS SECTIONS AND CONSTANTS TO BE USED ON THESE MATERIALS ARE PRESENTED. LASTLY, KINETIC EXPERIMENTS ALLOW A COMPARISON OF PULSED NEUTRON AND FLUCTUATION METHODS. (AUTH).

286 ID-NUMBER ID-NUMBER 286

AUTHOR KING, D. T./ WALL, G. P./ WHITE, J. W. C.
 TITLE CRITICAL ASSEMBLIES WITH HEAVY WATER SOLUTIONS OF URANYL FLUORIDE PART 1 FUEL SYSTEM
 REPORT NUMBER.... AERE-CE/R-2624
 DATE PUBLISHED .. 58-00-00
 NSA-NUMBER 13:5474
 SITE/PROGRAM UNITED KINGDOM, HARWELL - URANYL(46%)FLUORIDE IN HEAVY WATER

ABSTRACT

THE H.A.Z.E.L. (FORMERLY Z.E.T.R.II) CRITICAL ASSEMBLY WAS THE THIRD IN A SERIES OF HOMOGENEOUS AQUEOUS CRITICAL ASSEMBLIES TO BE CONSTRUCTED IN THE UNITED KINGDOM AND WAS DESIGNED TO EXTEND THE RANGE OF STUDIES, PREVIOUSLY CONFINED TO PLUTONIUM AND THE FISSILE URANIUM ISOTOPES IN LIGHT WATER TO COVER THE FISSILE URANIUM ISOTOPES IN HEAVY WATER. THIS REPORT DESCRIBES THE CONSTRUCTION, COMMISSIONING AND OPERATION OF THE FUEL SYSTEM FOR THE EXPERIMENTS WITH URANIUM-235 FOR WHICH THE MAJOR PROBLEM WAS TO PREPARE AND DISPENSE THE FUEL IN SUCH A MANNER THAT THE HIGH PURITY OF THE HEAVY WATER WAS MAINTAINED THROUGHOUT THE EXPERIMENTAL PROGRAMS. THE CRITICAL ASSEMBLY, ITS OPERATION AND PERFORMANCE ARE THE SUBJECT OF A SEPARATE REPORT.

287 ID-NUMBER ID-NUMBER 287

AUTHOR CROCKER, V. S./ ET AL
 TITLE CRITICAL ASSEMBLIES OF PLUTONIUM NITRATE SOLUTIONS
 REPORT NUMBER.... AERE-CR/R-1182
 DATE PUBLISHED .. 59-00-00
 SITE/PROGRAM UNITED KINGDOM, HARWELL - PLUTONIUM IN WATER

ABSTRACT

A COPY OF THIS REPORT IS NOT YET AVAILABLE IN THE SYSTEM

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

288 ID-NUMBER ID-NUMBER 288

AUTHOR CUNNINGHAM, J. E./ WALL, G. P./ WELLS, I.
 TITLE CRITICAL ASSEMBLIES OF AQUEOUS URANYL FLUORIDE SOLUTION PART 2 PREPARATION
 AND HANDLING OF SOLUTIONS
 REPORT NUMBER.... AERE-CE/R-2052
 DATE PUBLISHED ... 58-00-00
 NSA-NUMBER 12:12332
 SITE/PROGRAM UNITED KINGDOM, HARWELL - URANYL(46%)FLUORIDE IN WATER

ABSTRACT

LIGHT-WATER SOLUTIONS OF URANIUM-235 AND URANIUM-238 IN THE FORM OF URANYL FLUORIDE HAVE BEEN PREPARED AND DISPENSED TO THE ZERO ENERGY THERMAL REACTOR. THE DEVELOPMENT OF THE PROCESS, EQUIPMENT, AND HANDLING TECHNIQUES ARE DESCRIBED ALONG WITH EXPERIMENTAL CRITICALITY TEST TECHNIQUES, RESULTS, AND AN ANALYSIS OF THE RESULTS. (AUTH).

289 ID-NUMBER ID-NUMBER 289

AUTHOR CALLIHAN, A. D.
 TITLE SMALL THERMAL HOMOGENEOUS CRITICAL ASSEMBLIES
 REPORT NUMBER.... NUEGA 01
 JOURNAL NUCLEAR ENERGY
 DATE PUBLISHED ... 56-00-00
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

THE TERM CRITICAL ASSEMBLY REFERS TO A NEUTRON CHAIN-REACTING ACCUMULATION OF FISSIONABLE AND OTHER MATERIAL WHICH USUALLY OPERATES AT A NUCLEAR POWER OF THE ORDER OF ONE WATT. EXPERIMENTS WITH SUCH SYSTEMS PROVIDE DATA TO SUPPORT THE DESIGN OF REACTORS AND SPECIALIZED PROCESS EQUIPMENT FOR HANDLING FISSIONABLE ISOTOPES. CRITICAL EXPERIMENTS YIELD, IN ADDITION TO THE CRITICAL MASS, DATA ON NEUTRON FLUX AND POWER DISTRIBUTIONS, AND INFORMATION ON THE REACTIVITY EFFECTS DUE TO NEUTRON REFLECTORS, REACTOR STRUCTURAL MATERIALS, TEMPERATURE CHANGES, AND REACTOR CONTROL DEVICES. THEY PROVIDE BASIC INFORMATION FOR EVALUATING METHODS OF REACTOR ANALYSES AND GIVE EMPIRICAL DATA ON THOSE REACTOR PROTOTYPES TO WHICH ANALYTICAL METHODS ARE NOT APPLICABLE.

DURING THE PAST FEW YEARS SEVERAL LABORATORIES OPERATED FOR THE UNITED STATES ATOMIC ENERGY COMMISSION HAVE CARRIED ON EXTENSIVE EXPERIMENTAL PROGRAMS OF THIS KIND. IT IS THE PURPOSE OF THIS PAPER TO PRESENT A SURVEY OF THE DATA OBTAINED IN THREE LABORATORIES FROM MEASUREMENTS ON CRITICAL ARRAYS OF AQUEOUS SOLUTIONS CONTAINING URANIUM-233, URANIUM-235, AND PLUTONIUM-239. REPRESENTATIVE RESULTS HAVE BEEN SELECTED FROM AN EXTENSIVE ACCUMULATION OF DATA AND ARE INTENDED TO SUMMARIZE THE CRITICAL PARAMETERS FOR THESE ISOTOPES. TYPICAL EXPERIMENTAL EQUIPMENT AND PROCEDURES ARE BRIEFLY DESCRIBED.

291 ID-NUMBER ID-NUMBER 291

AUTHOR BERTRAND, J. / BONNAURE, P. / CLOUET D'ORVAL, C. / CORPEL, J. / GIROUSSE,
 A. / LACOGSTRY, B. / PREVOST, I. / SALESSE, H. / TACHON, J. / VENDRYES, C.
 TITLE PROSERPINE, A HOMOGENEOUS CRITICAL EXPERIMENT WITH PLUTONIUM
 REPORT NUMBER.... GENEVA-2, 12, 539-562
 CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
 ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958
 DATE PUBLISHED ... 58-09-00
 NSA-NUMBER 13:7139
 SITE/PROGRAM FRANCE - PROSERPINE

ABSTRACT

"PROSERPINE" IS A ZERO POWER REACTOR WHICH USES PLUTONIUM AS A SULPHATE SOLUTION IN LIGHT WATER. THE MAIN FEATURES OF ITS DESIGN ARE DIRECTED TOWARDS MINIMISING THE CRITICAL MASS AND TOWARDS SAFETY IN CONNECTION WITH CONTAMINATION HAZARDS. (AUTH).

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

294 ID-NUMBER ID-NUMBER 294

AUTHOR BECK, C. K. / CALLIHAN, A. D. / MURRAY, R. L.
 TITLE CRITICAL MASS STUDIES, PART-2
 REPORT NUMBER..... K-0126
 DATE PUBLISHED ... 64-00-00
 NSA-NUMBER 11:13147
 SITE/PROGRAM OAK RIDGE - URANIUM(30%)HEXAFLUORIDE - CUBES

ABSTRACT

USING URANIUM ENRICHED TO APPROXIMATELY 30% IN THE 235 ISOTOPE AND FABRICATED INTO ONE INCH CUBES HAVING A DENSITY OF 4.8 GM/CM³ WITH THE NUCLEAR PROPERTIES OF URANIUM-HEXAFLUORIDE A STUDY HAS BEEN MADE OF SEVERAL CONDITIONS AFFECTING THE MASS ASSEMBLED AT CRITICALITY. THE EFFECT OF INTERMIXED HYDROGEN ON THE CRITICAL MASS OF URANIUM-235 WAS EXAMINED BY INCLUDING SMALL BLOCKS OF POLYETHYLENE WITH THE ACTIVE MATERIAL. OTHER VARIABLES AFFECTING THE CRITICAL MASS ABOUT WHICH SOME INFORMATION WAS OBTAINED ARE: TYPE OF REFLECTOR SURROUNDING THE CORE, DENSITY OF URANIUM-235, HOMOGENEITY OF THE MIXING OF THE HYDROGENOUS AND ACTIVE MATERIALS AND THE GEOMETRICAL SHAPE OF THE ASSEMBLY.

WITH NO INTERMIXED HYDROGEN BUT WITH THE ACTIVE MATERIAL SURROUNDED BY PARAFFIN, IT IS POSSIBLE TO ASSEMBLE MORE THAN 100 KG OF URANIUM-235 INTO A CUBE WITHOUT CLOSELY APPROACHING CRITICALITY. INCREASING THE HYDROGEN CONTENT RAPIDLY LOWERS THE CRITICAL MASS TO 7.7 KG AND 4.0 KG AT HYDROGEN TO URANIUM-235 ATOMIC RATIOS OF 32 AND 128 RESPECTIVELY.

THE REMOVAL OF THE PARAFFIN REFLECTOR APPROXIMATELY DOUBLES THE CRITICAL MASS; INTERPOSING CADMIUM OR BORON BETWEEN THE CORE AND THE PARAFFIN ALSO INCREASES THE MASS BY ABOUT TWO IN THE RANGE OF MODERATION STUDIED.

PROVIDED THE CROSS-SECTIONAL AREA OF A PARALLELEPIPED ASSEMBLY IS SUFFICIENTLY SMALL, IT IS POSSIBLE TO EXTEND ITS LENGTH INDEFINITELY WITHOUT CRITICALITY OCCURRING. AT AN HYDROGEN TO URANIUM- 235 ATOMIC RATIO OF 64, AN ASSEMBLY 6-INCHES X 7-INCHES IN CROSS-SECTION CAN APPARENTLY BE SO EXTENDED.

A FEW MEASUREMENTS ON THE DENSITY EFFECT INDICATE THE CRITICAL MASS, AT AN HYDROGEN TO URANIUM- 235 ATOMIC RATIO OF 16, TO VARY AS THE -1.7 POWER OF THE DENSITY; AT HYDROGEN TO URANIUM-235 = 1.28, THE EXPONENT IS ABOUT -2.(AUTH).

297 ID-NUMBER ID-NUMBER 297

AUTHOR MILLS, C. B.
 TITLE REACTOR MINIMUM CRITICAL DIMENSIONS
 REPORT NUMBER..... LA-3221-MS
 DATE PUBLISHED ... 65-04-17
 NSA-NUMBER 19:31504
 SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THE PARAMETRIC STUDY OF THE CRITICAL REACTOR DIMENSION AS A FUNCTION OF MODERATOR, FISSIONABLE ISOTOPE, AND SIZE HAS BEEN MADE, BASED ON A CONSISTENT VARIETY OF CRITICAL EXPERIMENTS STUDIED IN A COMPANION REPORT(LA-3219-MS). MINIMUM CRITICAL SIZE AND MASS HAVE BEEN COMPUTED FOR A RANGE OF CONCENTRATION OF URANIUM-233, URANIUM-239, AND PLUTONIUM-239 FOR WATER-MODERATED BARE AND REFLECTED SLAB, CYLINDER, AND SPHERE GEOMETRIES, AS WELL AS CORRESPONDING RESULTS FOR URANIUM-235 AND HEAVIER ATOM MODERATORS DEUTERIUM-OXIDE, BERYLLIUM, BERYLLIUM-OXIDE, AND GRAPHITE. SOME RESULTS ARE PRESENTED OF THE SAME SORT FOR DEUTERIUM OXIDE, BERYLLIUM, AND GRAPHITE REFLECTOR-MODERATED REACTORS.

298 ID-NUMBER ID-NUMBER 298

AUTHOR RICHEY, C. R. / WHITE, J. D. / LLOYD, R. C. / CLAYTON, E. D.
 TITLE HOMOGENEOUS CRITICAL EXPERIMENTS WITH PLUTONIUM/PLASTIC MIXTURES IN THE INTERMEDIATE ENERGY RANGE
 REPORT NUMBER..... TANSO, 07, 081
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 64-06-00
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

PLUTONIUM MIXTURES IN THE FORM OF WET POWDERS, PRECIPITATES, SLURRIES, POLYMERS, ETC. CONSTITUTE A POTENTIAL CRITICALITY HAZARD IN CHEMICAL PLANTS PROCESSING IRRADIATED REACTOR FUELS. CRITICAL EXPERIMENTS ARE BEING CONDUCTED AT THE HANFORD CRITICAL MASS LABORATORY TO OBTAIN CRITICALITY DATA FOR PLUTONIUM MIXTURES CHARACTERISTIC OF THE ABOVE FORMS. CRITICALITY DATA HAVE THUS FAR BEEN OBTAINED WITH PLUTONIUM-OXIDE-POLYSTYRENE COMPACTS HAVING A PLUTONIUM CONCENTRATION OF 1.1 GRAMS/CC, 2.2% PLUTONIUM-240 AND A HYDROGEN-TO-PLUTONIUM ATOMIC RATIO OF 15. THE EXPERIMENTAL ASSEMBLIES WERE REFLECTED PRISMS RANGING FROM NEAR-CUBIC GEOMETRY TO THIN SLABS; THE PRINCIPAL REFLECTOR MATERIAL WAS 6-INCH-THICK LUCITE. CRITICALITY WAS ALSO OBTAINED FOR A NON- REFLECTED ARRAY OF NEAR-CUBIC GEOMETRY.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE FUEL COMPACTS WERE IN THE FORM OF 2.01-INCH CUBES. EACH CUBE WAS SPRAY-PAINTED WITH ONE-MIL-THICK COAT OF ALUMINUM PAINT AND 11-MIL-THICK RUBBERIZED PLASTIC. THE APPROACH-TO-CRITICAL TECHNIQUE WAS USED TO ASSEMBLE THE CRITICAL ARRAYS UTILIZING A REMOTELY OPERATED SPLIT-TABLE DEVICE.

301 ID-NUMBER ID-NUMBER 301

AUTHOR MC TAGGART, M. H./ GOODFELLOW, H./ PATERSON, W. J./ WEALE, J. W.
 TITLE INTERIM REPORT ON THE VERA URANIUM-235/GRAPHITE REACTOR EXPERIMENT
 REPORT NUMBER..... AWRE-R4/63
 DATE PUBLISHED ... 74-06-00
 NSA-NUMBER 21:40671
 SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - VERA FAST REACTOR

ABSTRACT

THIS REPORT DESCRIBES EXPERIMENTAL WORK ON A NUMBER OF SMALL FAST REACTOR ASSEMBLIES WITH URANIUM-235 / GRAPHITE CORES AND NATURAL URANIUM REFLECTORS. THE OBJECT OF THE EXPERIMENTS WAS TO PROVIDE DETAILED INFORMATION AGAINST WHICH THE NUCLEAR DATA FOR URANIUM-235 IN THE ENERGY REGION FROM 500 DOWN TO 50 KEV COULD BE CHECKED. CRITICAL MASSES WERE MEASURED FOR FIVE ASSEMBLIES.

304 ID-NUMBER ID-NUMBER 304

AUTHOR WEALE, J. W. / PATERSON, W. J.
 TITLE PULSED SOURCE METHODS IN FAST REACTOR PHYSICS
 REPORT NUMBER..... JBNSA, 03, 311-319
 JOURNAL THE JOURNAL OF THE BRITISH NUCLEAR ENERGY SOCIETY
 DATE PUBLISHED ... 64-00-00
 NSA-NUMBER 19:10494
 SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - VERA FAST REACTOR

ABSTRACT

PULSED SOURCE METHODS OF MEASURING THE PROMPT CHAIN DECAY CONSTANT, ALPHA AND THE LOWER RANGE NEUTRON ENERGY SPECTRUM OF A FAST REACTOR ARE DESCRIBED. THE METHODS ARE ILLUSTRATED IN TERMS OF EXPERIMENTAL RESULTS RECENTLY OBTAINED ON THE ZERO-ENERGY REACTOR, VERA. THE ALPHA RESULTS ARE IN GOOD AGREEMENT WITH ROSSI - ALPHA MEASUREMENTS BUT THE OBSERVED VARIATION OF ALPHA WITH REACTIVITY IS NOT IN AGREEMENT WITH SIMPLE THEORY. THE NEUTRON ENERGY SPECTRA HAVE BEEN MEASURED BY TIME-OF-FLIGHT IN THE RANGE 100 EV TO 50 KEV AND THERE IS SOME EVIDENCE FROM SPECTRAL-INDEX MEASUREMENTS THAT THE SPECTRUM IN THE EXTRACTED NEUTRON BEAM CORRESPONDS CLOSELY WITH REACTOR CORE SPECTRUM. (AUTH).

308 ID-NUMBER ID-NUMBER 308

AUTHOR BRUNSON, G. S.
 TITLE A SURVEY OF PROMPT NEUTRON LIFETIMES IN FAST CRITICAL SYSTEMS
 REPORT NUMBER..... ANL-6681
 DATE PUBLISHED ... 63-00-00
 NSA-NUMBER 18:4738
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

MEASUREMENTS OF PROMPT-NEUTRON LIFETIME BY THE ROSSI-ALPHA METHOD IN MORE THAN 30 DIFFERENT CRITICAL SYSTEMS ARE REPORTED. MOST WERE ASSEMBLED IN ARGONNE'S ZERO POWER REACTOR III(ZPR-3). THE ROSSI-ALPHA METHOD, WHICH HAS BEEN DESCRIBED IN THE LITERATURE, REPRESENTS A DIRECT EXPERIMENTAL DETERMINATION OF THE RATIO $\Delta K/\tau$, FROM WHICH A VALUE FOR τ IS OBTAINED IF AN ESTIMATE OF ΔK IS AVAILABLE.

OUR RESULTS INDICATE THAT FOR THESE ASSEMBLIES, THE LIFETIME IS ALMOST ENTIRELY GOVERNED BY THE URANIUM CONTENT OF THE CORE.

ORNDORFF LIMITS HIS DEVELOPMENT OF ROSSI-ALPHA THEORY TO SMALL SINGLE-REGION SYSTEMS IN WHICH THERE IS NO WIDE SPATIAL VARIATION OF NEUTRON ENERGY. SINCE SOME OF THE SYSTEMS WE HAVE STUDIED MAY BE BOTH LARGE AND COMPLEX BY HIS CRITERIA, WE HAVE DONE EXPERIMENTS TO TEST THE RANGE OF VALIDITY OF THE THEORY. WE FIND THAT IN A LARGE ALL-METAL SYSTEM, SUCH AS THE MOCKUP FOR THE ENRICO FERMI FAST BREEDER REACTOR, THE VALUE OBTAINED FOR ALPHA DOES NOT APPEAR TO VARY WITH THE POSITION OF THE COUNTERS IN THE CORE. A MORE INTERESTING RESULT ARISES FROM A MEASUREMENT OF THE TOTAL COINCIDENCE PROBABILITY AS A FUNCTION OF THE TWO COUNTERS. WE FIND THAT THE TERMINATING COUNTER WAS NOT NECESSARILY MOST LIKELY TO DETECT A CHAIN-RELATED NEUTRON WHEN IT WAS CLOSEST TO THE INITIATING COUNTER. RATHER, IT WAS MOST LIKELY

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

TO DETECT CHAIN-RELATED NEUTRONS WHEN IT WAS IN A POSITION OF HIGHEST FLUX, AND, FURTHER, THIS PROBABILITY IS, WITHIN THE LIMITS OF EXPERIMENTAL ERROR, DIRECTLY PROPORTIONAL TO THE FLUX IN WHICH THE TERMINATING COUNTER IS PLACED.

315 ID-NUMBER ID-NUMBER 315

AUTHOR PAXTON, H. C.
 TITLE CRITICAL ASSEMBLIES AT LOS ALAMOS, GODIVA, TOPSY, JEZEBEL
 REPORT NUMBER..... NUCLEONICS, 13, 048-050
 JOURNAL NUCLEONICS
 DATE PUBLISHED ... 55-10-00
 SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

SIMPLE CRITICAL ASSEMBLIES USED AT LOS ALAMOS HAVE PROVIDED VALUABLE INFORMATION ABOUT FAST- NEUTRON SYSTEMS. THEY'VE ALSO SERVED AS A SOURCE OF 50 MICRO-SECONDS BURSTS OF APPROXIMATELY 10^{16} NEUTRONS FOR INSTANTANEOUS IRRADIATIONS IN STUDIES OF DELAYED NEUTRONS FROM FISSION.

THE LOS ALAMOS CRITICAL-ASSEMBLIES GROUP IS LOCATED A FEW MILES FROM THE TOWN OF LOS ALAMOS IN PAJARITO CANYON. THE LABORATORIES, CONTROL ROOM, AND SOME OF THE CRITICAL ASSEMBLIES ARE SHOWN IN THE PHOTOGRAPHS ON P. 48.

THE REMOTELY-CONTROLLED ASSEMBLY MACHINES ARE OF TWO TYPES: SIMPLE BUT FLEXIBLE MACHINES FOR NUCLEAR SAFETY TESTS AND MORE SPECIALIZED, BUT STILL SIMPLE, MACHINES FOR THE OPERATION OF SEMIPERMANENT CRITICAL ASSEMBLIES. (AUTH.).

324 ID-NUMBER ID-NUMBER 324

AUTHOR HANSEN, G. E.
 TITLE PROPERTIES OF ELEMENTARY FAST-NEUTRON CRITICAL ASSEMBLIES
 REPORT NUMBER..... GENEVA-2, 12, 084-088
 CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
 ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958
 DATE PUBLISHED ... 58-09-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

A LARGE NUMBER OF ELEMENTARY FAST-NEUTRON CRITICAL ASSEMBLIES HAVE BEEN PREPARED AT THE LOS ALAMOS SCIENTIFIC LABORATORY. THE KINETIC, SPECTRAL, AND PERTURBATIVE PROPERTIES OF A FEW, SUCH AS GODIVA (UNREFLECTED SPHERICAL ORALLOY, 93.7%), TOPSY (THICK NORMAL URANIUM REFLECTED SPHERICAL ORALLOY, 94.1%), AND THEIR PLUTONIUM ANALOGUES HAVE BEEN STUDIED IN DETAIL. THESE DATA FURNISH A FOUNDATION FOR PREDICTIONS REGARDING THE BEHAVIORS OF MORE COMPLEX SYSTEMS, AND IT IS THE PRESENT PURPOSE TO GIVE SOME OF THEIR TYPICAL FEATURES. PERHAPS THE MOST IMPORTANT AND READILY DOCUMENTED FEATURE OF A CRITICAL SYSTEM IS ITS MASS OR SIZE, AND SECTIONS 2 AND 3 ARE DEVOTED TO THE INFLUENCES OF SHAPE AND MATERIAL COMPOSITION ON THIS QUANTITY. THESE TWO SECTIONS ARE MAINLY OF A CORRELATIVE OR EMPIRICAL NATURE. SECTION 4 IS THEN RESTRICTED TO THE PROPERTIES OF SPHERICAL URANIUM AND PLUTONIUM ASSEMBLIES, SUCH ASSEMBLIES BEING IDEALLY SUITED TO ACCURATE THEORETICAL ANALYSES.

325 ID-NUMBER ID-NUMBER 325

AUTHOR CALLIHAN, A. D./ MORFITT, J. W./ THOMAS, J. T.
 TITLE SMALL THERMAL HOMOGENEOUS CRITICAL ASSEMBLIES
 REPORT NUMBER..... GENEVA-1, 05, 145-155
 CONFERENCE FIRST UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
 ATOMIC ENERGY, GENEVA, SWITZERLAND, 8-20 AUGUST 1955
 DATE PUBLISHED ... 55-08-00
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

DURING THE PAST FEW YEARS SEVERAL LABORATORIES OPERATED FOR THE UNITED STATES ATOMIC ENERGY COMMISSION HAVE CARRIED ON EXTENSIVE EXPERIMENTAL PROGRAMS WITH CRITICAL ASSEMBLIES. IT IS THE PURPOSE OF THIS PAPER TO PRESENT A SURVEY OF THE DATA OBTAINED IN THREE LABORATORIES FROM MEASUREMENTS ON CRITICAL ARRAYS OF AQUEOUS SOLUTIONS CONTAINING URANIUM-233, URANIUM-235 AND PLUTONIUM-239. REPRESENTATIVE RESULTS HAVE BEEN SELECTED FROM AN EXTENSIVE ACCUMULATION OF DATA AND ARE INTENDED TO SUMMARIZE THE CRITICAL PARAMETERS FOR THESE ISOTOPES. TYPICAL EXPERIMENTAL EQUIPMENT AND PROCEDURES ARE BRIEFLY DESCRIBED.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

329 ID-NUMBER ID-NUMBER 329

AUTHOR LLOYD, R. C. / CLAYTON, E. D. / RICHEY, C. R. / BIERMAN, S. R.

TITLE CRITICAL EXPERIMENTS WITH PLUTONIUM NITRATE SOLUTIONS

REPORT NUMBER..... HW-77311, 40-47

DATE PUBLISHED ... 63-00-00

NSA-NUMBER 17:31081

SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

CRITICAL EXPERIMENTS WERE CONDUCTED WITH PLUTONIUM NITRATE SOLUTIONS IN AN 11.5-INCH DIAMETER STAINLESS STEEL SPHERE. THE MEASURED VOLUME OF THE 11.5-INCH SPHERE WAS 12.95 LITERS; THE VESSEL WALL THICKNESS WAS 0.049 INCH. CRITICALITY IN THE WATER REFLECTED SPHERE WAS STUDIED AS A FUNCTION OF NITRATE CONCENTRATION. PLUTONIUM CONCENTRATIONS WERE IN THE RANGE OF 51 TO 431 G PLUTONIUM/LITER, WITH LOW ACID MOLARITY (LESS THAN 2 IN MOST CASES). THE DATA OBTAINED YIELD A CURVE OF CRITICAL CONCENTRATION VERSUS NITRATE, WHICH MAY THEN BE USED TO ESTIMATE THE CRITICAL CONCENTRATION FOR A HOMOGENEOUS PLUTONIUM WATER MIXTURE IN THE ABSENCE OF NITRATE, OR TO EVALUATE THE MINIMUM MASS OF PLUTONIUM IN THE SPHERE. EXPERIMENTS WERE ALSO CONDUCTED TO DETERMINE THE EFFECT OF THE STAINLESS STEEL VESSEL WALL ON THE CRITICALITY OF THE WATER REFLECTED UNIT. PULSED NEUTRON SOURCE EXPERIMENTS WERE CONDUCTED CONCURRENTLY WITH CRITICAL MASS MEASUREMENTS. MULTIGROUP DIFFUSION THEORY CALCULATIONS WERE USED TO COMPUTE CRITICALITY FOR SOME OF THE SOLUTIONS AS USED IN THE EXPERIMENTS, WITH A COMPARISON BETWEEN THEORY AND EXPERIMENT BEING GIVEN IN TERMS OF K(EFF). (AUTH).

330 ID-NUMBER ID-NUMBER 330

AUTHOR GOODWIN, A. / SCHUSKE, C. L.

TITLE PLEXIGLAS AND GRAPHITE MODERATED PLUTONIUM ASSEMBLIES

REPORT NUMBER..... JAABA, 15, 120-129

JOURNAL JOURNAL OF NUCLEAR ENERGY

DATE PUBLISHED ... 61-00-00

NSA-NUMBER 16:2701

SITE/PROGRAM ROCKY FLATS - PLUTONIUM GRAPHITE SYSTEMS ; ROCKY FLATS - BORATED PLUTONIUM METAL CYLINDERS

ABSTRACT

THE CRITICAL MASSES OF MIXTURES OF PLUTONIUM AND PLEXIGLAS, AND OF PLUTONIUM AND GRAPHITE HAVE BEEN DETERMINED.

THE EXPERIMENTAL DATA WERE DERIVED FROM SUB-CRITICAL NEUTRON MULTIPLICATION MEASUREMENTS ON CYLINDRICAL ASSEMBLIES CONTAINING THESE MIXTURES. THE ATOMIC RATIOS OF MODERATOR-TO-FUEL RANGED FROM HYDROGEN/PLUTONIUM = 0 TO 100 AND CARBON/PLUTONIUM = 0 TO 10.

THEORETICAL VALUES OF CRITICAL MASSES WERE DERIVED FOR WATER AND GRAPHITE MODERATED SYSTEMS OF PLUTONIUM USING 16-GROUP TRANSPORT AND DIFFUSION CALCULATIONS. THE ATOMIC RATIOS OF MODERATOR-TO-FUEL RANGED FROM HYDROGEN/PLUTONIUM = 0 TO 1000 AND CARBON/PLUTONIUM = 0 TO 35000.

THE AUTHORS' EXPERIENCE INDICATES THAT THE RESULT OF THIS WORK IS AN INEXPENSIVE AND REASONABLY ACCURATE METHOD FOR MAKING NUCLEAR SAFETY CALCULATIONS UPON THESE SYSTEMS.

331 ID-NUMBER ID-NUMBER 331

AUTHOR HURWITZ, H. / EHRLICH, R.

TITLE COMPARISON OF THEORY AND EXPERIMENT FOR INTERMEDIATE ASSEMBLIES

REPORT NUMBER..... GENEVA-1, 05, 423-432

CONFERENCE FIRST UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 8-20 AUGUST 1955

DATE PUBLISHED ... 55-08-00

SITE/PROGRAM OAK RIDGE - URANIUM(93%) - BERYLLIUM ; GENERAL ELECTRIC CO., KNOLLS ATOMIC POWER LABORATORY - PRELIMINARY PILE ASSEMBLY (PPA)

ABSTRACT

EARLY MEASUREMENTS OF THE THERMAL NEUTRON CROSS SECTIONS OF PLUTONIUM MADE IT EVIDENT THAT THE PROSPECTS OF A PLUTONIUM BREEDING CYCLE UTILIZING THERMAL-NEUTRON REACTORS WERE POOR. AS A RESULT THERE WAS INTEREST IN EXPLORING THE POSSIBILITIES OF INTERMEDIATE POWER BREEDER REACTORS. A PROGRAM OF CRITICAL EXPERIMENTATION WAS ACCORDINGLY UNDERTAKEN FOR THE PURPOSE OF STUDYING THE PROPERTIES OF ASSEMBLIES IN WHICH THE MAJORITY OF THE FISSIONS ARE CAUSED BY NEUTRONS OF INTERMEDIATE ENERGY. ALTHOUGH AS AN OUTCOME OF THIS AND RELATED PROGRAMS IT WAS LEARNED THAT INTERMEDIATE ENERGY PLUTONIUM BREEDERS ARE NOT FEASIBLE, A GREAT DEAL OF INTERESTING INFORMATION WAS OBTAINED WHICH IS RELEVANT TO OTHER TYPES OF POWER REACTORS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE EXPERIMENTAL PROGRAM, WHICH IS DESCRIBED IN ANOTHER PAPER BY T. M. SNYDER, WAS ACCOMPANIED BY AN EXTENSIVE PROGRAM OF REACTOR CALCULATIONS. THE NATURE OF THESE CALCULATIONS AND THE COMPARISON OF THE RESULTS WITH EXPERIMENTAL MEASUREMENTS WILL BE DESCRIBED IN THIS PAPER.

332 ID-NUMBER ID-NUMBER 332

AUTHOR ZALESKI, C. P. / VAUTREY, L.
 TITLE THE FAST BREEDER REACTOR RAPSODIE
 REPORT NUMBER.... CEA-2193
 DATE PUBLISHED ... 61-10-23
 SITE/PROGRAM FRANCE - RAPSODIE

ABSTRACT

IN THIS REPORT, THE AUTHORS DESCRIBE THE RAPSODIE PROJECT, THE FRENCH FAST BREEDER REACTOR, AS IT STANDS AT CONSTRUCTION ACTUAL START-UP.

THE PAPER PROVIDES INFORMATION ABOUT

- THE PRINCIPAL NEUTRONIC AND THERMAL CHARACTERISTICS.
- THE REACTOR AND ITS COOLING CIRCUITS.
- THE MAIN HANDLING DEVICES OF RADIOACTIVE OR CONTAMINATED ASSEMBLIES.
- THE PRINCIPLES AND MEANS GOVERNING REACTOR OPERATION.
- THE PURPOSES AND LOCATIONS OF MISCELLANEOUS BUILDINGS.

RAPSODIE IS EXPECTED TO BE CRITICAL BY 1964.

333 ID-NUMBER ID-NUMBER 333

AUTHOR GOLDBERG, E./ KLOVERSTROM, F. A.
 TITLE RESONANCE ABSORPTION OF NEUTRONS IN THICK SHEETS OF MOLYBDENUM
 REPORT NUMBER.... TANSO, 03, 213-214
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 60-06-00
 NSA-NUMBER 14:10965
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

ABSTRACT

SEVERAL EXPERIMENTS HAVE BEEN PERFORMED TO DETERMINE THE EFFECTIVE RESONANCE ABSORPTION INTEGRAL FOR MOLYBDENUM AS A FUNCTION OF THE THICKNESS OF MOLYBDENUM SHEETS. THE RESULTS HAVE BEEN COMPARED TO THEORETICAL PREDICTIONS TO APPRAISE THE CONTRIBUTION FROM UNRESOLVED RESONANCES. THE LATTER IS SIGNIFICANT WHEN ONE IS INVOLVED WITH STRUCTURAL COMPONENTS IN A REACTOR THAT ARE QUITE THICK SUCH THAT LOWER ENERGY RESONANCES ARE STRONGLY SELF-SHIELDED WHEREAS THE RESONANCES IN THE KEY RANGE AND BEYOND ARE NOT. THE RESONANCE INTEGRALS WERE DETERMINED BY PLACING MOLYBDENUM SHEETS IN A CRITICAL ASSEMBLY AND FINDING THE CRITICAL DIMENSIONS. A MULTI-GROUP DIFFUSION CODE WAS THEN EMPLOYED TO DETERMINE THE CROSS SECTIONS WHICH GAVE THE CORRECT CRITICAL DIMENSIONS.

THE SPADE FACILITY OF LRL-LIVERMORE WAS EMPLOYED. THE CORE OF THE CRITICAL ASSEMBLY WAS BERYLLIUM OXIDE MODERATED ($\rho = 2.86 \text{ G/CC}$), AND THE FUEL WAS ENRICHED (I.E., 93.2 PERCENT) URANIUM-235. THE MOLAR RATIO WAS BERYLLIUM: URANIUM-235 = 247:1. THE FOIL THICKNESS AND SPACING WAS EIGHT MILS PER INCH. THE CROSS SECTION WAS 24 INCH X 24 INCH FOR BOTH THE CORE AND REFLECTORS. THE REFLECTORS WERE OF GRAPHITE ($\rho = 1.70 \text{ G/CC}$), TWELVE INCHES THICK, AND WERE IN LOWER PORTION OF THE ASSEMBLY RESTED ON A MOVABLE LOW MASS PEDESTAL WHILE THE UPPER RESTED ON A STEEL DIAPHRAGM. SUITABLE CORRECTIONS WERE MADE FOR THE PRESENCE OF THE DIAPHRAGM IN DETERMINING THE CRITICAL HEIGHT OF THE CORE.

THE SHEETS OF MOLYBDENUM OF HIGH PURITY, 24 INCH X 24 INCH IN EXTENT, WERE PLACED EITHER AT THE MID-PLANE OF THE CORE OR AT THE CORE-REFLECTOR INTERFACES. THE RESULTS ARE GIVEN IN TABLE I. ALSO INCLUDED IS THE FINDING FROM AN EXPERIMENT INVOLVING A GOLD SHEET, WHICH WAS DONE FOR REASONS OF CALIBRATION.

INASMUCH AS THE ASSEMBLIES WERE ONE-DIMENSIONAL IN NATURE, THE IBM 709 MULTIGROUP DIFFUSION CODE, ZOOM, WAS EMPLOYED TO DETERMINE THE EFFECTIVE RESONANCE ABSORPTION INTEGRALS FOR MOLYBDENUM. CONVENTIONAL SELF-SHIELDING FACTORS WERE USED. THE SPACING OF RESOLVED RESONANCES ARE SUCH THAT IT APPEARS JUSTIFIED TO ASSUME THAT FLUX DEPRESSION IN THE MODERATOR DOES NOT INFLUENCE RESONANCE ABSORPTION. THE RESULTANT RESONANCE INTEGRALS ARE GIVEN IN TABLE I.

A SIMILAR APPROACH USING THE RESULTS OF THE GOLD EXPERIMENT, AND THE PUBLISHED RESONANCE INTEGRAL OF 1558 BARNS YIELDED EXCELLENT AGREEMENT OF EXPERIMENT WITH THE STANDARD VALUE, TO WITHIN THE EXPERIMENTAL ERROR. IT WAS NECESSARY HERE TO TREAT THE L/V ABSORPTION CAREFULLY, TAKING SELF-SHIELDING INTO ACCOUNT. THIS LATTER ISSUE WAS SEEN TO BE UNIMPORTANT FOR THE MOLYBDENUM CALCULATIONS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

RECENT REACTIVITY MEASUREMENTS FROM HARWELL ARE FOUND TO BE IN SATISFACTORY AGREEMENT WITH THE PRESENT DATA. THE ESTIMATED RESONANCE ABSORPTION INTEGRAL FOR ZERO-THICKNESS SHEETS IS 22.7 ± 2.5 BARNs BASED ON THE COMBINED DATA. OF THIS, APPROXIMATELY FOUR BARNs IS DUE TO UNRESOLVED RESONANCES ABOVE 700 EV. THE LATTER ESTIMATE WAS FOUND BY COMPARING THE DATA TO PREDICATIONS BASED ON KNOWN RESONANCE PARAMETERS. (AUTH).

334 ID-NUMBER ID-NUMBER 334

AUTHOR JONES, A. F./ WALFORD, J. G.
 TITLE THE EQUIPMENT AND METHODS USED IN BRITISH CRITICALITY LABORATORIES
 REPORT NUMBER..... ENEA-KARLS.-1961, 553-588
 CONFERENCE CRITICALITY CONTROL IN CHEMICAL AND METALLURGICAL PLANT, KARLSRUHE
 SYMPOSIUM, ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT EUROPEAN
 NUCLEAR ENERGY AGENCY, 1961
 DATE PUBLISHED ... 61-00-00
 SITE/PROGRAM UNITED KINGDOM - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

CRITICAL EXPERIMENTS ON BEHALF OF PLANT SAFETY HAVE BEEN IN PROGRESS IN THE UNITED KINGDOM FOR ALMOST TEN YEARS AND HAVE BEEN CARRIED OUT AT THREE DIFFERENT A.E.A. ESTABLISHMENTS--HARWELL, ALDERMASTON AND DOUNREAY--OF WHICH ONLY THE LAST TWO ARE IN USE AT PRESENT. THE DIVISION OF WORK BETWEEN THESE LABORATORIES HAS DEPENDED PRIMARILY ON THE PHYSICAL FORM OF THE FISSILE MATERIALS. EXPERIMENTS WITH METALS BEING CARRIED OUT ALMOST ENTIRELY AT ALDERMASTON AND THOSE WITH SOLUTIONS AT HARWELL (UP TO 1957) AND DOUNREAY. WORK ON SOLIDS OTHER THAN METALS INCLUDING, IN PARTICULAR, MIXTURES OF FISSILE MATERIAL AND MODERATOR, IS CURRENTLY IN PROGRESS AT BOTH ALDERMASTON AND DOUNREAY.

THE DESIGN OF THE FACILITIES AND THE EXPERIMENTAL PROCEDURES AT THE THREE SITES HAVE BEEN SOMEWHAT DIFFERENT AND THEY ARE DESCRIBED SEPARATELY.

336 ID-NUMBER ID-NUMBER 336

AUTHOR BLOKHIN, G. E. / BLOKHINTSEV, D. I. / BLYUMKINA, YU. A. / BONDARENKO, I. I.
 / DERYAGIN, B. I. / ZAIMOVSKII, A. S. / ET AL
 TITLE A FAST NEUTRON BURST REACTOR
 REPORT NUMBER..... ATOMK.. 10, 437
 DATE PUBLISHED ... 61-00-00
 NSA-NUMBER 15:28844
 SITE/PROGRAM USSR - FAST BURST REACTOR

ABSTRACT

THE PULSED FAST REACTOR CONSTRUCTED AT THE JOINT INSTITUTE FOR NUCLEAR RESEARCH WENT CRITICAL IN JUNE 1960.

THE PULSED FAST REACTOR IS DESIGNED TO OPERATE WITH PERIODIC SURGES AT AN AVERAGE POWER OF ABOUT 1 KW. THE POWER PULSES ARE DEVELOPED THROUGH THE MULTIPLICATION OF PROMPT NEUTRONS AT TIMES WHEN THE REACTOR IS IN THE SUPERCRITICAL STATE. THE POWER PULSE HALF-WIDTH IS 36 MICRO-SEC AND THE PULSE REPETITION RATE MAY VARY OVER THE RANGE 8-80 PULSES/SEC.

340 ID-NUMBER ID-NUMBER 340

AUTHOR CALLIHAN, A. D.
 TITLE EXPERIMENTS FOR CRITICALITY CONTROL
 REPORT NUMBER..... ENEA-KARLS.-1961, 589-614
 CONFERENCE CRITICALITY CONTROL IN CHEMICAL AND METALLURGICAL PLANT, KARLSRUHE
 SYMPOSIUM, ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT EUROPEAN
 NUCLEAR ENERGY AGENCY, 1961
 DATE PUBLISHED ... 61-11-00
 NSA-NUMBER 16:7807
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

THIS PAPER DISCUSSES THE EXPERIMENTAL METHODS WHICH YIELD INFORMATION USEFUL IN THE SOLUTION OF CRITICALITY PROBLEMS. REFERENCE IS MADE ONLY TO ACTIVITIES WITHIN THE UNITED STATES. THE DISCUSSION IS VERY GENERAL, MERELY INDICATING THE TYPE OF EXPERIMENTS AND THE LABORATORY REQUIREMENTS. THERE IS NO THEORETICAL TREATMENT OF THE EXPERIMENTAL METHODS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

344 ID-NUMBER ID-NUMBER 344

AUTHOR HANSEN, G. E.
 TITLE STATUS OF COMPUTATIONAL AND EXPERIMENTAL CORRELATION FOR LOS ALAMOS FAST
 NEUTRON CRITICAL ASSEMBLIES
 REPORT NUMBER..... IAEA-VIENNA-1961, 445-455
 DATE PUBLISHED ... 61-08-00
 NSA-NUMBER 16:26533
 SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

NEW ASSEMBLIES AND IMPROVED MEASURING TECHNIQUES CALL FOR PERIODIC REVIEW OF THE STATUS OF COMPUTATION VS. EXPERIMENT. IT IS APPROPRIATE TO EMPHASIZE NEUTRON-SPECTRAL CHARACTERIZATIONS BECAUSE OF THE PARTICULARLY ELUSIVE PROBLEMS ASSOCIATED WITH ABSOLUTE SPECTRAL-INDEX MEASUREMENT AND THE NEED FOR CHECKS OF COMPUTATION BEYOND SIMPLE CRITICAL SIZE.

THE EVER-IMPROVING SPECTRAL-INDEX MEASUREMENTS IN CONJUNCTION WITH INCREASING PRECISION, BOTH OF MICROSCOPIC DATA FOR DETECTOR AND ASSEMBLY MATERIALS AND OF COMPUTATIONAL TECHNIQUES, PRODUCE A GRADUAL CLARIFICATION OF THE CHARACTERISTICS OF A FAMILY OF FAST-NEUTRON CRITICAL ASSEMBLIES. THIS FAMILY NOW INCLUDES UNREFLECTED AND THICK-URANIUM-REFLECTED URANIUM-233 IN SPHERICAL GEOMETRY.

DIRECT CORRELATIONS AMONG THE EXPERIMENTAL DATA WILL BE PRESENTED TO INDICATE THE A PRIORI POSSIBILITIES FOR SUCCESSFUL CORRELATIONS WITH COMPUTATION. SENSITIVITY OF COMPUTED SPECTRA AND CRITICAL SIZES TO NEUTRON-TRANSPORT MODELS (TRANSPORT AND LINEAR APPROXIMATIONS) AND ARITHMETIC APPROXIMATIONS (FINITE ANGULAR SEGMENTATIONS AND MULTI-GROUP REPRESENTATIONS) WILL BE PRESENTED FOR SEVERAL TYPICAL ASSEMBLIES TO HELP ESTABLISH THE NECESSARY COMPUTATIONAL DETAIL. COMPARISONS BETWEEN EXPERIMENT AND PREDICTION WILL INCLUDE, IN ADDITION TO SPECTRAL INDICES AND CRITICAL SIZES, NEUTRON LIFETIMES AND DELAYED-NEUTRON FRACTIONS. (AUTH.).

345 ID-NUMBER ID-NUMBER 345

AUTHOR TATTERSALL, R. B. / SMALL, V. G. / MACBEAN, I. J. / HOWE, W. D.
 TITLE REACTIVITY CHANGE MEASUREMENTS ON PLUTONIUM-URANIUM FUEL ELEMENTS IN
 HECTOR EXPERIMENTAL TECHNIQUES AND RESULTS
 REPORT NUMBER..... AEEW-R376
 DATE PUBLISHED ... 64-00-00
 SITE/PROGRAM UNITED KINGDOM, WINFRITH - HECTOR (GRAPHITE)

ABSTRACT

THE TECHNIQUES USED IN MAKING REACTIVITY CHANGE MEASUREMENTS ON HECTOR ARE DESCRIBED AND DISCUSSED. PILE PERIOD MEASUREMENTS WERE USED IN THE MAJORITY OF CASES, THOUGH THE PILE OSCILLATOR TECHNIQUE WAS USED OCCASIONALLY. THESE TWO METHODS ARE COMPARED.

FLUX DETERMINATIONS WERE MADE IN THE VICINITY OF THE FUEL ELEMENT SAMPLES USING MANGANESE FOILS, AND THE TECHNIQUES USED ARE DESCRIBED AND AN ERROR ASSESSMENT MADE.

RESULTS OF BOTH REACTIVITY CHANGE AND FLUX MEASUREMENTS ON 1.2 INCH DIAMETER URANIUM AND PLUTONIUM-URANIUM ALLOY FUEL ELEMENTS ARE PRESENTED, THESE MEASUREMENTS BEING CARRIED OUT IN A VARIETY OF GRAPHITE MODERATED LATTICES AT TEMPERATURES UP TO 450 DEGREES C.

346 ID-NUMBER ID-NUMBER 346

AUTHOR DONAHUE, D. J. / LANNING, D. D. / BENNETT, R. A. / HEINEMAN, R. E.
 TITLE DETERMINATION OF K(INF) FROM CRITICAL EXPERIMENTS WITH THE PCTR
 REPORT NUMBER..... NSEAO, 04, 297-321
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 58-09-00
 NSA-NUMBER 13:129
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

THE PCTR IS A SEVEN-FOOT CUBE OF GRAPHITE WITH A LARGE CAVITY, 2 X 2 X 3 FT, LOCATED AT ITS CENTER. IT IS MADE CRITICAL BY ENRICHED URANIUM WHICH IS DISTRIBUTED ON THE BOUNDARY OF THE CENTRAL CAVITY. ONE END OF THE ASSEMBLY, 2 X 7 X 7 FT, IS MOUNTED ON A MOVABLE CART, AND CAN BE MOVED AWAY FROM THE REACTOR PROPER ALLOWING ACCESS TO THE CENTRAL TEST REGION. THE INFINITE MEDIUM, THERMAL NEUTRON MULTIPLICATION FACTOR, K(INF) OF A MULTIPLYING MATERIAL IS OBTAINED BY DETERMINING THE AMOUNT OF THERMAL ABSORBER, WHICH WHEN INSERTED WITH THE MULTIPLYING MATERIAL INTO THE CENTRAL REGION OF THE PCTR, WILL CHANGE NEITHER THE REACTIVITY OF THE ASSEMBLY NOR THE ENERGY DISTRIBUTION OF NEUTRONS IN IT. THE DESIGN

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

OF THE REACTOR AND THE METHOD USED FOR DETERMINING THIS ABSORBER MASS ARE DISCUSSED AND RESULTS FOR TWO GRAPHITE-NATURAL URANIUM LATTICES ARE PRESENTED. (AUTH).

347 ID-NUMBER ID-NUMBER 347

AUTHOR ENGELDER, T. C. / SNIDOW, N. L. / ROBERTS, D. M. / FAIRBURN, G. T. / ROY, D. H.
 TITLE MEASUREMENTS OF K(INF) AND OTHER PARAMETERS IN THE SMALL LATTICE EXPERIMENTS TECHNIQUE
 REPORT NUMBER..... BAW-1283
 DATE PUBLISHED ... 63-00-00
 NSA-NUMBER 18:4787
 SITE/PROGRAM BABCOCK AND WILCOX CO. - PHYSICS VERIFICATION PROGRAM - SMALL LATTICE EXPERIMENT

ABSTRACT

THE SMALL LATTICE EXPERIMENT (SLE) IS A TECHNIQUE FOR MEASURING K(INF) AND OTHER INFINITE-MEDIUM LATTICE PARAMETERS USING MUCH LESS TEST FUEL THAN IS REQUIRED FOR EQUIVALENT CRITICAL OR EXPONENTIAL EXPERIMENTS. THE THEORETICAL BASIS FOR APPLYING SUCH AN EXPERIMENT TO EPITHERMAL LATTICES IS DISCUSSED, AN ANALYSIS OF SPECTRAL MISMATCH ERROR IS GIVEN, AND THE FACILITY FOR THE MEASUREMENTS IS DESCRIBED. SMALL LATTICE EXPERIMENT MEASUREMENTS ARE COMPARED TO THOSE IN AN EQUIVALENT CRITICAL ASSEMBLY TO TEST THE VALIDITY OF THE TECHNIQUE. IN AN EPITHERMAL LATTICE OF 4.02%-ENRICHED URANIUM DIOXIDE FUEL RODS HAVING A NONMODERATOR-TO-MODERATOR VOLUME RATIO OF 1.0 AND MODERATED BY A HEAVY WATER-WATER MIXTURE CONTAINING 70% HEAVY WATER, VALUES AGREE WITHIN STATISTICAL ERRORS (0.5 TO 1%). THE SLE TECHNIQUE WAS ALSO USED TO MEASURE THESE PARAMETERS IN TWO SIMILAR EPITHERMAL LATTICES CONTAINING (URANIUM-235-THORIA) FUEL RODS.

350 ID-NUMBER ID-NUMBER 350

AUTHOR AMUNDSON, P. I. / MC VEAN, R. L. / LONG, J. K.
 TITLE A TWO-ZONE FAST CRITICAL EXPERIMENTS, ZPR-3 ASSEMBLY 42.
 REPORT NUMBER..... ANL-6733
 DATE PUBLISHED ... 64-01-00
 NSA-NUMBER 18:28959
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

THIS STUDY WAS CONDUCTED TO DETERMINE WHAT PROPERTIES OF A PREVIOUSLY STUDIED DILUTE POWER REACTOR COULD BE DUPLICATED IN A SMALLER TWO-ZONE ASSEMBLY. REACTIVITY MEASUREMENTS INCLUDED DETERMINATIONS OF PLATE-ORIENTATION WORTH, HOMOGENEITY CORRECTIONS, REACTOR-SEGMENT WORTHS CENTRAL REACTIVITY COEFFICIENTS, AND RADIAL WORTH DISTRIBUTIONS OF AXIAL COLUMNS OF CORE MATERIALS. SPECTRAL INDEX DETERMINATIONS INCLUDED: CENTRAL FISSION RATIOS, NUCLEAR TRACK EMULSION MEASUREMENTS, FISSION COUNTER TRAVERSES, ROSSI-ALPHA MEASUREMENTS, SODIUM ACTIVATION, AND NATURAL AND ENRICHED URANIUM FOIL MEASUREMENTS.(AUTH).

351 ID-NUMBER ID-NUMBER 351

AUTHOR DAVEY, W. G.
 TITLE A CRITICAL COMPARISON OF MEASURED AND CALCULATED FISSION RATIOS FOR ZPR-3 ASSEMBLIES
 REPORT NUMBER..... ANL-6617
 DATE PUBLISHED ... 61-09-00
 NSA-NUMBER 17:702
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

A CRITICAL COMPARISON OF MEASURED AND CALCULATED CENTRAL FISSION RATIOS FOR 18 ZPR-3 FAST REACTOR ASSEMBLIES HAS BEEN MADE WITH THE OBJECT OF EXAMINING THE ACCURACY OF COMPUTATION OF SPECTRA AND OF THE FISSION CROSS SECTIONS USED. THIS COMPARISON USES FISSION RATIOS MEASURED WITH KIRN ABSOLUTE FISSION CHAMBERS AND COMPUTED WITH ANL CROSS-SECTION SET 635.

THE MEASURED AND CALCULATED FISSION RATIOS OBTAINED WITH URANIUM-233, URANIUM-234, URANIUM-235, URANIUM-236, URANIUM-238, PLUTONIUM-240, AND PLUTONIUM-240 ARE COMPARED, BOTH TO SEARCH FOR TRENDS WHICH MIGHT OCCUR WITH PROGRESSIVE CHANGES IN SPECTRA, AND ALSO TO DETERMINE THE ACCURACY OF PREDICTION OF RATIOS.

IT IS FOUND THAT THE CALCULATED RELATIVE FISSION RATES OF PLUTONIUM-239 AND URANIUM-233 ARE WITHIN ABOUT +/- 1.5% OF THE MEASURED VALUES, AND THE CALCULATED RATES FOR PLUTONIUM-240, URANIUM-236, AND URANIUM-238 RELATIVE TO EITHER PLUTONIUM-239 OR URANIUM-233 ARE WITHIN +/- 3.5% TO +/- 5% OF THE MEASURED VALUES. HOWEVER, CALCULATED FISSION RATES

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

FOR URANIUM-235 AND URANIUM-234 ARE ABOUT 6% LOW AND 8% HIGH, RESPECTIVELY, RELATIVE TO THOSE OF THE OTHER FIVE ISOTOPES. (AUTH).

352 ID-NUMBER ID-NUMBER 352

AUTHOR DAVEY, W. G.
 TITLE A COMPARISON OF EXPERIMENTAL AND CALCULATED PROMPT NEUTRON LIFETIMES AND
 CENTRAL REACTIVITY COEFFICIENTS IN ZPR-3 ASSEMBLIES AND THEIR RELATIONSHIP
 TO OTHER PARAMETERS

REPORT NUMBER.... ANL-6682
 DATE PUBLISHED ... 63-06-00
 NSA-NUMBER 17:36924
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

THIS REPORT IS A CONTINUATION OF A COMPARISON OF EXPERIMENTAL PARAMETERS OF ZPR-3 FAST REACTOR ASSEMBLIES WITH THOSE CALCULATED THROUGH USE OF A CROSS-SECTION SET DERIVED BY THE AUTHOR FROM THAT OF YIFTAH, OKRENT, AND MOLDAUER, AND INITIALLY USED FOR A STUDY OF THE CRITICAL SIZES OF ZPR-3 ASSEMBLIES. THIS CROSS-SECTION SET HAS ALSO BEEN USED TO STUDY CENTRAL FISSION RATIOS IN ZPR-3 ASSEMBLIES. IN THE PRESENT REPORT, THE ANALYSIS IS EXTENDED TO PROMPT NEUTRON LIFETIMES AND THE RELATIVE EFFECTS OF THE SUBSTITUTION OF MATERIALS AND THE REACTOR CENTERS. THE RESULTS OF THE PRESENT WORK ARE EXAMINED IN CONJUNCTION WITH THOSE OF THE CRITICAL SIZE AND FISSION RATIO STUDIES. (AUTH).

354 ID-NUMBER ID-NUMBER 354

AUTHOR LONG, J. K. / LOEWENSTEIN, W. B. / GRANYAN, C. E. / GRUNSON, G. S. / KIRN,
 F. S. / OKRENT, D. / RICE, R. E. / THALGOTT, F. W.

TITLE FAST NEUTRON POWER REACTOR STUDIES WITH THE ZPR-3

REPORT NUMBER.... GENEVA-2, 12, 119-141
 CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
 ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958
 DATE PUBLISHED ... 58-09-00
 NSA-NUMBER 12:15023
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

TO ASSIST IN THE DEVELOPMENT OF FAST POWER BREEDER REACTORS, THE ARGONNE NATIONAL LABORATORY OF THE UNITED STATES ATOMIC ENERGY COMMISSION HAS CONSTRUCTED AND PUT INTO OPERATION A FLEXIBLE, FAST, ZERO-POWER CRITICAL FACILITY, NAMED ZPR-3. THIS REACTOR FIRST WENT CRITICAL IN OCTOBER 1955 AND SINCE THEN HAS BEEN THE SCENE OF MORE THAN 30 CRITICALS OF WIDELY VARYING GEOMETRIES AND COMPOSITION.

THE ZPR-3 PROGRAM HAS EXTENDED THE AVAILABLE EXPERIMENTAL DATA THROUGH THE USE OF A CRITICAL ASSEMBLY FLEXIBLE ENOUGH THAT ITS POTENTIAL RANGE OF COMPOSITIONS, CONFIGURATIONS AND SPECTRA CAN INCLUDE MOST IF NOT ALL OF THE FAST POWER REACTORS CURRENTLY ENVISIONED. IN ADDITION TO SPECIFIC POWER REACTORS, ASSEMBLIES HAVING THE SAME COMPOSITION BUT SIMPLER GEOMETRY, AND HENCE WHICH ARE MORE SUITABLE FOR ANALYSIS, HAVE BEEN CONSTRUCTED. THIS HAS PROVIDED A BASIS FOR IMPROVING AND CONFIRMING THE TECHNIQUES OF FAST REACTOR CALCULATIONS.

THERE ARE TWO PHASES TO THE EXPERIMENTAL PROGRAM. FIRST THERE ARE CRITICAL EXPERIMENTS DESIGNED TO INVESTIGATE SPECIFIC REACTORS, EITHER EXISTING OR PROPOSED. IN SUCH EXPERIMENTS THE ACTUAL REACTOR SHAPE AND COMPOSITION, STRUCTURAL MATERIALS AND COOLANT, ARE COPIED AS NEARLY AS POSSIBLE. THIS HAS BEEN DONE FOR EBR-I AND THE PROPOSED EBR-II. SECOND, THERE IS A CLASS OF CRITICAL EXPERIMENTS DESIGNED TO CHECK THE ACCURACY OF THE CURRENT METHODS OF ANALYSIS. INCLUDED IN THIS CATEGORY ARE REACTORS OF A NUMBER OF DIFFERENT GEOMETRIC SHAPES; CYLINDERS WITH DIFFERENT LENGTH TO DIAMETER RATIOS, RECTANGLES AND SPHERES, ALL HAVING THE SAME COMPOSITION. VARIOUS COMPOSITIONS HAVE ALSO BEEN STUDIED, FOR EXAMPLE, CHANGES OF URANIUM CONCENTRATION AND ENRICHMENT. ALSO INCLUDED IN THIS STUDY ARE REACTORS WHOSE COMPOSITION IS ESPECIALLY DESIGNED TO EMPHASIZE CERTAIN REGIONS OF THE NEUTRON SPECTRUM. FOR EXAMPLE, GRAPHITE HAS BEEN ADDED TO SOME TYPICAL FAST REACTOR COMPOSITIONS TO PRODUCE THE SOFTER SPECTRA CHARACTERISTIC OF LARGER POWER REACTORS.

356 ID-NUMBER ID-NUMBER 356

AUTHOR CLAYTON, E. D.
 TITLE CRITICAL MASS EXPERIMENTS WITH PLUTONIUM NITRATE SOLUTIONS

REPORT NUMBER.... HW-71747
 DATE PUBLISHED ... 61-10-13
 NSA-NUMBER 16:15264
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

CRITICAL MASS EXPERIMENTS WERE BEGUN IN THE NEW HANFORD PLUTONIUM CRITICAL MASS LABORATORY DURING JUNE. THE PROGRAM FOR THE LABORATORY IS INTENDED TO BE A GENERAL STUDY INVOLVING HOMOGENEOUS AND HETEROGENEOUS SYSTEMS NEEDED FOR OBTAINING CRITICALITY DATA ON PLUTONIUM SOLUTIONS AND PRECIPITATES.

THE CRITICAL ASSEMBLY UNIT USED IN THE INITIAL EXPERIMENTS WAS A 14-INCH DIAMETER STAINLESS STEEL SPHERE OF 0.044-INCH WALL THICKNESS. IN THE INITIAL ATTEMPT TO REACH CRITICALITY, THE UNIT WAS UNREFLECTED. THE VESSEL WAS FILLED WITH PLUTONIUM-NITRATE SOLUTION AT A CONCENTRATION OF 298 GRAMS PLUTONIUM PER LITER. THE HYDROGEN TO PLUTONIUM ATOMIC RATIO FOR THE SOLUTION WAS ABOUT 64; THE NITRIC ACID MOLARITY WAS 6.3. THE VESSEL CONTAINED 6.95 KILOGRAMS OF PLUTONIUM WHEN FILLED TO CAPACITY. THE SYSTEM WAS SUBCRITICAL BY AN UNKNOWN AMOUNT, HOWEVER, THE EXTRAPOLATION OF THE MULTIPLICATION CURVES INDICATED THE VESSEL WOULD HAVE BEEN CRITICAL IF THE DIAMETER WERE ABOUT 14.8 INCHES.

HANFORD - PLUTONIUM NITRATE IN WATER

357 ID-NUMBER ID-NUMBER 357

AUTHOR CLAYTON, E. D./ LLOYD, R. C./ REARDON, W. A.

TITLE CRITICAL MASS EXPERIMENTS WITH PLUTONIUM NITRATE SOLUTIONS

REPORT NUMBER.... TANSO, 05, 075-076

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 62-00-00

NSA-NUMBER 16:27738

SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

CRITICALITY WAS FIRST ACHIEVED ON JULY 21, 1961, WITH PLUTONIUM TETRANITRATE SOLUTION IN A 14- INCH DIAM STAINLESS STEEL SPHERE REFLECTED WITH A 0.5-INCH LAYER OF PARAFFIN SINCE THEN CRITICALITY DATA HAVE BEEN OBTAINED FOR THE BARE SPHERE (FROM EXTRAPOLATION ONLY). FOR THE SPHERE NOMINALLY REFLECTED (WITH 0.5-INCH OF PARAFFIN AND 1-INCH OF PARAFFIN), AND WITH A 4-INCH THICK CONCRETE REFLECTOR. PLUTONIUM SOLUTIONS WITH ACID MOLARITIES IN THE RANGE OF APPROX. 1.2 TO 6, WITH PLUTONIUM CONCENTRATIONS OF APPROX. 33 TO 300 G PLUTONIUM/L HAVE BEEN STUDIED.

IT WAS POSSIBLE IN A FEW CASES TO DERIVE A COEFFICIENT RELATING THE NITRATE ION CONCENTRATION TO CRITICAL VOLUME. THE COEFFICIENT DERIVED IS THE CHANGE IN CRITICAL VOLUME PER GRAM OF NITRATE ION CHANGE AS NITRIC ACID. THE CONVERSION TO A CORRECTION FOR TOTAL (NITRATE ION) CONCENTRATION IS SIMPLY PERFORMED BY ASSUMING THAT THE PLUTONIUM IS PRESENT AS PLUTONIUM TETRANITRATE. FOR PLUTONIUM CONCENTRATIONS IN THE RANGE OF APPROX. 47 TO 98 G/L, THE COEFFICIENT VARIED BETWEEN APPROX. 0.025 TO APPROX. 0.029 L/G NITRATE ION. (AUTH).

358 ID-NUMBER ID-NUMBER 358

AUTHOR LLOYD, R. C./ CLAYTON, E. D./ RICHEY, C. R./ BIERMAN, S. R.

TITLE CRITICAL EXPERIMENTS WITH PLUTONIUM NITRATE SOLUTIONS

REPORT NUMBER.... HW-77311

DATE PUBLISHED ... 63-04-15

NSA-NUMBER 17:31081

SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

INTRODUCTION: CRITICAL EXPERIMENTS WERE CONDUCTED WITH PLUTONIUM NITRATE SOLUTIONS IN AN 11.5- INCHES DIAMETER STAINLESS STEEL SPHERE. THE RESULTS OF OTHER MEASUREMENTS ARE INCLUDED IN PREVIOUS QUARTERLY REPORTS. THE MEASURED VOLUME OF THE 11.5-INCHES SPHERE WAS 12.95 LITERS; THE VESSEL WALL THICKNESS WAS 0.049-INCH. CRITICALITY IN THE WATER REFLECTED SPHERE WAS STUDIED AS A FUNCTION OF NITRATE CONCENTRATION. PLUTONIUM CONCENTRATIONS WERE IN THE RANGE OF 51 TO 431 G PLUTONIUM/LITER WITH LOW ACID MOLARITY (LESS THAN 2 IN MOST CASES). THE DATA OBTAINED YIELD A CURVE OF CRITICAL CONCENTRATION VERSUS NITRATE, WHICH MAY THEN BE USED TO ESTIMATE THE CRITICAL CONCENTRATION FOR A HOMOGENEOUS PLUTONIUM WATER MIXTURE IN THE ABSENCE OF NITRATE, OR TO EVALUATE THE MINIMUM MASS OF PLUTONIUM IN THE SPHERE.

EXPERIMENTS WERE ALSO CONDUCTED TO DETERMINE THE EFFECT OF THE STAINLESS STEEL VESSEL WALL ON THE CRITICALITY OF THE WATER REFLECTED UNIT.

PULSED NEUTRON SOURCE EXPERIMENTS WERE CONDUCTED CONCURRENTLY WITH CRITICAL MASS MEASUREMENTS. BASED ON THE MEASURED NEUTRON LIFETIMES AND THE PROMPT DECAY RATIOS OBSERVED AT VARIOUS SOLUTION LEVELS IN THE 11.5-INCHES SPHERE, EFFECTIVE MULTIPLICATION CONSTANTS WERE DETERMINED AS A FUNCTION OF THE PLUTONIUM CONCENTRATION AND SOLUTION VOLUME IN THE SPHERE. ONE OF THE PURPOSES OF THE PULSED NEUTRON SOURCE EXPERIMENTS IS TO EXAMINE THE FEASIBILITY OF USING THIS TECHNIQUE FOR K-EFF MEASUREMENTS ON IN-PLANT EQUIPMENT.

MULTIGROUP DIFFUSION THEORY CALCULATIONS WERE USED TO COMPUTE CRITICALITY FOR SOME OF THE SOLUTIONS AS USED IN THE EXPERIMENTS, WITH A COMPARISON BETWEEN THEORY AND EXPERIMENT BEING GIVEN IN TERMS OF K-EFF (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

359 ID-NUMBER ID-NUMBER 359

AUTHOR LLOYD, R. C./ CLAYTON, E. D.
 TITLE CRITICAL MASS EXPERIMENTS WITH PLUTONIUM NITRATE SOLUTIONS
 REPORT NUMBER..... HW-76128
 DATE PUBLISHED ... 63-01-15
 NSA-NUMBER 17:24037
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

CRITICAL MASS MEASUREMENTS WERE CONTINUED WITH PLUTONIUM NITRATE SOLUTIONS IN A 14-INCHES DIAMETER SPHERE. THESE EXPERIMENTS WERE DEVOTED TO A STUDY OF THE EFFECTS OF CONCRETE REFLECTORS ON THE CRITICALITY OF THE VESSEL, AND THE EFFECT OF AN AIR GAP BETWEEN THESE REFLECTORS AND THE CORE.

CRITICAL MASS STUDIES WERE ALSO BEGUN WITH AN 11.5-INCHES DIAMETER STAINLESS STEEL SPHERE REFLECTED WITH WATER. THE SMALLER SPHERE SIZE PERMITS EXTENDING THE CRITICALITY DATA TO REGIONS OF HIGHER PLUTONIUM CONCENTRATION IN SPHERICAL GEOMETRY. (AUTH).

360 ID-NUMBER ID-NUMBER 360

AUTHOR LLOYD, R. C./ CLAYTON, E. D./ RICHEY, C. R.
 TITLE CRITICAL MASS EXPERIMENTS WITH PLUTONIUM NITRATE SOLUTIONS
 REPORT NUMBER..... HW-75228
 DATE PUBLISHED ... 62-10-25
 NSA-NUMBER 17:11303
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

CRITICALITY EXPERIMENTS WERE CONTINUED WITH PLUTONIUM NITRATE SOLUTIONS IN A 14-INCH DIAMETER STAINLESS STEEL SPHERE REFLECTED WITH WATER. CRITICALITY WAS STUDIED AS A FUNCTION OF THE PLUTONIUM CONCENTRATION AND ACID MOLARITY OF THE SOLUTIONS. PLUTONIUM CONCENTRATIONS WERE IN THE RANGE OF 33.5 TO 70.4 GRAMS PER LITER WITH ACID MOLARITIES RANGING FROM ABOUT 2.0 TO 6.7. DATA WERE OBTAINED FOR EVALUATING THE EFFECT OF THE STAINLESS STEEL SHELL ON THE CRITICALITY OF THE WATER REFLECTED SPHERE. IN ONE SERIES OF EXPERIMENTS, THE VESSEL WAS WRAPPED WITH 0.03-INCH THICK CADMIUM SHEET AND REFLECTED WITH WATER.

361 ID-NUMBER ID-NUMBER 361

AUTHOR LLOYD, R. C./ CLAYTON, E. D.
 TITLE CRITICAL MASS EXPERIMENTS WITH PLUTONIUM NITRATE SOLUTIONS
 REPORT NUMBER..... HW-74190
 DATE PUBLISHED ... 62-07-16
 NSA-NUMBER 16:33580
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

A SERIES OF CRITICALITY EXPERIMENTS WAS BEGUN WITH PLUTONIUM-NITRATE SOLUTIONS IN A 14-INCH DIAMETER STAINLESS STEEL SPHERE, FULLY REFLECTED WITH WATER. PLUTONIUM CONCENTRATIONS WERE IN THE RANGE OF ABOUT 38 TO 46 G PLUTONIUM PER LITER WITH AN ACID MOLARITY OF ABOUT 4.

THE DATA OBTAINED FROM THE WATER REFLECTED EXPERIMENTS AT LOW PLUTONIUM CONCENTRATIONS WILL PROVIDE A NEEDED TIE POINT FOR COMPARING THE CURRENT EXPERIMENTAL RESULTS WITH THE EARLY HANFORD P- 11 EXPERIMENTS WHICH WERE CONDUCTED WITH DILUTE PLUTONIUM SOLUTIONS. (AUTH).

362 ID-NUMBER ID-NUMBER 362

AUTHOR LLOYD, R. C. / CLAYTON, E. D. / REARDON, W. A.
 TITLE CRITICAL MASS EXPERIMENTS WITH PLUTONIUM NITRATE SOLUTIONS
 REPORT NUMBER..... HW-73116
 DATE PUBLISHED ... 62-04-16
 NSA-NUMBER 16:27726
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

FURTHER CRITICAL MASS STUDIES WERE MADE OF PLUTONIUM NITRATE SOLUTIONS IN A 14-INCH DIAMETER STAINLESS STEEL SPHERE. THE PLUTONIUM CONCENTRATIONS RANGED FROM 30 TO 231 GRAM/LITER WITH ACID MOLARITIES VARYING FROM 1.1 TO 5.6 MOLAR. THE WALL THICKNESS OF THE SPHERICAL VESSEL IS 0.044 INCH. MEASUREMENTS WERE MADE WITH THE VESSEL BARE AND REFLECTED WITH 0.5 INCH OF PARAFFIN, 1 INCH OF PARAFFIN, 4 INCHES OF CONCRETE, AND 10 INCHES OF CONCRETE. FOUR MEASUREMENTS WERE MADE WITH THE SPHERE COVERED WITH 0.030-INCH CADMIUM SHEET BACKED WITH REFLECTOR. EVALUATIONS WERE MADE OF CONTROL ROD WORTH AT VARIOUS CONCENTRATIONS.

363 ID-NUMBER ID-NUMBER 363

AUTHOR THOMAS, J. T./ FOX, J. K./ CALLIHAN, A. D.
 TITLE A DIRECT COMPARISON OF SOME NUCLEAR PROPERTIES OF URANIUM-233 AND URANIUM-235
 REPORT NUMBER.... ORNL-1992
 DATE PUBLISHED ... 55-00-00
 NSA-NUMBER 10:1642
 SITE/PROGRAM OAK RIDGE - URANIUM-233 SYSTEMS ; OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

A COMPARISON HAS BEEN MADE OF SOME NUCLEAR PROPERTIES OF URANIUM-233 AND URANIUM-235 BASED ON DATA OBTAINED IN A SERIES OF CRITICAL EXPERIMENTS. AQUEOUS SOLUTIONS OF URANYL OXYFLUORIDE CONTAINING URANIUM ENRICHED TO ABOUT 90% IN EACH OF THE TWO ISOTOPES HAVE BEEN MADE CRITICAL IN WATER REFLECTED SPHERICAL REACTORS HAVING DIAMETERS OF 26.4 AND 32.0 CM.

364 ID-NUMBER ID-NUMBER 364

AUTHOR HORTON, C. C./ MC CULLEN, J. D.
 TITLE PLUTONIUM - WATER CRITICAL ASSEMBLIES
 REPORT NUMBER.... GENEVA-1, 05, 156-161
 CONFERENCE FIRST UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 8-20 AUGUST 1955
 DATE PUBLISHED ... 55-08-00
 SITE/PROGRAM UNITED KINGDOM, HARWELL - PLUTONIUM IN WATER

ABSTRACT

THE EXPERIMENTS DESCRIBED IN THIS PAPER WERE CARRIED OUT TO PROVIDE DATA ON WHICH THE DESIGN OF STORAGE VESSELS FOR PLUTONIUM SOLUTION COULD BE BASED, AND TO CHECK THE VALIDITY OF THEORETICAL METHODS OF CRITICAL SIZE CALCULATIONS ON AQUEOUS SOLUTIONS OF FISSILE MATERIAL. PRELIMINARY CALCULATIONS SHOWED THAT THE VARIATION OF CRITICAL MASS IN AQUEOUS SOLUTION SHOULD EXHIBIT A MINIMUM AT A HYDROGEN TO PLUTONIUM ATOMIC RATIO OF ABOUT 600; EXPERIMENTS WERE THEREFORE PLANNED TO MEASURE THE CRITICAL MASS AS A FUNCTION OF CONCENTRATION IN THIS REGION. THREE CONCENTRATIONS WERE CHOSEN, ONE AT THE EXPECTED MINIMUM, AND TWO AT CONCENTRATIONS BRACKETING THIS VALUE; THE HYDROGEN TO PLUTONIUM-239 RATIOS FINALLY ACHIEVED WERE 397, 655 AND 892.

IN ORDER THAT THE EXPERIMENT SHOULD USE A SMALL AMOUNT OF FISSILE MATERIAL, IT WAS DECIDED TO USE A WATER-REFLECTED SYSTEM, AND THE GEOMETRY OF A CYLINDER REFLECTED AT THE SIDES ONLY WAS CHOSEN AS THE MOST CONVENIENT SHAPE. THE SOLUTION WAS OBTAINED IN THE FORM OF PLUTONIUM NITRATE DISSOLVED IN NITRIC ACID, THE FREE ACIDITY OF THE SOLUTION WAS KEPT AS LOW AS POSSIBLE IN ORDER TO MAKE THE HYDROGEN CONCENTRATION IN THE SOLUTION AS NEAR AS POSSIBLE TO THAT IN THE REFLECTOR. THE ACIDITY USED IN THE EXPERIMENTS WAS IN FACT 1.7N, A VALUE CONSIDERED NECESSARY TO AVOID HYDROLYSIS.

366 ID-NUMBER ID-NUMBER 366

AUTHOR RICHEY, C. R./ WHITE, J. D./ CLAYTON, E. D.
 TITLE SUBCRITICAL EXPERIMENTS WITH PLUTONIUM DIOXIDE-POLYSTYRENE COMPACTS
 REPORT NUMBER.... HW-77871
 DATE PUBLISHED ... 63-00-00
 NSA-NUMBER 17:41725
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

THE PAUCITY OF EXISTING DATA ON THE CRITICALITY OF PLUTONIUM SOLUTIONS FOR HIGHER CONCENTRATION THAT MAY BE ENCOUNTERED IN CALCINING OPERATIONS AND IN PRECIPITATES OF PLUTONIUM REQUIRES AN EXPERIMENTAL PROGRAM OF CRITICAL MASS MEASUREMENTS. SUCH A PROGRAM HAS BEEN INITIATED AT THE HANFORD CRITICAL MASS LABORATORY. PLUTONIUM MIXTURES WHICH SIMULATE A PRECIPITATE IN THE EXPERIMENTS ARE NOT IN LIQUID FORM, BUT ARE IN THE FORM OF PLUTONIUM DIOXIDE-POLYSTYRENE COMPACTS; THE REMOTE SPLIT-TABLE MACHINE (RSTM) THUS BEING UTILIZED FOR THE CONDUCT OF THESE EXPERIMENTS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SUBCRITICAL EXPERIMENTS, LIMITED TO 85 PERCENT OF THE ESTIMATED CRITICAL MASS, WERE STARTED ON MAY 28, 1963 WITH PLUTONIUM DIOXIDE-POLYSTYRENE CUBES HAVING A HYDROGEN-TO-PLUTONIUM RATIO OF 15. THE PURPOSE OF THESE MEASUREMENTS ARE:

1. OBTAIN PRELIMINARY CRITICAL MASS DATA AT A HYDROGEN-TO-PLUTONIUM RATIO OF 15.
2. OBTAIN A PRELIMINARY EVALUATION OF THE SAFETY AND CONTROL ROD WORTHS.

THE SUBCRITICAL MEASUREMENTS TO DATE HAVE GIVEN PRELIMINARY VALUES FOR THE CRITICAL MASS OF THE NON-REFLECTED NEAR CUBIC ASSEMBLY AND FOR VARIOUS LUCITE REFLECTED ASSEMBLIES. ALSO, PRELIMINARY EVALUATIONS HAVE BEEN OBTAINED FOR THE SAFETY AND CONTROL RODS. THE REFLECTOR WORTH OF THE BASE ON WHICH THE ASSEMBLIES REST, AND REACTIVITY AS A FUNCTION OF TABLE SEPARATION. (AUTH.).

367 ID-NUMBER ID-NUMBER 367

AUTHOR RICHEY, C. R./ WHITE, J. D./ CLAYTON, E. D./ BIERMAN, S. R./ GARLID, K. L.
/ SKEEN, D. R.

TITLE CRITICAL EXPERIMENTS WITH PLUTONIUM DIOXIDE-POLYSTYRENE COMPACTS

REPORT NUMBER.... HW-79054

DATE PUBLISHED .. 63-10-15

NSA-NUMBER 18:10624

SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

INTRODUCTION: CRITICAL MASS EXPERIMENTS ARE CURRENTLY BEING PERFORMED WITH PLUTONIUM DIOXIDE- POLYSTYRENE COMPACTS AT THE HANFORD CRITICAL MASS LABORATORY. THE DATA FROM THESE EXPERIMENTS WILL BE USED TO PROVIDE AN IMPROVED BASIS FOR ESTABLISHING NUCLEAR SAFETY IN HANDLING AND PROCESSING PLUTONIUM. PLUTONIUM DIOXIDE-PLASTIC MIXTURES ARE BEING USED IN THE EXPERIMENTS TO COVER THE RANGE OF DENSITIES OF PLUTONIUM PRECIPITATES AND POLYMERS WHICH CAN FORM IN SEPARATIONS PLANTS. THESE DATA ARE APPLICABLE TO THE INTERVENING SYSTEMS OF WET POWDERS, PRECIPITATES, SLURRIES, POLYMERS, ETC. IN THE EXPERIMENTS TO DATE, THE PLUTONIUM DIOXIDE-POLYSTYRENE COMPACTS HAD A HYDROGEN/PLUTONIUM ATOMIC RATIO OF 15 WITH A PLUTONIUM CONTENT OF 1.14 G/CM³ (PLUTONIUM-240 CONTENT 2.2 PERCENT).

RESULTS OF SEVERAL SUBCRITICAL NEUTRON MULTIPLICATION MEASUREMENTS WERE REPORTED IN THE PREVIOUS QUARTER. CRITICAL EXPERIMENTS PERFORMED WITH THE PLUTONIUM DIOXIDE-PLASTIC MIXTURES ARE REPORTED HEREIN. HOWEVER, IT SHOULD BE RECOGNIZED THAT THE EXPERIMENTS WITH THESE PARTICULAR COMPACTS HAVE NOT BEEN COMPLETED AND ALSO THAT THE ANALYSES OF THE DATA ARE INCOMPLETE, AND IN THIS SENSE THE DATA ARE PRELIMINARY.

A NUMBER OF RECTANGULAR PRISMS MAKE UP THE CRITICAL ARRAYS THUS FAR STUDIED; THE ARRAYS WERE BOTH BARE AND REFLECTED WITH LUCITE. IN ADDITION TO THE DETERMINATION OF THE CRITICAL DIMENSIONS OF THE VARIOUS GEOMETRIES, CONTROL AND SAFETY RODS WERE EVALUATED, TEMPERATURE COEFFICIENTS WERE MEASURED, AND FLUX TRAVERSES HAVE BEEN CARRIED OUT ON TWO OF THE CRITICAL ARRAYS. PULSED NEUTRON SOURCE EXPERIMENTS WERE CONDUCTED CONCURRENTLY WITH THE CRITICAL EXPERIMENTS AND SEVERAL MEASUREMENTS WERE MADE OF THE "PILE NOISE" BY DR. R. W. ALBRECHT OF THE UNIVERSITY OF WASHINGTON. THE MEAN GENERATION TIMES OF THE NEUTRONS WERE DETERMINED FOR SEVERAL ARRAYS FROM THESE LATTER MEASUREMENTS. ALSO FROM THE PULSED NEUTRON SOURCE EXPERIMENTS, THE PROMPT CRITICAL DIMENSIONS WERE DETERMINED.

A PREVIOUS DESCRIPTION WAS GIVEN OF THE REMOTE SPLIT-TABLE MACHINE (RSTM) AND OF THE POLYSTYRENE CUBES USED IN THESE EXPERIMENTS, BUT A BRIEF REITERATION WILL BE MADE HERE FOR THE READER'S CONVENIENCE. (AUTH.).

368 ID-NUMBER ID-NUMBER 368

AUTHOR FOX, J. K./ GILLEY, L. W.

TITLE CRITICAL PARAMETERS OF AQUEOUS SOLUTIONS OF URANIUM-235

REPORT NUMBER.... ORNL-2389

DATE PUBLISHED .. 58-00-00

NSA-NUMBER 12:3138

SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

THE SERIES OF EXPERIMENTS TO DETERMINE THE CRITICAL PARAMETERS OF AQUEOUS SOLUTIONS OF URANYL- FLUORIDE HIGHLY ENRICHED IN URANIUM-235 HAS CONTINUED. IN ONE SET OF THE EXPERIMENTS REPORTED BELOW, THE CRITICAL PARAMETERS OF UNREFLECTED AND WATER-REFLECTED SOLUTIONS IN SINGLE VESSELS OF VARYING SIZE WERE DETERMINED. BOTH CYLINDRICAL AND SLAB-TYPE VESSELS WERE USED. IN ANOTHER GROUP OF EXPERIMENTS, SIMILAR VESSELS WERE USED UNDER SPECIAL REFLECTOR CONDITIONS. IN A THIRD SET THE CRITICAL PARAMETERS OF ARRAYS OF INTERACTING VESSELS WERE DETERMINED. FOR ALL THE EXPERIMENTS THE URANIUM-235 ENRICHMENT OF THE SOLUTIONS WAS 93.2%(AUTH.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

369 ID-NUMBER ID-NUMBER 369

AUTHOR FOX, J. K./ GILLEY, L. W.
 TITLE CRITICAL PARAMETERS OF A PROTON MODERATED AND PROTON REFLECTED SLAB OF URANIUM-235
 REPORT NUMBER..... ORNL-CF-58-2-63
 DATE PUBLISHED ... 56-02-07
 NSA-NUMBER 11:7810
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL SLABS

ABSTRACT

THE THICKNESS OF A CRITICAL SLAB-SHAPED VOLUME OF FISSIONABLE MATERIAL IS OF PRACTICAL INTEREST IN SETTING LIMITING VESSEL DIMENSIONS AND IS OF IMPORTANCE IN ELEMENTARY REACTOR ANALYSES IF THE AREA-TO-THICKNESS RATIO IS SUFFICIENTLY LARGE TO MAKE THE SYSTEM ESSENTIALLY UNIDIMENSIONAL. TO MEASURE THE THICKNESS OF A CRITICAL SLAB OF A SOLUTION WHEN ALL THE OTHER PARAMETERS ARE OPTIMIZED IS OF EVEN MORE PRACTICAL INTEREST. EVALUATIONS OF THIS SO-CALLED "MINIMUM THICKNESS OF AN INFINITE SLAB" HAVE BEEN MADE PREVIOUSLY BY EXTRAPOLATION OF THE CRITICAL DIMENSIONS OF WATER- REFLECTED CYLINDERS OF FINITE AREA. OTHER ESTIMATES OF THE THICKNESS OF WATER-REFLECTED SLABS HAVE BEEN OBTAINED FROM THE EXTRAPOLATION OF MEASUREMENTS ON PARTLY REFLECTED VESSELS.

AN ATTEMPT HAS NOW BEEN MADE TO MEASURE DIRECTLY THE CRITICAL THICKNESS OF A HYDROGEN- REFLECTED SLAB OF AQUEOUS SOLUTION OF URANYL-FLUORIDE (ENRICHED TO 93:2% IN URANIUM-235) AT CHEMICAL CONCENTRATIONS SELECTED TO GIVE THE MINIMUM CRITICAL VOLUME. FOR THIS PURPOSE A REACTOR VESSEL WAS CONSTRUCTED FROM .75 INCH THICK LUCITE SHEET REINFORCED BY STIFFENING MEMBERS, ALSO OF LUCITE, ATTACHED TO THE OUTSIDE. THE NOMINAL INSIDE DIMENSIONS WERE 58 X 71 X 2.25 INCH. THE SLAB WAS MOUNTED WITH THE 71-INCH DIMENSION VERTICAL IN SUCH A MANNER THAT IT COULD BE FILLED WITH URANYL-FLUORIDE SOLUTION AND SURROUNDED, EXCEPT FOR THE TOP SURFACE, BY AN EFFECTIVELY INFINITE WATER REFLECTOR. THE SIZE OF THE SLAB WAS ALTERED BY INSERTING PLASTIC SHEETS OF VARIOUS THICKNESSES ADJACENT TO ONE INSIDE SURFACE. BLOCKS OF PLASTIC ABOUT 1 INCH SQUARE AND OF APPROPRIATE LENGTH WERE PLACED WITHIN THE SLAB ON 12-INCH CENTERS IN TWO DIRECTIONS IN AN ATTEMPT TO MAINTAIN CONSTANT THICKNESS AS THE HYDROSTATIC PRESSURES VARIED WITH THE INNER AND OUTER LIQUID HEIGHTS.

370 ID-NUMBER ID-NUMBER 370

AUTHOR PAXTON, H. C./ ORNDOFF, J. D./ LINENBERGER, G. A.
 TITLE ORALLOY (ENRICHED URANIUM) HYDRIDE CRITICAL ASSEMBLIES
 REPORT NUMBER..... LA-1159 (DEL)
 DATE PUBLISHED ... 50-00-00
 NSA-NUMBER 11:4093
 SITE/PROGRAM LOS ALAMOS - ENRICHED URANIUM HYDRIDE

ABSTRACT

PART I OF THIS REPORT COVERS CRITICAL-MASS DETERMINATIONS FOR PSEUDOSPHERES OF ORALLOY HYDRIDE COMPOSITION (APPROXIMATING URANIUM HYDRIDE) IN 8 INCH-THICK TUBALLOY AND NICKEL TAMPERS AND IN THE TUBALLOY TAMPER WITH NICKEL LINER. THE CRITICAL MASS OF A HYDRIDE CUBE IN THE THICK TUBALLOY ALSO IS GIVEN. DATA ON WEIGHT AND DIMENSIONAL CHANGES OF HYDRIDE PIECES DURING THE PERIOD OF USE ARE INCLUDED. IN PART II ARE PRESENTED THE RESULTS OF ROSSI TIME-SCALE MEASUREMENTS ON THE HYDRIDE ASSEMBLIES. VALUES OF ALPHA AT DELAYED CRITICAL AND ITS VARIATION WITH MASS IN THE NEIGHBORHOOD OF DELAYED CRITICAL ARE GIVEN. MEASUREMENTS ON THE ACTIVATION OF VARIOUS DETECTORS WITHIN THE HYDRIDE ASSEMBLIES ARE DESCRIBED IN PART III. RESULTS AS A FUNCTION OF RADIAL POSITION ARE GIVEN FOR GOLD, FOR GOLD SHIELDED BY GOLD AND BY CADMIUM FOR SULFUR AND FOR FISSION CATCHERS WITH URANIUM-235 AND URANIUM-238. REACTIVITY CHANGES RESULTING FROM THE INTRODUCTION OF FOREIGN MATERIALS INTO THE HYDRIDE ASSEMBLIES ARE DISCUSSED IN PART IV. APPARENT REGULARITIES WITH RESPECT TO ATOMIC NUMBER AND QUALITATIVE INTERPRETATIONS OF VARIATIONS WITH RADIUS ARE POINTED OUT. FROM DATA FOR VARIOUS RADIAL POSITIONS, CHANGES IN CRITICAL MASS CORRESPONDING TO SMALL CHANGES IN COMPOSITION AND DENSITY ARE COMPUTED. (AUTH).

371 ID-NUMBER ID-NUMBER 371

AUTHOR FOX, J. K./ GILLEY, L. W.
 TITLE SOME STUDIES OF WATER, STYROFOAM AND PLEXIGLAS REFLECTORS
 REPORT NUMBER..... ORNL-CF-58-9-39
 DATE PUBLISHED ... 58-00-00
 NSA-NUMBER 13:3095
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

THE REFLECTING PROPERTIES OF WATER, STYROFOAM, AND PLEXIGLAS WERE STUDIED IN CRITICAL EXPERIMENTS WITH 6-INCH-THICK SLABS OF AQUEOUS SOLUTIONS OF URANYL-FLUORIDE ENRICHED TO 93% IN URANIUM-235. IT WAS FOUND THAT STYROFOAM IS SIGNIFICANTLY LESS EFFECTIVE THAN WATER AS A NEUTRON REFLECTOR, SINCE THE HEIGHT OF A SLAB WITH AN EFFECTIVELY INFINITE STYROFOAM REFLECTOR (EXCEPT ON TOP) WAS REDUCED BY ONLY ABOUT 20% FROM THAT OF THE UNREFLECTED SLAB, WHILE THE HEIGHT OF

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

A SLAB WITH AN EFFECTIVELY INFINITE WATER REFLECTOR WAS REDUCED BY MORE THAN A FACTOR OF 3. THE EFFECTS OF PLACING WATER, STYROFOAM, AND PLEXIGLAS BETWEEN TWO-SLAB ASSEMBLIES, BOTH UNREFLECTED AND WATER- REFLECTED, WERE ALSO INVESTIGATED.(AUTH).

372 ID-NUMBER ID-NUMBER 372

AUTHOR FOX, J. K./ GILLEY, L. W.
 TITLE CRITICAL PARAMETERS FOR POISONED ANNULAR CYLINDERS CONTAINING AQUEOUS SOLUTIONS OF URANIUM-235
 REPORT NUMBER..... ORNL-CF-58-8-5
 DATE PUBLISHED ... 58-08-01
 NSA-NUMBER 13:2858
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

EXPERIMENTS WERE PERFORMED TO DETERMINE THE CRITICAL PARAMETERS OF AQUEOUS SOLUTIONS OF 93.2% URANIUM-235 ENRICHED URANYL FLUORIDE CONTAINED IN CYLINDRICAL ANNULI FORMED BY VARIOUS COMBINATIONS OF ALUMINUM CYLINDERS VARYING IN DIAMETER FROM 2 TO 30 INCH IN ALL OF THE EXPERIMENTS THE INSIDE CYLINDER WAS LINED WITH A 20-MIL-THICK CADMIUM SHEET AND FILLED WITH WATER TO A HEIGHT OF 18 INCH, AND IN SOME EXPERIMENTS A WATER REFLECTOR WAS USED ON THE SIDES AND BOTTOM OF THE OUTSIDE CYLINDER. THE DATA INDICATE THAT FOR THE SOLUTION HAVING AN HYDROGEN TO URANIUM-235 ATOMIC RATIO OF 50.4 THE CRITICAL INFINITELY HIGH, REFLECTED ANNULUS WOULD HAVE A MINIMUM THICKNESS BETWEEN 2.5 AND 3 INCH, WHILE THE UNREFLECTED ANNULUS WOULD HAVE A THICKNESS BETWEEN 3.75 AND 4.5 INCH THE CORRESPONDING THICKNESSES FOR THE SOLUTION HAVING AN HYDROGEN TO URANIUM-235 ATOMIC RATIO OF 509 WOULD BE BETWEEN 5.5 AND 4 INCH FOR THE REFLECTED ANNULUS AND BETWEEN 4.5 AND 5.5 INCH FOR THE UNREFLECTED ANNULUS. (AUTH).

373 ID-NUMBER ID-NUMBER 373

AUTHOR MIHALCZO, J. T.
 TITLE COMPARISON OF K(INF) MEASUREMENTS IN A CRITICAL ASSEMBLY WITH K(INF) MEASUREMENTS IN THE PHYSICAL CONSTANTS TESTING REACTOR
 REPORT NUMBER..... ORNL-CF-60-04-24
 DATE PUBLISHED ... 60-05-03
 NSA-NUMBER 14:14249
 SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN ; HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

THE INFINITE MEDIUM MULTIPLICATION FACTOR, K(INF), FOR A HOMOGENEOUS MIXTURE OF 2 PERCENT URANIUM-235-ENRICHED URANIUM TETRA-FLUORIDE IN PARAFFIN, WAS DETERMINED FROM A SERIES OF CRITICAL EXPERIMENTS IN WHICH KNOWN CHANGES IN THE BUCKLING WERE MADE AND THE RESULTING STABLE PERIODS MEASURED. THE VALUE DETERMINED, USING A TWO-GROUP MODEL FOR THE NONLEAKAGE PROBABILITY, IS 1.197 +/- 0.09. WITHIN THE QUOTED ERRORS THIS VALUE IS IN AGREEMENT WITH AN EARLIER VALUE OF K(INF) = 1.216 +/- 0.013 FOR THE SAME MATERIAL EXPERIMENTALLY DETERMINED IN THE PHYSICAL CONSTANTS TESTING REACTOR AT THE HANFORD LABORATORIES OPERATION OF THE GENERAL ELECTRIC COMPANY. (AUTH).

375 ID-NUMBER ID-NUMBER 375

AUTHOR THOMAS, J. T./ FOX, J. K./ JOHNSON, E. B.
 TITLE CRITICAL MASS STUDIES - PART 13, BOROSILICATE GLASS RASCHIG RINGS IN AQUEOUS URANYL NITRATE SOLUTIONS
 REPORT NUMBER..... ORNL-TM-0499
 DATE PUBLISHED ... 63-02-06
 NSA-NUMBER 17:19034
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER ; OAK RIDGE - URANYL(93%)NITRATE - WATER - BOROSILICATE GLASS

ABSTRACT

THE EFFECT OF COMMERCIALY AVAILABLE BOROSILICATE GLASS RASCHIG RINGS ON THE CRITICALITY OF AQUEOUS URANYL NITRATE SOLUTIONS ENRICHED IN URANIUM-235 HAS BEEN EXPERIMENTALLY INVESTIGATED. THE NATURAL-BORON CONTENT OF THE GLASS VARIED FROM 0.5 TO 5.7 WEIGHT PER CENT, AND THE VOLUME OF THE VESSEL OCCUPIED BY THE GLASS RANGED FROM 20.9 TO 30 PER CENT. RESULTS FROM EXPONENTIAL EXPERIMENTS, USING A CRITICAL LAYER OF SOLUTION ABOVE THE COLUMN OF SOLUTION-RING MIXTURE AS A NEUTRON SOURCE, HAVE PROVIDED ESTIMATES OF THE MATERIAL BUCKLING OF THE MIXTURE AS A FUNCTION OF SOLUTION CONCENTRATION, BORON CONTENT OF THE GLASS, AND THE GLASS VOLUME PRESENT. IT HAS BEEN SHOWN, FOR EXAMPLE, THAT THE BUCKLING IS NEGATIVE (I.E., K-INFINITY .LT. 1) IF GLASS CONTAINING 4 WT% BORON OCCUPIES MORE THAN 22% OF THE MIXTURE VOLUME, WHEREAS THE SAME CONCENTRATION OF GLASS CONTAINING ONLY 0.5 WT% OF BORON RESULTS IN POSITIVE VALUES OF THE BUCKLING EXCEPT FOR SOLUTIONS MORE DILUTE THAN ABOUT 72 G OF U PER LITER (H TO URANIUM-235 RATIO EQUALS 380).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

376 ID-NUMBER ID-NUMBER 376

AUTHOR BERTRAND, J./ BRUNET, J. P./ CAIZERGUES, R./ CLOUET D'ORVAL, C./ KREMSER, J./ VERRIERE, P.
 TITLE PROSERPINE - CRITICAL MASSSES AND STANDARDS
 REPORT NUMBER....: CEA-2309
 DATE PUBLISHED ...: 63-00-00
 NSA-NUMBER: 18:1229
 SITE/PROGRAM: FRANCE - PROSERPINE

ABSTRACT

THE CRITICAL MASS FOR THE PROSERPINE REACTOR WAS MEASURED AS A FUNCTION OF THE SOLUTION HEIGHT IN THE TANK, WITH VARIOUS SOLUTION CONCENTRATIONS. A REACTIVITY STANDARD WAS THEN OBTAINED BY A BORON POISONING TECHNIQUE. THE RELATION TO THE REACTIVITY OF CONTROL ROD DISPLACEMENT, SELF- SHIELDING OF TWO CONTROL RODS, AND RISE OF THE SOLUTION LEVEL OVER THE VERTICAL LEVEL WAS DETERMINED. (AUTH).

377 ID-NUMBER ID-NUMBER 377

AUTHOR GWIN, R./ TRUMBEEY, D. K./ WEINBERG, A. M.
 TITLE: EXPERIMENTAL AND THEORETICAL STUDIES OF UNREFLECTED AQUEOUS URANIUM-235 CRITICAL ASSEMBLIES
 REPORT NUMBER....: GENEVA-2, 12, 529-538
 CONFERENCE: SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958
 DATE PUBLISHED ...: 58-09-00
 NSA-NUMBER: 12:15018
 SITE/PROGRAM: OAK RIDGE - URANYL(92%)SALTS - WATER - CALCULATIONS

ABSTRACT

AN EXTENSIVE PROGRAM INVESTIGATING NEUTRON CHAIN-REACTING ASSEMBLIES OF AQUEOUS SOLUTIONS OF FISSIONABLE URANIUM ISOTOPES HAS BEEN IN PROGRESS AT THE OAK RIDGE NATIONAL LABORATORY FOR A NUMBER OF YEARS. THE RESULTS OF MANY OF THE EXPERIMENTS ESTABLISHED THE CRITICAL DIMENSIONS OF THE SOLUTIONS; THESE EXPERIMENTS HAVE BEEN ANALYZED BY SEVERAL WELL-KNOWN METHODS WHICH DIFFER ACCORDING TO THE METHOD OF TREATING ENERGY DEGRADATION OF NEUTRONS BY WATER. MOST OF THE PREVIOUSLY PUBLISHED WORK HAS BEEN CONCERNED WITH REFLECTED SYSTEMS. THE PRESENT PAPER DEALS EXCLUSIVELY WITH BARE FULLY ENRICHED URANYL-FLUORIDE-WATER SYSTEMS. THE EXPERIMENTAL DATA ARE BETTER THAN MOST PREVIOUSLY PUBLISHED RESULTS IN THAT THE EFFECT OF NEUTRON REFLECTION BACK INTO THE SYSTEM HAS BEEN LARGELY ELIMINATED. IN THE THEORETICAL ANALYSIS, THE EMPIRICAL KERNEL METHOD, RATHER THAN THE MORE CUSTOMARY GOERTZEL-SELENGUT METHOD, IS EMPLOYED.(AUTH).

378 ID-NUMBER ID-NUMBER 378

AUTHOR STEINKE, R. G.
 TITLE: NEUTRON FLUX MEASUREMENTS IN URANIUM METAL EXPONENTIAL COLUMNS OF 6.53 PERCENT AND 9.12 PERCENT URANIUM-235
 REPORT NUMBER....: LA-3934
 DATE PUBLISHED ...: 68-10-24
 NSA-NUMBER: 23:4314
 SITE/PROGRAM: LOS ALAMOS - CYLINDERS OF MIXED DISKS OF URANIUM(93%) AND URANIUM(.75%)

ABSTRACT

MATERIAL BUCKLINGS MEASURED IN THE EQUILIBRIUM NEUTRON SPECTRA OF HETEROGENEOUS URANIUM METAL EXPONENTIAL COLUMNS CONTAINING 9.12 PERCENT AND 6.53 PERCENT URANIUM-235 ARE REPORTED. THESE RESULTS OF EXPONENTIAL-COLUMN MEASUREMENTS ARE COMPARED WITH VALUE COMPUTED BY MEANS OF HANSEN- ROACH CROSS SECTIONS. THROUGH APPLICATION OF A FINE-STRUCTURE INSERT IN THE EQUILIBRIUM SPECTRAL REGION OF EACH COLUMN, FISSION CROSS-SECTION RATIOS ARE STRUCTURE-AVERAGED. THE MEASURED SPECTRAL INDICES ARE GIVEN. (AUTH).

379 ID-NUMBER ID-NUMBER 379

AUTHOR HELLSTRAND, E./ ANDERSSON, T. L./ BRUNFELTER, B./ KOCKUM, J./ LONDEN, S. O. / TIREN, L. I.
 TITLE: EXPERIMENTAL STUDIES ON ASSEMBLIES 1 AND 2 OF THE FAST REACTOR FRO
 REPORT NUMBER....: AE-207
 DATE PUBLISHED ...: 65-12-00

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

NSA-NUMBER 20:14178
 SITE/PROGRAM SWEDEN - FRO ZERO ENERGY FAST REACTOR (URANIUM(20%) - GRAPHITE)

ABSTRACT

IN A FIRST PART OF THIS REPORT, PUBLISHED AS AE-195, AN ACCOUNT WAS GIVEN OF CRITICAL MASS DETERMINATIONS AND MEASUREMENTS OF FLUX DISTRIBUTION AND REACTION RATIOS IN THE FIRST ASSEMBLIES OF THE FAST ZERO POWER REACTOR FRO. THIS SECOND PART OF THE REPORT DEALS WITH VARIOUS INVESTIGATIONS INVOLVING THE MEASUREMENT OF REACTIVITY.

CONTROL ROD CALIBRATIONS HAVE BEEN MADE USING THE POSITIVE PERIOD, THE INVERSE MULTIPLICATION, THE ROD DROP AND THE PULSED SOURCE TECHNIQUES, AND SHOW SATISFACTORY AGREEMENT BETWEEN THE VARIOUS METHODS.

THE REACTIVITY WORTHS OF SAMPLES OF DIFFERENT MATERIALS AND DIFFERENT SIZES HAVE BEEN MEASURED AT THE CORE CENTRE. COMPARISONS WITH PERTURBATION CALCULATIONS SHOW THAT THE REGULAR AND ADJOINT FLUXES ARE WELL PREDICTED IN THE CENTRAL REGION OF THE CORE.

THE VARIATION IN THE PROMPT NEUTRON LIFE-TIME WITH REACTIVITY HAS BEEN STUDIED BY MEANS OF THE PULSED SOURCE AND THE ROSSI-ALPHA TECHNIQUES. COMPARISON WITH ONE REGION CALCULATIONS REVEALS LARGE DISCREPANCIES, INDICATING THAT THIS SIMPLE MODEL IS INADEQUATE.

SOME INVESTIGATIONS OF STREAMING EFFECTS IN AN EMPTY CHANNEL IN THE REACTOR AND OF INTERACTION EFFECTS BETWEEN CHANNELS HAVE BEEN MADE AND ARE COMPARED WITH THEORETICAL ESTIMATES.

MEASUREMENTS OF THE REACTIVITY WORTH OF AN AIR GAP BETWEEN THE REACTOR HALVES AND OF THE TEMPERATURE COEFFICIENT ARE ALSO DESCRIBED IN THE REPORT.

THE WORK HAS BEEN PERFORMED AS A JOINT EFFORT BY AB ATOMENERGI AND THE RESEARCH INSTITUTE OF NATIONAL DEFENCE. (AUTH).

382 ID-NUMBER ID-NUMBER 382

AUTHOR CHEZEM, C. G.
 TITLE A URANIUM-METAL EXPONENTIAL EXPERIMENT
 REPORT NUMBER..... NSENAO, 08, 652-669
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 60-12-00
 SITE/PROGRAM LOS ALAMOS - LOW ENRICHED URANIUM METAL EXPONENTIAL EXPERIMENTS

ABSTRACT

CERTAIN CONFLICTS ARISING FROM PREVIOUS MEASUREMENTS OF NEUTRON FLUX PARAMETERS IN THE EQUILIBRIUM SPECTRUM OF NATURAL URANIUM HAVE BEEN RESOLVED. THE PARAMETERS WHICH WERE INVESTIGATED ARE LISTED BELOW ALONG WITH "BEST" VALUES AS MEASURED IN THIS WORK.

MATERIAL BUCKLING ----- : -00.0119 +/- 00.0005 CM⁻² .
 DIFFUSION LENGTH ----- : 009.1700 +/- 00.1800 CM .
 URANIUM-235 / URANIUM-238 FISSION CROSS SECTION RATIO--: 239.0000 +/- 07.0000 .
 PLUTONIUM-239 / URANIUM-238 FISSION CROSS SECTION RATIO: 250.0000 +/- 16.0000 .
 NEPTUNIUM-237 / URANIUM-238 FISSION CROSS SECTION RATIO: 014.50000 +/- 00.5000 .
 URANIUM-238 INELASTIC SCATTERING CROSS SECTION -----: 002.00000 +/- 00.04 BARNS .

THE EXPERIMENT WAS PERFORMED AT THE PAJARITO CRITICAL ASSEMBLIES FACILITY UTILIZING TWO EXPONENTIAL COLUMNS OF NATURAL URANIUM, EACH 30.7 INCHES HIGH, HAVING DIAMETERS OF 15 AND 21 INCHES AND EXCITED BY A SMALL FAST REACTOR. THE SYSTEM WAS OUTDOORS, ELEVATED SOME 11 FEET ABOVE THE GROUND LEVEL TO REDUCE FLUX PERTURBATIONS DUE TO BACKSCATTERING OF NEUTRONS. PERTURBATION CORRECTED MEASUREMENTS IN BOTH COLUMNS MADE BY SEVERAL DETECTION METHODS AND WITH VARIOUS SOURCE SPECTRA AGREE TO WITHIN EXPERIMENTAL ERROR AND ARE CONSISTENT WITH CALCULATED VALUES. (AUTH).

390 ID-NUMBER ID-NUMBER 390

AUTHOR RICHEY, C. R./ LLOYD, R. C./ CLAYTON, E. D.
 TITLE CRITICALITY OF SLIGHTLY ENRICHED URANIUM IN WATER-MODERATED LATTICES
 REPORT NUMBER..... NSENAO, 21, 217-226
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 65-02-00
 NSA-NUMBER 19:10496
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

WITH THE DEVELOPMENT OF COMMERCIAL ELECTRICAL-POWER PRODUCING REACTORS, INCREASED QUANTITIES AND VARIETIES OF REACTOR FUEL WITH ENRICHMENTS UP TO APPROXIMATELY 5 WT% URANIUM-235 ARE BEING HANDLED THROUGHOUT THE NUCLEAR INDUSTRY. THE NEED FOR CRITICALITY DATA TO ESTABLISH PROCEDURES FOR SAFELY HANDLING THESE MATERIALS OUTSIDE OF REACTOR ENVIRONMENTS HAS, THEREFORE, STEADILY INCREASED. A LARGE NUMBER OF EXPERIMENTS HAS BEEN CONDUCTED WITH SLIGHTLY ENRICHED URANIUM IN WATER ON WHICH THE CRITERIA FOR SAFELY HANDLING LOW-ENRICHMENT REACTOR FUELS ARE BASED. MANY OF THE EARLY EXPONENTIAL EXPERIMENTS WITH SLIGHTLY ENRICHED URANIUM RODS WERE PERFORMED BY KOUTS, ET AL. KOUTS' INITIAL MEASUREMENTS WERE WITH 0.750 INCH-DIAMETER URANIUM RODS CONTAINING 1.027 WT% URANIUM-235; SUBSEQUENT EXPERIMENTS WERE CONDUCTED WITH 0.387 AND 0.600 INCH-DIAM RODS AT 1.027, 1.143, AND 1.299 WT% URANIUM-235 ENRICHMENT. CLAYTON (1955), UTILIZING RODS OF 0.925 AND 1.66-INCH DIAM, CONDUCTED A SERIES OF EXPONENTIAL EXPERIMENTS WITH 1.007 WT% URANIUM-235 ENRICHED URANIUM. THE SAFETY CRITERIA FOR HANDLING REACTOR FUEL ENRICHED TO APPROXIMATELY 1 WT% URANIUM-235 ARE BASED ON THESE TWO SETS OF DATA. ROGERS AND KINARD HAVE RECENTLY CONDUCTED EXPONENTIAL PILE MEASUREMENTS UTILIZING 3.0 WT%-ENRICHED URANIUM RODS OF 2.0- AND 3.0-INCH DIAM.

SINCE CLAYTON'S INITIAL EXPERIMENTS AT THE HANFORD LABORATORIES WITH 1.007 WT% URANIUM-235- ENRICHED RODS, EXPERIMENTS HAVE BEEN CONDUCTED WITH WATER-MODERATED ARRAYS CONSISTING OF 1) TUBULAR FUEL ELEMENTS WITH ENRICHMENTS RANGING FROM 1.0 TO 1.6 WT% URANIUM-235 (1956-58), 2) URANIUM RODS HAVING 3.063 WT% URANIUM-235 (1958-59) AND 2.0 WT% URANIUM-235 (1960), AND 3) EXPONENTIAL EXPERIMENTS WITH 0.925 INCH-DIAM RODS TO TEST THE POSSIBILITY OF ATTAINING CRITICALITY WITH NATURAL URANIUM, WATER-MODERATED LATTICES. ALTHOUGH THE RESULTS OF THESE LATTER EXPERIMENTS ARE ALREADY FAMILIAR TO MANY INVOLVED IN CRITICALITY SAFETY AND HAVE FOUND APPLICATION IN ESTABLISHING SAFETY CRITERIA OF SLIGHTLY ENRICHED URANIUM, THEY HAVE NOT PREVIOUSLY APPEARED IN THE FORMAL LITERATURE. (PREVIOUS DISSEMINATION OF THE DATA HAS BEEN LIMITED TO REGULAR HANFORD PROGRESS REPORTS AND MEMORANDA OF LIMITED DISTRIBUTION.) THIS PAPER PRESENTS A SUMMARY OF THESE EXPERIMENTS. THE RESULTS ARE COMBINED WITH THE EARLIER DATA OF KOUTS AND CLAYTON TO OBTAIN MAXIMUM BUCKLINGS AND MINIMUM CRITICAL MASSES FOR URANIUM RODS ENRICHED TO APPROXIMATELY 3 WT% URANIUM-235. ANALYTICAL METHODS USED TO CORRELATE THE EXPERIMENTAL DATA ARE APPLIED IN EXTENDING THE RESULTS TO URANIUM CONTAINING 5 WT% URANIUM-235. (AUTH).

391 ID-NUMBER ID-NUMBER 391

AUTHOR BOUREGEOIS, P./ CLAIR, C./ COMTE, C./ LONG, J. J.
 TITLE DESCRIPTION OF RACHEL CRITICAL ASSEMBLY
 REPORT NUMBER..... IAEA-VIENNA-1961, 313-319
 DATE PUBLISHED ... 61-08-00
 NSA-NUMBER 16:26527
 SITE/PROGRAM FRANCE - RACHEL (PLUTONIUM METAL)

ABSTRACT

THE RACHEL ASSEMBLY IS USED FOR CARRYING OUT CRITICAL EXPERIMENTS WITH FAST NEUTRONS. THE ASSEMBLY IS COMPOSED OF TWO HEMISPHERES OF CANNED PLUTONIUM SURROUNDED BY A NATURAL-URANIUM REFLECTOR. AFTER THE UPPER REFLECTING CAP HAS BEEN SLOWLY BROUGHT CLOSE, CRITICALITY IS ACHIEVED BY THE GRADUAL INSERTION OF FOUR URANIUM RODS WHICH FILL CYLINDRICALWAYS IN THE LOWER REFLECTOR. SAFETY IS ENSURED BY PROVISION FOR THE RAPID EJECTION DOWNWARDS OF A PART OF THE LOWER REFLECTOR. AS DISTANCE IS THE ONLY FORM OF BIOLOGICAL PROTECTION, THE HALL IS EVACUATED DURING EXPERIMENTS, THE CONTROL ROOM BEING SITUATED 120 M AWAY. (AUTH).

394 ID-NUMBER ID-NUMBER 394

AUTHOR CLAIR, C.
 TITLE NEUTRON PROPERTIES OF RACHEL CRITICAL ASSEMBLY
 REPORT NUMBER..... IAEA-VIENNA-1961, 321-325
 DATE PUBLISHED ... 61-08-00
 NSA-NUMBER 16:26528
 SITE/PROGRAM FRANCE - RACHEL (PLUTONIUM METAL)

ABSTRACT

THE CRITICAL SIZES WERE DETERMINED EXPERIMENTALLY AND COMPARED WITH THE CALCULATED RESULTS. THE EFFECT OF NON-FISSILE STRUCTURAL MATERIALS WAS STUDIED. (AUTH).

396 ID-NUMBER ID-NUMBER 396

AUTHOR MENEGHETTI, D.
 TITLE RECENT ADVANCES AND PROBLEMS IN THEORETICAL ANALYSES OF ZPR-3 FAST CRITICAL ASSEMBLIES
 REPORT NUMBER..... IAEA-VIENNA-1961, 457-487
 DATE PUBLISHED ... 61-08-00
 NSA-NUMBER 16:26534

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

THEORETICAL ANALYSES OF CRITICAL ASSEMBLIES RECENTLY STUDIED EXPERIMENTALLY ON THE ARGONNE ZERO POWER FACILITY, ZPR-3, ARE COMPARED WITH THE MEASURED DATA. DISCREPANCIES BETWEEN CALCULATED AND EXPERIMENTAL VALUES ARE EXAMINED, TOGETHER WITH RESULTS FROM PREVIOUS ASSEMBLIES FOR SYSTEMATIC TRENDS. EFFECTS OF MODIFICATIONS IN THE CROSS-SECTIONS AND IN THE CALCULATIONAL PROCEDURES IN REDUCING THE DISCREPANCIES ARE DISCUSSED.

CALCULATION OF REACTIVITY CHANGES, FLUX VARIATIONS, AND DETECTOR-RESPONSE VARIATIONS RESULTING FROM THE HETEROGENEITIES CAUSED BY VARIOUS INTRA-DRAWER CONFIGURATIONS OF FUEL AND DILUENT PLATES WITHIN THE DRAWERS OF THE CRITICAL ASSEMBLIES ARE COMPARED WITH EXPERIMENTAL DATA. TRANSPORT METHODS FOR SUCH THIN SLAB CELL CONFIGURATIONS ARE COMPARED. IMPROVEMENTS IN THE CALCULATIONAL METHODS FOR THESE CELLS ARE SUGGESTED; AND, A SIMPLE MULTI-GROUP APPROXIMATION METHOD, AMENABLE TO HAND CALCULATION, IS DESCRIBED.

THE SENSITIVITIES OF REACTIVITY AND INHOURS AS FUNCTIONS OF ASYMPTOTIC REACTOR PERIOD ARE EXAMINED FOR A RANGE OF FAST-REACTOR COMPOSITIONS. RESULTS OF CALCULATIONS OF EFFECTIVE DELAYED- NEUTRON FRACTION, INHOURS PER CENT K(EFF.), AND PROMPT- AND DELAYED- NEUTRON WORTHS ARE GIVEN FOR A SERIES OF FAST ASSEMBLIES. (AUTH).

397 ID-NUMBER ID-NUMBER 397

AUTHOR KATO, W. Y./ DATES, L. R.

TITLE DESIGN AND CONSTRUCTION OF THE ARGONNE FAST CRITICAL FACILITY (ZPR-6)

REPORT NUMBER..... IAEA-VIENNA-1961, 295-312

DATE PUBLISHED ... 61-08-00

NSA-NUMBER 16:26526

SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6

ABSTRACT

IN A FAST-POWER-REACTOR DEVELOPMENT PROGRAMME, A CRITICAL FACILITY IS FOUND TO BE A HIGHLY USEFUL TOOL TO ASCERTAIN CALCULATIONAL TECHNIQUES, TO VERIFY NEUTRON CROSS-SECTION SETS, AND TO OBTAIN INTEGRAL REACTOR- PHYSICS PARAMETERS NECESSARY FOR THE NUCLEAR DESIGN OF A POWER SYSTEM. SINCE IT IS PRIMARILY A PHYSICS INSTRUMENT, THE DESIGN OF A FAST CRITICAL FACILITY ITSELF POSES A NUMBER OF DIFFERENT PROBLEMS NOT FOUND IN THE DESIGN OF A POWER REACTOR. IN ADDITION TO USUAL QUESTIONS OF SITE, CONTAINMENT, CORE DESIGN AND INSTRUMENTATION, THERE ARISE SUCH PROBLEMS AS: HOW TO OBTAIN A LARGE DEGREE OF FLEXIBILITY CONSISTENT WITH SAFETY, THE DETERMINATION OF THE SIZE AND TYPE OF FACILITY TO MEET THE EXPERIMENTAL PHYSICS REQUIREMENTS, THE DETERMINATION OF THE NUMBER AND LOCATION OF CONTROL AND SAFETY RODS MINIMIZING PERTURBATION EFFECTS AND THE SPECIFICATION OF THE REPRODUCIBILITY OF CONTROL RODS AND OTHER MOVABLE COMPONENTS TO OBTAIN THE ACCURACY REQUIRED IN REACTIVITY MEASUREMENTS. THESE ARE SOME OF THE PROBLEMS WHICH ARE DISCUSSED IN THIS PAPER BASED ON RECENT EXPERIENCE AT THE ARGONNE NATIONAL LABORATORY WHICH HAS UNDER CONSTRUCTION A FAST CRITICAL FACILITY, ZPR-6 AT ITS LEMONT, ILLINOIS SITE FOR FAST-REACTOR-PHYSICS STUDIES. THE ZPR-6 IS A MOVABLE HALF-OR SPLIT-TABLE-TYPE MACHINE SIMILAR TO ZPR-3. IT HAS A MATRIX ABOUT TWO AND A HALF TIMES THE VOLUME OF THE EARLIER MACHINE AND WILL BE USED TO INVESTIGATE THE PHYSICS OF LARGE, HIGHLY DILUTE, METAL AND CERMET, UNMODERATED AND PARTIALLY MODERATED SYSTEMS HAVING CORE VOLUMES UP TO ABOUT 1500 LITERS. A DETAILED DESCRIPTION OF THE ZPR-6 WITH A DISCUSSION ON THE CRITERIA USED IN THE DESIGN OF ITS VARIOUS COMPONENTS FROM THE POINT OF VIEW OF REACTOR PHYSICS IS PRESENTED. IN ADDITION, SUCH TOPICS AS MANAGEMENT AND OPERATING PROCEDURES, POTENTIAL HAZARDS DURING OPERATION, EXPERIMENTAL TECHNIQUES TO BE USED AND CONSTRUCTION COSTS ARE ALSO INCLUDED. (AUTH).

398 ID-NUMBER ID-NUMBER 398

AUTHOR LONG, J. K./ BAKER, A. R./ GEMMELL, W./ KEENEY, W. P./ MC VEAN, R. L./
THALGOTT, F. W.

TITLE EXPERIMENTAL RESULTS ON LARGE DILUTE FAST CRITICAL SYSTEMS WITH METALLIC
AND CERAMIC FUELS

REPORT NUMBER..... IAEA-VIENNA-1961, 271-285

DATE PUBLISHED ... 61-08-00

NSA-NUMBER 16:26524

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

THE FLEXIBILITY OF THE ZPR-3 FAST CRITICAL PROJECT PERMITS THE ASSEMBLY OF COMPOSITIONS TYPICAL OF LARGE POWER REACTORS. BECAUSE OXIDE AND CARBIDE FUELS PROMISE ATTRACTIVE MECHANICAL PROPERTIES, THEIR BEHAVIOUR IN CRITICAL COMPOSITION HAS BEEN STUDIED. CENTRAL FISSION RATIOS, REACTIVITY MEASUREMENTS, ROSSI-ALPHA AND HETEROGENEITY EFFECTS HAVE BEEN DETERMINED FOR SEVERAL URANIUM-BLANKETED CYLINDRICAL CORES. SOME OF THESE ARE SIMPLIFIED COMPOSITIONS USEFUL FOR EVALUATION OF CROSS-SECTION SETS, AND OTHERS ARE MORE TYPICAL OF POWER-REACTOR COMPOSITIONS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

400 ID-NUMBER ID-NUMBER 400

AUTHOR BATTAT, M. E.
 TITLE CRITICAL EXPERIMENTS AND NUCLEAR CALCULATIONS-LAMPRE-I
 REPORT NUMBER..... IAEA-VIENNA-1961, 263-270
 DATE PUBLISHED ... 61-08-00
 SITE/PROGRAM LOS ALAMOS - LAMPRE (PLUTONIUM FUELED FAST BREEDER)

ABSTRACT

AS PART OF A PROGRAMME TO DEVELOP PLUTONIUM FUELS FOR FAST-BREEDER REACTORS, THE LOS ALAMOS SCIENTIFIC LABORATORY HAS CONSTRUCTED AND IS OPERATING A 1-MW SODIUM-COOLED TEST REACTOR WHOSE CORE CONTAINS A MOLTEN ALLOY OF PLUTONIUM AND IRON (90 ATOM, PERCENT PLUTONIUM, 10 ATOM, PERCENT IRON, MELTING POINT OF 410 DEGREE CENTIGRADE). REACTIVITY CONTROL IS PROVIDED BY THE USE OF A STAINLESS-STEEL REFLECTOR AND FOUR NICKEL CONTROL-RODS LOCATED EXTERNAL TO THE CORE.

EXPERIMENTS HAVE BEEN PERFORMED AT CORE TEMPERATURES (ISOTHERMAL) OF 80, 160 AND 480 DEGREE CENTIGRADE TO DETERMINE CRITICAL MASS AND REFLECTOR WORTH AT EACH OF THESE TEMPERATURES. CONTROL-ROD WORTHS, FROM PERIOD MEASUREMENTS, AND TEMPERATURE COEFFICIENT OF REACTIVITY WERE ALSO MEASURED.

CALCULATIONS HAVE BEEN MADE, USING THE S-N METHOD FOR SOLVING THE NEUTRON TRANSPORT PROBLEM, TO DETERMINE THE BASIC NUCLEAR PARAMETERS OF THE SYSTEM. THE COMPARISON BETWEEN CALCULATED AND MEASURED VALUES OF PARAMETERS SUCH AS TEMPERATURE COEFFICIENT, CONTROL-ELEMENT WORTHS, AND CRITICAL MASS IS ALSO OF INTEREST IN EVALUATING THE RELIABILITY OF THE DESIGN CALCULATIONS. (AUTH).

402 ID-NUMBER ID-NUMBER 402

AUTHOR MOREWITZ, H. A./ CARPENTER, S. G.
 TITLE THE EPITHERMAL CRITICAL EXPERIMENTS
 REPORT NUMBER..... IAEA-VIENNA-1961, 287-293
 DATE PUBLISHED ... 61-08-00
 NSA-NUMBER 16:26525
 SITE/PROGRAM ATOMICS INTERNATIONAL - ADVANCED EPITHERMAL THORIUM REACTOR

ABSTRACT

THE PRESENT PHASE OF THE ADVANCED-EPITHERMAL-THORIUM-REACTOR PROGRAMME CONSISTS OF INTEGRAL-REACTOR-PHYSICS EXPERIMENTS DESIGNED TO PROVIDE NEUTRON-CROSS-SECTION INFORMATION IN THE 10-MEV TO 1-KEV RANGE. A SERIES OF NINE, MULTI-REGION, SLOW-FAST, PSEUDOSPHERICAL CRITICAL ASSEMBLIES OF THE HONEYCOMB, SPLIT-TABLE TYPE ARE BEING STUDIED. SO FAR, THREE ASSEMBLIES HAVE BEEN RUN. THE OUTER DRIVER-DECOUPLER REGION DRIVES AN INTERIOR URANIUM-233 THORIUM FUELLED SPHERICAL TEST REGION WHOSE NEUTRON-FLUX SPECTRUM IS SUCCESSIVELY DEGRADED BY INCREASING THE GRAPHITE MODERATOR TO FUEL RATIO.

A SQUARE-WAVE OSCILLATOR EXPERIMENT DEFINES THE CENTRAL REACTIVITY WORTHS OF FORTY SMALL SAMPLES OF DIFFERENT MATERIALS TO 10E-8 DELTA-K FOR EACH ASSEMBLY. ADDITIONALLY, INTERCALIBRATED ARTIFICIAL NEUTRON SOURCES ARE OSCILLATED TO DETERMINE THE VARIOUS CENTRAL NEUTRON IMPORTANCE FUNCTIONS. THE SPECTRA ARE OBTAINED BY FISSION-COUNTER MEASUREMENTS WITH CALIBRATED FOILS OF DIFFERENT THRESHOLDS AND BY A LITHIUM-6-SOLID-STATE-COUNTER SANDWICH SPECTROMETER. A DIGITAL COMPUTER ROUTINE WILL BE USED TO COMPILE ALL MEASUREMENTS INTO A SELF-CONSISTENT LIBRARY OF SPECTRUM AVERAGED CROSS-SECTIONS. (AUTH).

403 ID-NUMBER ID-NUMBER 403

AUTHOR LOEWENSTEIN, W. B./ MENEGHETTI, D.
 TITLE INTEGRAL PHYSICS DATA FOR FAST-REACTOR DESIGN
 REPORT NUMBER..... IAEA-VIENNA-1961, 415-434
 DATE PUBLISHED ... 61-08-00
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

THE RECENT COMPILATION OF THE SECTION ON FAST-REACTOR PHYSICS FOR THE FORTHCOMING SECOND EDITION OF REACTOR PHYSICS CONSTANTS HAS NECESSITATED A SURVEY OF THE AVAILABLE EXPERIMENTAL INTEGRAL DATA. THE CHOICE OF FAST-REACTOR-PHYSICS INTEGRAL DATA TO BE INCLUDED IN THE COMPILATION WAS BASED UPON TWO CRITERIA BESIDES AVAILABILITY: (A) THE DATA ARISE FROM RELATIVELY SIMPLE SYSTEMS WHICH LEND THEMSELVES TO SIMPLE THEORETICAL ANALYSES; AND (B) COMPLICATED SYSTEMS REPRESENTING PROTOTYPES OR MOCK-UPS HAVING GENERAL INTEREST IN TERMS OF FAST-POWER REACTORS.

THE FIRST CRITERION WAS DECIDED UPON SO AS TO LIST INTEGRAL DATA FOR THOSE SYSTEMS OF MOST GENERAL UTILITY FOR THE VERIFICATION OF CROSS-SECTION PARAMETERS AND CALCULATIONAL PROCEDURES. THE SECOND CRITERION IS BASED UPON PRESENTATION OF CURRENT DATA ON ACTUAL FAST POWER BREEDER REACTOR SYSTEMS. THESE ARE TOO COMPLICATED FOR SIMPLE THEORETICAL

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ANALYSIS. THEY DEMONSTRATE THE COMPLEXITY OF THE ACTUAL REACTOR VERSUS THE MORE IDEALIZED AND EASILY ANALYSED CRITICAL EXPERIMENT.

INTEGRAL PHYSICS DATA FOR REACTOR DESIGN REFER TO MEASUREMENTS ON REACTOR SYSTEMS, CRITICAL OR OTHERWISE, OF THE VARIOUS REACTOR PHYSICS QUANTITIES OF PRACTICAL AND/OR THEORETICAL IMPORTANCE. THESE CHARACTERIZE AND LEAD TO AN UNDERSTANDING OF THE SYSTEM. THE MEASUREMENTS ARE REPRESENTED BY CRITICAL MASS, CORE SHAPE FACTOR, DETECTOR RATIOS, NEUTRON SPECTRA, MATERIAL REPLACEMENT EXPERIMENTS, REFLECTOR SAVINGS, NEUTRON LIFETIME, ROSSI-ALPHA, AND SIMILAR QUANTITIES.

THESE DATA ARE REVIEWED AND THE RANGE OF APPLICABILITY IS DESCRIBED. LIMITATIONS OF EXPERIMENTAL AND ANALYTICAL RESULTS ARE SHOWN TO EXIST IN CERTAIN SPECTRAL AND CRITICALITY ANALYSES. EXPERIMENTAL AND ANALYTICAL INVESTIGATIONS ARE SUGGESTED FOR FUTURE WORK, THESE WILL TEND TO NARROW THE GAP BETWEEN THEORY AND EXPERIMENT ON KNOWN SYSTEMS. THEY ALSO INCLUDE INVESTIGATIONS TO FIRM UP THE PHYSICS OF LARGE CONCEPTUAL, FAST POWER-BREEDER REACTOR SYSTEMS. (AUTH).

404 ID-NUMBER ID-NUMBER 404

AUTHOR NIKOLAYEV, M. N. / GOLOOBYEV, V. I. / ABAGYAN, A. A. / ORLOV, M. U.

TITLE NEUTRON PROPAGATION IN THE NICKEL SCREEN OF FAST REACTOR.

REPORT NUMBER.... IAEA-VIENNA-1961, 403-412

DATE PUBLISHED ... 61-08-00

SITE/PROGRAM USSR - BR-1 FAST ZERO POWER REACTOR

ABSTRACT

THE PRESENT STUDY IS THE CONTINUATION OF A SERIES OF MACROSCOPIC EXPERIMENTS CARRIED OUT ON THE BR-1 FAST ZERO-POWER REACTOR IN ORDER TO STUDY NEUTRON PROPAGATION IN VARIOUS MATERIALS. THE PURPOSE OF THESE INVESTIGATIONS WAS TO CHECK AND REFINE THE SYSTEM OF CONSTANTS USED IN MULTI-GROUP, FAST-REACTOR CALCULATIONS. THE RESULTS OF EXPERIMENTS CARRIED OUT ON THE BR-1 REACTOR WITH URANIUM AND COPPER SCREENS WERE REPORTED IN 1958 AT THE SECOND INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY IN GENEVA (PAPER NO. 2038). THE PRESENT PAPER IS DEVOTED TO A STUDY OF NEUTRON PROPAGATION IN NICKEL. THIS MATERIAL WAS CHOSEN BECAUSE IT IS WIDELY USED IN REACTORS, BOTH AS A CONSTRUCTION MATERIAL AND AS A SCREEN MATERIAL (IN THE BR-5 REACTOR, FOR EXAMPLE).

NICKEL CROSS-SECTIONS, ESPECIALLY THEIR RESONANCE STRUCTURE, HAVE BEEN TOO LITTLE STUDIED IN THE ELEMENTARY EXPERIMENTS. ACCORDINGLY, THE MULTI-GROUP SYSTEM OF CONSTANTS FOR NICKEL, COMPILED ON THE BASIS OF THOSE EXPERIMENTS, NEEDED FURTHER CHECKING BY MACROSCOPIC EXPERIMENT.

THE DISTRIBUTION OF NEUTRONS OF VARIOUS ENERGIES OVER THE RADIUS OF THE REACTOR'S NICKEL SCREEN WAS MEASURED WITH AN ASSEMBLY OF DETECTORS OF VARIOUS ENERGY SENSITIVITIES. THE RESULTS OBTAIN ARE COMPARED IN PAPER WITH THE RESULTS OF THE 18-GROUP CALCULATION CARRIED OUT WITH A P(1) APPROXIMATION. THE COMPARISON SHOWS THAT THE RESULTS OF THE EXPERIMENT TALLY SATISFACTORILY WITH THE CALCULATION. (AUTH).

405 ID-NUMBER ID-NUMBER 405

AUTHOR DUBOVSKII, B. G. / ET AL

TITLE CRITICAL PARAMETERS OF AQUEOUS SOLUTIONS OF URANYL NITRATE AND INTERACTION OF SUBCRITICAL HOMOGENEOUS REACTORS

REPORT NUMBER.... IAEA-STOCK.-1965, 267-278

CONFERENCE SYMPOSIUM ON CRITICALITY CONTROL OF FISSILE MATERIALS HELD BY THE INTERNATIONAL ATOMIC ENERGY AGENCY AT STOCKHOLM, 1-5 NOVEMBER 1965

DATE PUBLISHED ... 65-11-00

SITE/PROGRAM USSR - URANYL NITRATE SOLUTIONS

ABSTRACT

THIS REPORT GIVES EXPERIMENTAL AND CALCULATED DATA ON THE CRITICAL RADII OF SPHERES CONTAINING URANYL NITRATE SOLUTIONS WITHOUT A REFLECTOR. VARIOUS REFLECTORS ARE ALSO STUDIED. THE CRITICAL EXPERIMENTS WERE PERFORMED IN SPHERICAL GEOMETRY. THE SPHERES HAVE STEEL WALLS 0.1 - 0.15 CM THICK. NEUTRON REFLECTION FROM THE WALLS OF THE ROOM AND TEMPERATURE FLUCTUATIONS FROM EXPERIMENT TO EXPERIMENT DO NOT INTRODUCE SUBSTANTIAL CORRECTIONS TO THE CRITICAL PARAMETERS OF THE SOLUTIONS.

THE FUNDAMENTAL ERROR IN THE EXPERIMENTAL DETERMINATION OF THE CRITICAL PARAMETERS OF URANYL NITRATE SOLUTIONS IS CAUSED BY THE INACCURACY OF DETERMINING THE VOLUMES OF THE SOLUTION AND THE CONCENTRATIONS; THIS AMOUNTS TO +/- 2 PERCENT. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

406 ID-NUMBER ID-NUMBER 406

AUTHOR STEWART, L.
 TITLE LEAKAGE NEUTRON SPECTRUM FROM A BARE PLUTONIUM-239 CRITICAL ASSEMBLY
 REPORT NUMBER..... NSENAO, 08, 595-597
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 60-12-00
 NSA-NUMBER 15:6603
 SITE/PROGRAM LOS ALAMOS - PLUTONIUM METAL SPHERES

ABSTRACT

THE LEAKAGE NEUTRON SPECTRUM OF A BARE PLUTONIUM-239 CRITICAL ASSEMBLY HAS BEEN MEASURED WITH NUCLEAR EMULSIONS AS BOTH RADIATOR AND DETECTOR. A COMPARISON WITH SIMILAR MEASUREMENTS ON THE URANIUM-235 ANALOGUE OF THIS ASSEMBLY INDICATES A HIGHER AVERAGE ENERGY FOR THE PLUTONIUM-239 NEUTRONS.

407 ID-NUMBER ID-NUMBER 407

AUTHOR GRUNDL, J./ USNER, A.
 TITLE SPECTRAL COMPARISONS WITH HIGH ENERGY ACTIVATION DETECTORS
 REPORT NUMBER..... NSENAO, 08, 598-607
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 60-12-00
 NSA-NUMBER 15:6161
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES ; LOS ALAMOS - PLUTONIUM METAL SPHERES

ABSTRACT

THE RESPONSES OF THE ACTIVATION DETECTORS PHOSPHORUS (N,P), ALUMINUM (N,P), IRON (N,P), ALUMINUM (N,ALPHA), AND COPPER (N,2N) TO THE NEUTRON SPECTRA AT THE CENTER OF THE BARE URANIUM-235 AND PLUTONIUM-239 CRITICAL ASSEMBLIES, GODIVA AND JEZEBEL, ARE THE BASIS OF A PRECISION COMPARISON OF THESE TWO SPECTRA ABOVE 2 MEV. RESULTS, INTERPRETED IN TERMS OF THE SPECTRAL FUNCTION $(E^{1/2}) \cdot (\exp(-\beta E))$, SHOW THAT THE AVERAGE ENERGY OF THIS COMPONENT OF THE SPECTRUM IN GODIVA IS 4.7 +/- 0.8 PERCENT LOWER THAN IN JEZEBEL. FROM SOME PRELIMINARY MEASUREMENTS A CLOSE RESEMBLANCE TO THE CORRESPONDING FISSION NEUTRON SPECTRA IS INDICATED IN THIS ENERGY REGION. RESULTS OF PHOTOPLATE MEASUREMENTS IN THE LEAKAGE SPECTRA OF BOTH ASSEMBLIES ARE CONSIDERED AND BRIEFLY ANALYZED. A DISCUSSION AND DETERMINATION OF EFFECTIVE THRESHOLDS IS APPENDED. (AUTH).

411 ID-NUMBER ID-NUMBER 411

AUTHOR D'ARDENNE, W. H.
 TITLE REACTOR PHYSICS PARAMETERS OF 1.03 PERCENT ENRICHED URANIUM METAL, HEAVY WATER MODERATED LATTICES
 REPORT NUMBER..... NSENAO, 32, 283-291
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 68-06-00
 SITE/PROGRAM MASSACHUSETTS INSTITUTE OF TECHNOLOGY - HEAVY WATER LATTICE PROJECT

ABSTRACT

REACTOR PHYSICS PARAMETERS WERE MEASURED IN THREE HEAVY WATER LATTICES CONSISTING OF 0.250- INCH-DIAM, 1.03 WT PERCENT URANIUM-235 METAL RODS IN TRIANGULAR ARRAYS SPACED AT 1.25, 1.75, AND 2.50 INCH. THE FOLLOWING QUANTITIES WERE MEASURED IN EACH LATTICE: THE RATIO OF EPICADMIUM TO SUBCADMIUM RADIATIVE CAPTURES IN URANIUM-238 (RHO-28); THE RATIO OF EPICADMIUM TO SUBCADMIUM FISSIONS IN URANIUM-235 (DELTA-25); THE RATIO OF RADIATIVE CAPTURES IN URANIUM-238 TO FISSIONS IN URANIUM-235 (C-STAR); AND THE FISSIONS IN URANIUM TO FISSIONS IN URANIUM-235 (DELTA-28). THESE EXPERIMENTAL RESULTS WERE USED TO CALCULATE THE FOLLOWING REACTOR PHYSICS PARAMETERS FOR EACH LATTICE: THE RESONANCE ESCAPE PROBABILITY P, THE FAST FISSION FACTOR EPSILON, THE MULTIPLICATION FACTOR FOR AN INFINITE SYSTEM K(INF), AND THE INITIAL CONVERSION RATIO C. ANALYTICAL RESULTS OBTAINED BY USING THERMOS AND GAM-I ARE IN FAIR AGREEMENT WITH THE EXPERIMENTAL RESULTS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

414 ID-NUMBER ID-NUMBER 414

AUTHOR MENDELSON, M. R.
 TITLE MONTE CARLO CRITICALITY CALCULATIONS FOR THERMAL REACTORS
 REPORT NUMBER..... NSENAO, 32, 319-331
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 68-06-00
 NSA-NUMBER 22:3305
 SITE/PROGRAM GENERAL ELECTRIC CO., KNOX ATOMIC POWER LABORATORY - SOLID HOMOGENEOUS ASSEMBLY (SHA) - CALCULATIONS ; OAK RIDGE - URANYL(92%)SALTS - WATER - CALCULATIONS

ABSTRACT

THE FEASIBILITY OF USING MONTE CARLO METHODS TO COMPUTE THE CRITICALITY OF THERMAL REACTORS IS INVESTIGATED BY ANALYZING THREE SIMPLE CRITICAL ASSEMBLIES WITH THE O5R MONTE CARLO NEUTRON TRANSPORT CODE. RESULTS INDICATE THAT A PRECISION OF 0.5 TO 0.8 PERCENT IN THE EIGENVALUE IS OBTAINABLE FOR THESE CORES IN LESS THAN ONE HOUR ON THE CDC-6600 COMPUTER. FURTHER TIME REDUCTIONS ARE FORESEEABLE PENDING REFINEMENTS IN THE OPERATING SYSTEM AND MORE EFFECTIVE UTILIZATION OF VARIANCE- REDUCTION TECHNIQUES. SEVERAL ASPECTS OF PROBLEM STRATEGY AND VARIANCE ESTIMATION ARE EXAMINED, LEADING TO INCREASED UNDERSTANDING OF CRITICALITY ESTIMATORS AND CORRELATION OF DATA. (AUTH).

416 ID-NUMBER ID-NUMBER 416

AUTHOR RICHEY, C. R./ WHITE, J. D./ CLAYTON, E. D./ LLOYD, R. C./
 TITLE CRITICALITY OF HOMOGENEOUS PLUTONIUM OXIDE-PLASTIC COMPACTS AT HYDROGEN TO PLUTONIUM RATIO = 15
 REPORT NUMBER..... NSENAO, 23, 150-158
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 65-10-00
 NSA-NUMBER 19:43521
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

CRITICAL EXPERIMENTS WERE CONDUCTED WITH HOMOGENEOUS MIXTURES OF PLUTONIUM DIOXIDE-POLYSTYRENE (HYDROGEN/PLUTONIUM ATOMIC RATIO OF 15) CONTAINING BOTH 2.2 AND 8.0 PERCENT PLUTONIUM-240. CRITICALITY WAS DETERMINED FOR A SERIES OF PLEXIGLAS REFLECTED RECTANGULAR PRISMS RANGING FROM NEAR CUBES, TO LONG COLUMNS, AND TO THIN SLABS; BARE ARRAYS OF NEAR-CUBIC GEOMETRY WERE ALSO STUDIED. CRITICAL THICKNESSES WERE 16.09 +/-0.41 AND 5.99 +/-0.10 CM, RESPECTIVELY, FOR THE BARE AND REFLECTED INFINITE SLABS OF PLUTONIUM DIOXIDE-POLYSTYRENE CONTAINING 2.2 PERCENT PLUTONIUM-240. CORRESPONDING VALUES FOR THE 8.0 PERCENT PLUTONIUM-240 MIXTURES WERE 18.48 +/- 0.41 AND 7.38 +/- 0.09 CM. THE INFINITE SLAB THICKNESSES FOR AN EQUIVALENT PLUTONIUM-239-WATER MIXTURE (HYDROGEN/PLUTONIUM = 15, RHO = 1.62 G PLUTONIUM/CM**3) WERE 11.66 +/- 0.30 AND 4.38 +/- 0.08 CM, RESPECTIVELY, FOR THE BARE AND WATER-REFLECTED SLABS. CORRESPONDING CRITICAL RADII FOR INFINITELY LONG CYLINDERS WERE 10.52 +/- 0.16 AND 6.54 +/- 0.14 CM; RADII FOR CRITICAL SPHERES WERE 13.81 +/- 0.16 AND 10.40 +/- 0.17 CM. (AUTH).

427 ID-NUMBER ID-NUMBER 427

AUTHOR MOUNTFORD, L. A./ MOREWITZ, H. A.
 TITLE THE ADVANCED EPITHERMAL THORIUM REACTOR (AETR) CRITICAL EXPERIMENTS
 REPORT NUMBER..... NSENAO, 21, 421-428
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 65-04-00
 NSA-NUMBER 19:17310
 SITE/PROGRAM ATOMICS INTERNATIONAL - ADVANCED EPITHERMAL THORIUM REACTOR

ABSTRACT

MULTIREGION CRITICAL CORES, BUILT ON A SPLIT-TABLE ASSEMBLY MACHINE, HAVE BEEN USED TO INVESTIGATE REACTOR COMPOSITIONS TYPICAL OF EPITHERMAL AND FAST POWER REACTORS. THE DESIGN AND OPERATING FEATURES OF THE FACILITY, CONSTRUCTED TO STUDY THE THORIUM-URANIUM-233 FUEL CYCLE, ARE DESCRIBED. CRITICALITY CALCULATIONS HAVE BEEN IN GOOD AGREEMENT WITH EXPERIMENTAL VALUES. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

429 ID-NUMBER ID-NUMBER 429

AUTHOR STROMINGER, D./ SCHLESINGER, G.
 TITLE FISSION-RATE MEASUREMENTS IN THE ADVANCED EPITHERMAL THORIUM REACTOR (AETR)
 CRITICAL EXPERIMENTS
 REPORT NUMBER..... NSENAO, 21, 441-450
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 65-04-00
 NSA-NUMBER 19:17312
 SITE/PROGRAM ATOMICS INTERNATIONAL - ADVANCED EPITHERMAL THORIUM REACTOR

ABSTRACT

SOLID-STATE P-N JUNCTION COUNTERS HAVE BEEN FABRICATED TO MEASURE FISSION RATES OF MATERIALS WITH DIFFERENT FISSION THRESHOLDS. THE FISSION REACTIONS ARE CAUSED BY NEUTRONS VARYING IN ENERGY FROM THERMAL ENERGIES FOR URANIUM-235 TO 1.5 MEV FOR THORIUM-232. THE DATA GATHERED FROM THESE SOLID-STATE FISSION COUNTERS HAVE BEEN USED TO COMPARE EXPERIMENTAL WITH CALCULATED FISSION RATES IN THE AETR CORES.

THE FISSION COUNTER IS ASSEMBLED BY PLACING AN ELECTROPLATED FOIL OF A FISSIONABLE MATERIAL NEAR A P-N JUNCTION DETECTOR. AN ALUMINUM CAP IS PLACED OVER EACH DETECTOR AND FOIL TO FORM A NEAT, COMPACT ASSEMBLY. THE RESULTING COUNTER IS SMALL ENOUGH TO FIT INSIDE A REACTOR WITH MINIMUM DISTORTION TO THE NEUTRON SPECTRUM.

FISSION COUNTERS EMPLOYING THORIUM-232, URANIUM-233, URANIUM-234, URANIUM-235, URANIUM-236, URANIUM-238, NEPTUNIUM-237, AND PLUTONIUM-239 AS THE PRINCIPAL FISSIONABLE MATERIAL HAVE BEEN SUCCESSFULLY FABRICATED. THESE SOLID-STATE FISSION COUNTERS HAVE PROVED RELIABLE INSTRUMENTS TO MEASURE NEUTRON FLUXES IN HIGH GAMMA-RAY FIELDS. TRUE FISSION EVENTS ARE EASILY SEPARATED FROM OTHER INDUCED REACTIONS IN THE COUNTER (AUTH).

435 ID-NUMBER ID-NUMBER 435

AUTHOR LITTLE, W. W. / HARDIE, R. W. / MAAS, L. L.
 TITLE MULTIGROUP ANALYSIS OF SELECTED FAST CRITICAL ASSEMBLIES
 REPORT NUMBER..... BNWL-0347
 DATE PUBLISHED ... 67-02-01
 NSA-NUMBER 21:14068
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS ; UNITED KINGDOM,
 WINFRITH - ZEBRA - CALCULATIONS

ABSTRACT

A MODIFIED VERSION OF THE RUSSIAN DATA COMPILATION IS USED TO COMPUTE NUCLEAR PARAMETERS FOR VARIOUS FAST CRITICAL ASSEMBLIES. CALCULATED AND EXPERIMENTAL VALUES OF CRITICAL MASS, FISSION RATIOS, AND REACTIVITY COEFFICIENTS ARE COMPARED. FOR THE MODERATE VOLUME PLUTONIUM AND URANIUM ASSEMBLIES ANALYZED, THE DATA PREDICTS K (EFFECTIVE) WITHIN ABOUT 1.5 PERCENT. (AUTH).

436 ID-NUMBER ID-NUMBER 436

AUTHOR PENDLEBURY, E. D.
 TITLE THE SENSITIVITY OF CALCULATED CRITICAL MASSES OF SMALL FAST SYSTEMS TO
 CHANGES IN THE URANIUM-235 AND URANIUM-238 NEUTRON-SCATTERING DATA
 REPORT NUMBER..... IAEA-VIENNA-1961, 097-110
 DATE PUBLISHED ... 61-08-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS ; UNITED KINGDOM,
 ALDERMASTON - URANIUM(30%) METAL - CALCULATIONS

ABSTRACT

THE SENSITIVITY OF CALCULATED CRITICAL MASSES OF SMALL FAST SYSTEMS TO CHANGES IN THE URANIUM- 235 AND URANIUM-238 NEUTRON-SCATTERING DATA. THE SENSITIVITY OF THE CALCULATED CRITICAL MASSES OF A NUMBER OF SIMPLE SYSTEMS, TO CHANGES IN THE BASIC NEUTRON SCATTERING DATA, HAVE BEEN INVESTIGATED. THE SYSTEMS CONSIDERED ARE SPHERES OF 29 PERCENT URANIUM-235 AND 93.5 PERCENT URANIUM-235, BOTH BARE, AND REFLECTED BY THICK NATURAL URANIUM. THE CALCULATIONS HAVE BEEN CARRIED OUT USING THE CARLSON S-N METHOD WITH 4 ENERGY GROUPS, AND THE PERCENTAGE CHANGES IN THE CALCULATED CRITICAL MASSES OF THE DIFFERENT SYSTEMS, DUE TO SPECIFIED CHANGES IN THE VARIOUS ASPECTS OF THE NEUTRON SCATTERING DATA, HAVE BEEN OBTAINED. THE RESULTS ARE PRESENTED AND DISCUSSED WITH PARTICULAR REFERENCE TO THE ADJUSTMENT OF THE BASIC DATA TO GIVE GOOD AGREEMENT WITH EXPERIMENTAL CRITICAL SIZES.

THE BASIC DATA ON WHICH THESE CALCULATIONS HAVE BEEN BASED ARE THOSE GIVEN IN AWRE REPORT O- 28/60. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

437 ID-NUMBER ID-NUMBER 437

AUTHOR LYEPOONSKI, A. I. / KOENYETSOB, V. A. / ARTUKHOB, G. YA. / MOGILNYER, A. I. / PROKHOROV, U. A. / STEKLOVSKIE, V. M. / CHYENOV, L. A.
 TITLE EXPERIMENTAL STUDIES OF SOME OF THE PHYSICAL FEATURES OF BERYLLIUM-MODERATED INTERMEDIATE REACTORS.
 REPORT NUMBER..... IAEA-VIENNA-1961, 327-343
 DATE PUBLISHED ... 61-08-00
 SITE/PROGRAM USSR - PF-4 CRITICAL ASSEMBLY (URANIUM(90%),BERYLLIUM)

ABSTRACT

THIS PAPER IS DEVOTED TO A REVIEW OF THE RESULTS OBTAINED FROM A NUMBER OF EXPERIMENTS CARRIED OUT ON THE PF-4 CRITICAL ASSEMBLY (INTERMEDIATE-PHYSICAL ASSEMBLY), WHICH IS DESIGNED FOR DETAILED STUDIES OF THE PHYSICAL CHARACTERISTICS OF INTERMEDIATE REACTORS.

THE CORES AND REFLECTORS OF THE VARIOUS CRITICAL ASSEMBLIES WERE COMPRISED OF COMPACT UNITS OF STEEL OR ALUMINUM TUBES, IN WHICH DISCS OF VARIOUS MATERIALS WERE PLACED. BY COMBINING 90% ENRICHED URANIUM DISCS WITH MODERATING MATERIALS IN VARIOUS PROPORTIONS, AND ALSO BY INTRODUCING MODERATING LAYERS OF DIFFERENT THICKNESSES INTO THE REFLECTOR, IT WAS POSSIBLE TO ALTER THE SPECTRUM OF THE FISSION-INDUCING NEUTRONS WITHIN A VERY BROAD RANGE.

THE PAPER DESCRIBES THE PF-4 CRITICAL ASSEMBLY AND ITS VARIOUS SUBASSEMBLIES. THE RELATIVE EFFICIENCY OF INTERNAL AND EXTERNAL MODERATION IS ANALYSED FOR REACTORS WITH A VERY LOW RATIO OF MODERATOR NUCLEI TO URANIUM NUCLEI IN THE CORE. THE EXPERIMENTS SHOW THAT EVEN WHEN THICK MODERATING REFLECTORS ARE USED, THIS LOW RATIO (THE RATIO OF BERYLLIUM NUCLEI TO URANIUM-235 NUCLEI BEING BERYLLIUM/URANIUM-235 = 1) LEADS TO AN INCREASE OF THE CRITICAL MASS.

A CONSIDERABLE PART OF THE PAPER IS DEVOTED TO AN ANALYSIS OF HETEROGENEOUS EFFECTS IN INTERMEDIATE REACTORS. IT IS SHOWN THAT FOR REACTORS WITH BERYLLIUM/URANIUM-235 = 30-TO-40 VARIOUS THICKNESSES OF HIGHLY ENRICHED URANIUM, RANGING FROM 0.023 G/CM² TO 32 G/CM², HAVE AN IDENTICAL EFFECT ON THE REACTIVITY OF THE SYSTEM. THE CAUSES UNDERLYING COMPENSATION OF THE NEUTRON-FLUX SCREENING EFFECT BY THICK LAYERS OF URANIUM ARE ANALYSED.

THE INTERESTING FACT THAT THE EFFICIENCY OF URANIUM INCREASES IN THE NEIGHBOURHOOD OF THE ABSORBING RODS, WHICH WAS EXPERIMENTALLY REVEALED IN AN ASSEMBLY WITH BERYLLIUM/URANIUM-235= APPROXIMATELY 200, IS DISCUSSED IN THE PAPER. THIS FACT IS EXPLAINED BY THE SHARP DECLINE IN THE IMPORTANCE OF NEUTRONS ABSORBED BY THE URANIUM. THE PAPER PROVIDES DATA, DERIVED FROM THE SAME ASSEMBLY, ON THE EFFICIENCY OF RODS MADE OF VARIOUS ABSORBING MATERIALS. IT GIVES THE EXPERIMENTALLY MEASURED DISTRIBUTION OF NEUTRON DENSITY FOR NEUTRONS OF VARIOUS ENERGIES IN THE NEIGHBOURHOOD OF A BORON-CARBIDE ROD, AND THE DENSITY OF NEUTRON CAPTURES BY A 1/V DETECTOR WITHIN THE ROD.

THE PAPER ALSO DISCUSSES METHODS USED AND THE RESULTS OBTAINED FROM EXPERIMENTS DESIGNED TO ASSESS THE EFFICIENCY OF RECOMPENSATION CYLINDERS PLACED ON THE BOUNDARY BETWEEN CORE AND REFLECTOR. (AUTH)

439 ID-NUMBER ID-NUMBER 439

AUTHOR WEBSTER, J. W.
 TITLE CALCULATED NEUTRON MULTIPLICATION FACTORS OF UNIFORM AQUEOUS SOLUTIONS OF URANIUM-233 AND URANIUM-235
 REPORT NUMBER..... ORNL-CDC-02
 DATE PUBLISHED ... 67-10-00
 NSA-NUMBER 22:1564
 SITE/PROGRAM OAK RIDGE - URANIUM-233 SYSTEMS - CALCULATIONS ; OAK RIDGE - URANYL(92%) SALTS - WATER - CALCULATIONS

ABSTRACT

COMPUTATIONS OF THE EFFECTIVE NEUTRON MULTIPLICATION FACTOR OF SINGLE UNITS OF AQUEOUS SOLUTIONS OF URANIUM-233 OXYFLUORIDE AND URANIUM-235 OXYFLUORIDE ARE REPORTED FOR GUIDANCE IN THE SPECIFICATION OF LIMITS APPLICABLE TO PROCESSES, SUCH AS STORAGE AND TRANSPORT, FOR THESE FISSION ISOTOPES. GRAPHS ARE PRESENTED OF K(EFF) AS A FUNCTION OF SUCH PARAMETERS AS THE MASS OF FISSION MATERIAL, THE CHEMICAL CONCENTRATION, THE DIMENSIONS OF SPHERES AND INFINITELY LONG CYLINDERS, AND THE THICKNESS AND AREAL DENSITY OF INFINITE SLABS. TRANSPORT THEORY (DTF) CODES IN THE S-N APPROXIMATION WITH HANSEN-ROACH CROSS SECTIONS WERE UTILIZED AND THE RESULTS AGREE WITH RELEVANT EXPERIMENTS TO WITHIN 0.01 IN K(EFF). (AUTH)

444 ID-NUMBER ID-NUMBER 444

AUTHOR BENNETT, R. A. / HOFMANN, P. L.
 TITLE RATIONALE AND PLANS FOR THE FTR CRITICAL EXPERIMENTS PROGRAM
 REPORT NUMBER..... BNWL-0490
 DATE PUBLISHED ... 67-08-20
 NSA-NUMBER 24:11169

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

INTRODUCTION: AT THE 1966 ANL CONFERENCE ON "FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS", A PRELIMINARY OUTLINE AND JUSTIFICATION FOR A SERIES OF PROPOSED CRITICAL EXPERIMENTS IN SUPPORT OF FTR DESIGN WAS PRESENTED. SINCE THAT TIME, FAIRLY LARGE DESIGN CHANGES IN THE FTR CONCEPT HAVE TAKEN PLACE AND MORE DETAILED NUCLEAR DESIGN INFORMATION HAS BEEN GENERATED, SO THAT A REVISION, AND A MORE DETAILED JUSTIFICATION OF THE PROPOSED EXPERIMENTAL PROGRAM IS IN ORDER.

THE PURPOSE OF THIS REPORT IS TO IDENTIFY THE UNCERTAINTIES IN THE FTR DESIGN WHICH EXIST DUE TO THE LACK OF CRITICAL EXPERIMENT DATA, TO ASSESS THE DEGREE TO WHICH ADDITIONAL CRITICAL EXPERIMENTS COULD IMPROVE THAT SITUATION, AND TO OUTLINE BRIEFLY THE PROPOSED, OVERALL FTR CRITICAL EXPERIMENT PROGRAM.

BEFORE PROCEEDING INTO A SPECIFIC DISCUSSION OF THE PROPOSED FTR PROGRAM, IT IS INSTRUCTIVE TO EXAMINE THE MANNER IN WHICH CRITICAL EXPERIMENTS ARE USED, AND TO CONSIDER BRIEFLY THE TYPES OF PROGRAMS NOW UNDER WAY OR PLANNED FOR THE NEAR FUTURE AT VARIOUS SITES ENGAGED IN FAST REACTOR EXPERIMENTAL WORK. THIS IS DONE IN SECTION II.

IN SECTION III, AN ASSESSMENT OF THE PRESENT STATUS OF FAST REACTOR PHYSICS CALCULATIONAL METHODS AND ACCURACY OF CURRENT NUCLEAR DATA IS PRESENTED. SUCH AN ASSESSMENT IS NECESSARY, IF ONE IS TO EVALUATE THE NUCLEAR DESIGN UNCERTAINTIES OF THE FTR AND THE DEGREE TO WHICH THEY CAN BE REMOVED BY CRITICAL EXPERIMENTS.

IN SECTION IV, THE EFFECTS OF SOME CALCULATIONAL UNCERTAINTIES ON THE FTR NUCLEAR DESIGN ARE ENUMERATED AND THE POSSIBLE CONSEQUENCES OF THESE UNCERTAINTIES ARE DESCRIBED.

FINALLY, IN SECTION V, A BRIEF OUTLINE OF THE ENTIRE CRITICAL EXPERIMENT PROGRAM IS PRESENTED. (AUTH).

450 ID-NUMBER ID-NUMBER 450

AUTHOR DAVEY, W. G.

TITLE AN ANALYSIS OF SIX AETR FAST CRITICAL EXPERIMENTS

REPORT NUMBER..... ANL-7014

DATE PUBLISHED ... 65-03-00

NSA-NUMBER 19:42077

SITE/PROGRAM ATOMICS INTERNATIONAL - ADVANCED EPITHERMAL THORIUM REACTOR

ABSTRACT

ATOMICS INTERNATIONAL HAS CONSTRUCTED A SERIES OF MULTIREGION FAST-THERMAL CRITICAL ASSEMBLIES AS PART OF THE ADVANCED EPITHERMAL THORIUM REACTOR (AETR) PROGRAM TO OBTAIN DATA ON THE PHYSICS OF URANIUM-233/THORIUM-FUELED REACTORS. IN EACH CASE, THE CENTRAL TEST REGION WAS OF A COMPOSITION APPROPRIATE TO A FULL-SCALE CORE. THE PHYSICS DATA OBTAINED IN SIX CORES, WHERE THE TEST REGIONS SIMULATED THE CORES OF FAIRLY LARGE FAST REACTORS, HAVE BEEN ANALYZED USING A CROSS-SECTION SET PREVIOUSLY USED IN AN ANALYSIS OF ZPR-3 FAST CRITICAL ASSEMBLIES. THESE DATA ARE CENTRAL FISSION RATIOS, RELATIVE REACTIVITIES OF CERTAIN MATERIALS, AND THE RELATIVE IMPORTANCE OF NEUTRON SOURCES OF DIFFERENT ENERGIES. TRENDS ARE IDENTIFIED IN THE DIFFERENCES BETWEEN CALCULATED AND MEASURED DATA, AND THESE ARE COMPARED WITH SIMILAR TRENDS FOUND IN THE ZPR-3 ASSEMBLIES. (AUTH).

452 ID-NUMBER ID-NUMBER 452

AUTHOR CHRISTIE, E. R./ MAR, B. W.

TITLE HAZARDS SUMMARY REPORT: THE KUKLA PROMPT CRITICAL ASSEMBLY

REPORT NUMBER..... UCRL-6105

DATE PUBLISHED ... 60-02-24

NSA-NUMBER 15:7951

SITE/PROGRAM LIVERMORE - URANIUM(93%) METAL

ABSTRACT

THE KUKLA ASSEMBLY IS A BARE SPHERICAL ORALLOY ASSEMBLY THAT IS CAPABLE OF PRODUCING SELF- LIMITING PROMPT CRITICAL FISSION BURSTS. DESIGN AND THEORY OF OPERATION ARE TO A LARGE EXTENT BASED ON THE LOS ALAMOS SCIENTIFIC LABORATORY'S GODIVA ASSEMBLIES. THE ASSEMBLY HAS BEEN CONSTRUCTED TO MEET SPECIFIC PHYSICS EXPERIMENTAL REQUIREMENTS AT THE LAWRENCE RADIATION LABORATORY, LIVERMORE. IT IS EXPECTED THAT THE ASSEMBLY WILL ALSO FIND A SOURCE OF FAST NEUTRONS IN IRRADIATION EXPERIMENTS. THE ASSEMBLY WILL BE LOCATED IN AN EXISTING CONCRETE ASSEMBLY VAULT IN BUILDING 110, THE CRITICAL ASSEMBLY RESEARCH SECTION AREA, AT THE LIVERMORE SITE. REACTIVITY ASSEMBLY RATE AND AMOUNTS ARE DESIGNED TO PRECLUDE A DAMAGING EXCURSION. IN THE UNLIKELY EVENT OF A MAJOR EXCURSION, IT IS WILL WITHIN THE CAPABILITIES OF THE ASSEMBLY VAULT TO CONTAIN THE EFFECT OF A 10^{-18} FISSION ACCIDENT. THIS ACCIDENT IS SEVERAL TIMES THAT WHICH COULD BE ENVISIONED UNDER ANY UNFORTUNATE SERIES OF EVENTS. NO UNDUE HAZARD OR EXPOSURE TO RADIOACTIVITY WOULD OCCUR TO EITHER OPERATING PERSONNEL OR THE CIVILIAN POPULATION AS A RESULT OF SUCH AN ACCIDENT. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

453 ID-NUMBER ID-NUMBER 453

AUTHOR WEBSTER, J. W.
 TITLE OSR MONTE CARLO CALCULATIONS OF LOW-ENRICHED URANIUM THERMAL CRITICAL ASSEMBLIES, AND EVIDENCE OF ERRORS IN URANIUM-238 CROSS SECTIONS
 REPORT NUMBER..... ORNL-TM-2187
 DATE PUBLISHED ... 68-11-00
 NSA-NUMBER 23:4317
 SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN - CALCULATIONS ; OAK RIDGE - URANYL(92%)SALTS - WATER - CALCULATIONS ; OAK RIDGE - URANYL(4.9%)FLUORIDE - WATER - CALCULATIONS

ABSTRACT

AS CRITICALITY CALCULATION METHODS HAVE BECOME MORE EXACT AND CAPABLE OF UTILIZING CROSS SECTIONS IN ALL THEIR DETAIL, INSTEAD OF IN THE FORM OF INTEGRAL VALUES SUCH AS AGE AND RESONANCE ESCAPE PROBABILITY, EVIDENCE HAS BEEN GROWING THAT THE COMPUTED MULTIPLICATION FACTORS, $K(\text{EFF})$, OF LOW-ENRICHED URANIUM THERMAL SYSTEMS ARE LOW COMPARED TO EXPERIMENT.

THE WORK REPORTED HERE WAS INITIATED TO SEE IF THIS DISCREPANCY OCCURS WHEN THE MONTE CARLO METHOD IS USED TOGETHER WITH POINT-SET REPRESENTATIONS OF THE CROSS SECTIONS. CONSIDERABLE ANALYSIS WAS DEVOTED TO THE REPRESENTATION OF THE URANIUM-238 CROSS SECTIONS WITH POINT SETS OF DATA AND THE RESULTS ARE PRESENTED BY CALCOMP PLOTS OF CROSS SECTION VS NEUTRON ENERGY AND TABLES OF THE RESONANCE INTEGRALS.

THE CRITICAL EXPERIMENTS CHOSEN FOR COMPARISONS WITH COMPUTATIONS WERE ALL UNREFLECTED, HOMOGENEOUS, AND REPRESENTATIVE OF A BROAD RANGE OF RESONANCE CAPTURE IN URANIUM-238. A DEFINITE PATTERN EMERGED FROM THESE COMPARISONS; NAMELY, THE GREATER THE NEUTRON CAPTURE IN URANIUM-238, THE LOWER THE COMPUTED $K(\text{EFF})$. THE EVIDENCE OF ERRORS IN THE CROSS SECTIONS OF URANIUM-238 OR THEIR REPRESENTATION, PREVIOUSLY NOTED BY OTHERS, IS THUS STRENGTHENED BY THIS REPORT. (AUTH).

454 ID-NUMBER ID-NUMBER 454

AUTHOR GREULING, E.
 TITLE THEORY OF WATER-TAMPED WATER BOILER
 REPORT NUMBER..... LA-0399
 DATE PUBLISHED ... 45-09-27
 NSA-NUMBER 10:11492
 SITE/PROGRAM LOS ALAMOS - URANYL SULFATE - WATER - CALCULATIONS

ABSTRACT

THE CRITICAL MASS OF THE WATER-TAMPED 14 PERCENT ENRICHED URANYL SULPHATE WATER BOILER CALCULATED BY INTEGRAL DIFFUSION THEORY IS $1.31 \pm .10$ KG OF 25. THE CALCULATED THERMAL NEUTRON DISTRIBUTION (FIG. 11) IN CORE AND TAMPER OF THE UNDER CRITICAL BOILER CONTAINING 717 GMS OF 25 AND A RA-BE SOURCE AGREES WITH THE MEASURED DISTRIBUTION (LA-41). SIMPLE FORMULAE AND CURVES APPROPRIATE FOR WATER-TAMPED SPHERICAL, INFINITE CYLINDRICAL, AND PLANE SLAB HYDRIDE CORES ARE APPLIED TO THE CALCULATION OF THE MINIMUM CRITICAL MASS AND THE MINIMUM CRITICAL DIMENSIONS OF THE ABOVE TYPE BOILERS. (AUTH).

455 ID-NUMBER ID-NUMBER 455

AUTHOR DAVEY, W. G.
 TITLE CALCULATIONS OF K FOR SOME SMALL URANIUM-233-, URANIUM-235-, AND PLUTONIUM-239- FUELED FAST REACTORS
 REPORT NUMBER..... ANL-6850
 DATE PUBLISHED ... 64-02-00
 NSA-NUMBER 18:23010
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS ; LOS ALAMOS - PLUTONIUM METAL SPHERES - CALCULATIONS ; LOS ALAMOS - URANIUM-233 METAL SPHERES - CALCULATIONS ; UNITED KINGDOM, ALDERMASTON - VERA FAST REACTOR - CALCULATIONS ; ARGONNE NATIONAL LABORATORY, IDAHO - EBR-I - CALCULATIONS ; ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

VALUES OF THE MULTIPLICATION CONSTANT, K , HAVE BEEN CALCULATED FOR A NUMBER OF SMALL URANIUM-233-, URANIUM-235-, AND PLUTONIUM-239- FUELED FAST REACTORS THROUGH USE OF A CROSS-SECTION SET PREVIOUSLY USED BY THE AUTHOR FOR INVESTIGATION OF A NUMBER OF URANIUM-235-FUELED ZPR-3 ASSEMBLIES. (1-3) THE REACTORS CONSIDERED IN THE PRESENT REPORT ARE (A) GODIVA, TOPSY, JEMIMA, JEZEBEL, POPSY, AND URANIUM-233 ASSEMBLIES CONSTRUCTED AT LOS ALAMOS; (B) THREE PLUTONIUM GRAPHITE CRITICAL ASSEMBLIES CONSTRUCTED WITH THE REACTOR VERA AT AWRE, ALDERMASTON, ENGLAND; (C) THE

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

PLUTONIUM-FUELED MARK-IV LOADING OF THE EBR-I REACTOR AT IDAHO DIVISION OF ANL; AND (D) A PLUTONIUM-AND URANIUM-235-FUELED MOCKUP IN ZPR-3 OF A PROPOSED FRENCH REACTOR, RAPSODIE. (AUTH).

456 ID-NUMBER ID-NUMBER 456

AUTHOR HENRY, H. F./ NEWLON, C. E./ KNIGHT, J. R.

TITLE EXTENSIONS OF NEUTRON INTERACTION CRITERIA

REPORT NUMBER..... K-1478

DATE PUBLISHED ... 61-07-11

NSA-NUMBER 15:23072

SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS ; OAK RIDGE -
URANIUM(93%) METAL CYLINDERS - CALCULATIONS

ABSTRACT

THE SOLID-ANGLE METHOD OF CALCULATING THEORETICAL SPACINGS BETWEEN SUBCRITS HAS BEEN EXTENDED AND APPLIED TO LARGE ARRAYS OF CYLINDERS, TO SYSTEMS OF UNITS SUBMERGED IN WATER, AND TO METAL SYSTEMS. THE RESULTING PREDICTIONS HAVE BEEN COMPARED WITH EXPERIMENTAL DATA, AND, IN MOST OF THE CASES EVALUATED, K, THE MULTIPLICATION FACTOR FOR THE SYSTEM OF CONCERN IS FOUND TO BE WITHIN +/- 5 PERCENT OF 1.00 FOR AN EXPERIMENTALLY MEASURED CRITICAL SYSTEM. FOR 5 INCH CYLINDERS IN PLANAR ARRAYS AS LARGE AS 10 X 10, THE SPACING PREDICTED BY THE THEORY IS FOUND TO BE WITHIN 0.25 INCH OF THE EXPERIMENTAL VALUES. (AUTH).

461 ID-NUMBER ID-NUMBER 461

AUTHOR KOCH, L. J./ LOEWENSTEIN, W. B./ LOVOFF, A./ HOOKER, H. H. / MONSON, H. O.
/ RAMP, R. L./ HUTTER, E.

TITLE EBR-II DRY CRITICAL EXPERIMENTS, EXPERIMENTAL PROGRAM, EXPERIMENTAL
PROCEDURES AND SAFETY CONSIDERATIONS

REPORT NUMBER..... ANL-6299

DATE PUBLISHED ... 61-02-00

SITE/PROGRAM ARGONNE NATIONAL LABORATORY - EBR-II

ABSTRACT

INTRODUCTION: THE DRY CRITICAL EXPERIMENTS ARE ZERO POWER EXPERIMENTS (LESS THAN 1 KW) TO BE CONDUCTED IN THE EBR-II REACTOR PRIOR TO FILLING THE PRIMARY SYSTEM WITH SODIUM COOLANT. THESE EXPERIMENTS HAVE TWO GENERAL OBJECTIVES:

(1) TO DETERMINE INFORMATION RELATING TO THE PERFORMANCE OF THE SYSTEM WITHOUT SODIUM COOLANT, FOR FUTURE COMPARISON WITH INFORMATION DERIVED WITH SODIUM COOLANT. BY COMPARISON, IT WILL THEN BE POSSIBLE TO ASCERTAIN VARIOUS SODIUM EFFECTS ON THE NEUTRONICS OF THE SYSTEM.

(2) TO DETERMINE AND/OR VERIFY CERTAIN OPERATIONAL DATA TO PERMIT MODIFICATION OR IMPROVEMENT OF THE SYSTEM (NEUTRON SHIELD, INSTRUMENTATION, ETC.) PRIOR TO THE INTRODUCTION OF SODIUM INTO THE SYSTEM. AFTER SODIUM FILLING IT WILL BE DIFFICULT TO ALTER, MODIFY, OR CORRECT MANY OF THE SYSTEM COMPONENTS.

INSTALLATION OF REACTOR SYSTEM EQUIPMENT IS IN PROGRESS WITH THE EXPECTATION THAT ALL EQUIPMENT ASSOCIATED WITH THE CONDUCT OF THESE EXPERIMENTS WILL BE INSTALLED BY ABOUT THE END OF APRIL, 1961. IT IS PROPOSED TO THEN BEGIN THE FINAL CHECK-OUT OPERATIONS AND TO PREPARE THE REACTOR SYSTEM FOR THE DRY CRITICAL EXPERIMENTAL PROGRAM.

CONSTRUCTION WORK WILL CONTINUE IN OTHER AREAS OF THE PLANT ASSOCIATED WITH THE SECONDARY SODIUM SYSTEM, STEAM SYSTEM, AND THE FUEL CYCLE FACILITY. NO CONSTRUCTION WORK WILL BE PERMITTED WITHIN THE AREAS INVOLVED IN THE DRY CRITICAL EXPERIMENTS (REACTOR PLANT AND CONTROL ROOM).

SOME OF THE OPERATIONAL AND SAFETY CONSIDERATIONS RELATING TO THESE EXPERIMENTS ARE DIFFERENT FROM THOSE RELATING TO POWER OPERATION OF THE REACTOR. THE EXPERIMENTAL OPERATIONS WILL BE CONDUCTED ON A ONE-SHIFT BASIS AND WILL NOT REQUIRE THE TRANSFER OF INFORMATION FROM SHIFT TO SHIFT. BECAUSE OF THE NATURE OF THE EXPERIMENT, THE OPERATIONS WILL BE PERFORMED BY LABORATORY STAFF (PHYSICISTS AND ENGINEERS) INTIMATELY FAMILIAR WITH THE SYSTEM. OTHER SIGNIFICANT CONSIDERATIONS ARE:

(1) THE MAXIMUM REACTOR POWER LEVEL WILL NOT EXCEED 1 KW.

(2) THERE WILL BE NO INITIAL CONTAMINATION OF THE FISSIONABLE AND FERTILE MATERIALS WITH FISSION PRODUCTS OR PLUTONIUM, NOR WILL A SIGNIFICANT QUANTITY OF EITHER BE GENERATED DURING THESE EXPERIMENTS.

(3) THE REACTOR CRITICAL MASS IS LARGER, AND THE CORE WILL BE AT LEAST 20 PERCENT LARGER IN DIAMETER THAN CONTEMPLATED FOR THE REACTOR WITH SODIUM PRESENT. THE REACTIVITY WORTH OF INDIVIDUAL FUEL SUBASSEMBLIES IS CONSEQUENTLY SMALLER PARTICULARLY THE WORTH OF EACH SUBASSEMBLY AT THE PERIPHERY OF THE CORE AS THE CRITICAL CONFIGURATION IS APPROACHED. THE REACTIVITY WORTH OF EACH CONTROL ROD AND SAFETY ROD IS ALSO SMALLER.

THE REDUCTION IN SAFETY ROD WORTH IS APPROXIMATELY PROPORTIONAL TO THE REDUCTION IN SUBASSEMBLY WORTH; HOWEVER, THE WORTH OF THE CONTROL RODS IS NOT REDUCED PROPORTIONALLY BECAUSE IN A LARGER CORE THEY ARE DISPOSED INSIDE THE CORE PERIPHERY.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

(4) IT WILL BE POSSIBLE TO INSTALL VIEWING APPARATUS TO PERMIT OBSERVATION OF OPERATIONS IN AND AROUND THE REACTOR.

(5) ALL EXPERIMENTS WILL BE CONDUCTED WITHIN A PRIMARY STRUCTURE AND A BUILDING CONTAINMENT SYSTEM DESIGNED FOR A POWER REACTOR.

SIMILAR EXPERIMENTS HAVE BEEN CONDUCTED IN ZPR-3 AND THE SIGNIFICANT PARAMETERS HAVE BEEN MEASURED. THESE INCLUDE THE EBR-II MOCK-UP EXPERIMENTS DESCRIBED IN APPENDIX A. ALTHOUGH THESE EXPERIMENTS WERE NOT AN EXACT MOCK-UP OF THE EBR-II DRY CRITICAL CONFIGURATION, THEY PROVIDED A SOUND BASIS FOR EXTRAPOLATION. THESE RESULTS ARE PARTICULARLY SIGNIFICANT WITH RESPECT TO CONTROL, NEUTRON SOURCE, AND INSTRUMENT RESPONSE AT LOW POWER LEVEL. (AUTH).

464 ID-NUMBER ID-NUMBER 464

AUTHOR REDMAN, W. C./ THIE, J. A.
 TITLE PROPERTIES OF EXPONENTIAL AND CRITICAL SYSTEMS OF THORIA-URANIA AND HEAVY WATER AND APPLICATION TO REACTOR DESIGN
 REPORT NUMBER.... GENEVA-2, 12, 402-413
 CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958
 DATE PUBLISHED ... 58-09-00
 NSA-NUMBER 12:15025
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - THORIUM DIOXIDE - URANIUM HEAVY WATER

ABSTRACT

THE EXPERIMENTAL PROGRAM TO ESTABLISH THE NUCLEAR PROPERTIES OF THORIA-URANIA-HEAVY WATER SYSTEMS WAS INITIATED BECAUSE OF SEVERAL DEFINITE ADVANTAGES IN A BOILING POWER REACTOR OF THIS COMPOSITION. A CERAMIC COMPOSED OF THORIUM OXIDE WITH A RELATIVELY SMALL AMOUNT OF ENRICHED URANIUM OXIDE IS PARTICULARLY ATTRACTIVE AS A FUEL ELEMENT FOR USE IN WATER REACTORS BECAUSE OF ITS CORROSION AND RADIATION STABILITY, SIMPLICITY AND ECONOMY IN FABRICATION, AND THE UTILIZATION OF THORIUM RESERVES BY CONVERSION. IN THE INITIAL STUDY OF A THORIA-URANIUM-HEAVY-WATER CORE FOR THE EBR-II IT WAS RECOGNIZED THAT THE PRECISION IN THE REQUIRED NUCLEAR DATA FOR A SYSTEM CONTAINING THORIUM WAS INADEQUATE. THIS WAS PARTICULARLY TRUE IN REGARD TO RESONANCE ESCAPE PROBABILITY AND AGE. IN ADDITION, THERE WAS MUCH UNCERTAINTY IN VOID COEFFICIENTS NECESSARY FOR BOILING REACTOR DESIGN. CONSEQUENTLY EXPONENTIAL AND CRITICAL FACILITIES WERE CONSTRUCTED TO ACQUIRE BOTH GENERAL INFORMATION ON LATTICE AND CRITICALITY PARAMETERS AND DATA ON VOID COEFFICIENTS OF REACTIVITY OF DOMINANT INTEREST IN BOILING SYSTEMS.

465 ID-NUMBER ID-NUMBER 465

AUTHOR ARMSTRONG, J. W. / BEIDELMAN, J. A./ KAUFMANN, S. G./ PLUMLEE, K. E.
 TITLE EXPERIMENTS WITH THORIA-URANIA-DEUTERIUM OXIDE WATER CRITICALS
 REPORT NUMBER.... TANSO, 01, 1, 098-099
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 58-06-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - THORIUM DIOXIDE - URANIUM HEAVY WATER

ABSTRACT

INITIAL RESULTS OBTAINED IN AN EXPERIMENTAL INVESTIGATION OF THE NUCLEAR PROPERTIES OF A THORIA-URANIA HEAVY WATER SYSTEM WERE PRESENTED AT THE SECOND WINTER MEETING OF THE ANS. RECENT EXPERIMENTS HAVE EXPLORED THE EFFECT OF DEVIATIONS FROM AN IDEAL 3/4 INCH TRIANGULAR LATTICE SPACING OF THE FUEL PINS ON THE BUCKLING AND MIGRATION AREA. MEASUREMENTS OF THE DISADVANTAGE FACTOR, REFLECTOR SAVINGS AND PHOTONEUTRON INTENSITY ARE ALSO REPORTED.

THE FIRST SYSTEM STUDIED WAS A 3/4 INCH TRIANGULAR LATTICE OF ONE-QUARTER INCH DIAMETER FUEL HAVING A 25 TO 1 ATOM RATIO OF THORIUM TO THORIUM TO URANIUM-235, LOADED INTO ELEMENT HOLDERS WHICH FITTED AMONG A PATTERN OF CONTROL ROD GUIDE CHANNELS DUPLICATING THE EBR-II STRUCTURE. SUBSEQUENTLY THE FUEL RODS IN EACH ELEMENT WERE CLUSTERED AT ITS CENTER WITH A 3/4 INCH SPACING, AND FINALLY THE ENTIRE CORE STRUCTURE WAS REPLACED BY THREE LAYERS OF PERFORATED SHEET WHICH ALLOWED THE ASSEMBLY OF A 3/4 INCH LATTICE FREE OF INTERRUPTIONS DUE TO THE CONTROL ROD GUIDE CHANNELS AND THE STRUCTURE OF THE FUEL ROD HOLDERS. THE BUCKLINGS FOR THESE THREE GEOMETRIES WERE 1.89, 1.78 AND 1.99 E-3 CM⁻² (-2), RESPECTIVELY. THE MODIFIED MIGRATION AREA, $\tau + (L \cdot \tau + (L \cdot B) \cdot \tau)$, WAS DETERMINED BY THE DIFFERENTIAL WATER WORTH METHOD TO BE 188 CM⁻². (AUTH.).

466 ID-NUMBER ID-NUMBER 466

AUTHOR REDMAN, W. C./ KAUFMANN, S. G./ PLUMLEE, K. E./ BAIRD, Q. L.
 TITLE CRITICAL EXPERIMENTS WITH THORIA-URANIA FUEL IN HEAVY WATER
 REPORT NUMBER.... ANL-6378
 DATE PUBLISHED ... 61-12-00
 NSA-NUMBER 16:9344
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - THORIUM DIOXIDE - URANIUM HEAVY WATER

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE NUCLEAR CHARACTERISTICS OF A VARIETY OF SMALL REACTORS COMPOSED OF THORIA-URANIA FUEL IN HEAVY WATER HAVE BEEN DETERMINED IN A PROGRAM OF CRITICAL EXPERIMENTATION. THE FUEL ELEMENT CONSISTED OF CERAMIC THORIUM-OXIDE/URANIUM-OXIDE PELLETS STACKED TO A HEIGHT OF 1.5 M WITHIN 0.787- CM-OD ALUMINUM TUBING. THE PELLETS USED MOST FREQUENTLY WERE OF 0.587-CM DIAMETER AND HAD A THORIUM/URANIUM-235 ATOM RATIO OF 25. RODS CONTAINING SIMILAR PELLETS WITH ONLY HALF AS MUCH URANIUM-235 WERE USED TO ACHIEVE SMALL CHANGES IN THE URANIUM-235 CONTENT OF THE CORES. SOME CORES WERE ASSEMBLED WITH 0.660-CM-DIAMETER PELLETS HAVING AN ATOM RATIO OF 15. ALL CORES WERE LOCATED IN A 2-M-DIAMETER TANK CONTAINING DEUTERIUM-OXIDE.

THREE DISTINCT CORE STRUCTURES WERE USED, ALLOWING MEASUREMENTS WITH UNIFORMLY DISTRIBUTED FUEL RODS, LOADING PATTERNS COMPATIBLE WITH THE EBWR CORE GEOMETRY, AND CLUSTERED LATTICE ARRANGEMENTS WITH DEUTERIUM-OXIDE, WATER, AND AIR SURROUNDING THE CLUSTERED FUEL. MOST OF THE CORES ASSEMBLED HAD SOME AMOUNT OF RADIAL DEUTERIUM-OXIDE REFLECTOR. A 0.3-M-THICK BOTTOM REFLECTOR COMPOSED OF DEUTERIUM-OXIDE AND ALUMINUM WAS ALWAYS PRESENT.

467 ID-NUMBER ID-NUMBER 467

AUTHOR KRASNIN, A. K. / DUBOVSKY, B. G. / LANTSOV, M. N. / GLAZKOV, Y. Y. /
GONCHOROV, R. K. / KAMAEV, A. V. / VAVILOV, V. V. / INYUTIN, E. I. /
SENCHENKOV, A. P.

TITLE PHYSICAL CHARACTERISTICS OF BERYLLIUM MODERATED REACTOR

REPORT NUMBER.... GENEVA-2, 12, 571-579

CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958

DATE PUBLISHED ... 58-09-00

NSA-NUMBER 13:7178

SITE/PROGRAM USSR - URANIUM(10%) - BERYLLIUM

ABSTRACT

THE PAPER OUTLINES THE EXPERIMENTAL RESULTS OBTAINED WITH ZERO POWER BERYLLIUM MODERATED REACTOR. THE REACTOR WAS ASSEMBLED FOR OBTAINING EXPERIMENTAL VALUES OF CRITICAL MASSES, FOR DETERMINING LATTICE MULTIPLICATION PARAMETERS, FOR INVESTIGATING THE CONTRIBUTION OF THE BERYLLIUM(N,2N) REACTION TO THE VALUE OF THE EFFECTIVE MULTIPLICATION FACTOR AND FOR STUDYING THE EFFECT OF DELAYED PHOTONEUTRONS ON THE REACTOR KINETICS. THE QUANTITY OF BERYLLIUM (1500 KG) AT OUR DISPOSAL WAS INSUFFICIENT FOR INVESTIGATING THE CRITICAL ASSEMBLIES OF BERYLLIUM WITH NATURAL OR SLIGHTLY ENRICHED URANIUM. APART FROM THIS, COSTLY BERYLLIUM COULD NOT COMPETE IN THE NEAR FUTURE WITH GRAPHITE AND ORDINARY WATER, THE MORE AVAILABLE MODERATORS. FOR THIS REASON IT SEEMED MORE EXPEDIENT TO USE BERYLLIUM FOR STUDYING SMALL-SIZED REACTORS WITH ENRICHED URANIUM.(AUTH).

468 ID-NUMBER ID-NUMBER 468

AUTHOR CAMPBELL, R. W./ DOYAS, R. J./ FIELD, H. C./ GUDERJAHN, C. A./ GUENTHER, R.
L./ HAUSKNECT, D. F./ MAYER, M. S./ MOREWITZ, H. A.

TITLE CRITICAL EXPERIMENTS ON SLIGHTLY ENRICHED URANIUM METAL FUEL ELEMENTS IN
GRAPHITE LATTICES

REPORT NUMBER.... NAA-SR-7541

DATE PUBLISHED ... 63-06-30

NSA-NUMBER 18:16739

SITE/PROGRAM ATOMICS INTERNATIONAL - URANIUM(2%) METAL - GRAPHITE

ABSTRACT

A SERIES OF CLEAN CRITICAL EXPERIMENTS WAS PERFORMED IN THE SGR CRITICAL FACILITY UTILIZING 2 WT% ENRICHED, URANIUM METAL, HOLLOW CYLINDER, FUEL ELEMENTS IN AGOT GRAPHITE MODERATOR. SIX LATTICE SPACINGS WERE USED, VARYING FROM 6.93 TO 16.0 INCH ON A TRIANGULAR PITCH. CRITICAL LOADINGS AND FUEL ELEMENT WORTHS WERE DETERMINED AND COMPARED TO THE RESULTS OF 4-GROUP DIFFUSION THEORY. CALCULATIONS UTILIZED TEMPEST, S-4 FORM, AND AIM-5 PROGRAMS ON THE IBM 7090. THE CALCULATED K(EFF) COMPARES WELL WITH EXPERIMENTS OVER THE FULL RANGE OF MODERATOR-TO-FUEL VOLUME RATIOS WHEN USING A 2200M/SEC GRAPHITE ABSORPTION CROSS SECTION OF 4.07 MILLIBARN. THE SENSITIVITY OF THE CALCULATION TO VARIATIONS IN THE GRAPHITE ABSORPTION CROSS SECTION WAS EXAMINED AND THE EXPERIMENTAL ERROR DUE TO INVENTORY UNCERTAINTIES WAS ASSESSED. THE DIFFERENTIAL WORTHS OF BOTH THE CENTRAL AND PERIPHERAL FUEL ELEMENTS WERE OBTAINED AND AGREED IN GENERAL WITH AIM-5 CALCULATIONS. THE THERMAL FLUX TRAVERSE OF A UNIT CELL WAS SHOWN TO AGREE BEST WITH A WILKINS' SPECTRUM OPTION OF TEMPEST.

DETAILS OF BOTH THE EXPERIMENTAL AND THEORETICAL METHODS ARE GIVEN. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

469 ID-NUMBER ID-NUMBER 469

AUTHOR KRASIK, S./ RADKOWSKY, A.
 TITLE PRESSURISED WATER REACTOR (P.W.R.) CRITICAL EXPERIMENTS
 REPORT NUMBER..... GENEVA-1, 05, 203-214
 CONFERENCE FIRST UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
 ATOMIC ENERGY, GENEVA, SWITZERLAND, 8-20 AUGUST 1955
 DATE PUBLISHED ... 55-08-00
 SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - PWR CRITICAL EXPERIMENTS

ABSTRACT

THE AIMS OF THE PWR CRITICAL EXPERIMENT PROGRAM ARE (1) TO PROVIDE ESSENTIAL REACTOR PHYSICS INFORMATION WHICH CANNOT BE OBTAINED BY AVAILABLE CALCULATIONAL PROCEDURES, (2) TO PROVIDE GENERAL GUIDANCE TO THE ANALYTICAL NUCLEAR DESIGN PROGRAM AND (3) TO SUBSTANTIATE AND VERIFY THE SIGNIFICANT REACTOR CALCULATIONS. THERE ARE TWO DISTINCT PARTS TO THE CRITICAL EXPERIMENT PROGRAM WHICH MEET SUBSTANTIALLY DIFFERENT NEEDS.

ONE PART OF THE PROGRAM RELATES SPECIFICALLY TO THE ACTUAL PWR DESIGN. THE INFORMATION DEVELOPED IN THIS PART OF THE PROGRAM DEALS PRIMARILY WITH REACTOR CONTROL, FLUX DISTRIBUTIONS AND THE TEMPERATURE COEFFICIENT OF REACTIVITY. BY ITS NATURE AN EXPERIMENT DESIGNED TO PROVIDE THIS TYPE OF INFORMATION BECOMES IN MANY RESPECTS A NUCLEAR MOCKUP OF THE ACTUAL REACTOR DESIGN.

THE OTHER PART OF THE EXPERIMENTAL REACTOR PHYSICS PROGRAM AND OF EQUAL IMPORTANCE TO THE FIRST AIMS TO PROVIDE EXPERIMENTAL INFORMATION OF CONSIDERABLY BROADER SCOPE. AS REMARKED ABOVE THE NUCLEAR MOCKUP EXPERIMENT PROVIDES LITTLE OR NO EXPLANATION OF BASIC DIFFICULTIES WHICH MAY ARISE IN A DESIGN AND EQUALLY LITTLE GUIDANCE AS TO SIGNIFICANT DIRECTIONS IN REACTOR DESIGN. THE SECOND PART OF THE EXPERIMENTAL PROGRAM, PARTICULARLY WHEN COUPLED WITH A STRONG THEORETICAL PROGRAM, SUPPLIES THIS NEED.

472 ID-NUMBER ID-NUMBER 472

AUTHOR DAVISON, P. W. / BERG, S. S. / BERGMANN, W. H. / HANLEN, D. F. / JENNINGS, B. / LEAMER, R. D. / HOWARD, J. E.
 TITLE YANKEE CRITICAL MEASUREMENTS - MEASUREMENTS ON LATTICES OF STAINLESS STEEL CLAD SLIGHTLY ENRICHED URANIUM DIOXIDE FUEL RODS IN LIGHT WATER
 REPORT NUMBER..... YAE-094
 DATE PUBLISHED ... 59-04-01
 NSA-NUMBER 12:14618
 SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - YANKEE REACTOR - URANIUM DIOXIDE - WATER

ABSTRACT

TO AID IN THE ANALYTICAL DESIGN OF THE CORE FOR THE POWER REACTOR FOR THE YANKEE ATOMIC ELECTRIC COMPANY, MEASUREMENTS HAVE BEEN MADE OF VARIOUS REACTOR PARAMETERS IN A COLD CLEAN CRITICAL ASSEMBLY OF DESIGN SIMILAR TO THE POWER REACTOR. IN ORDER TO BETTER SIMULATE THE EFFECTS OF LARGE TEMPERATURE CHANGES IN THE CORE, THREE CORE CONFIGURATIONS WERE STUDIED HAVING WATER/URANIUM RATIOS OF 2.19, 2.93 AND 3.87. THE FOLLOWING MEASUREMENTS WERE MADE: CRITICAL SIZE, BUCKLING AND REFLECTOR SAVINGS, MIGRATION AREA, DISADVANTAGE FACTOR AND CADMIUM RATIOS. THE RESONANCE ESCAPE PROBABILITY AND FAST FISSION FACTOR WERE MEASURED IN THE 2.93 AND 3.87 WATER/URANIUM CORES. THE EFFECTS ON CORE REACTIVITY OF TEMPERATURE, VOIDS, INSERTION OF CONTROL RODS AND OF STAINLESS STEEL WERE ALSO MEASURED. NEUTRON FLUX DISTRIBUTIONS IN THE CORE WERE DETERMINED IN THE NEIGHBORHOOD OF CONTROL RODS AND THROUGH GAPS AND SLOTS IN THE FUEL CONFIGURATION. WHERE APPLICABLE, THE RESULTS OF THESE MEASUREMENTS ARE CORRELATED WITH THE WATER/URANIUM RATIO. (AUTH).

474 ID-NUMBER ID-NUMBER 474

AUTHOR POND, J. A.
 TITLE CRITICAL GEOMETRIES FOR BARE CYLINDERS
 REPORT NUMBER..... GAT-189
 DATE PUBLISHED ... 56-07-20
 NSA-NUMBER 11:1322
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER - CALCULATIONS

ABSTRACT

IN SECTION I, A MODIFIED TWO-GROUP TREATMENT IS USED TO STUDY NEUTRON TRANSPORT IN AQUEOUS SOLUTIONS OF URANYL FLUORIDE. FOR A BARE REACTOR, THE CRITICAL CONDITION $k = (\eta) \cdot (f) \cdot (u_{\text{SUB-T}}) \cdot (u_{\text{SUB-F}}) = 1$ IS INVESTIGATED. THIS IS TESTED ON EXPERIMENTAL DATA FROM CRITICAL MASS STUDIES CARRIED OUT AT THE UNION CARBIDE NUCLEAR COMPANY. IT IS SHOWN THAT AN ALWAYS-SAFE, UNREFLECTED CYLINDER DIAMETER OF 20 CM. RESULTS FROM THIS ARGUMENT AS DOES AN ALWAYS-SAFE MODERATION, HYDROGEN/X = 2270. THE DERIVED SAFE RADIUS FOR A CYLINDER OF INFINITE LENGTH, R, IS DEVELOPED AS A FUNCTION

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

OF MODERATION HYDROGEN/X. THE DERIVED CRITICAL RADIUS FOR A BARE SPHERE, $R(\text{SUB-S, SUPER-BC})$, IS EXPRESSED AS A FUNCTION OF BOTH URANIUM-235 ASSAY AND MODERATION.

IN SECTION II, THE MULTIPLICATION FACTOR, K , IS DEVELOPED FOR A SYSTEM OF RIGHT CIRCULAR CYLINDERS IN LINE. IN EACH CASE, K IS EXPRESSED IN TERMS OF $\Omega(\text{AVERAGE, SUB-F})$, THE AVERAGE FRACTIONAL SOLID ANGLE SUBTENDED BY A CYLINDER ON AN ADJACENT CYLINDER. DATA ARE PRESENTED FOR CRITICAL SYSTEMS SHOWING HOW NEARLY THE CONDITION $K = 1$ IS SATISFIED BY CRITICAL DATA TAKEN FROM STUDIES CONDUCTED BY THE UNION CARBIDE NUCLEAR COMPANY. (AUTH).

475 ID-NUMBER ID-NUMBER 475

AUTHOR SPRINGER, T. H./ TUTTLE, R. J./ OTTER, J. M./ PASCHALL, R. K.
 TITLE DOPPLER AND RELATED MEASUREMENTS IN A SOFT FAST-REACTOR SPECTRUM
 REPORT NUMBER.... AI-AEC-12705
 DATE PUBLISHED ... 69-00-00
 SITE/PROGRAM ATOMICS INTERNATIONAL - LMFBR - EPITHERMAL CRITICAL EXPERIMENT LABORATORY

ABSTRACT

THIS REPORT DEALS WITH A GROUP OF BOTH THEORETICAL AND EXPERIMENTAL INVESTIGATIONS WHICH HAVE BEEN CARRIED OUT, UTILIZING CORE 15, ONE IN A SERIES OF CRITICAL ASSEMBLIES THAT HAVE BEEN CONSTRUCTED AT ATOMICS INTERNATIONAL'S EPITHERMAL CRITICAL EXPERIMENTS LABORATORY (ECEL). CORE 15 CONTAINS A URANIUM-235--URANIUM-238 FUELED, FAST-SPECTRUM TEST REGION, CHARACTERIZED BY A MEDIAN FISSION ENERGY (MFE) OF 18 KEV. THE INVESTIGATIONS INCLUDED STUDIES OF THE NEUTRON ENERGY SPECTRUM, THE REACTIVITY WORTHS, AND THE DOPPLER COEFFICIENTS OF VARIOUS CANDIDATE LIQUID METAL, FAST BREEDER REACTOR (LMFBR) MATERIALS. THE LATTER TWO STUDIES WERE PERFORMED ON SMALL HEATED SAMPLES, NOT ONLY IN THE UNPERTURBED CORE BUT ALSO IN AN ENVIRONMENT IN WHICH THE SAMPLES WERE SURROUNDED BY "BLANKETS" OF FERTILE MATERIALS WHICH COULD BE HEATED TO 400 DEGREE CENTIGRADE. THE HEATED BLANKET TECHNIQUE PERMITTED DETAILED EXPERIMENTAL INVESTIGATION OF THE SO-CALLED "HOT SAMPLE - COLD REACTOR" PROBLEM.

THESE EXPERIMENTS SHOW THAT, AS A RESULT OF FLUX DEPRESSIONS AT THE RESONANCES, LARGE DECREASES IN THE DOPPLER COEFFICIENTS OF THORIUM AND URANIUM-238 OCCUR WHEN A BLANKET OF THE SAME MATERIAL AS THE SAMPLE IS INTRODUCED IN THE IMMEDIATE ENVIRONMENT. WHEN THE SURROUNDING BLANKET OF THE SAME MATERIAL IS HEATED TO 400 DEGREE CENTIGRADE, A FURTHER DECREASE IN THE DOPPLER COEFFICIENT IS OBSERVED. THE IMPLICATION IS THAT A SIMILAR REDUCTION IN THE DOPPLER EFFECT OF A PARTICULAR ISOTOPE WOULD OCCUR IN A LMFBR IN WHICH THAT ISOTOPE EXISTS IN LARGE QUANTITIES. (AUTH).

476 ID-NUMBER ID-NUMBER 476

AUTHOR HERMANN, O. W.
 TITLE A GENERALIZED AND CONSISTENT METHOD FOR CALCULATING THE CRITICAL MASS OF
 HOMOGENEOUS AQUEOUS URANYL FLUORIDE SOLUTIONS
 REPORT NUMBER.... KY-294
 DATE PUBLISHED ... 58-10-01
 NSA-NUMBER 13:16107
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER - CALCULATIONS ; OAK RIDGE -
 URANIUM(2-5%) - PARAFFIN - CALCULATIONS ; OAK RIDGE - URANYL(4.9%)FLUORIDE
 - WATER - CALCULATIONS

ABSTRACT

A MORE ENCOMPASSING, YET CONSISTENT AND PRACTICAL, METHOD OF CALCULATING THE CRITICAL MASS OF AQUEOUS URANYL FLUORIDE SOLUTIONS HAS BEEN DEVELOPED. COMPARISON OF CALCULATED RESULTS WITH EXPERIMENTATION GAVE A MAXIMUM OF ONLY 2.3 PERCENT ERROR IN THE EFFECTIVE MULTIPLICATION FACTOR AND 9 PERCENT ERROR IN THE CRITICAL MASS, WITH ABSOLUTE AVERAGES OF 0.7 PERCENT AND 3.4 PERCENT, RESPECTIVELY, THROUGH THE RANGES FROM HIGH MODERATION DOWN TO AN HYDROGEN/URANIUM OF 25 FOR 90 PERCENT URANIUM-235 ASSAYS OR AN HYDROGEN-URANIUM OF 4 FOR 2 PERCENT URANIUM-235 ASSAYS. (AUTH).

481 ID-NUMBER ID-NUMBER 481

AUTHOR CLARK, H. K.
 TITLE COMPARISON OF A SIMPLE THEORETICAL TREATMENT OF CRITICAL ARRAYS OF
 FISSIONABLE UNITS WITH EXPERIMENT
 REPORT NUMBER.... DP-868
 DATE PUBLISHED ... 64-01-00
 NSA-NUMBER 28:32506
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS - CALCULATIONS ; OAK RIDGE -
 URANYL(92%)SALTS - WATER - CALCULATIONS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

CALCULATIONS OF THE CRITICAL SIZES OF CUBIC ARRAYS OF INTERACTING FISSIONABLE UNITS ARE COMPARED WITH CRITICAL EXPERIMENTS. THE UNITS WERE OF TWO TYPES: VESSELS CONTAINING 5 LITERS OF AN AQUEOUS SOLUTION OF HIGHLY ENRICHED URANIUM AND CYLINDERS OF HIGHLY ENRICHED URANIUM METAL. THE ARRAYS WERE SURROUNDED BY VARIOUS THICKNESSES OF HYDROGENOUS REFLECTORS. AGREEMENT BETWEEN CALCULATION AND EXPERIMENT IS REASONABLY GOOD WHEN CONSIDERATION IS GIVEN TO THE SIMPLICITY OF THE METHOD OF CALCULATION. CURVES ARE PRESENTED FOR COMPUTING CRITICAL SIZES OF CUBIC ARRAYS OF 8, 27, 64, OR 125 IDENTICAL UNITS AS A FUNCTION OF THE ALBEDO OF THE REFLECTOR SURROUNDING THE ARRAY AND OF THE REACTIVITY OF AN INDIVIDUAL UNIT. (AUTH).

483 ID-NUMBER ID-NUMBER 483

AUTHOR SCHUSKE, C. L.
 TITLE NEUTRON MULTIPLICATION MEASUREMENTS OF PARALLEL ARRAYS OF ORALLOY UNITS
 REPORT NUMBER..... RFP-0059
 DATE PUBLISHED ... 60-11-14
 NSA-NUMBER 12:506
 SITE/PROGRAM ROCKY FLATS - URANIUM(93%) ARRAYS - CONCRETE REFLECTED

ABSTRACT

SEVERAL SUB-CRITICAL CONFIGURATIONS OF ORALLOY UNITS (APPROXIMATELY 32-KG ORALLOY EQUIVALENT PER UNIT) IN A CLOSE-FITTING CONCRETE VAULT, ARE PRESENTED. (AUTH).

484 ID-NUMBER ID-NUMBER 484

AUTHOR ROTHE, R. E.
 TITLE CRITICAL MASSES FOR PARTIALLY STEEL REFLECTED ENRICHED URANIUM METAL ASSEMBLIES
 REPORT NUMBER..... RFP-1021
 DATE PUBLISHED ... 67-09-18
 NSA-NUMBER 21:44947
 SITE/PROGRAM ROCKY FLATS - URANIUM(93%) METAL - SPHERES

ABSTRACT

SIXTY-ONE CRITICAL MASSES WERE MEASURED FOR SPHERICAL OR HEMISPHERICAL ENRICHED URANIUM ASSEMBLIES. THE ASSEMBLIES DIFFERED IN THE AMOUNT OF MILD-STEEL REFLECTOR OUTSIDE THE URANIUM. THEY ALSO DIFFERED IN THE SIZE OF A CENTRAL CAVITY IN THE URANIUM. THE CAVITY WAS FORMED BY THE OMISSION OF SMALL-RADIUS URANIUM COMPONENTS FROM THE ASSEMBLY. THIS CENTRAL CAVITY CONTAINED EITHER AIR OR MILD STEEL. THE CRITICAL MASSES WERE DETERMINED BY THE EXTRAPOLATION OF RECIPROCAL MULTIPLICATION DATA FOR SUBCRITICAL ASSEMBLIES. (AUTH).

485 ID-NUMBER ID-NUMBER 485

AUTHOR JARVIS, G. A./ MILLS, C. B.
 TITLE CRITICAL MASS REDUCTION
 REPORT NUMBER..... LA-3651
 DATE PUBLISHED ... 67-03-22
 NSA-NUMBER 21:23606
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) - LUCITE - POLYETHYLENE ; LOS ALAMOS -
 URANIUM(93%) - LUCITE - POLYETHYLENE

ABSTRACT

A NEW LOW VALUE FOR THE CRITICAL MASS OF URANIUM-235 IN A CRITICAL REACTOR ASSEMBLY HAS BEEN DETERMINED. THIS VALUE IS 250 GRAMS OF URANIUM-235 IN A POLYETHYLENE CORE SURROUNDED BY A THICK BERYLLIUM REFLECTOR. (AUTH).

487 ID-NUMBER ID-NUMBER 487

AUTHOR CLAYTON, E. D.
 TITLE PROGRESS IN PLUTONIUM CRITICAL MASS PHYSICS, 1961-1964
 REPORT NUMBER..... HW-83603
 DATE PUBLISHED ... 64-10-00
 NSA-NUMBER 19:13703

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM: HANFORD - PLUTONIUM NITRATE IN WATER ; HANFORD - PLUTONIUM DIOXIDE -
POLYSTYRENE COMPACTS

ABSTRACT

THIS REPORT IS A BRIEF REVIEW OF THE TECHNICAL ACCOMPLISHMENTS AND OF THE RELEVANT ACTIVITIES PERFORMED IN THE HANFORD PLUTONIUM CRITICAL MASS LABORATORY SINCE BEGINNING OPERATIONS IN THE FACILITY DURING 1961.

THE PRINCIPAL CONCERN OF NUCLEAR SAFETY IS THE PREVENTION OF ACCIDENTAL CHAIN REACTIONS IN NONREACTOR ENVIRONMENTS. WITH THE APPLICATION OF SUITABLE CONTROLS, FISSILE MATERIALS MAY BE PROCESSED BOTH SAFELY AND ECONOMICALLY. THE PAUCITY OF DATA ON THE CRITICALITY OF PLUTONIUM AND THE UNCERTAINTY WHICH EXISTS IN THEORETICAL VALUES REQUIRE AN EXPERIMENTAL PROGRAM OF CRITICALITY STUDIES TO OBTAIN DATA NEEDED FOR IMPROVING NUCLEAR SAFETY IN PLUTONIUM PROCESSING OPERATIONS. DURING THE PAST 3 YEARS SEVERAL HUNDRED CRITICAL MASS DETERMINATIONS HAVE BEEN MADE WITH PLUTONIUM IN A CRITICAL MASS LABORATORY AT HANFORD. THIS FACILITY, A PART OF THE HANFORD LABORATORIES, WAS SPECIALLY DESIGNED AND EQUIPPED TO HANDLE PLUTONIUM. SINCE OPERATIONS BEGAN IN MID-1961, OVER 300 CRITICAL EXPERIMENTS HAVE BEEN PERFORMED WITH PLUTONIUM. NEARLY THREE-FOURTHS OF THESE WERE PERFORMED WITH PLUTONIUM NITRATE SOLUTIONS, THE OTHERS WERE PERFORMED WITH PLUTONIUM DIOXIDE- PLASTIC MIXTURES (SOLIDS) USING A REMOTE SPLIT-TABLE MACHINE. THE FIRST CRITICALITY WAS ACHIEVED WITH PLUTONIUM NITRATE SOLUTIONS ON JULY 21, 1961, AND CRITICALITY WAS INITIALLY ACHIEVED WITH THE FIRST SOLID ASSEMBLY (PLUTONIUM DIOXIDE-POLYSTYRENE COMPACTS AT AN HYDROGEN/ PLUTONIUM ATOMIC RATIO OF 15) ON AUGUST 21, 1963.) THERE HAVE BEEN NO UNUSUAL INCIDENTS INVOLVING ANY OF THE CRITICAL ASSEMBLIES DURING THE CONDUCT OF THESE EXPERIMENTS. (AUTH).

490 ID-NUMBER ID-NUMBER 490

AUTHOR: CHALMERS, J. H./ WALKER, G./ PUGH, J.

TITLE: HANDBOOK OF CRITICALITY DATA, VOLUME I

REPORT NUMBER....: AHSB(S) HANDBOOK-1

DATE PUBLISHED ...: 65-00-00

NSA-NUMBER: 20:1410

SITE/PROGRAM: GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

THE HANDBOOK OF CRITICALITY DATA, AHSB(S) HANDBOOK 1, WAS FIRST PUBLISHED IN 1960 TO GIVE GUIDANCE TO PLANT DESIGNERS AND OPERATORS ON THE CRITICAL PARAMETERS OF THE MOST REACTIVE SYSTEMS LIKELY TO BE ENCOUNTERED IN PROCESS PLANTS. FOR THIS REASON, EXCEPT IN A FEW INSTANCES, ONLY METAL/WATER DATA WERE CONSIDERED AND IN ALL CASES FULL WATER REFLECTION WAS ASSUMED.

IN THIS REVISED EDITION MANY OF THESE PARAMETERS HAVE BEEN REASSESSED IN THE LIGHT OF BETTER INFORMATION, AND THE CURRENT BEST ESTIMATES ARE PRESENTED. ADDITIONAL COMPOUNDS OF PLUTONIUM AND URANIUM ARE INCLUDED AND SOME ACCOUNT IS TAKEN OF THE NEUTRON POISONING EFFECTS OF THE NITRATE ION AND OF PLUTONIUM-240. UNREFLECTED DATA ARE ALSO INCLUDED.

NO THEORETICAL JUSTIFICATION OF THE DATA IS GIVEN, NOR IS CORRELATION WITH EXPERIMENT SHOWN ON THOSE GRAPHS WHERE THE INFORMATION IS FIRMLY ESTABLISHED. IN CASES WHERE SUFFICIENT EXPERIMENTAL EVIDENCE OR DATA CHECK POINTS ARE NOT AVAILABLE, GRAPHS ARE OVERPRINTED AS PROVISIONAL. THE BASIS OF CALCULATION IS GIVEN AND QUANTITATIVE COMPARISON WITH OTHER KNOWN CALCULATIONS IS QUOTED AS APPROPRIATE. DATA IN THIS CATEGORY ARE INCLUDED SPECIFICALLY FOR THE INFORMATION OF EXPERIENCED NUCLEAR SAFETY TEAMS WHO CAN APPLY IT JUDICIOUSLY. OTHER USERS MUST REGARD IT AS SPECULATIVE AND SHOULD SEEK ADVICE FROM THE APPROPRIATE SPECIALIST GROUP ON ITS APPLICATION TO PARTICULAR PROBLEMS. DOTTED LINES ARE USED TO INDICATE THE PROBABLE SHAPE OF CURVES.

THIS HANDBOOK WILL BE EXTENDED PROGRESSIVELY TO INCLUDE FURTHER PARAMETRIC SURVEYS AND, IN ADDITION, THE RESULTS OF AD HOC CALCULATIONS AND OTHER MISCELLANEOUS DATA WHICH MAY BE OF INTEREST. (AUTH).

491 ID-NUMBER ID-NUMBER 491

AUTHOR: BLAINE, R./ FROELICH, R./ GREENSPAN, H./ LATHROP, K./ TURNER, W./ VONDY,
D./ WACHSPRESS, E.

TITLE: ARGONNE CODE CENTER: BENCHMARK PROBLEM BOOK, NUMERICAL DETERMINATION OF
THE SPACE, TIME, ANGLE, OR ENERGY DISTRIBUTION OF PARTICLES IN AN ASSEMBLY

REPORT NUMBER....: ANL-7416

DATE PUBLISHED ...: 68-02-00

NSA-NUMBER: 22:46693

SITE/PROGRAM: GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

PREFACE: THIS BOOK IS AN OUTGROWTH OF ACTIVITIES OF THE BENCHMARK PROBLEM COMMITTEE OF THE MATHEMATICS AND COMPUTATION DIVISION OF THE AMERICAN NUCLEAR SOCIETY. AFTER MUCH DISCUSSION AND CONSIDERATION OF SAMPLE BENCHMARK PROBLEMS, THE COMMITTEE DECIDED TO RESTRICT THIS FIRST PUBLICATION TO A SPECIFIC AREA WHICH ENCOMPASSES A MAJOR PORTION OF REACTOR-PHYSICS COMPUTATIONS.

THE OBJECTIVES AND THEIR IMPLEMENTATION ARE DESCRIBED IN THE INTRODUCTORY MATERIAL. A FEW SAMPLE BENCHMARK PROBLEMS PREPARED BY COMMITTEE MEMBERS HAVE BEEN INCLUDED IN THE INITIAL BOOK SKELETON.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE STRUCTURE AND MECHANISM FOR MAINTAINING THIS BOOK WERE DESIGNED TO FACILITATE USE OF THE BENCHMARK PROBLEMS IN A VARIETY OF WAYS WITHOUT EXCESSIVE PAPERWORK. THIS FIRST EFFORT IS AN ATTEMPT TO ESTABLISH A WORKABLE FRAMEWORK UPON WHICH THIS AND OTHER BENCHMARK PROBLEM BOOKS MAY BE DEVELOPED. (AUTH).

494 ID-NUMBER ID-NUMBER 494

AUTHOR ROTHE, R. E.
 TITLE CRITICAL MEASUREMENTS ON AN ENRICHED URANIUM SOLUTION SYSTEM
 REPORT NUMBER..... NSENAO, 35, 267-276
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 69-02-00
 NSA-NUMBER 23:15688
 SITE/PROGRAM ROCKY FLATS - BORON/STAINLESS STEEL PLATES

ABSTRACT

CRITICAL PARAMETERS ARE REPORTED FOR AN ESSENTIALLY UNREFLECTED SYSTEM CONTAINING URANIUM SOLUTION AND A FIXED NEUTRON POISON. THE URANIUM SOLUTION CONTAINED 450.8 G OF URANIUM PER LITER. THE URANIUM WAS ENRICHED TO 93.19 WT PERCENT URANIUM-235. THE FIXED POISON WAS NATURAL BORON CONTAINED IN STAINLESS STEEL PLATES AND COMPRISED 1.02 WT PERCENT OF THE PLATES. THE TOTAL BORON CONTENT WAS VARIED ON SUCCESSIVE RUNS BY CHANGING THE NUMBER OF PLATES. THE PLATES WERE ARRANGED ALONG PARALLEL CHORDS OF THE 106.6-CM-DIAM CYLINDRICAL EXPERIMENTAL TANK; THEY WERE APPROXIMATELY UNIFORMLY SPACED.

THREE TYPES OF MEASUREMENTS ARE REPORTED. THE FIRST TYPE PROVIDES DATA ON AN UNPOISONED SLAB. IN THE SECOND TYPE, THE URANIUM SOLUTION HEIGHT AT CRITICALITY WAS LESS THAN THE HEIGHT OF THE PLATES (119 CM) AND PROVIDED DATA ON A POISONED SOLUTION CYLINDER. WHEN THE BORON CONCENTRATION WAS 16.41 GRAMS/LITER, THE CYLINDER WAS SUBCRITICAL EVEN IF INFINITELY LONG. THE THIRD TYPE OF MEASUREMENT, WHERE THE CRITICAL URANIUM SOLUTION HEIGHT EXCEEDED THE PLATE HEIGHT, ALLOWED AN EVALUATION OF THE INTERACTION BETWEEN AN UNPOISONED SLAB AND A HIGHLY POISONED REGION. THE HIGHEST BORON CONCENTRATION MEASURED WAS 20.62 GRAMS/LITER.

THE EXPERIMENTAL DATA ARE COMPARED WITH RESULTS FROM NEUTRON TRANSPORT AND DIFFUSION COMPUTER CODES. COMPUTER RESULTS ALSO PROVIDE ASYMPTOTIC VALUES FOR CRITICAL PARAMETERS NOT AMENABLE TO MEASUREMENT BECAUSE OF APPARATUS LIMITATIONS. FINALLY, THE COMPUTER WAS USED TO EXTEND THE APPLICABILITY OF THE DATA TO MORE GENERAL SYSTEMS. (AUTH).

500 ID-NUMBER ID-NUMBER 500

AUTHOR KISTNER, G./ MIHALCZO, J. T.
 TITLE CRITICAL EXPERIMENTS FOR THE REPETITIVELY PULSED REACTOR SORA
 REPORT NUMBER..... NSENAO, 35, 027-044
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 69-01-00
 NSA-NUMBER 22:35605
 SITE/PROGRAM OAK RIDGE - SORA REACTOR (FAST, PULSED, NAK)

ABSTRACT

A SERIES OF STATIC CRITICAL EXPERIMENTS HAS BEEN PERFORMED ON AN ACCURATE MOCKUP OF THE SORA REACTOR. SORA IS A PROPOSED SODIUM-POTASSIUM COOLED, REPETITIVELY PULSED FAST REACTOR WHICH WOULD BE USED AS A HIGH-INTENSITY NEUTRON SOURCE FOR TIME-OF-FLIGHT EXPERIMENTS. THE REACTIVITY OF THIS REACTOR IS VARIED BY A MOVABLE REFLECTOR. THOSE PARAMETERS WHICH ARE RELATED TO THE KINETICS OF THE REACTOR HAVE BEEN INVESTIGATED THOROUGHLY IN THE CRITICAL EXPERIMENTS. THEY HAVE BEEN MEASURED FOR BOTH BERYLLIUM AND IRON REFLECTORS OF SEVERAL SIZES AND FOR VARIOUS CORE AND FIXED REFLECTOR CONFIGURATIONS.

THE TOTAL REACTIVITY OF THE MOVABLE REFLECTORS VARIED FROM 3.7 DOLLARS FOR A 11.0-CM-WIDE IRON REFLECTOR TO 12 DOLLARS FOR A 26.2-CM-WIDE BERYLLIUM REFLECTOR. THE REACTIVITY OF THE MOVABLE REFLECTOR AS A FUNCTION OF ITS POSITION HAS BEEN SHOWN TO HAVE A PARABOLIC DEPENDENCE ON POSITION CHARACTERIZED BY THE PARAMETER $\alpha(\text{SUB-X})$, WHICH VARIED FROM 4 TO 9.9 CENTS/CM². THE PROMPT- NEUTRON TIME DECAY IS DESCRIBED BY A FAST DECAY CONSTANT WHICH VARIED BETWEEN 0.30 AND 0.55 MICRO- SECONDS AND A SLOW DECAY CONSTANT WHICH VARIED BETWEEN 0.05 AND 0.10 MICRO-SECONDS. THE CRITICAL MASS FOR THE VARIOUS EXPERIMENTS WAS BETWEEN 50.3 AND 57.3 KG OF URANIUM ENRICHED TO 93.2 WT PERCENT URANIUM-235. USING SPACE-INDEPENDENT NEUTRON KINETICS WITH ONE DELAYED-NEUTRON GROUP, IT HAS BEEN SHOWN THAT WITH A 24-CM-HIGH X 7-CM-THICK X 21-CM-WIDE BERYLLIUM REFLECTOR THE ASSEMBLY WILL PRODUCE 100 PULSES/SEC ABOUT 50-MICRO-SECONDS WIDE AT HALF-MAXIMUM POWER WITH A PEAK-TO- AVERAGE POWER RATIO OF ABOUT 180. (AUTH).

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

502 ID-NUMBER ID-NUMBER 502

AUTHOR STAUB, A./ HARRIS, D. R./ GOLDSMITH, M.
 TITLE ANALYSIS OF A SET OF CRITICAL HOMOGENEOUS URANIUM-WATER SPHERES
 REPORT NUMBER..... NSENAO, 34, 263-274
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 68-12-00
 NSA-NUMBER 23:4384
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER ; OAK RIDGE - URANIUM-233 SYSTEMS - CALCULATIONS

ABSTRACT

A GROUP OF 11 AQUEOUS CRITICAL EXPERIMENTS FUELED BY URANIUM-233 AND URANIUM-235 AND PERFORMED BY GWIN AND MAGNUSON HAVE BEEN ANALYZED TO SERVE AS INTEGRAL TESTS OF NUCLEAR DATA IMPORTANT IN REACTOR DESIGN. MEASURED EIGENVALUES WERE CORRECTED FOR VARIOUS EFFECTS INCLUDING THE PRESENCE OF THE ALUMINUM CONTAINER, DEPARTURES FROM SPHERICITY, DELAYED-NEUTRON IMPORTANCE, AND ROOM RETURN. EIGENVALUES WERE CALCULATED IN SIMPLIFIED P-3 APPROXIMATION USING 60 ENERGY GROUPS, AND DETERMINATIONS WERE MADE OF THE EIGENVALUE UNCERTAINTIES (+/- 0.1 PERCENT) ASSOCIATED WITH THIS TREATMENT. WITHIN THE EIGENVALUE UNCERTAINTIES (+/- 0.25 PERCENT) RESULTING FROM FUEL INVENTORIES, IT WAS CONCLUDED THAT FISSILE NUCLIDE AND H(N,GAMMA CROSS SECTIONS WERE ADEQUATE TO MATCH CALCULATIONS AND EXPERIMENTS BUT THAT THERE WAS EVIDENCE OF ERRONEOUS NUCLEAR DATA IMPORTANT IN DETERMINING NEUTRON LEAKAGE. IN PARTICULAR, A SUBSTANTIALLY HARDER URANIUM-233 FISSION NEUTRON SPECTRUM SEEMS TO BE INDICATED. (AUTH).

503 ID-NUMBER ID-NUMBER 503

AUTHOR SEHGAL, B. R.
 TITLE ANALYSIS OF BROOKHAVEN URANIUM-235 GRAPHITE CRITICAL EXPERIMENTS
 REPORT NUMBER..... NSENAO, 34, 251-262
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 68-12-00
 NSA-NUMBER 23:4383
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - URANIUM(93%) - GRAPHITE - CALCULATIONS

ABSTRACT

ANALYSIS OF THE NEARLY HOMOGENEOUS ENRICHED URANIUM-GRAPHITE CRITICAL ASSEMBLIES DESCRIBED IN THE PRECEDING PAPER BY PHELPS AND WEINSTOCK ARE REPORTED IN THIS PAPER. THESE ASSEMBLIES ARE CHARACTERIZED MAINLY BY THEIR HIGH LEAKAGE RATE, AND TWO METHODS ARE USED FOR ESTIMATING THE LEAKAGE: 1) THE CONVENTIONAL B-1 APPROXIMATION METHOD AND 2) THE MOMENTS METHODS USING MONTE CARLO CALCULATIONS FOR THE MOMENTS OF THE SLOWING DOWN DISTRIBUTION. IT IS FOUND THAT THE B-1 APPROXIMATION DESCRIBES THE LEAKAGE EFFECTS QUITE ACCURATELY. MOST OF THE CROSS SECTIONS USED IN THE CALCULATIONS ARE FROM THE RECENT EVALUATED NUCLEAR DATA FILE (ENDF/B). RESULTS OF CALCULATIONS FOR K(EFF), NEUTRON LIFETIMES, AND FOIL ACTIVATION RATIOS ARE GENERALLY IN EXCELLENT AGREEMENT WITH THE MEASUREMENTS. (AUTH).

504 ID-NUMBER ID-NUMBER 504

AUTHOR PHELPS, J./ WEINSTOCK, E. V.
 TITLE CRITICALITY MEASUREMENTS ON NEARLY HOMOGENEOUS ENRICHED URANIUM-GRAPHITE SYSTEMS
 REPORT NUMBER..... NSENAO, 34, 237-250
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 68-12-00
 NSA-NUMBER 23:4382
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - URANIUM(93%) - GRAPHITE

ABSTRACT

ACCURATE CRITICAL PARAMETERS HAVE BEEN OBTAINED FOR BARE, NEARLY HOMOGENEOUS ASSEMBLIES OF ENRICHED URANIUM AND GRAPHITE HAVING CARBON/URANIUM ATOM RATIOS IN THE RANGE 960 TO 23,000. AMONG THE QUANTITIES MEASURED WERE K(EFF), CRITICAL BUCKLINGS, EXTRAPOLATION DISTANCES, SPECTRAL INDICES, AND NEUTRON LIFETIMES. PARTICULAR ATTENTION WAS PAID TO THE PROBLEM OF NEUTRONS RETURNING FROM THE SURROUNDINGS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

513 ID-NUMBER ID-NUMBER 513

AUTHOR CHEZEM, C. G.
 TITLE INVESTIGATION OF THE CRITICALITY OF LOW-ENRICHMENT URANIUM CYLINDERS
 REPORT NUMBER..... NSENAO, 33, 139
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 68-07-00
 NSA-NUMBER 22:35637
 SITE/PROGRAM LOS ALAMOS - CYLINDERS OF MIXED DISKS OF URANIUM(93%) AND URANIUM(.75%)

ABSTRACT

AN ATTEMPT TO ACHIEVE A NEAR-CRITICAL ASSEMBLY WITH A MINIMUM AVERAGE URANIUM-235 ENRICHMENT OF AN UNREFLECTED, URANIUM METAL, 21-INCH-DIAM CYLINDER HAS BEEN COMPLETED. THE PROJECT WAS A PART OF THE GRADUATE-STUDENT SUMMER EMPLOYMENT PROGRAM AT THE PAJARITO CRITICAL ASSEMBLIES FACILITY OF THE LOS ALAMOS SCIENTIFIC LABORATORY.

DATA WERE REQUIRED FOR THE DESIGN OF A LOW-ENRICHMENT, URANIUM METAL, REFLECTED SYSTEM. UTILIZING ONLY THE MATERIALS ON HAND, 21-INCH-DIAM PLATES OF 93.3 PERCENT ENRICHED URANIUM AND NORMAL URANIUM, FOUR LOW-ENRICHMENT CYLINDERS WERE INVESTIGATED. THE THICKNESS OF THE NORMAL URANIUM PLATES DICTATED THE EXACT ENRICHMENTS ATTAINABLE BY INTERLEAVING THE PLATES IN A CYCLIC MANNER ALONG THE AXIS.

THE CRITICAL PARAMETERS WERE OBTAINED BY EXTRAPOLATION OF INVERSE MULTIPLICATION CURVES, WHICH EXTEND TO 93 TO 95 PERCENT OF THE CRITICAL HEIGHT. CORRECTIONS FOR THE REFLECTING PROPERTIES OF THE VERTICAL SUPPORT STRUCTURE AND THE BUILDING ITSELF WERE APPLIED. THE SIGNIFICANT RESULTS ARE TABULATED IN TABLE I.

A LEAST-SQUARES ANALYSIS (QUADRATIC) OF THE DATA, INVERSE CRITICAL HEIGHT SQUARED VS PERCENT ENRICHMENT, YIELDS RESULTS WHICH EXTRAPOLATE TO AN INFINITE-HEIGHT ENRICHMENT OF 10.5 +/- 0.2 PERCENT. (AUTH).

515 ID-NUMBER ID-NUMBER 515

AUTHOR STRAWBRIDGE, L. E./ BARRY, R. F.
 TITLE CRITICALITY CALCULATIONS FOR UNIFORM WATER-MODERATED LATTICES
 REPORT NUMBER..... NSENAO, 23, 058-073
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 65-09-00
 NSA-NUMBER 19:42354
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

A PROCEDURE FOR CALCULATING THE NEUTRON MULTIPLICATION FACTOR AND FEW-GROUP CONSTANTS FOR WATER-MODERATED REACTORS HAS BEEN DEVELOPED. THE INTENT OF THIS DEVELOPMENT WAS TO PRODUCE A CALCULATIONAL PROCEDURE WHICH COULD BE USED WITH CONFIDENCE IN THE ENGINEERING DESIGN OF WATER-MODERATED REACTORS. ANALYTIC PROCEDURES THAT REQUIRE LARGE AMOUNTS OF COMPUTER TIME WERE EXCLUDED FROM CONSIDERATION.

THE PROPOSED PROCEDURE INCLUDES A HETEROGENEOUS TREATMENT OF THE FAST-FISSION EFFECT, RESONANCE ABSORPTIONS AND THE THERMAL UTILIZATION. THE RESULTS OF THE PROCEDURE AGREE WELL WITH MORE RIGOROUS CALCULATIONS REQUIRING ORDERS OF MAGNITUDE MORE COMPUTER TIME. THE PROCEDURES HAVE BEEN APPLIED TO 116 URANIUM-METAL AND URANIUM DIOXIDE EXPERIMENTAL LATTICES COVERING A WIDE RANGE OF PARAMETERS. THE MULTIPLICATION FACTOR IS CALCULATED FOR ALL CASES WITH A STANDARD DEVIATION ABOUT THE MEAN OF 0.86 PERCENT. (AUTH).

522 ID-NUMBER ID-NUMBER 522

AUTHOR LONG, J. K./ MC VEAN, R. L./ REYNOLDS, A. B./ STEWART, S. L./ WEITZBERG, A.
 / LERIDON, A. M.
 TITLE CRITICAL MASS OF SEFOR MOCKUP IN ZPR-3
 REPORT NUMBER..... NSENAO, 25, 442-444
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 66-08-00
 NSA-NUMBER 20:36499
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

CRITICALITY OF THE MOCKUP OF THE SOUTHWEST EXPERIMENTAL FAST OXIDE REACTOR (SEFOR) IN THE ZPR-3 FACILITY WAS ACHIEVED NOVEMBER 17, 1965. THE NEUTRON SPECTRUM AND URANIUM-TO-PLUTONIUM RATIO OF THIS ALL-PLUTONIUM CRITICAL IS CHARACTERISTIC OF LARGE FAST CERAMIC POWER REACTORS. THE CRITICAL LOADING WAS THE FIRST IN A SERIES OF EXPERIMENTS CURRENTLY BEING CONDUCTED ON THE SEFOR MOCKUP IN A JOINT PROGRAM BY THE GENERAL ELECTRIC COMPANY AND ARGONNE NATIONAL LABORATORY. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

525 ID-NUMBER ID-NUMBER. 525

AUTHOR LLOYD, R. C./ RICHEY, C. R./ CLAYTON, E. D./ SKEEN, D. R.

TITLE CRITICALITY STUDIES WITH PLUTONIUM SOLUTIONS

REPORT NUMBER.... NSENAO, 25, 165-173

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 66-06-00

SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

A SERIES OF CRITICALITY EXPERIMENTS WERE PERFORMED WITH PLUTONIUM (4.6 PERCENT PLUTONIUM-240) NITRATE SOLUTION IN STAINLESS STEEL SPHERES OF 11.5-, 14-, AND 15.2-INCH DIAMETER REFLECTORS OF WATER, CONCRETE, PARAFFIN, AND STAINLESS STEEL WERE USED; EXPERIMENTS WERE ALSO PERFORMED ON THE 15.2-INCH SPHERE UNREFLECTED. THE SPHERES WERE MADE CRITICAL WITH PLUTONIUM CONCENTRATIONS VARYING FROM 24 TO 435 G PLUTONIUM/LITER AND MOLARITY VARYING FROM 0.2 TO 7.7. THE MINIMUM CRITICAL VOLUMES FOR PLUTONIUM NITRATE IN WATER CONTAINING 4.6 PERCENT PLUTONIUM-240 WERE DETERMINED TO BE ABOUT 22 AND 11 LITERS, RESPECTIVELY, FOR BARE AND REFLECTED SPHERES AT A CONCENTRATION OF 175 G PLUTONIUM/LITER. THE EFFECT OF A 0.030-INCH CADMIUM SHELL OR A 4-INCH AIR CAP BETWEEN THE REFLECTOR AND THE VESSEL REDUCED THE REFLECTOR WORTH TO THAT OF A NOMINAL REFLECTOR (1-INCH OF WATER OR LESS) FOR THE CONCENTRATIONS OF PLUTONIUM MEASURED. COMPARISONS WERE MADE BETWEEN EXPERIMENTAL AND THEORETICAL RESULTS USING MULTIGROUP DIFFUSION THEORY. (AUTH).

539 ID-NUMBER ID-NUMBER 539

AUTHOR HARDY, J./ KLEIN, D./ DANNELS, R.

TITLE SPATIAL VARIATION OF THE FAST NEUTRON FLUX IN CELLS OF SLIGHTLY URANIUM-235-ENRICHED-URANIUM WATER-MODERATED LATTICES

REPORT NUMBER.... NSENAO, 26, 462-471

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 66-12-00

SITE/PROGRAM WESTINGHOUSE, BETTIS ATOMIC POWER LABORATORY - TRX CRITICAL ASSEMBLY

ABSTRACT

THE INTRA-CELL STRUCTURE OF THE FAST NEUTRON FLUX HAS BEEN MEASURED IN SEVERAL TRX LATTICES WITH URANIUM-238 (N, FISSION) AND ALUMINUM (N,ALPHA) DETECTORS. THE LATTICES WERE LIGHT-WATER-MODERATED, WITH CYLINDRICAL, 0.387-INCH-DIAM FUEL RODS OF SLIGHTLY ENRICHED URANIUM. THE FUEL RODS WERE ARRANGED IN HEXAGONAL ARRAYS, WITH WATER:URANIUM VOLUME RATIOS OF 1.0, 2.35, 4.02, AND 8.1. MEASURED ACTIVATION SHAPES AND INTEGRAL FAST ADVANTAGE FACTORS WERE COMPARED WITH CALCULATED RESULTS OBTAINED WITH THE MOCA2A MONTE CARLO PROGRAM. AGREEMENT WAS VERY GOOD. A ONE-GROUP MONTE CARLO CALCULATION AND A ONE-GROUP COLLISION-PROBABILITY MODEL WERE FOUND TO PERFORM WELL IN COMPARISON WITH MOCA2A. (AUTH).

543 ID-NUMBER ID-NUMBER 543

AUTHOR BROWN, C. L./ LLOYD, R. C.

TITLE MATERIAL BUCKLINGS FOR 1.002, 1.25, AND 1.95 WT% URANIUM-235- ENRICHED URANIUM TUBES IN LIGHT WATER

REPORT NUMBER.... NSENAO, 27, 010-015

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 67-01-00

SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

MATERIAL BUCKLINGS AND EXTRAPOLATION DISTANCES WERE MEASURED FOR SEVERAL SLIGHTLY ENRICHED URANIUM-METAL TUBE LATTICES AND TUBE-IN-TUBE ASSEMBLY LATTICES IN LIGHT WATER. THE TUBES MEASURED WERE: 1.002 WT PERCENT URANIUM-235 ENRICHED URANIUM (2.34-INCH O. D.; 1.79-INCH I. D.); 1.25 WT PERCENT URANIUM-235 ENRICHED URANIUM (2.37-INCH O. D.; 1.80-INCH I. D.); AND 1.95 WT PERCENT URANIUM-235 ENRICHED URANIUM (2.28-INCH O. D.; 1.41-INCH I. D.). THE TUBE-IN-TUBE ASSEMBLIES MEASURED WERE: 1.002 WT PERCENT URANIUM-235 OUTER TUBES (2.34-INCH O. D.; 1.79-INCH I. D.) CONTAINING 1.002 WT PERCENT URANIUM-235 INNER TUBES (1.18-INCH O. D.; 0.49-INCH I. D.); AND 1.25 WT PERCENT URANIUM-235 OUTER TUBES (2.37-INCH O. D.; 1.80-INCH I. D.) CONTAINING 0.95 WT PERCENT URANIUM-235 INNER TUBES (1.18-INCH O. D.; 0.48-INCH I. D.). MAXIMUM BUCKLINGS FOR THE TUBES WERE FOUND TO BE 25.00, 47.00, AND 83.00 M⁻²(-2), RESPECTIVELY; AND FOR THE TUBE-IN-TUBE ASSEMBLIES, 23.50 AND 38.50 M⁻²(-2), RESPECTIVELY. BASED ON THE MEASUREMENTS, CRITICAL PARAMETERS FOR USE IN NUCLEAR SAFETY ANALYSES WERE CALCULATED. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

544 ID-NUMBER ID-NUMBER 544

AUTHOR BENNETT, E. F.
 TITLE NEUTRON SPECTRUM MEASUREMENT IN A FAST CRITICAL ASSEMBLY
 REPORT NUMBER..... NSENAO, 27, 028-033
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 67-01-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6

ABSTRACT

A MEASUREMENT OF THE NEUTRON SPECTRUM AT THE CENTER OF A LARGE, DILUTE FAST REACTOR IS REPORTED OVER THE ENERGY INTERVAL FROM 1 KEV TO 1 MEV. RESOLUTION OF THE MEASUREMENT WAS ABOUT 20 PERCENT (FWHM) EXCEPT AT THE LOWER ENERGIES. ERRORS IN THE MEASUREMENT ARE DESCRIBED AND A COMPARISON MADE OF THE MEASURED RESULT WITH A MULTI ENERGY-GROUP CALCULATION. THERE EXISTS FAIR AGREEMENT BETWEEN THE MEASURED SPECTRUM AND THE MULTIGROUP CALCULATION. (AUTH).

553 ID-NUMBER ID-NUMBER 553

AUTHOR MIHALCZO, J. T.
 TITLE MULTIPLICATION FACTOR OF URANIUM METAL BY ONE-VELOCITY MONTE CARLO CALCULATIONS
 REPORT NUMBER..... NSENAO, 27, 557-563
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 67-03-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS ; LOS ALAMOS - URANIUM(93%) METAL CYLINDERS - CALCULATIONS ; OAK RIDGE - URANIUM(93%) METAL CYLINDERS - CALCULATIONS

ABSTRACT

A METHOD IS DESCRIBED FOR PREDICTING THE NEUTRON MULTIPLICATION FACTORS OF GEOMETRICALLY COMPLICATED CONFIGURATIONS OF UNREFLECTED UNMODERATED ENRICHED-URANIUM METAL FROM THE RESULTS OF TWO DELAYED-CRITICAL EXPERIMENTS IN SIMPLE GEOMETRY. THE METHOD REQUIRES TWO CONSTANTS CHARACTERISTIC OF THE METAL. THESE ARE THE TOTAL COLLISION CROSS SECTION ($\Sigma(TOTAL)$) AND THE NUMBER OF NEUTRONS PRODUCED PER COLLISION ($\nu \cdot \Sigma(FISSION) / (\Sigma(TOTAL))$), WHICH ARE OBTAINED FROM THE TWO EXPERIMENTS BY USING S(12) TRANSPORT-THEORY CALCULATIONS WITH ISOTROPIC SCATTERING. THESE CONSTANTS, TOGETHER WITH THE ASSUMPTION OF ISOTROPIC SCATTERING, ARE THEN USED IN OSR MONTE CARLO NEUTRON-TRANSPORT CALCULATIONS TO PREDICT THE MULTIPLICATION FACTORS. THE METHOD HAS BEEN TESTED BY PREDICTING THE MULTIPLICATION FACTORS OF 21 DIFFERENT DELAYED-CRITICAL ASSEMBLIES WITH A WIDE VARIETY OF GEOMETRIES TO WITHIN A STANDARD DEVIATION OF 1.5 PERCENT (AUTH.).

558 ID-NUMBER ID-NUMBER 558

AUTHOR BITELLI, G./ MARTINELLI, R./ ORESTANO, F. V./ SANTANDREA, E.
 TITLE ANALYSIS OF CRITICAL EXPERIMENTS WITH ORGANIC-MODERATED ASSEMBLIES
 REPORT NUMBER..... NSENAO, 28, 270-276
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 67-05-00
 SITE/PROGRAM ITALY - ROSPO (ORGANIC MODERATED REACTOR - 90% ENRICHED)

ABSTRACT

THE RESULTS OF CRITICAL EXPERIMENTS, PERFORMED WITH ORGANIC-MODERATED PLATE-TYPE ASSEMBLIES CONTAINING URANIUM ENRICHED TO 90 PERCENT IN URANIUM-235, IN THE ZERO-POWER REACTOR ROSPO, ARE REPORTED. SEVERAL CORES, DIFFERING IN CRITICAL RADIUS (19.5 TO 47.5 CM) AND IN THE RATIO OF URANIUM- TO-STAINLESS-STEEL PLATE NUMBER, HAVE BEEN INVESTIGATED. THE COMPARISON WITH THE REACTIVITIES CALCULATED BY A STANDARD TWO-GROUP CALCULATION PROCEDURE SHOWS AN OVERESTIMATE OF THE $(K(EFF))$ 'S (UP TO 1.95 PERCENT $(\Delta K)/K$ FOR THE SMALLEST CRITICAL CORE) WITH A SYSTEMATIC DEPENDENCE ON THE CORE RADIUS. A SATISFACTORY AGREEMENT IS FOUND FOR LARGE-SIZE CORES (EQUAL TO OR GREATER THAN 40 CENTIMETER) IT IS SHOWN THAT SIMPLE CALCULATIONAL IMPROVEMENTS, SUCH AS A FOUR-GROUP EVALUATION OF THE NUCLEAR CONSTANTS, AND A MORE DETAILED TREATMENT OF CORE-RADIAL REFLECTOR INTERFACE ZONE, LEAD TO A HOMOGENEOUSLY GOOD AGREEMENT (WITHIN 0.25 PERCENT $(\Delta K)/K$) OVER THE WHOLE RANGE OF CORE DIMENSIONS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

560 ID-NUMBER ID-NUMBER 560

AUTHOR STACEY, W. M.
 TITLE FAST-REACTOR CALCULATIONAL MODELS
 REPORT NUMBER..... NSENAO, 28, 443-449
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 67-06-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS ; ARGONNE NATIONAL
 LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

THREE NEW MODELS HAVE BEEN DEVELOPED FOR-REACTOR PHYSICS CALCULATIONS. THESE WERE OBTAINED FROM THE ENERGY-DEPENDENT P-1 EQUATIONS BY A MODAL EXPANSION OF THE NEUTRON FLUX. FOR CERTAIN CLASSES OF PROBLEMS, THESE MODELS PROVIDE ATTRACTIVE ALTERNATIVES AND SUPPLEMENTS TO CONVENTIONAL MULTIGROUP FINITE-DIFFERENCE MODELS. IN THAT CONSIDERABLE REDUCTIONS IN COMPLEXITY AND COMPUTATIONAL EFFORT ARE REALIZED. INTEGRAL EXPERIMENTAL DATA CAN BE USED DIRECTLY IN ONE OF THE MODELS, AND PHYSICAL INSIGHT CAN BE INCORPORATED INTO ALL THE MODELS VIA THE CHOICE OF EXPANSION MODES. EACH OF THE MODELS WAS APPLIED TO CALCULATE THE INTEGRAL PROPERTIES OF FAST-REACTOR CRITICAL ASSEMBLIES. (AUTH).

568 ID-NUMBER ID-NUMBER 568

AUTHOR RICHEY, C. R.
 TITLE THEORETICAL ANALYSES OF HOMOGENEOUS PLUTONIUM CRITICAL EXPERIMENTS
 REPORT NUMBER..... NSENAO, 31, 032-039
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 68-01-00
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER - CALCULATIONS ; LOS ALAMOS -
 PLUTONIUM NITRATE IN WATER - CALCULATIONS

ABSTRACT

A COMPUTATIONAL ANALYSIS WAS MADE FOR THE LARGE NUMBER OF AVAILABLE CRITICAL EXPERIMENTS WITH HYDROGENOUS MIXTURES. THE CALCULATIONS WERE MADE USING BOTH MULTIGROUP S-4 AND DIFFUSION THEORY WITH 18 ENERGY GROUPS OBTAINED WITH THE GAMTEC-II CODE. RESONANCE CAPTURE BY THE ISOTOPE PLUTONIUM-240 WAS TREATED IN THE NR AND NRIA APPROXIMATIONS. RATHER GOOD AGREEMENT WAS FOUND BETWEEN EXPERIMENT AND THEORY. THE RESULTS ARE GIVEN AS A PARAMETRIC SURVEY FOR PLUTONIUM DENSITIES RANGING FROM 0.015 TO 1.0 G/(CM*3). THE CALCULATED MINIMUM CRITICAL MASS OF PLUTONIUM-239 IS 547 G FOR WATER-REFLECTED AQUEOUS PLUTONIUM NITRATE SOLUTIONS AND 531 G FOR SIMILAR MIXTURES OF PLUTONIUM-239 AND WATER. (AUTH).

569 ID-NUMBER ID-NUMBER 569

AUTHOR RICHEY, C. R.
 TITLE CRITICALITY OF HETEROGENEOUS ARRAYS UNDERGOING DISSOLUTION
 REPORT NUMBER..... NSENAO, 31, 040-048
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 68-01-00
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN URANYL NITRATE - CALCULATIONS

ABSTRACT

EXPERIMENTAL DATA TO ESTABLISH CRITICALITY CONTROL SPECIFICATIONS FOR ENRICHED URANIUM RODS UNDERGOING DISSOLUTION ARE EXTREMELY LIMITED. A PRINCIPAL DIFFICULTY IN TREATING THE PROBLEM THEORETICALLY IS THAT THE RESONANCE ABSORBING URANIUM-238 IS ADMIXED IN THE AQUEOUS SOLUTION IN WHICH THE RODS ARE IMMersed. THE "NARROW RESONANCE" AND "INFINITE MASS" APPROXIMATIONS ARE APPLIED; AND FROM THIS APPLICATION, EXPRESSIONS ARE DEVELOPED FOR TREATING RESONANCE CAPTURE BY AN ABSORBING LUMP EMBEDDED IN A MODERATOR ADMIXED WITH THE ABSORBER. THE COMPUTED CHANGE IN THE CRITICAL BUCKLING OF A HETEROGENEOUS ARRAY ON REPLACING THE WATER MODERATOR BY A URANYL NITRATE SOLUTION IS IN GOOD AGREEMENT WITH EXPERIMENT. RESULTS FROM SURVEY CALCULATIONS FOR 3 AND 5 WT PERCENT URANIUM-235 RODS LATTICED IN URANIUM-WATER MIXTURES ARE GIVEN. IT WAS CONCLUDED THAT FOR ENRICHMENTS UP TO 5 WT PERCENT URANIUM-235, DISSOLVER VESSELS DESIGNED GEOMETRICALLY SAFE FOR WATER-MODERATED ARRAYS OF URANIUM RODS WILL REMAIN SAFE DURING THE DISSOLUTION PROCESS. (AUTH).

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

571 ID-NUMBER ID-NUMBER 571

AUTHOR GRAVES, W. E./ BENTON, F. D./ SATTERFIELD, R. M.
 TITLE A COMPARISON OF HETEROGENEOUS NUCLEAR-REACTOR LATTICE THEORY WITH
 EXPERIMENT
 REPORT NUMBER.... NSENAO, 31, 057-066
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 68-01-00
 SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES
 IN HEAVY WATER - CALCULATIONS

ABSTRACT

SOURCE-SINK METHODS OF CALCULATION ARE COMPARED WITH A SET OF EXPERIMENTS WITH MIXED-FUEL LATTICES IN A HEAVY-WATER MODERATOR. THE THEORETICAL MODEL USED WAS C. N. KLAHR'S MODIFICATION OF THE FEINBERG-GALANIN THEORY. A COMPARISON OF CALCULATION AND EXPERIMENT WAS MADE BOTH FOR THERMAL-NEUTRON DENSITY RATIOS WITHIN THE LATTICE COMPONENTS, AND FOR CRITICAL GEOMETRIC BUCKLINGS (RADIAL AND VERTICAL SEPARATELY). AGREEMENT WAS GOOD IN THE CASE OF THERMAL-NEUTRON DENSITY RATIOS AND RATHER GOOD FOR RADIAL BUCKLINGS. THE MODERATE DISAGREEMENTS BETWEEN CALCULATED AND EXPERIMENTAL CRITICAL VERTICAL BUCKLINGS WERE ASCRIBED PRIMARILY TO ERRORS IN THE CELL CODES USED TO GENERATE INPUT FOR THE MIXED LATTICE CALCULATIONS. (AUTH).

579 ID-NUMBER ID-NUMBER 579

AUTHOR WEBSTER, J. W.
 TITLE MINIMUM THICKNESS OF A WATER-REFLECTED INFINITE SLAB OF AN AQUEOUS
 SOLUTION OF URANYL FLUORIDE AT OPTIMUM CONCENTRATION
 REPORT NUMBER.... NSENAO, 32, 133-135
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 68-04-00
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

FOR THE PURPOSE OF DEFINING SAFETY STANDARDS FOR THE STORAGE, PROCESSING, AND TRANSPORT OF SOLUTIONS OF FISSION MATERIAL, IT IS IMPORTANT TO ESTABLISH CERTAIN LIMITING SIZES AT OPTIMUM URANIUM CONCENTRATION. THIS NOTE CONCERNS THE MINIMUM CRITICAL THICKNESS OF AN INFINITE SLAB OF URANIUM-BEARING SOLUTION. (AUTH).

580 ID-NUMBER ID-NUMBER 580

AUTHOR BIERMAN, S. R./ HESS, G. M.
 TITLE MINIMUM CRITICAL URANIUM-235 ENRICHMENT OF HOMOGENEOUS, HYDROGENOUS URANYL
 NITRATE SYSTEMS
 REPORT NUMBER.... NSENAO, 32, 135-139
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 68-04-00
 SITE/PROGRAM HANFORD - URANYL(2-3%) NITRATE IN WATER

ABSTRACT

IN THE RECOVERY OF URANIUM FROM SPENT FUEL ELEMENTS AND URANIUM BEARING WASTES, THE URANIUM IS CONVERTED TO THE NITRATE FORM BY DISSOLUTION IN A NITRIC ACID SOLUTION. IT REMAINS IN THIS CHEMICAL FORM THROUGHOUT MANY OF THE PROCESSING AND HANDLING STEPS ASSOCIATED WITH ITS RECOVERY. CONSEQUENTLY, A FIRM KNOWLEDGE IS NEEDED OF THE MINIMUM URANIUM-235 ENRICHMENT FOR WHICH A HOMOGENEOUS URANYL NITRATE SYSTEM CAN BE MADE CRITICAL. THIS MINIMUM CRITICAL ENRICHMENT IS THE ENRICHMENT REQUIRED TO OBTAIN AN INFINITE NEUTRON MULTIPLICATION FACTOR, $K(\infty)$, OF UNITY UNDER CONDITIONS OF OPTIMUM MODERATION. BELOW THIS ENRICHMENT, CRITICALITY WOULD NOT BE POSSIBLE DURING THE PROCESSING AND HANDLING OF THE URANYL NITRATE. ALSO, THIS ENRICHMENT AND THE HYDROGENOUS URANYL ATOMIC RATIO OF THE HOMOGENEOUS MIXTURE THAT GIVES UNITY AS THE MAXIMUM VALUE OF $K(\infty)$ PROVIDE A FUNDAMENTAL POINT FOR COMPARISON WITH REACTOR THEORY. IT IS ALSO DESIRABLE, WHEN CHECKING CALCULATIONAL MODELS AND ESTABLISHING NUCLEAR SAFETY GUIDELINES, TO KNOW OVER WHAT RANGE OF MODERATION CRITICALITY IS POSSIBLE FOR A GIVEN ENRICHMENT. THIS IS PARTICULARLY TRUE FOR LOW ENRICHED URANIUM SYSTEMS, SINCE AT LOW ENRICHMENTS CRITICALITY IS STRONGLY DEPENDENT ON BOTH NEUTRON MODERATION AND URANIUM-235 ENRICHMENT.

AND EXPERIMENTAL PROGRAM TO PROVIDE THE ABOVE INFORMATION WAS INITIATED AND COMPLETED IN THE PHYSICAL CONSTANTS TEST REACTOR (PCTR) OF BATTTELLE-NORTHWEST. THE RESULTS AND INTERPRETATION OF THESE MEASUREMENTS ARE PRESENTED HERE. PREVIOUS EXPERIMENTS PERFORMED IN THE PCTR SHOWED THE MINIMUM CRITICAL URANIUM-235 ENRICHMENT FOR HOMOGENEOUS MIXTURES OF URANIUM TRIOXIDE IN WATER TO BE 1.034 +/- 0.010 WT PERCENT. ADDITIONAL EXPERIMENTS WITH 3.04 WT PERCENT ENRICHED URANIUM TRIOXIDE AND URANYL NITRATE, HYDROGENOUS SYSTEMS ESTABLISHED THAT THE PRESENCE OF THE NITRATE RADICAL HAD A PRONOUNCED EFFECT ON CRITICALITY. THE 3.04 WT PERCENT ENRICHED URANIUM TRIOXIDE HAD A MAXIMUM $K(\infty)$ VALUE OF 1.350 +/- 0.013 AS COMPARED TO 1.145 +/- 0.01 FOR THE 3.04 WT PERCENT ENRICHED URANYL NITRATE. SUBSEQUENT CALCULATIONS INDICATED

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THAT THE MINIMUM CRITICAL ENRICHMENT FOR HOMOGENEOUS, HYDROGENOUS URANYL NITRATE MIXTURES WAS ABOUT 2 WT PERCENT. CONSEQUENTLY, EXPERIMENTS WERE PLANNED FOR URANIUM-235 ENRICHMENTS SLIGHTLY ABOVE THIS VALUE. (AUTH).

581 ID-NUMBER ID-NUMBER 581

AUTHOR CHEZEM, C. G. / STEINKE, R. G.
 TITLE LOW-ENRICHMENT URANIUM-METAL EXPONENTIAL EXPERIMENTS
 REPORT NUMBER..... NSENAO. 31, 549-550
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 68-03-00
 SITE/PROGRAM LOS ALAMOS - LOW ENRICHED URANIUM METAL EXPONENTIAL EXPERIMENTS

ABSTRACT

A STUDY OF LOW AVERAGE ENRICHMENT, URANIUM-METAL EXPONENTIAL COLUMNS HAS BEEN PERFORMED AT THE LOS ALAMOS SCIENTIFIC LABORATORY. THE SOURCE REACTOR, MATERIALS, EQUIPMENT, AND PROCEDURES WERE ESSENTIALLY THE SAME AS USED IN THE EARLIER NATURAL-URANIUM EXPERIMENT. (AUTH).

582 ID-NUMBER ID-NUMBER 582

AUTHOR MILLS, C. B.
 TITLE CRITICAL ASSEMBLIES OF FISSIONABLE MATERIALS
 REPORT NUMBER..... LA-3219-MS
 DATE PUBLISHED ... 65-04-07
 SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

A NUMBER OF CRITICAL ASSEMBLIES WERE STUDIED FOR REACTOR SAFETY AND CRITICALITY EVALUATION REASONS EARLY IN THE NUCLEAR POWERED ROCKET DEVELOPMENT PERIOD. THESE WERE ALL OF WATER MODERATED URANIUM-233, URANIUM-235, AND PLUTONIUM-239 CRITICAL EXPERIMENTS AND THE RELATIVELY FEW HEAVY WATER, BERYLLIUM, BERYLLIUM-OXIDE, AND CARBON MODERATED, ENRICHED URANIUM-235 CRITICAL EXPERIMENTS AVAILABLE THAT PROVIDED SIMPLE PARAMETRICS AND EXTREMES IN TYPE. THE ATOMIC DENSITIES AND DIMENSIONS DIRECTLY USEFUL FOR COMPUTATIONAL PURPOSES ARE LISTED FOR FAST TO THERMAL FLUX SPECTRUM ASSEMBLIES. (AUTH).

588 ID-NUMBER ID-NUMBER 588

AUTHOR BONDARENKO, I. I. / KAZACHKOVSKII, O. D. / ABAGYAN, L. P. / ABORIN, YU. S.
 / BAZAZYANTS, N. O. / ET AL
 TITLE EXPERIMENTAL STUDIES ON FAST-NEUTRON REACTOR PHYSICS
 REPORT NUMBER..... GENEVA-3, 06, 152-169
 CONFERENCE THIRD UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
 ATOMIC ENERGY, GENEVA, SWITZERLAND, 31 AUGUST - 9 SEPTEMBER 1964
 DATE PUBLISHED ... 64-09-00
 SITE/PROGRAM USSR - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THE RESULTS OF RESEARCH WORK ON PHYSICS OF FAST REACTORS ARE REPORTED. THIS WORK WAS CARRIED OUT IN THE INSTITUTE OF PHYSICS AND ENERGETICS OF THE STATE COMMITTEE ON USES OF ATOMIC ENERGY OF THE USSR SINCE THE SECOND UNITED NATIONS CONFERENCE ON PEACEFUL USES OF ATOMIC ENERGY HELD IN GENEVA AND WAS DONE AS THE CONTINUATION OF INVESTIGATIONS REPORTED THERE MULTIGROUP CONSTANT SYSTEMS.

MULTIGROUP METHOD IS OFTEN USED NOW FOR CALCULATIONS IN FAST REACTOR PHYSICS. ALL THE NEUTRONS ARE DIVIDED INTO A FINITE NUMBER OF ENERGY-GROUPS IN THIS METHOD.

IN THE EARLY DEVELOPMENTS OF THIS METHOD THE CONSTANT SETS WITH A SMALL NUMBER OF GROUPS WERE USED TO COVER THE NEUTRON ENERGY RANGE OF INTEREST FOR FAST REACTORS. (1), (2). SUCH SYSTEMS ARE VERY CONVENIENT IN THE CASE OF REACTORS WITH HIGHLY CONCENTRATED CORES AND HEAVY, STRONGLY ABSORBING REFLECTORS, WHEN NEUTRON SPECTRA HAVE RELATIVELY WELL DEFINED LOWER LIMIT. HOWEVER THEY HARDLY ARE OF GREAT USE FOR CALCULATIONS OF LARGE POWER REACTORS, ESPECIALLY ONES WITH OXIDE OR CARBIDE FUEL. THE ELASTIC MODERATION OF NEUTRONS PLAYS CONSIDERABLE ROLE IN THESE REACTORS AND LOWER LIMIT OF THE SPECTRUM BECOMES INDEFINITE. IT IS VERY DESIRABLE IN THESE CONDITIONS TO HAVE CONSTANT SYSTEMS INCLUDING ALL THE NEUTRON ENERGIES DOWN TO THERMAL ONES. THE 18- AND 21-GROUP SYSTEMS MEET THESE REQUIREMENTS RATHER WELL. THEY HAVE BEEN WIDELY USED IN OUR INSTITUTE DURING SOME TIME UP TO RECENTLY. NOW WE USE 26-GROUP SYSTEM WHICH IS SET AS PRINCIPAL IN THIS REPORT. (AUTH).

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

591 ID-NUMBER ID-NUMBER 591

AUTHOR BENOIST, P./ DENIZ, V./ GOURDON, CH./ JOSHI, B. V./ MARTELLY, J./ SAGOT, M.
/ SAHAI, K./ WANNER, G.

TITLE CRITICAL AND SUBCRITICAL EXPERIMENTS ON URANIUM-BERYLLIUM OXIDE LATTICES

REPORT NUMBER.... GENEVA-2, 12, 585-606

CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958

DATE PUBLISHED ... 58-09-00

SITE/PROGRAM FRANCE - URANIUM - BERYLLIUM OXIDE LATTICES

ABSTRACT

THE MEDIUM UNDER STUDY IS A VERTICAL PRISM 140 CM HIGH WITH A MEAN RADIUS OF 80.5 CM. IT IS MADE UP OF BERYLLIUM OXIDE BRICKS, THE DENSITY OF WHICH IS 2.95 GRAMS/CC AND URANIUM RODS JACKETED IN ALUMINUM, 0.1 CM THICK (RODS 2.60 AND 2.92 CM IN DIAMETER) OR 0.07 CM (3.56 CM RODS). THESE RODS (90 IN ALL) GO THROUGH THE PRISM PARALLEL TO ITS AXIS IN CHANNELS HAVING A CROSS SECTION OF 5 X 5 CM, ARRANGED IN A SQUARE LATTICE OF 15 CM PITCH AND STRENGTHENED INTERNALLY WITH DRAWN ALUMINUM (A-5), 0.05 CM THICK, WITH A LINEAR DENSITY OF 2.7 GRAMS/CC. SEVENTY-EIGHT VERTICAL CHANNELS, HAVING A CROSS SECTION OF 5 X 0.5 CM MAKE IT POSSIBLE TO PLACE THE DETECTORS (MANGANESE OR INDIUM, WITH OR WITHOUT A CADMIUM JACKET) AT THE POINTS WHERE THE MICROSCOPIC FLUX IS A MAXIMUM, NAMELY, AT THE CENTERS OF THE ABOVE MENTIONED LATTICE ELEMENTS.

592 ID-NUMBER ID-NUMBER 592

AUTHOR POPOVIC, D.

TITLE A BARE CRITICAL ASSEMBLY OF NATURAL URANIUM AND HEAVY WATER

REPORT NUMBER.... GENEVA-2, 12, 392-394

CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958

DATE PUBLISHED ... 58-09-00

SITE/PROGRAM YUGOSLAVIA - NATURAL URANIUM - HEAVY WATER

ABSTRACT

THE FIRST REACTOR BUILT IN YUGOSLAVIA WAS THE BARE ZERO ENERGY HEAVY WATER AND NATURAL URANIUM ASSEMBLY AT THE BORIS KIDRIC INSTITUTE OF NUCLEAR SCIENCES, BELGRADE. THE REACTOR WENT CRITICAL ON APRIL 29, 1958.

THE POSSESSION OF FOUR TONS OF NATURAL URANIUM METAL AND THE TEMPORARY AVAILABILITY OF SEVEN TONS OF HEAVY WATER ENCOURAGED THE STAFF OF THE INSTITUTE TO BUILD A CRITICAL ASSEMBLY. A CRITICAL ASSEMBLY WAS CHOSEN, RATHER THAN A HIGHER FLUX REACTOR, BECAUSE THE HEAVY WATER WAS AVAILABLE ONLY TEMPORARILY. BESIDES, A 10 MW, ENRICHED URANIUM, RESEARCH REACTOR IS BEING BUILT AT THE SAME INSTITUTE AND SHOULD BE READY FOR OPERATION LATE THIS YEAR.

IT WAS SUPPOSED THAT THE ZERO ENERGY REACTOR WOULD BE A VERY USEFUL TOOL WHICH WOULD PROVIDE EXPERIENCE IN CARRYING OUT CRITICAL EXPERIMENTS, OPERATIONAL EXPERIENCE WITH NUCLEAR REACTORS, AND THE POSSIBILITY FOR AN EXTENSIVE PROGRAM IN REACTOR PHYSICS. (AUTH).

594 ID-NUMBER ID-NUMBER 594

AUTHOR MILANI, S. / WEISS, S. H.

TITLE SMALL URANIUM-233 FUELED SEED-AND-BLANKET CRITICAL EXPERIMENTS (LWBR-LSBR
DEVELOPMENT PROGRAM)

REPORT NUMBER.... WAPD-TM-0614

DATE PUBLISHED ... 67-12-23

NSA-NUMBER 22:14262

SITE/PROGRAM WESTINGHOUSE, BETTIS ATOMIC POWER LABORATORY - URANIUM-233 SYSTEMS

ABSTRACT

A SERIES OF EIGHT SMALL SEED-AND-BLANKET CRITICAL ASSEMBLIES WERE STUDIED AT THE BETTIS ATOMIC POWER LABORATORY. ROD-TYPE SEED FUEL ELEMENTS WHICH CONTAINED EITHER URANIUM-233 OR URANIUM-235 WERE UTILIZED SO THAT A DIRECT COMPARISON COULD BE MADE BETWEEN THE LATTICE CHARACTERISTICS OF THE TWO FUELS. ALSO, BLANKET REGIONS WHICH CONTAINED ROD TYPE ELEMENTS WITH EITHER NATURAL THORIA OR 1-WT% URANIUM-233 DIOXIDE-THORIA WERE COMPARED. THE EIGHT ASSEMBLIES WERE OF TWO PRINCIPAL TYPES. THE FIRST TYPE WAS A RECTANGULAR ARRAY HAVING A CENTRAL SEED REGION SURROUNDED BY A WET BLANKET WITH A METAL-TO-WATER RATIO OF ABOUT ONE, AND THE SECOND WAS A HEXAGONAL ARRAY HAVING A CENTRAL SEED REGION SURROUNDED BY A TIGHTLY PACKED DRY BLANKET WITH A METAL-TO-WATER RATIO OF ABOUT 9.2. ALL EXPERIMENTS ON THESE EIGHT ASSEMBLIES WERE CONDUCTED AT 20C TEMPERATURE. IN ADDITION, TWO OF THE WET BLANKET ASSEMBLIES WERE STUDIED IN THE HIGH TEMPERATURE TEST FACILITY AT 480F AND 650 PSI. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

601 ID-NUMBER ID-NUMBER 601

AUTHOR KUNZE, J. F./ PINCOCK, G. D./ HYLAND, R. E.
 TITLE CAVITY REACTOR CRITICAL EXPERIMENTS
 REPORT NUMBER.... NUAPA, 06, 104-115
 JOURNAL NUCLEAR APPLICATIONS AND TECHNOLOGY
 DATE PUBLISHED ... 69-02-00
 SITE/PROGRAM GENERAL ELECTRIC CO., IDAHO - CAVITY REACTOR

ABSTRACT

THE CAVITY REACTOR CONCEPT CONSISTS OF A CORE, GENERALLY OF DILUTE FUEL, SURROUNDED BY A MODERATING REFLECTOR. THIS CONCEPT HAS LONG BEEN CONSIDERED AS A MEANS OF ATTAINING VERY HIGH TEMPERATURES IN A GASEOUS CORE, SINCE THE FUEL NEED NOT BE IN CONTACT WITH STRUCTURAL MATERIAL. A NUMBER OF CRITICAL EXPERIMENTS HAVE BEEN PERFORMED ON CONFIGURATIONS OF DIFFERENT CORE SIZE AND SHAPE, WITH DIFFERENT STRUCTURAL MATERIAL THICKNESSES BETWEEN THE CAVITY AND REFLECTOR, WITH DIFFERENT COOLANT DENSITIES SURROUNDING THE CORE, AND WITH VARIOUS OTHER ALTERATIONS. THE PRINCIPAL PURPOSE WAS TO EVALUATE THE EFFECTS OF ENGINEERING DESIGN VARIABLES FOR A CAVITY PROPULSION REACTOR CONCEPT. EXPERIMENTS REVEAL THAT A POWER REACTOR WITH THE REQUIRED STRUCTURE AND A CAVITY SIZE 182.9 CENTIMETER (6 FT) IN DIAMETER BY 121.9 CENTIMETER (4 FT) LONG CAN BE EXPECTED TO HAVE A CRITICAL CORE LOADING OF BETWEEN 20 AND 30 KILOGRAM OF URANIUM-235. (AUTH).

604 ID-NUMBER ID-NUMBER 604

AUTHOR SCHUSKE, C. L.
 TITLE NEUTRON MULTIPLICATION MEASUREMENTS OF ORALLOY UNITS IN ARRAYS
 REPORT NUMBER.... RFP-0051
 DATE PUBLISHED ... 55-06-29
 SITE/PROGRAM ROCKY FLATS - URANIUM(93%) ARRAYS - CONCRETE REFLECTED

ABSTRACT

THIS REPORT INCLUDES A SERIES OF NEUTRON MULTIPLICATION MEASUREMENTS ON PARTIALLY TAMPED ARRAYS OF ORALLOY UNITS. AN EMPIRICAL ANALYSIS WAS MADE TO PREDICT THE CRITICAL SPACING FOR A PLANE ARRAY CONSTRUCTED ON A CONCRETE FLOOR. TESTS WERE ALSO MADE TO DETERMINE THE EFFECT OF BODY TAMPING ON TWO LATTICES CONTAINING ORALLOY UNITS.

607 ID-NUMBER ID-NUMBER 607

AUTHOR HESS, A. L. / GEMMELL, W. / LONG, J. K. / MC VEAN, R. L.
 TITLE CRITICAL STUDIES OF A 450-LITER URANIUM OXIDE FAST REACTOR CORE,
 REPORT NUMBER.... ANL-6336
 DATE PUBLISHED ... 60-11-00
 NSA-NUMBER 16:2397
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

RESULTS OF STUDIES WITH ZPR-3 ASSEMBLY 29, A MOCKUP OF A TYPICAL, DILUTE URANIUM DIOXIDE- FUELED FAST REACTOR, ARE REPORTED. THE ASSEMBLY CONSISTED OF A 454-LITER CYLINDRICAL CORE, BLANKETED WITH DEPLETED URANIUM, WITH A CRITICAL MASS OF 421 KILOGRAMS URANIUM-235. EXPERIMENTS INCLUDED MEASUREMENTS OF FISSION RATES, MATERIAL REACTIVITY WORTHS, AND ROSSI ALPHA. THE RESULTS OF MULTIGROUP CALCULATIONS USING THE PRESENT ARGONNE CROSS-SECTION SETS ARE PRESENTED, AND DISCREPANCIES BETWEEN EXPERIMENTAL RESULTS AND CALCULATIONS ARE DISCUSSED. (AUTH).

609 ID-NUMBER ID-NUMBER 609

AUTHOR MORTON, J. R.
 TITLE STUDY OF SOLID-MODERATED ENRICHED URANIUM EPITHERMAL SYSTEMS BY THE PULSED NEUTRON TECHNIQUE
 REPORT NUMBER.... IAEA-KARLS.-1965, 2, 193-218
 DATE PUBLISHED ... 65-05-00
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS ; LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE PULSED NEUTRON TECHNIQUE HAS BEEN APPLIED TO SUBCRITICAL ASSEMBLIES TO ACCUMULATE DATA USEFUL FOR THE TESTING OF MULTIGROUP CALCULATIONAL METHODS. THE MEASUREMENTS WERE GENERALLY OF TWO TYPES: STUDIES DESIGNED TO EXAMINE THE PROPERTIES OF FUEL-MODERATOR SYSTEMS, AND STUDIES OF THE EFFECTS OF VARIOUS SINGLE PERTURBATIONS UPON THE FUEL-MODERATOR SYSTEM. THE PULSED NEUTRON METHOD IS PARTICULARLY SUITED TO THE LATTER TYPE APPLICATION BECAUSE THE RELATIVE WORTH OF SUCH A PERTURBATION CAN BE MEASURED QUITE DIRECTLY WITH HIGH PRECISION. (AUTH).

611 ID-NUMBER ID-NUMBER 611

AUTHOR YOUNG, D. S.

TITLE NEUTRON DISTRIBUTION MEASUREMENTS AT PAJARITO BY MEANS OF PHOTOGRAPHIC EMULSIONS

REPORT NUMBER..... LA-1487

DATE PUBLISHED ... 52-05-15

SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

A METHOD OF USING PHOTOGRAPHIC EMULSIONS FOR THE STUDY OF NEUTRON DISTRIBUTIONS IS DESCRIBED. THE CONSTRUCTION OF A SIMPLE MACHINE FOR PRODUCING EXPERIMENTAL CRITICAL ASSEMBLIES IN WHICH THE METHOD HAS BEEN USED IS REPORTED. SOURCES OF ERROR ARE DISCUSSED. CURVES OF THE PERTURBATIONS WHEN SMALL SPHERES OF VARIOUS MATERIALS ARE PLACED IN THE CENTER OF THE ASSEMBLY ARE SHOWN.(AUTH).

613 ID-NUMBER ID-NUMBER 613

AUTHOR PAXTON, H. C.

TITLE EFFECTS OF FOREIGN MATERIALS IN THE TOPSY METAL ASSEMBLY - PRELIMINARY

REPORT NUMBER..... LAMS-1154

DATE PUBLISHED ... 50-09-12

SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

THIS PAPER PRESENTS PRELIMINARY RESULTS ON THE EFFECTS OF INSERTING VARIOUS MATERIALS IN SPACES WITHIN THE ORALLOY-TUBALLOY TOPSY ASSEMBLY. THE RESULTING REACTIVITY CHANGES OF THE SYSTEM ARE GIVEN AS A FUNCTION OF RADIUS FOR ORALLOY, TUBALLOY, ALUMINUM, NICKEL, TUNGSTEN CARBIDE AND TUNGSTEN. BASED ON THESE MEASUREMENTS, ATTEMPTS ARE MADE TO COMPUTE THE VARIATION OF CRITICAL MASS WITH DENSITY OF ORALLOY, WITH URANIUM-235 CONCENTRATION AND WITH CONCENTRATION OF ADMIXED ALUMINUM. THE RATIO OF THE EFFECT INTRODUCED PER ATOM TO THAT PER ATOM OF URANIUM-235 ALSO IS GIVEN AS A FUNCTION OF RADIUS FOR EACH OF THE ABOVE MATERIALS.

THE PRINCIPAL PURPOSE OF THIS ACCOUNT IS TO INVITE CRITICISM AND SUGGESTIONS WHICH IT IS HOPED MAY INFLUENCE PLANS FOR A MORE EXTENDED PROGRAM.

614 ID-NUMBER ID-NUMBER 614

AUTHOR JOHNSON, E. B.

TITLE CRITICALITY OF A SPHERE OF 4.98% ENRICHED URANYL FLUORIDE SOLUTION

REPORT NUMBER..... ORNL-3973, 14

DATE PUBLISHED ... 66-05-31

SITE/PROGRAM OAK RIDGE - URANYL(4.9%)FLUORIDE - WATER

ABSTRACT

AN EXTENSIVE PROGRAM OF CRITICAL EXPERIMENTS WITH AN AQUEOUS SOLUTION OF URANYL FLUORIDE IN WHICH THE URANIUM IS ENRICHED TO 4.98% IN URANIUM-235 HAS BEEN UNDER WAY FOR SOME TIME. EARLIER MEASUREMENTS DESCRIBED THE CRITICAL SPACING OF A NUMBER OF CYLINDERS OF THE SOLUTION CONTAINED IN ALUMINUM AND POLYETHYLENE VESSELS TO PROVIDE GUIDANCE IN STORAGE AND TRANSPORT OF LOW-ENRICHED URANIUM. MORE RECENT MEASURES HAVE ATTEMPTED TO DEFINE THE CRITICAL QUANTITY OF THE SOLUTION, ESSENTIALLY UNREFLECTED, IN SINGLE UNITS OF SIMPLE GEOMETRY.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

615 ID-NUMBER ID-NUMBER 615

AUTHOR JOHNSON, E. B./ REEDY, R. K.
 TITLE CRITICAL EXPERIMENTS WITH SPERT-D FUEL ELEMENTS
 REPORT NUMBER..... ORNL-TM-1207
 DATE PUBLISHED ...: 65-07-14
 SITE/PROGRAM: OAK RIDGE - PWR FUEL ELEMENTS IN WATER (SPERT)

ABSTRACT

THE CRITICAL DIMENSIONS OF LATTICES OF SPERT-D FUEL ELEMENTS IN SEVERAL NON-REACTOR ENVIRONMENTS WERE DETERMINED TO ESTABLISH SPECIFICATIONS FOR USE IN STORAGE, TRANSPORTATION, AND CHEMICAL PROCESSING OPERATIONS. EACH FUEL ELEMENT CONTAINED ABOUT 300 G OF URANIUM-235 IN 22 ALUMINUM-CLAD FLAT PLATES. IN ADDITION TO LATTICES WITH WATER MODERATOR AND REFLECTOR, A DILUTE AQUEOUS SOLUTION OF URANYL NITRATE WAS USED IN SOME EXPERIMENTS TO SIMULATE A DISSOLVER. IN STILL OTHER EXPERIMENTS, VARYING AMOUNTS OF BORON WERE ADDED TO THE URANYL NITRATE SOLUTION TO DETERMINE ITS EFFECT AS A SOLUBLE NEUTRON ABSORBER IN CHEMICAL PROCESS EQUIPMENT.

IT WAS SHOWN, FOR EXAMPLE, THAT A MINIMUM OF ABOUT 3.5 KG OF URANIUM-235 IS REQUIRED IN A CRITICAL LATTICE MODERATED AND REFLECTED BY WATER. THIS MASS IS REDUCED TO 2.8 KG (CONTAINED IN THE ELEMENTS) WHEN U(92.6) SOLUTION HAVING A URANIUM-235 CONCENTRATION OF 3.99 G/LITER WAS SUBSTITUTED FOR WATER. IT WAS INCREASED TO 13.6 KG WHEN 1.118 G OF NATURAL BORON WAS ADDED TO EACH LITER OF THE URANYL NITRATE SOLUTION.

616 ID-NUMBER ID-NUMBER 616

AUTHOR FOX, J. K.
 TITLE ACCURACY OF REACTOR CODES FOR CRITICALITY CALCULATIONS ON ARRAYS OF FUEL ELEMENTS IN WATER WITH VARIOUS WATER GAPS
 REPORT NUMBER..... JANSO, 09, 133
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ...: 66-06-00
 SITE/PROGRAM: OAK RIDGE - PWR FUEL ELEMENTS IN WATER (SPERT) - CALCULATIONS

ABSTRACT

RECENTLY, AN EXPERIMENTAL STUDY HAS BEEN MADE AT ORNL OF THE CRITICAL NUMBERS OF SPERT-D FUEL ELEMENTS IN WATER HAVING VARIOUS WATER GAPS BETWEEN ELEMENTS. THE EXPERIMENTS WERE PERFORMED IN ORDER TO EXTEND BASIC CRITICALITY DATA IN THIS AREA. CRITICAL PARAMETERS WERE OBTAINED FOR UNIFORMLY SPACED RECTANGULAR ARRAYS AS A FUNCTION OF WATER-GAP WIDTH AND ON A SERIES OF THREE- AND FOUR-SLAB ARRAY IN WHICH THE WATER GAPS BETWEEN EACH VARIED. BECAUSE OF THE WIDE VARIATIONS IN WATER-GAP THICKNESS, IT WAS FELT THAT A COMPARISON WITH EXPERIMENT WOULD BE A GOOD TEST OF THE ACCURACY OF A SET OF REACTOR CODES. FOR THE CALCULATED K(EFF) VALUES, PDQ AND FOG FEW-GROUP DIFFUSION-THEORY CODES WERE USED. FOUR-GROUP CONSTANTS WERE OBTAINED BY PHROG AND TAMP. PHROG IS A VARIATION OF GAM-1, AND TAMP IS A THERMAL-RANGE CODE THAT USES THE WIGNER-WILKINS EQUATION FOR THE ENERGY SPECTRUM, AND A TRANSPORT CODE FOR DISADVANTAGE FACTORS. IN OBTAINING ALL CONSTANTS, INPUT BUCKLINGS CORRESPONDING TO OVERALL-ARRAY GEOMETRIC BUCKLINGS WERE USED. THE UPPER LIMIT OF THE THERMAL RANGE WAS AT 0.683 EV.

FOR THESE CALCULATIONS, THE FUEL PLATES WERE HOMOGENIZED WITH THE WATER SEPARATING THEM. THE ALUMINUM BOXES WERE MADE INTO A SEPARATE REGION. IN SOME OF THE EARLY CALCULATIONS, THE HOMOGENIZED FUEL REGION EXTENDED TO THE INSIDE OF THE BOX. HOWEVER, FOR THE MORE WIDELY SEPARATED ELEMENTS, THIS GAVE K-EFF VALUES AS MUCH AS THREE PERCENT HIGH. FOR THESE CASES, THE HOMOGENIZED REGION WAS LATER REDUCED TO CORRESPOND TO THE FUEL MEAT WIDTH AND A THIRD REGION OF ALUMINUM AND WATER INSERTED BETWEEN FUEL AND BOX. THUS, THE TRUE GAPS BETWEEN FUEL WERE DEFINED AND THE CALCULATED RESULTS AGREED BETTER WITH EXPERIMENT. FOR THE RECTANGULAR ARRAYS, PDQ IN XY GEOMETRY WAS USED. FOR THE SLAB ARRAYS WHERE TWO DIMENSIONS ARE LARGE, ONE-DIMENSIONAL FOG WAS USED IN THE DIRECTION PERPENDICULAR TO THEM. HOWEVER, FOR THE DOUBLE-SLAB CASE, THE RESULT WAS CHECKED WITH PDQ. TO ESTIMATE TRANSVERSE BUCKLINGS, A SINGLE-CHANNEL FLUX SYNTHESIS UTILIZING BOTH FOG AND PDQ WAS USED. FROM THESE RESULTS, WATER REFLECTOR SAVINGS WERE OBTAINED. THESE VARIED FROM ABOUT 6.5 TO 7.5 CM. SINCE EACH SLAB LAYER CONSISTED OF FUEL ELEMENTS SEPARATED 0.5-INCH IN THE ROW, IT WAS NECESSARY TO HOMOGENIZE THE FUEL WITH THE WATER GAPS WHEN USING FOG. FLUX-WEIGHTED AVERAGE THERMAL CONSTANTS WERE OBTAINED USING TAMP. IN ONE CASE, CALCULATION WAS MADE ON A RECTANGULAR-ARRAY EXPERIMENT WHERE THE MODERATOR AND REFLECTOR WAS A DILUTE SOLUTION CONTAINING 4.0 GRAMS/LITER URANIUM-235 AND 0.891 GRAMS/LITER NATURAL BORON. HERE, THE POISON WAS SUFFICIENT TO INCREASE THE CRITICAL NUMBER FROM ABOUT 12 TO 33 AT AN ELEMENT SEPARATION OF 0.5 INCH. THE RESULTS OF THE COMPARISONS ARE SHOWN IN TABLE I. IN GENERAL, THE AGREEMENT BETWEEN CALCULATED K-EFF VALUES AND EXPERIMENT IS QUITE GOOD. SINCE NO FLUX PROFILES WERE MADE EXPERIMENTALLY, NO FLUX COMPARISONS COULD BE MADE. HOWEVER, THE AGREEMENT IN EIGENVALUE INDICATES THAT FLUX-PEAKING EFFECTS ARE WELL REPRESENTED FOR THESE RATHER WIDE WATER GAPS BY DIFFUSION THEORY. THUS, THE USE OF TRANSPORT THEORY MAY BE LIMITED TO LOCAL EFFECTS BETWEEN FUEL PLATES. THE RESULTS ALSO INDICATE THAT THE METHODS OF OBTAINING FEW-GROUP AVERAGE CONSTANTS ARE ACCURATE FOR THESE NEAR-THERMAL SYSTEMS. (AUTH):

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

617 ID-NUMBER ID-NUMBER 617

AUTHOR INGRAM, G./ SANDERS, J. E.
 TITLE THE BEHAVIOUR OF ZEPHYR WITH A GRAPHITE ENVELOPE
 REPORT NUMBER..... AERE-R/R-2539
 DATE PUBLISHED ... 58-07-00
 SITE/PROGRAM UNITED KINGDOM, HARWELL - ZEPHYR (PLUTONIUM FAST REACTOR CRITICAL ASSEMBLY)

ABSTRACT

THE PRESENT REPORT GIVES AN ACCOUNT OF SOME EXPERIMENTAL STUDIES OF A VERSION OF ZEPHYR, A PLUTONIUM FUELLED FAST REACTOR, HAVING A MAIN ENVELOPE OF PURE GRAPHITE. THIS WORK WAS UNDERTAKEN AS THE FIRST OF A SERIES OF STUDIES OF SYSTEMS WITH ENVELOPES CONTAINING MODERATING MATERIAL, AND IT WAS INTENDED THAT FURTHER INVESTIGATIONS WOULD INCLUDE A VARIETY OF FERTILE (URANIUM) ATOM-LIGHT ATOM MIXTURES. (AUTH).

623 ID-NUMBER ID-NUMBER 623

AUTHOR BAKER, A. R./ SMITH, R. D.
 TITLE ZEUS FINAL REPORT
 REPORT NUMBER..... AERE-R/R-2444
 DATE PUBLISHED ... 59-00-00
 SITE/PROGRAM UNITED KINGDOM, HARWELL - ZEUS (ZERO POWER FAST REACTOR MODEL FOR DOUNREAY REACTOR)

ABSTRACT

ZEUS WAS A URANIUM-235--FUELLED, EXPERIMENTAL, LOW-POWER, FAST REACTOR WHICH WAS IN OPERATION AT HARWELL FROM DECEMBER 1955 UNTIL SEPTEMBER 1957. IT WAS DESIGNED FOR THE MEASUREMENT OF THE NEUTRON PHYSICS OF THE POWER-PRODUCING FAST REACTOR UNDER CONSTRUCTION AT DOUNREAY. ITS DIMENSIONS WERE THEREFORE MADE SIMILAR TO THOSE OF THE DOUNREAY REACTOR. THE CORE WAS CONSTRUCTED SO THAT ITS COMPOSITION COULD BE ALTERED READILY, AND SEVERAL DIFFERENT ASSEMBLIES WERE MADE WITH CRITICAL MASSES RANGING FROM 190 KILOGRAMS TO 210 KILOGRAMS. A LARGE NUMBER OF MEASUREMENTS WERE MADE WITH THESE VARIOUS CORES. SOME OF THESE WERE CONCERNED WITH THE DETAILED BEHAVIOUR OF THE DOUNREAY REACTOR, BUT THE MAJORITY ARE OF GENERAL APPLICATION TO FAST REACTOR SYSTEMS WITH CORES OF SIMILAR COMPOSITION. (AUTH).

624 ID-NUMBER ID-NUMBER 624

AUTHOR BEVAN, G. / MUMMERY, P. W. / SALMON, A. J. / THOMPSON, M. W.
 TITLE EXPONENTIAL EXPERIMENTS FOR PIPPA MK. 1 (DECLASSIFIED VERSION OF AERE-RP/R-1545)
 REPORT NUMBER..... AERE-R/R-2602
 DATE PUBLISHED ... 54-11-00
 SITE/PROGRAM UNITED KINGDOM, HARWELL - EXPONENTIAL EXPERIMENTS FOR PIPPA-MK I (GRAPHITE - URANIUM)

ABSTRACT

SOME EXPERIENCE ON EXPERIMENTAL LATTICES WAS AVAILABLE AT THE TIME THE PIPPA DESIGN WAS AUTHORISED, BUT ADDITIONAL WORK WAS CONSIDERED TO BE NECESSARY. THIS WOULD SERVE THE DUAL PURPOSE OF PROVIDING AD HOC DATA RELATED TO THE CHOSEN PIPPA DESIGN AND OF CONTRIBUTING TO THAT SERIES OF EXPERIMENTS REQUIRED FOR A MORE COMPLETE UNDERSTANDING OF THE NEUTRON FATES IN GAS COOLED GRAPHITE MODERATED REACTORS. THE MAIN FUNCTION OF THE AD HOC EXPERIMENTS MUST BE TO DETERMINE: (I) EFFECT OF USING HIGH PURITY AND HIGH DENSITY GRAPHITE. (II) EFFECT OF CHANGE OF LATTICE PITCH. (III) EFFECT OF CHANGE OF URANIUM ROD DIAMETER. (IV) EFFECT OF CHANGE OF SIZE OF COOLANT CHANNELS. (V) EFFECT OF 4.5% ENRICHMENT OF URANIUM-235 IN THE URANIUM. (AUTH).

628 ID-NUMBER ID-NUMBER 628

AUTHOR ENGELDER, T. C. / CLARK, R. H. / BALDWIN, M. N. / DEROCHE, E. J. / FAIRBURN, G. T. / HALLAM, J. W.
 TITLE MEASUREMENTS AND ANALYSIS OF UNIFORM LATTICE OF SLIGHTLY ENRICHED URANIUM DIOXIDE MODERATED BY HEAVY WATER-WATER MIXTURES
 REPORT NUMBER..... BAW-1273
 DATE PUBLISHED ... 63-11-00
 NSA-NUMBER 18:4786
 SITE/PROGRAM BABCOCK AND WILCOX CO. - SPECTRAL SHIFT CONTROL REACTOR (URANIUM(2-4%) DIOXIDE IN WATER - HEAVY WATER)

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THIS REPORT SUMMARIZES THE EXPERIMENTAL RESULTS AND THEORETICAL INTERPRETATION OF A SERIES OF TWENTY UNIFORM LATTICE CRITICAL EXPERIMENTS IN WHICH THE NEUTRON SPECTRUM IS VARIED OVER A FAIRLY BROAD RANGE. TWO TYPES OF FUEL RODS WERE STUDIED: 4.02%-ENRICHED URANIUM-OXIDE IN STAINLESS STEEL TUBES AND 2.46%-ENRICHED URANIUM-OXIDE IN ALUMINUM TUBES. LATTICE NONMODERATOR-TO-MODERATOR VOLUME RATIOS RANGED FROM 0.65 TO 1.2. THE MODERATORS WERE MIXTURES OF LIGHT AND HEAVY WATER RANGING IN COMPOSITION FROM ZERO TO 77% DEUTERIUM-OXIDE, WITH AND WITHOUT BORIC ACID. MEASUREMENTS INCLUDE CRITICAL SIZE AND COMPOSITION, $D(\rho H_2O)/DH$, BUCKLING AND REFLECTOR SAVINGS, THERMAL DISADVANTAGE FACTOR, AND CADMIUM RATIOS OF URANIUM-235 AND URANIUM-238. THEORETICAL METHODS USED TO ANALYZE THE DATA ARE GIVEN, AND RESULTS ARE COMPARED. (AUTH).

631 ID-NUMBER ID-NUMBER 631

AUTHOR KOUTS, H. / DOWNES, K. / PRICE, G. A. / SHER, R. / WALSH, V.
 TITLE BUCKLING OF LIGHT WATER LATTICES (0.600 INCHES DIAMETER RODS - 1.3 PERCENT AND 1.15 PERCENT URANIUM-235
 REPORT NUMBER..... BNL-01627
 DATE PUBLISHED ... 53-11-05
 NSA-NUMBER 10:3038
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - SLIGHTLY ENRICHED URANIUM - WATER LATTICES

ABSTRACT

THREE METHODS ARE DESCRIBED FOR MEASURING THE BUCKLING OF LIGHT-WATER LATTICES. IN METHOD 1, A SUB-CRITICAL, CYLINDRICAL REACTOR LATTICE IS PLACED IN THE NEUTRON FIELD OF THE BROOKHAVEN REACTOR THERMAL COLUMN. THE VERTICAL RELAXATION LENGTH OF THE NEUTRON-EXCITED THERMAL NEUTRON FLUX IS THEN MEASURED AS A FUNCTION OF THE LOADED RADIUS, AND BEST VALUES OF BUCKLING AND REFLECTOR SAVINGS ARE FOUND WHICH FIT THE CALCULATED FUNCTIONAL DEPENDENCE TO THE MEASURED DATA. IN THE SECOND PROCEDURE, THAT OF THE STANDARD EXPONENTIAL EXPERIMENT, BUCKLING AND REFLECTOR SAVINGS ARE DETERMINED FROM PLOTS OF THE MEASURED RADIAL AND AXIAL VARIATION OF THE THERMAL NEUTRON FLUX, DETERMINED BY FOIL EXPOSURE. METHOD 3 IS ESSENTIALLY THAT OF THE CRITICAL ASSEMBLY. URANIUM IS LOADED IN THE PRESENCE OF A PO-BE SOURCE UNTIL A $k(\text{eff})$ OF 0.99 IS ATTAINED. THE SOURCE IS THEN REMOVED, AND THE LATTICE IS PARTLY UNLOADED BY STEPS. FOIL COUNTING METHODS AND EXPERIMENTAL PROCEDURES FOR OBTAINING RELAXATION LENGTHS AND RADIAL TRAVERSES ARE EXPLAINED. TABULATED BUCKLING MEASUREMENTS ARE GIVEN FOR 1.15 AND 1.3% ENRICHMENT FACTORS AT 4:1, 3:1, 2:1, 1.5:1 VOLUME RATIOS.

632 ID-NUMBER ID-NUMBER 632

AUTHOR DOWNES, K.
 TITLE BUCKLING OF A NATURAL URANIUM LIGHT WATER MODERATED LATTICE
 REPORT NUMBER..... BNL-02016
 DATE PUBLISHED ... 54-07-23
 NSA-NUMBER 10:3392
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - SLIGHTLY ENRICHED URANIUM - WATER LATTICES

ABSTRACT

THE BROOKHAVEN NATIONAL LABORATORY REACTOR PHYSICS GROUP IS MEASURING THE PILE PARAMETERS OF A SERIES OF LIGHT-WATER MODERATED, SLIGHTLY ENRICHED URANIUM LATTICES. WE ARE MEASURING PARAMETERS FOR THREE DIFFERENT SIZES OF RODS, THREE DIFFERENT ENRICHMENTS, AND FIVE DIFFERENT WATER-TO-METAL RATIOS. IN ORDER TO EXPAND THIS INVESTIGATION WE DECIDED TO MEASURE SOME OF THE PARAMETERS OF A LIGHT-WATER NATURAL URANIUM LATTICE. THE LATTICE WE CHOSE HAS A URANIUM ROD SIZE OF 1.1 INCH DIAMETER, AND A WATER-TO-URANIUM VOLUME RATIO OF 1.5.

633 ID-NUMBER ID-NUMBER 633

AUTHOR GREEN, R. E. / BIGHAM, C. B.
 TITLE URANIUM DIOXIDE LATTICE - PARAMETER MEASUREMENTS IN ZED2
 REPORT NUMBER..... AECL-1814
 DATE PUBLISHED ... 63-09-00
 NSA-NUMBER 17:38564
 SITE/PROGRAM CANADA, CHALK RIVER NUCLEAR LABORATORIES - HEAVY WATER LATTICES

ABSTRACT

THE ZED-2 REACTOR (1) AT CHALK RIVER IS A DEUTERIUM OXIDE-MODERATED, ZERO-POWER, CRITICAL FACILITY IN WHICH EXPERIMENTS ARE DONE TO DETERMINE THE PARAMETERS OF LATTICES OF FUEL ASSEMBLIES WHICH ARE POSSIBLE CONTENDERS AS FUEL FOR NUCLEAR POWER STATIONS. DETAILED LATTICE PARAMETER MEASUREMENTS HAVE BEEN MADE FOR LATTICES OF FUEL ASSEMBLIES WHICH ARE SIMILAR TO THE FUEL CHANNELS OF THE NPD AND CANDU POWER REACTORS. EXPERIMENTAL RESULTS FOR LATTICES OF NPD TYPE 7-ROD URANIUM- DIOXIDE FUEL BUNDLES WERE PRESENTED AT THE I.A.E.A. PANEL MEETING ON HEAVY WATER LATTICES IN VIENNA

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

IN FEBRUARY, 1963. THIS PAPER DESCRIBES THE RESULTS THAT HAVE BEEN OBTAINED FOR LATTICES OF CANDU TYPE19-ROD URANIUM-DIOXIDE FUEL BUNDLES.(AUTH).

639 ID-NUMBER ID-NUMBER 639

AUTHOR SMITH, J. C. / PARKER, A. V. / WALFORD, J. G. / WHITE, C.
 TITLE CRITICALITY OF 30 PERCENT ENRICHED URANIUM SOLUTIONS IN CYLINDRICAL GEOMETRY. INTERIM REPORT
 REPORT NUMBER..... DEG MEMO.-633 (D)
 DATE PUBLISHED ... 60-03-00
 SITE/PROGRAM UNITED KINGDOM, DOUNREAY - URANYL(30%) FLUORIDE - WATER

ABSTRACT

AN EXPERIMENTAL SURVEY IS BEING CARRIED OUT JOINTLY BY AWRE AND DERE OF THE CRITICAL PARAMETERS OF URANIUM-HYDROGEN MIXTURE AT 30 V ENRICHMENT. THE DERE PHASE OF THIS SURVEY IS CONCERNED WITH THE CRITICALITY OF AQUEOUS URANIUM SOLUTIONS AND COVERS THE RANGE IN HYDROGEN TO URANIUM-235 RATIO FROM ABOUT 50 UPWARDS; THE AWRE PHASE WILL MAKE USE OF SOLID COMPACTS OF URANIUM- DIOXIDE AND PARAFFIN.

645 ID-NUMBER ID-NUMBER 645

AUTHOR CLAYTON, E. D.
 TITLE EXPONENTIAL PILE MEASUREMENTS IN WATER MODERATED LATTICES WITH ENRICHED URANIUM-WATER ROD LATTICES
 REPORT NUMBER..... HW-40930
 DATE PUBLISHED ... 56-01-16
 NSA-NUMBER 11:1657
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

THIS PAPER PRESENTS THE RESULTS OF A SERIES OF BUCKLING MEASUREMENTS INVOLVING THE USE OF ENRICHED URANIUM RODS (1.007% BY WEIGHT URANIUM-235) IN LIGHT WATER. THE BUCKLING WAS DETERMINED FOR TWO ROD SIZES, 0.925 INCH AND 1.66 INCH IN DIAMETER. FOR THE 0.925 INCH RODS THE FOLLOWING WATER-TO-URANIUM-VOLUME RATIOS WERE USED: 1.37, 1.74, 1.94, AND 2.15. THE WATER-TO-URANIUM-VOLUME RATIOS USED FOR THE 1.66 INCH RODS WERE 0.86, 1.33, AND 1.85. THE INFORMATION OBTAINED WITH THE PRECEDING ROD SIZES AND WATER-TO-URANIUM-VOLUME RATIOS WAS SUFFICIENT (WHEN COUPLED WITH EXISTING DATA FOR OTHER ROD SIZES) TO ESTIMATE THE MAXIMUM OBTAINABLE BUCKLING AS APPROXIMATELY 3600 E-6 CM- 2 FOR 1.007% ENRICHED URANIUM IN LIGHT WATER. THIS WOULD OCCUR FOR A ROD SIZE OF ABOUT 0.75 INCH AT A WATER-TO-URANIUM-VOLUME RATIO OF 2.1. A CURVE IS GIVEN RELATING MAXIMUM BUCKLING WITH WATER-TO- URANIUM-VOLUME RATIO AND ROD DIAMETER FROM WHICH ESTIMATES MAY BE MADE REGARDING CRITICALITY HAZARDS WITH THE 1.007% ENRICHED URANIUM.

THE EFFECT OF REPLACING A WATER REFLECTOR WITH ONE OF URANYL NITRATE SOLUTION OF TWO DIFFERENT CONCENTRATIONS, 536 AND 188 GRAMS OF URANIUM PER LITER OF SOLUTION WAS INVESTIGATED FOR THE 0.925 INCH RODS WITH THE 1.74 WATER-TO-URANIUM-VOLUME RATIO IN THE CORE. SOME INFORMATION WAS ALSO OBTAINED ON THE EXTRAPOLATION LENGTH TO BE USED IN UNREFLECTED CASES.(AUTH).

646 ID-NUMBER ID-NUMBER 646

AUTHOR HANDLER, H. E.
 TITLE EXPERIMENTS TO DETERMINE THE INFINITE MULTIPLICATION FACTORS OF ENRICHED URANYL FLUORIDE-WATER MIXTURES
 REPORT NUMBER..... HW-51168
 DATE PUBLISHED ... 57-07-01
 NSA-NUMBER 12:686
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

THE PROGRAM WAS INITIATED, TO FIND THE MAXIMUM URANIUM-235 ENRICHMENT FOR MIXTURES OF URANYL OXIDE AND WATER AND OF URANYL NITRATE AND WATER WHICH WILL BE SUBCRITICAL INDEPENDENT OF BOTH THE HYDROGEN TO URANIUM ATOMIC RATIO, H/U, AND THE VOLUME OF MATERIAL.

IT WAS DECIDED TO USE THE PCTR FOR THE EXPERIMENTS BECAUSE OF THIS SUBSTANTIALLY SMALLER MATERIAL REQUIREMENT AND THE ACCOMPANYING SAVINGS IN MECHANICAL EQUIPMENT AND TIME.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

647 ID-NUMBER ID-NUMBER 647

AUTHOR NEELEY, V. I.
 TITLE A COMPARISON OF PCTR AND CRITICAL EXPERIMENT DETERMINATION OF K(INF) FOR 2 WEIGHT PERCENT URANIUM-235. ENRICHED URANIUM TETRAFLUORIDE IN PARAFFIN
 REPORT NUMBER..... HW-62031
 DATE PUBLISHED ... 59-09-22
 NSA-NUMBER 14:5775
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

NUCLEAR SAFETY SPECIFICATIONS FOR SAFE HANDLING AND STORAGE OF FISSILE MATERIALS REQUIRES ADEQUATE KNOWLEDGE OF THE CRITICALITY PARAMETERS OF THESE MATERIALS. ONE OF THE MOST USEFUL OF THESE PARAMETERS IS THE INFINITE MEDIUM THERMAL NEUTRON MULTIPLICATION FACTOR COMMONLY REFERRED TO AS K(INF).

THE PHYSICAL CONSTANTS TEST REACTOR IS A USEFUL TOOL FOR DETERMINING THIS PARAMETER; HOWEVER, THE TECHNIQUES OF K(INF) MEASUREMENTS IN THE PCTR HAVE NOT ALWAYS BEEN FULLY UNDERSTOOD. FOR THIS REASON AN EXPERIMENT WAS DESIGNED TO CHECK THE VALUE OF K(INF) OBTAINED FROM PCTR MEASUREMENTS. THE METHOD WAS TO OBTAIN AN INDEPENDENT VALUE OF K(INF) FROM CRITICAL EXPERIMENTS ON THE SAME MATERIAL USED IN THE PCTR EXPERIMENTS.

649 ID-NUMBER ID-NUMBER 649

AUTHOR SCHUSKE, C. L. / ERNST, B. B. / KING, H. W.
 TITLE EMPIRICAL ANALYSIS OF CRITICAL BARE ARRAYS OF CYLINDERS OF ENRICHED URANIUM NITRATE
 REPORT NUMBER..... RFP-0315
 DATE PUBLISHED ... 63-05-29
 NSA-NUMBER 17:26282
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER - CALCULATIONS

ABSTRACT

SIMPLE EMPIRICAL EQUATIONS HAVE BEEN FOUND THAT RELATE THE CRITICAL HEIGHTS OF CYLINDERS IN ARRAYS WITH THE ARRAY BASE DIMENSIONS FOR VARIOUS SURFACE-TO-SURFACE SEPARATIONS OF THE INDIVIDUAL CYLINDERS IN THE ARRAY. THE METHODS HAVE BEEN APPLIED TO CRITICAL ARRAYS OF CYLINDRICAL VESSELS CONTAINING AQUEOUS SOLUTIONS OF URANYL-NITRATE. THESE CRITICAL DATA WERE GENERATED BY THE CRITICAL MASS FACILITY OF THE OAK RIDGE NATIONAL LABORATORY.(AUTH).

652 ID-NUMBER ID-NUMBER 652

AUTHOR GRAY, A. W./ JONES, L. L.
 TITLE AN ANALYTICAL STUDY OF THE MINIMUM CRITICAL MASS OF HIGHLY ENRICHED URANIUM-235 WHEN REFLECTED BY NATURAL URANIUM AND WATER MIXTURES IN OPTIMIZED LATTICES
 REPORT NUMBER..... WAPD-TM-0933
 DATE PUBLISHED ... 70-03-00
 NSA-NUMBER 24:20606
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER - CALCULATIONS ; UNITED KINGDOM - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES - CALCULATIONS

ABSTRACT

AN EXTENSIVE ANALYTICAL STUDY HAS BEEN UNDERTAKEN TO ADD TO THE LIMITED DATA AVAILABLE CONCERNING THE MINIMUM CRITICAL MASS PARAMETERS FOR A SPHERICAL REGION OF AN OPTIMUM URANIUM-235- PLUS-WATER MIXTURE, WHEN THIS REGION IS REFLECTED BY NATURAL URANIUM IN AN OPTIMUM LIGHT-WATER CONFIGURATION. THE CONDITIONS UNDER WHICH THE CENTRAL, ENRICHED REGION WOULD BE EXACTLY CRITICAL, WITH A MINIMUM CRITICAL MASS OF URANIUM-235, HAVE BEEN COMPUTED FOR VARIOUS REFLECTOR CONFIGURATIONS. THESE REFLECTOR CONFIGURATIONS ARE (1) A HOMOGENEOUS MIXTURE OF WATER AND NATURAL URANIUM AT THE OPTIMUM HYDROGEN TO URANIUM-235 RATIO. (SUFFICIENT DATA WAS OBTAINED TO MAP THE BEHAVIOR OF THIS SYSTEM OVER A WIDE RANGE OF NATURAL URANIUM MASSES.), AND (2) NATURAL URANIUM METAL CYLINDERS OF AN OPTIMUM URANIUM-WATER LATTICE. SPECIFIC CALCULATIONS WERE PERFORMED IN THIS LATTER SYSTEM FOR 0, 225, AND 17,000 KILOGRAMS OF NATURAL URANIUM. THE RESULTS OF THESE CALCULATIONS INDICATE THAT THE MINIMUM CRITICAL MASS PARAMETER FOR THE CENTRAL ENRICHED REGION LIES IN THE RANGE OF 75 TO 200 GRAMS OF URANIUM-235.

THE HETEROGENEOUS SYSTEMS WERE ANALYZED USING A MONTE CARLO PROGRAM. THE VALIDITY OF THIS ANALYSIS WAS ESTABLISHED BY APPLICATION OF THE MONTE CARLO PROGRAM TO A NUMBER OF URANIUM-ROD-WATER LATTICE SYSTEMS (URANIUM-235 ENRICHMENT IN THE RANGE 0.71 TO 3.0 WT%) FOR WHICH EXPERIMENTAL DATA IS AVAILABLE.

THESE RESULTS WERE THEN UTILIZED TO SELECT APPROPRIATE CRITICALITY LIMITS AND RULES FOR THE UNDERWATER HANDLING OF NATURAL URANIUM AND ENRICHED URANIUM MATERIALS UNDER CONDITIONS WHEN BOTH TYPES OF MATERIALS ARE AVAILABLE.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

653 ID-NUMBER ID-NUMBER 653

AUTHOR TUCK, G.
 TITLE CRITICAL MASSES OF SPHERICAL AND HEMISPHERICAL ENRICHED URANIUM ASSEMBLIES
 REPORT NUMBER..... JAABA, 23, 663-672
 JOURNAL JOURNAL OF NUCLEAR ENERGY
 DATE PUBLISHED ... 69-12-00
 NSA-NUMBER 24:20642
 SITE/PROGRAM ROCKY FLATS - URANIUM(93%) METAL - SPHERES

ABSTRACT

THE CRITICAL MASSES OF OIL REFLECTED, ENRICHED URANIUM METAL ASSEMBLIES WERE EXPERIMENTALLY DETERMINED TO OBTAIN DATA FOR COMPARISON WITH CALCULATIONS. THE CENTER, OR MODERATOR REGION, OF THESE ASSEMBLIES IS FILLED WITH OIL OR STEEL. THE MODERATOR REGION AND THE SURROUNDING URANIUM REGION ARE SPHERICALLY SHAPED FOR ONE SERIES OF MEASUREMENTS AND HEMISPHERICAL IN SHAPE FOR THE SECOND. THE INNER URANIUM REGION RADIUS IS VARIED FROM 0 TO 12 CM. CALCULATIONS WERE PERFORMED FOR THE OIL MODERATED AND REFLECTED SPHERICAL ASSEMBLIES. THE RESULTS OF THE CALCULATIONS AND EXPERIMENT ARE COMPARED.(AUTH).

654 ID-NUMBER ID-NUMBER 654

AUTHOR HURLEY, T. J.
 TITLE MEASURED LATTICE PARAMETERS FOR NATURAL URANIUM METAL ROD LATTICES IN HEAVY WATER
 REPORT NUMBER..... DP-777
 DATE PUBLISHED ... 63-08-00
 NSA-NUMBER 18:7893
 SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES IN HEAVY WATER

ABSTRACT

NUCLEAR PARAMETERS OF SIXTEEN DEUTERIUM-OXIDE-MODERATED LATTICES OF NATURAL URANIUM ROD CLUSTERS WERE MEASURED IN THE PROCESS DEVELOPMENT PILE. THE CLUSTERS CONSISTED OF 1, 3, 7, OR 19 URANIUM METAL RODS. EACH ROD WAS 1 INCH IN DIAMETER AND WAS CLAD WITH 0.032 INCH OF ALUMINUM. TRIANGULAR LATTICE SPACINGS BETWEEN CLUSTERS RANGED FROM 7 TO 21 INCHES, CENTER TO CENTER. THE PARAMETERS THAT WERE MEASURED INCLUDED THE NUMBER OF FISSION NEUTRONS PER THERMAL NEUTRON ABSORPTION, THE FAST FISSION FACTOR, THE RESONANCE ESCAPE PROBABILITY, THE THERMAL UTILIZATION, AND THE THERMAL DIFFUSION AREA.(AUTH).

673 ID-NUMBER ID-NUMBER 673

AUTHOR CARTER, D. H. / CLARKE, W. G. / HUNT, C. / MARSHALL, J. / MC CULLOCH, D. B. / SANDERS, J. E. / SYMONS, C. R.
 TITLE MEASUREMENTS OF BUCKLING AND RELATIVE REACTION RATES IN SOME PLUTONIUM-GRAPHITE ASSEMBLIES
 REPORT NUMBER..... AEEW-R201
 DATE PUBLISHED ... 64-00-00
 NSA-NUMBER 18:24852
 SITE/PROGRAM UNITED KINGDOM, WINFRITH - URANIUM-PLUTONIUM-GRAPHITE

ABSTRACT

THE MATERIALS BUCKLINGS OF A SERIES OF PLUTONIUM-ALUMINUM ALLOY-FUELLED, GRAPHITE-MODERATED ASSEMBLIES HAVE BEEN MEASURED. THE CARBON/PLUTONIUM RATIO RANGING FROM 14,520 TO 2420. FISSION RATIOS OF PLUTONIUM-239, URANIUM-235, AND URANIUM-233 IN THE ASSEMBLIES HAVE BEEN OBTAINED USING SMALL FISSION CHAMBERS. ON ONE OF THE SYSTEMS, EXPERIMENTS WERE EXTENDED UP TO A TEMPERATURE OF 370 DEGREES C. THE EXPERIMENTAL DATA HAVE BEEN COMPARED WITH THE PREDICTIONS OF A 43-GROUP DIFFUSION- THEORY CODE. AGREEMENT BETWEEN PREDICTED AND MEASURED BUCKLINGS IS GOOD OVER THE WHOLE RANGE OF COMPOSITION, WITHIN THE LIMITS OF EXPERIMENTAL ERROR, WHICH ARE EQUIVALENT TO AN UNCERTAINTY OF ABOUT +/- 2 PER CENT IN REACTIVITY. THE SPECTRUM-SENSITIVE PLUTONIUM-239/URANIUM-235 FISSION RATIOS ARE 6-9 PER CENT HIGHER THAN THOSE CALCULATED FROM THE MULTIGROUP SPECTRA.

COMPARISON WITH FURTHER RESULTS FROM AN ASSEMBLY LOADED WITH URANIUM-235 IN SIMILAR CONFIGURATION, LEADS TO A RATIO OF THE 2200 METER/SEC ETA VALUES OF PLUTONIUM-239 AND URANIUM-235 OF 1.02 +/-0.02.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

680 ID-NUMBER ID-NUMBER 680

AUTHOR DAVISON, P. W. / GROB, V. E. / HANLEN, D. F. / LEAMER, R. D. / RITZ, H. / SANTANDREA, E.
 TITLE TWO REGION CRITICAL EXPERIMENTS WITH WATER MODERATED SLIGHTLY ENRICHED URANIUM DIOXIDE LATTICES
 REPORT NUMBER..... YAEC-142
 DATE PUBLISHED ... 59-11-30
 NSA-NUMBER 14:18470
 SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - MULTIPLE REGION URANIUM DIOXIDE - WATER

ABSTRACT

AS AN EXTENSION OF THE YANKEE AND BR-3 CRITICAL EXPERIMENTS, A SERIES OF TWO-REGION CRITICAL EXPERIMENTS WERE PERFORMED AT THE WESTINGHOUSE REACTOR EVALUATION CENTER FROM THE END OF 1958 THROUGH THE FIRST HALF OF 1959. THE PRIMARY PURPOSE OF THESE EXPERIMENTS WAS TO MEASURE THE SPATIAL DISTRIBUTION OF NEUTRON FLUX AND POWER PRODUCTION IN REACTOR CORES OF SIMPLE GEOMETRIC SHAPE CONTAINING TWO REGIONS OF DIFFERENT FUEL ENRICHMENTS IN ORDER THAT A COMPARISON COULD BE MADE WITH ANALYTICALLY DERIVED DISTRIBUTIONS FOR THE SAME CORES. GOLD FOILS, URANIUM-238 FOILS AND FUEL RODS WERE USED TO OBTAIN THERMAL FLUX, FAST FLUX AND POWER PRODUCTION THROUGH THE CORES. IN ADDITION, CRITICAL SIZE, BUCKLING, REFLECTOR SAVINGS, AND MICROSCOPIC PARAMETER MEASUREMENTS WERE MADE IN SINGLE-REGION CORES OF 4.4% FUEL IN THE TWO LATTICES USED.

681 ID-NUMBER ID-NUMBER 681

AUTHOR GROB, V. E. / DAVISON, P. W. / HANLEN, D. F. / LEAMER, R. D. / KELLEY, F. L. / CLEARY, J. D.
 TITLE MULTI-REGION REACTOR LATTICE STUDIES RESULTS OF CRITICAL EXPERIMENTS IN LOOSE LATTICES OF URANIUM DIOXIDE RODS IN WATER
 REPORT NUMBER..... WCAP-1412
 DATE PUBLISHED ... 60-03-30
 NSA-NUMBER 15:2067
 SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - MULTIPLE REGION URANIUM DIOXIDE - WATER

ABSTRACT

THIS REPORT DESCRIBES THE LOOSE LATTICE EXPERIMENTAL WORK PERFORMED UNDER THE MULTI-REGION LATTICE PROGRAM CONDUCTED AT THE WESTINGHOUSE REACTOR EVALUATION CENTER. THE FUEL USED IN THESE EXPERIMENTS WAS THE 2.73% ENRICHED YANKEE CRX FUEL, DESCRIBED ON PAGE 14 OF YAEC-94. THE PURPOSE OF THE EXPERIMENTS WAS TO OBTAIN CRITICAL MASS INFORMATION IN THE RANGE OF MODERATING RATIOS CLOSE TO THE OPTIMUM, AND TO VERIFY THE PHYSICS COMPUTATIONAL METHODS NOW USED FOR FUEL STORAGE CALCULATIONS. THE EXPERIMENTAL PROGRAM CONSISTED OF CRITICAL SIZE, BUCKLING, REFLECTOR SAVINGS, AND MICROSCOPIC PARAMETER MEASUREMENTS. (AUTH).

682 ID-NUMBER ID-NUMBER 682

AUTHOR RUTLEDGE, G. P. / KANTORCZYK, P. A.
 TITLE NUCLEAR ANALYSIS OF THERMAL REFLECTED CYLINDRICAL HOMOGENEOUS CRITICAL ASSEMBLIES
 REPORT NUMBER..... WAPD-TM-0244
 DATE PUBLISHED ... 60-11-00
 NSA-NUMBER 15:4594
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER - CALCULATIONS

ABSTRACT

THIS REPORT DESCRIBES THE RESULTS OF AN ANALYTIC STUDY OF SOME HOMOGENEOUS REACTORS WITH SEVERAL REACTOR MODELS PRESENTLY USED AT THE BETTIS LABORATORY. THE CALCULATED CRITICALITY IS COMPARED WITH EXPERIMENT; HOWEVER, THE EXPERIMENTS WERE DESIGNED FOR REASONS OTHER THAN ANALYTICAL EVALUATION. THEREFORE, CONSIDERABLE EFFORT HAS BEEN MADE TO NOT ONLY COMPARE K(EFF) (I.E., EIGENVALUE) ANALYTICALLY AND EXPERIMENTALLY BUT TO ESTIMATE THE EXPERIMENTAL ERROR OF K(EFF) SO DIFFERENCES DUE TO THE MODEL CHOSEN COULD BE PROPERLY EVALUATED.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

685 ID-NUMBER ID-NUMBER 685

AUTHOR JAWOROWSKI, T. R. / ALINE, P. G. / KOSANKE, H. D.
 TITLE CONTROL AUGMENTATION CRITICAL EXPERIMENTS
 REPORT NUMBER..... APED-4236
 DATE PUBLISHED ... 63-07-15
 NSA-NUMBER 18:3093
 SITE/PROGRAM GENERAL ELECTRIC CO., VALLECITOS - LOW ENRICHED URANIUM OXIDE - WATER

ABSTRACT

CRITICAL EXPERIMENTS ARE REPORTED FOR CLUMPED HETEROGENEOUS LIGHT WATER MODERATED LATTICES USING 3 WT% ENRICHED URANIUM-DIOXIDE FUEL CLAD WITH STAINLESS STEEL. REACTIVITY WORTH UTILIZING WATER HEIGHT AND PULSED NEUTRON TECHNIQUES, TEMPERATURE AND VOID COEFFICIENTS, FLUX AND POWER DISTRIBUTIONS, AND SPECTRAL INDICATOR ACTIVATIONS WERE MEASURED FOR A WIDE RANGE OF CONFIGURATIONS. THESE CONFIGURATIONS WERE TYPICAL OF BOILING WATER REACTOR LATTICES AND INCLUDED ASSEMBLIES WITH BLACK AND GRAY ABSORBING SLABS AND CONTROL ROD CRUCIFORMS. DIFFERENTIAL REACTIVITY AND SPECTRUM EFFECTS WERE INVESTIGATED FOR VARIOUS SLAB, CRUCIFORM AND VOID TUBE PERTURBATIONS IN THESE EXPERIMENTS. THE RESONANCE SPECTRAL INDICATOR METHOD WAS USED IN PARTICULAR TO STUDY THE SPATIAL VARIATION OF THE NEUTRON SPECTRUM AND DENSITY IN A TYPICAL BOILING WATER REACTOR LATTICE. THE OBSERVED SPATIAL NEUTRON SPECTRUM VARIATIONS SHOW THAT THIS IS A VERY USEFUL TECHNIQUE FOR FURTHER DEVELOPMENT. THIS TECHNIQUE HOLDS PROMISE OF PROVIDING THE REACTOR DESIGNER WITH INFORMATION TO DEVELOP BETTER REACTOR MODELS FOR POWER REACTOR DESIGN ANALYSIS.(AUTH).

686 ID-NUMBER ID-NUMBER 686

AUTHOR SANDERS, J. E.
 TITLE EXPERIMENTS IN ZENITH
 REPORT NUMBER..... AE EW-M340
 CONFERENCE DRAGON PROJECT PHYSICS SYMPOSIUM, 7-9 MAY, 1963
 DATE PUBLISHED ... 63-04-00
 SITE/PROGRAM UNITED KINGDOM, WINFRITH - ZEBRA

ABSTRACT

THE EXPERIMENTAL PROGRAMME ON URANIUM-235 FUELLED CORES OF THE HEATED ZERO ENERGY REACTOR ZENITH WAS COMPLETED IN JULY, 1962. MEASUREMENTS WITH A PLUTONIUM FUELLED CORE ARE NOW IN PROGRESS.

DETAILED REPORTS HAVE BEEN ISSUED DESCRIBING THE WORK ON CORES 1, 2, 2A AND 4 AND THE ASSESSMENT OF THE DATA FROM THE FIFTH CORE IS IN COURSE OF COMPLETION. THESE CORES, WHICH CONTAINED CARBON, THORIUM AND STEEL, HAVE ENABLED THEORETICAL METHODS TO BE TESTED OVER A WIDE RANGE OF NEUTRON ENERGY SPECTRA.

THE PRESENT PAPER DESCRIBES BRIEFLY THE RESULTS OF SOME ASPECTS OF THE EXPERIMENTAL WORK AND THE COMPARISON WITH THEORETICAL PREDICTION. A FURTHER SURVEY WILL LATER BE MADE COVERING THE PHYSICS WORK ON ALL THE CORE LOADINGS.

691 ID-NUMBER ID-NUMBER 691

AUTHOR MIHALCZO, J. T.
 TITLE PROMPT NEUTRON LIFETIME IN ENRICHED URANIUM METAL CYLINDERS
 REPORT NUMBER..... TANSO, 07, 048-049
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 64-06-00
 NSA-NUMBER 18:28303
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

A SERIES OF EXPERIMENTS WITH UNREFLECTED AND UNMODERATED CYLINDERS OF ENRICHED-URANIUM METAL (93.15 PERCENT URANIUM-235) HAS BEEN PERFORMED AT THE ORNL CRITICAL EXPERIMENTS FACILITY TO DETERMINE THE DEPENDENCE OF THE PROMPT-NEUTRON LIFETIME ON THE CYLINDER DIMENSIONS. FIVE CYLINDERS RANGING IN DIAMETER FROM 17.77 TO 38.09 CM AND IN HEIGHT-TO-DIAMETER FROM ABOUT 0.2 TO 0.7 WERE ASSEMBLED AND THEIR PROMPT-NEUTRON DECAY CONSTANTS MEASURED AT DELAYED CRITICAL BY THE ROSSI-ALPHA TECHNIQUE. PROMPT-NEUTRON LIFETIMES WERE OBTAINED FROM THE MEASURED DECAY CONSTANTS AND EFFECTIVE DELAYED-NEUTRON FRACTIONS CALCULATED BY TRANSPORT THEORY. THE AVERAGE URANIUM DENSITY FOR EACH ASSEMBLY WAS GREATER THAN 18.7 G/CM³.

THE EXPERIMENTAL PROCEDURE CONSISTED IN CONSTRUCTING CYLINDERS THAT WERE AS NEARLY REGULAR AS POSSIBLE AND ALSO AS NEARLY CRITICAL AS POSSIBLE. HOWEVER, THE CYLINDERS HAD IRREGULAR TOP SURFACES BECAUSE OF THE METHOD OF ASSEMBLY, AND IN SOME CASES THE REACTIVITY WAS AS MUCH AS 8.5 CENTS BELOW DELAYED CRITICAL. TO ESTIMATE THE DIMENSIONS OF CORRESPONDING REGULAR CRITICAL CYLINDERS, CORRECTIONS TO THE DATA WERE APPLIED TO COMPENSATE FOR THE REFLECTING EFFECT OF THE SUPPORT STRUCTURE AND FOR THE IRREGULARITY OF THE TOP SURFACE. THE FORMER CORRECTIONS WERE DETERMINED EXPERIMENTALLY. THE LATTER WERE DETERMINED BY FIRST-ORDER PERTURBATION THEORY USING THE ADJOINT AND FORWARD ANGULAR

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

FLUXES OBTAINED FROM TRANSPORT CALCULATIONS WITH THE TDC CODE IN THE SB APPROXIMATION AND THE CROSS SECTIONS DESCRIBED BY HANSEN AND ROACH. THE RESULTING DIMENSIONS AND MASSES OF THE REGULAR ASSEMBLIES ARE GIVEN IN THE TABLE. (AUTH.).

692 ID-NUMBER ID-NUMBER 692

AUTHOR DUBOVSKII, B. G. / KAMAEV, A. V. / ORLOV, V. V. / VLADYKOV, G. M. / GURIN, V. N. / KUZNETSOV, F. M. / KOCHERGIN, V. P. / MARKELOV, I. P. / POPOV, G. A. / SVIRIDENKO, V. J.

TITLE THE CRITICAL PARAMETERS OF AQUEOUS SOLUTIONS OF URANIUM NITRATE AND NUCLEAR SAFETY

REPORT NUMBER..... GENEVA-3, 13, 254-263
CONFERENCE THIRD UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 31 AUGUST - 9 SEPTEMBER 1964

DATE PUBLISHED ... 64-09-00

NSA-NUMBER 18:37867

SITE/PROGRAM USSR - URANYL NITRATE SOLUTIONS

ABSTRACT

CRITICAL EXPERIMENTS WERE PERFORMED IN REFLECTED AND UNREFLECTED RIGHT CIRCULAR CYLINDERS, PARALLELEPIPEDS WITH SQUARE CROSS SECTION AND SPHERES USING AN AQUEOUS SOLUTION OF URANYL-NITRATE.

THE ASSEMBLY VESSELS WERE MADE FROM STAINLESS STEEL.

IN UNREFLECTED EXPERIMENTS MINIMUM DISTANCE FROM CORE TO ROOM CONCRETE WALLS WAS ABOUT 2 METERS.

THE SOLUTION TEMPERATURE WAS CHANGED WITHIN THE LIMITS OF 15 - 21 DEGREE.

693 ID-NUMBER ID-NUMBER 693

AUTHOR PONOMAREV-STEPNOI, N. N. / SMIRNOV, O. N. / KULEVA, R. V.

TITLE INVESTIGATION ON SYSTEM WITH ZIRCONIUM HYDRIDE MODERATOR

REPORT NUMBER..... GENEVA-3, 03, 241-247
CONFERENCE THIRD UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 31 AUGUST - 9 SEPTEMBER 1964

DATE PUBLISHED ... 64-09-00

NSA-NUMBER 18:38303

SITE/PROGRAM USSR - URANIUM(90%) - ZIRCONIUM HYDRIDE

ABSTRACT

RESULTS OF AN INVESTIGATION ON PHYSICAL CHARACTERISTICS OF CRITICAL ASSEMBLIES WITH ZIRCONIUM- HYDRIDE MODERATOR AND 90% URANIUM ENRICHMENT ARE DESCRIBED. THE CRITICAL SYSTEMS WITH DIFFERENT REFLECTORS AND WITHOUT WERE STUDIED. THE MEASUREMENTS WERE FULFILLED WITH ASSEMBLIES OF DIFFERENT RELATIVE CONCENTRATIONS (DENSITY HYDROGEN / DENSITY URANIUM-235), CHANGED WITHIN A RANGE FROM 120 TO 500.

694 ID-NUMBER ID-NUMBER 694

AUTHOR CLARK, H. K.

TITLE INTERACTION OF SUBCRITICAL COMPONENTS

REPORT NUMBER..... DP-312

DATE PUBLISHED ... 58-11-00

NSA-NUMBER 13:11702

SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

A SIMPLE, GENERALLY CONSERVATIVE, AND REASONABLY ACCURATE METHOD IS DEVELOPED FOR COMPUTING SAFE SPACINGS OF VESSELS CONTAINING FISSILE MATERIAL, SUCH AS THOSE ENCOUNTERED IN SEPARATIONS PROCESS EQUIPMENT. SIMPLIFYING ASSUMPTIONS ARE MADE TO PERMIT THE FRACTION OF THE NEUTRONS ESCAPING FROM ONE COMPONENT THAT ENTERS ANOTHER TO BE OBTAINED BY A PURELY GEOMETRIC CALCULATION, INDEPENDENT OF THE DETAILS OF THE FLUX DISTRIBUTION. FOR EACH COMPONENT THE ALBEDO AND THE EFFECTIVE REFLECTOR SAVING PROVIDED BY THE OTHER COMPONENTS ARE EXPRESSED IN TERMS OF THESE FRACTIONS. INTERACTIONS BETWEEN SLABS (BOTH PARALLEL AND PERPENDICULAR) BETWEEN CYLINDERS, WITH REFLECTORS, AND SELF-INTERACTIONS IN THE CASE OF ANNULI ARE CONSIDERED. COMPARISONS WITH EXPERIMENTS ARE MADE.(AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

698 ID-NUMBER ID-NUMBER 698

AUTHOR RICHMOND, R.
 TITLE BUCKLING MEASUREMENTS ON GRAPHITE LATTICES CONTAINING COMPOSITE PLUTONIUM-
 URANIUM FUEL ELEMENTS
 REPORT NUMBER..... AEEW-R124
 DATE PUBLISHED ... 64-01-00
 SITE/PROGRAM UNITED KINGDOM, WINFRITH - URANIUM-PLUTONIUM-GRAPHITE

ABSTRACT

THE RESULTS ARE PRESENTED OF A SERIES OF BUCKLING MEASUREMENTS ON GRAPHITE LATTICES IN WHICH THE FUEL ELEMENTS CONSISTED OF THIN STRIPS OF PLUTONIUM-ALUMINUM ALLOY COMBINED WITH RODS OR PLATES OF URANIUM CONTAINING 0.43% URANIUM-235. THE PLUTONIUM TO URANIUM RATIOS RANGED FROM 0.125% TO 0.25% WHILE THE PLUTONIUM-240 CONTENT OF THE PLUTONIUM WAS 2.5% IN ALL CASES. THE EXPERIMENTS WERE RESTRICTED TO ROOM TEMPERATURE.

THESE EXPERIMENTS, TOGETHER WITH A SERIES OF REACTION RATE MEASUREMENTS ON SIMILAR LATTICES, REPRESENT THE FIRST STAGE OF A PROGRAMME OF EXPERIMENTAL INVESTIGATIONS OF THE EFFECT OF PLUTONIUM BUILD-UP AND ENRICHMENT IN GRAPHITE-MODERATED REACTORS.

698 ID-NUMBER ID-NUMBER 698

AUTHOR NONE
 TITLE SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM QUARTERLY TECHNICAL
 REPORT NUMBER 2
 REPORT NUMBER..... BAW-1218
 DATE PUBLISHED ... 60-12-00
 NSA-NUMBER 15:15277
 SITE/PROGRAM BABCOCK AND WILCOX CO. - SPECTRAL SHIFT CONTROL REACTOR (URANIUM(2-4%)
 DIOXIDE IN WATER - HEAVY WATER)

ABSTRACT

THIS REPORT SUMMARIZES THE WORK ACCOMPLISHED DURING THE SECOND CONTRACT QUARTER (OCTOBER 1 TO DECEMBER 31, 1960) ON CONTRACT AT(30-I)-2602 BETWEEN THE U. S. ATOMIC ENERGY COMMISSION AND THE BABCOCK AND WILCOX COMPANY. THE MAJOR OBJECTIVE OF THE CONTRACT IS TO DETERMINE BASIC PHYSICS PARAMETERS FOR LATTICES OF SLIGHTLY ENRICHED FUEL IN MODERATORS CONSISTING OF DEUTERIUM-OXIDE WATER MIXTURES OF DIFFERENT CONCENTRATIONS IN THE RANGE OF PARAMETERS OF INTEREST TO THE SPECTRAL SHIFT CONTROL REACTOR (SSCR) CONCEPT.

DURING THE SECOND QUARTER THE PRINCIPAL EFFORT WAS DEVOTED TO PROCUREMENT AND ERECTION OF EQUIPMENT AND MATERIALS NEEDED FOR THE CRITICAL EXPERIMENTS WITH DEUTERIUM-OXIDE IN THE MODERATOR, THE EXPONENTIAL EXPERIMENTS, THE HOT EXPONENTIAL EXPERIMENTS, AND THE NEUTRON AGE EXPERIMENTS. THE ERECTION OF THESE FACILITIES AND THE DEUTERIUM-OXIDE HANDLING SYSTEM WAS COMPLETED AND CHECKED OUT. THE FUEL ROD PREPARATION WAS COMPLETED, AND ALL NECESSARY HAZARD EVALUATIONS AND LICENSE APPLICATIONS WERE SUBMITTED.

TWO CRITICAL EXPERIMENTS WITH 4%-ENRICHED URANIUM-DIOXIDE FUEL AND WATER MODERATOR (ONE CLEAN AND ONE POISONED WITH BORIC ACID) WERE COMPLETED. IN THESE CORES THE CRITICAL MASS, CRITICAL BUCKLING, THERMAL DISADVANTAGE FACTOR, AND CADMIUM RATIO OF URANIUM-235 WERE MEASURED AND THE DATA ARE REPORTED HEREIN.

699 ID-NUMBER ID-NUMBER 699

AUTHOR NONE
 TITLE SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM QUARTERLY TECHNICAL
 REPORT NUMBER 4
 REPORT NUMBER..... BAW-1221
 DATE PUBLISHED ... 61-06-00
 NSA-NUMBER 16:1232
 SITE/PROGRAM BABCOCK AND WILCOX CO. - SPECTRAL SHIFT CONTROL REACTOR (URANIUM(2-4%)
 DIOXIDE IN WATER - HEAVY WATER)

ABSTRACT

CRITICAL EXPERIMENTS WERE PERFORMED WITH 4%-ENRICHED URANIUM-OXIDE FUEL RODS IN MODERATORS CONTAINING 70 MOLE% DEUTERIUM-OXIDE, 70 MOLE% DEUTERIUM-OXIDE WITH DISSOLVED BORIC ACID, AND 50 MOLE% DEUTERIUM-OXIDE WITH BORIC ACID. THESE EXPERIMENTS MEASURED THE CRITICAL MASS, THE CRITICAL BUCKLING, THE THERMAL DISADVANTAGE FACTOR, AND THE CADMIUM RATIO OF URANIUM-235. ALSO REPORTED ARE THE RESULTS OF THE MEASUREMENTS OF EPITHERMAL ABSORPTIONS IN URANIUM-238, BY SEVERAL TECHNIQUES, AND THE NEUTRON SPECTRA AT 76.7 AND 70 MOLE% DEUTERIUM-OXIDE. DISCUSSED ARE PRELIMINARY RESULTS OF A ZONE-LOADED CRITICAL ASSEMBLY CONTAINING AN INNER REGION OF HIGHLY ENRICHED URANIUM-THORIUM-OXIDE FUEL RODS AND AN OUTER REGION OF 4%-ENRICHED URANIUM-OXIDE FUEL RODS AT A DEUTERIUM-OXIDE CONCENTRATION OF ABOUT 82 MOLE%

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE ROOM-TEMPERATURE EXPONENTIAL EXPERIMENTS WITH HIGHLY ENRICHED URANIUM-THORIUM-OXIDE FUEL WERE COMPLETED. THE MATERIAL BUCKLING, CADMIUM RATIO OF URANIUM-235, AND CADMIUM RATIO OF THORIUM AT 80, 71, AND 53 MOLE% DEUTERIUM-OXIDE ARE REPORTED. PREPARATIONS FOR EXPONENTIAL EXPERIMENTS AT ELEVATED TEMPERATURES AND PRESSURES CONTINUED: THE HAZARDS REVIEW WAS COMPLETED, AND DESIGN MODIFICATIONS WERE MADE FOR THE DEUTERIUM-OXIDE HANDLING SYSTEM.

NEUTRON AGE MEASUREMENTS IN A LATTICE OF THORIUM-OXIDE RODS AT DEUTERIUM-OXIDE CONCENTRATIONS OF 80, 70, AND 50 MOLE% ARE REPORTED, AND EARLIER MEASUREMENTS AT 0 AND 90% DEUTERIUM-OXIDE ARE RE-ANALYZED.

ADDITIONAL REFINEMENTS WERE MADE TO THE BPG CODE, WHICH IS USED TO ANALYZE THESE EXPERIMENTS, AND THE CROSS SECTION LIBRARY WAS IMPROVED. THIS CODE WAS USED TO COMPUTE THE NUCLEAR PROPERTIES OF THE POISONED AND UNPOISONED CRITICAL EXPERIMENTS; GOOD AGREEMENT WAS FOUND IN MOST MEASUREMENTS. (AUTH).

700 ID-NUMBER ID-NUMBER 700

AUTHOR ENGELDER, T. C. / SNIDOW, N. L. / CLARK, R. H. / BARKSDALE, C. E. / LEWIS, R. H. / BALDWIN, M. N.

TITLE SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM CRITICAL EXPERIMENTS ON LATTICES MODERATED BY HEAVY WATER-WATER MIXTURES

REPORT NUMBER.... BAW-1231

DATE PUBLISHED ... 61-12-00

NSA-NUMBER 16:8301

SITE/PROGRAM BABCOCK AND WILCOX CO. - SPECTRAL SHIFT CONTROL REACTOR (URANIUM(2-4%) DIOXIDE IN WATER - HEAVY WATER)

ABSTRACT

THIS REPORT SUMMARIZES THE RESULTS OF CRITICAL EXPERIMENTS PERFORMED UNDER THE SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM. NINE MAJOR CRITICAL ASSEMBLIES OF ROD LATTICES WERE STUDIED IN MODERATOR MIXTURES OF LIGHT AND HEAVY WATER RANGING FROM ZERO TO 81.2 MOLE % DEUTERIUM-OXIDE. IN SOME ASSEMBLIES, THE MODERATOR WAS POISONED WITH BORIC ACID. THE NON-MODERATOR-TO-MODERATOR VOLUME RATIO IN ALL LATTICES WAS APPROXIMATELY 1.0. THE FUEL IN MOST LATTICES WAS 4%-ENRICHED URANIUM-DIOXIDE SWAGED IN STAINLESS STEEL, ALTHOUGH TWO EXPERIMENTS WERE PERFORMED WITH 93%-ENRICHED URANIUM-DIOXIDE-THORIUM-DIOXIDE PELLETS IN ALUMINUM TUBES. ONE ASSEMBLY WAS ZONE-LOADED RADIALY AND CONTAINED BOTH TYPES OF FUEL.

THE CRITICAL MASS, DEUTERIUM-OXIDE CONCENTRATION, BORON CONCENTRATION, BUCKLING, THERMAL DISADVANTAGE FACTOR, AND CADMIUM RATIO OF URANIUM-235 WERE MEASURED IN EACH ASSEMBLY. IN MOST ASSEMBLIES, THE CADMIUM RATIO OF URANIUM-238 OR THORIUM-232 WAS MEASURED, AND IN FIVE ASSEMBLIES, THE EPITHERMAL NEUTRON SPECTRUM WAS DERIVED FROM THE MEASUREMENTS TAKEN OF THE RESONANCE ACTIVITY OF DETECTOR FOILS. IN SPECIAL EXPERIMENTS AT HIGH DEUTERIUM-OXIDE CONCENTRATIONS, THE PERTURBATIONS BY MODERATOR GAPS AND CONTROL BLADES WERE STUDIED, AND THE REFLECTOR SAVINGS VERSUS REFLECTOR THICKNESS WAS MEASURED. THE FLUX DISTRIBUTION IN THE ZONE-LOADED ASSEMBLY WAS ALSO MAPPED. THE MEASURED LATTICE PARAMETERS ARE SUMMARIZED IN THE FOLLOWING TABLE. (AUTH).

701 ID-NUMBER ID-NUMBER 701

AUTHOR NONE

TITLE SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM QUARTERLY TECHNICAL REPORT NUMBER 5

REPORT NUMBER.... BAW-1240

DATE PUBLISHED ... 61-12-00

NSA-NUMBER 16:11190

SITE/PROGRAM BABCOCK AND WILCOX CO. - SPECTRAL SHIFT CONTROL REACTOR (URANIUM(2-4%) DIOXIDE IN WATER - HEAVY WATER)

ABSTRACT

THIS REPORT SUMMARIZES THE WORK DONE ON THE SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM DURING THE FIFTH CONTRACT QUARTER. THE MAJOR OBJECTIVE OF THIS PROGRAM IS TO DETERMINE BASIC NUCLEAR PARAMETERS OF TIGHT-PACKED LATTICES OF SLIGHTLY ENRICHED FUELS IN MODERATORS CONSISTING OF DEUTERIUM-OXIDE-WATER MIXTURES.

CRITICAL EXPERIMENTS WERE PERFORMED WITH 4%-ENRICHED URANIUM-DIOXIDE FUEL RODS IN MODERATORS CONTAINING 0 AND 50% DEUTERIUM-OXIDE, AND WITH 93%-ENRICHED URANIUM-DIOXIDE - THORIUM-DIOXIDE FUEL RODS AT 60% DEUTERIUM-OXIDE. MEASURED WERE CRITICAL MASS, BUCKLING AND REFLECTOR SAVINGS, THERMAL DISADVANTAGE FACTOR, CADMIUM RATIOS OF URANIUM-235 AND URANIUM-238, AND EPITHERMAL NEUTRON SPECTRUM. A RADIALY ZONE-LOADED ASSEMBLY WAS STUDIED AT A DEUTERIUM-OXIDE CONCENTRATION OF 82% THIS ASSEMBLY CONTAINED 93%-ENRICHED URANIUM-OXIDE - THORIUM-DIOXIDE FUEL IN THE INNER ZONE AND 4%-ENRICHED URANIUM-OXIDE FUEL IN THE OUTER ZONE. ALSO MEASURED WERE CRITICAL MASS, AXIAL BUCKLING, CADMIUM RATIOS OF URANIUM-235 AND THORIUM-232, THERMAL DISADVANTAGE FACTOR, THERMAL FLUX DISTRIBUTION, AND POWER DISTRIBUTION.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

702 ID-NUMBER ID-NUMBER 702

AUTHOR NONE
 TITLE SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM QUARTERLY TECHNICAL REPORT NUMBER 6
 REPORT NUMBER..... BAW-1250
 DATE PUBLISHED ... 62-03-00
 NSA-NUMBER 16:30006
 SITE/PROGRAM BABCOCK AND WILCOX CO. - SPECTRAL SHIFT CONTROL REACTOR (URANIUM(2-4%) DIOXIDE IN WATER - HEAVY WATER)

ABSTRACT

SUMMARIZED HERE IS THE WORK PERFORMED UNDER THE SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM DURING THE SIXTH CONTRACT QUARTER. THE MAJOR OBJECTIVE OF THIS PROGRAM IS TO DETERMINE BASIC NUCLEAR PARAMETERS OF LIGHTLY PACKED LATTICES OF SLIGHTLY ENRICHED FUELS MODERATED WITH DEUTERIUM-OXIDE/WATER MIXTURES.

THE FINAL RESULTS OF EXPONENTIAL EXPERIMENTS AT ELEVATED TEMPERATURES, PERFORMED DURING THE PRECEDING QUARTER, ARE REPORTED. IN THESE EXPERIMENTS, THE 4%-ENRICHED URANIUM-OXIDE FUEL RODS WERE MODERATED BY 81.5% DEUTERIUM-OXIDE IN WATER; THE NON-MODERATOR-TO-MODERATOR VOLUME RATIO WAS 1.0, AND THE MATERIAL BUCKLING WAS MEASURED AS A FUNCTION OF TEMPERATURE TO APPROXIMATELY 400 DEGREES F.

CRITICAL EXPERIMENTS WERE PERFORMED WITH 4%-ENRICHED URANIUM-OXIDE FUEL RODS IN MODERATORS CONTAINING 0% (CORE X) AND APPROXIMATELY 70% (CORE XI) DEUTERIUM-OXIDE. THE NON-MODERATOR-TO-MODERATOR VOLUME RATIO IN EACH CORE WAS APPROXIMATELY 1.2. THE CRITICAL MASS, BUCKLINGS, $D(\rho)/DH$, AND REFLECTOR SAVINGS, THERMAL DISADVANTAGE FACTOR, AND CADMIUM RATIOS OF URANIUM-235 AND URANIUM-238 WERE MEASURED IN EACH CORE.

703 ID-NUMBER ID-NUMBER 703

AUTHOR NONE
 TITLE SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM QUARTERLY TECHNICAL REPORT NUMBER 7
 REPORT NUMBER..... BAW-1259
 DATE PUBLISHED ... 62-06-00
 NSA-NUMBER 16:33977
 SITE/PROGRAM BABCOCK AND WILCOX CO. - SPECTRAL SHIFT CONTROL REACTOR (URANIUM(2-4%) DIOXIDE IN WATER - HEAVY WATER)

ABSTRACT

THIS REPORT SUMMARIZES THE WORK PERFORMED ON THE SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM DURING THE SEVENTH CONTRACT QUARTER. THE MAJOR OBJECTIVE OF THIS PROGRAM IS TO STUDY THE NUCLEAR PROPERTIES OF SLIGHTLY ENRICHED LATTICES MODERATED BY DEUTERIUM-OXIDE/WATER MIXTURES.

CRITICAL EXPERIMENTS WERE PERFORMED WITH 4%-ENRICHED URANIUM-OXIDE FUEL RODS IN A LATTICE HAVING A NON-MODERATOR-TO-MODERATOR VOLUME RATIO OF 1.2, AND MODERATED BY A 49.7% DEUTERIUM-OXIDE/WATER MIXTURE. MEASURED WERE CRITICAL MASS, $D(\rho)/DH$, BUCKLING AND REFLECTOR SAVINGS, AND CADMIUM RATIOS OF URANIUM-235 AND URANIUM-238. (AUTH).

706 ID-NUMBER ID-NUMBER 706

AUTHOR KAPLAN, I.
 TITLE MEASUREMENTS OF REACTOR PARAMETERS IN SUBCRITICAL AND CRITICAL ASSEMBLIES - A REVIEW
 REPORT NUMBER..... MITNE-25
 DATE PUBLISHED ... 62-08-15
 NSA-NUMBER 17:22796
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

THE LITERATURE ON THE RELATIONS OF PARAMETERS OBTAINED IN VARIOUS TYPES OF ASSEMBLIES IS SURVEYED. THE EMPHASIS IS PLACED ON EXPERIMENTAL RESULTS OBTAINED IN THERMAL SYSTEMS AND ON PROBLEMS RAISED BY THE EXISTING DATA. 135 REFERENCES. (J.R.D.)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

708 ID-NUMBER ID-NUMBER 708

AUTHOR MOSS, L. I.
 TITLE EXPERIMENTS WITH WATER-REFLECTED, UNDERMODERATED, ZIRCONIUM HYDRIDE
 CRITICAL ASSEMBLIES
 REPORT NUMBER..... NAA-SR-8490
 DATE PUBLISHED ... 63-09-15
 NSA-NUMBER 17:28481
 SITE/PROGRAM ATOMICS INTERNATIONAL - SNAP CORES (ZIRCONIUM HYDRIDE)

ABSTRACT

THIS REPORT DESCRIBES THE PHASES I AND II SNAP CRITICAL ASSEMBLY -4B (SCA-4B) EXPERIMENTS CONDUCTED BY ATOMICS INTERNATIONAL AS ONE OF THE PROJECTS IN THE SNAP AEROSPACE SAFETY PROGRAM. THIS PROJECT COMPRISED A SERIES OF CRITICAL EXPERIMENTS WITH WATER-REFLECTED, UNDERMODERATED, ZIRCONIUM HYDRIDE ASSEMBLIES. THE PURPOSE OF THESE EXPERIMENTS WAS TO EVALUATE THE CONSEQUENCES OF WATER IMMERSION OF SNAP 2/10A REACTOR CORES.(AUTH).

712 ID-NUMBER ID-NUMBER 712

AUTHOR DAVEY, W. G.
 TITLE AN ANALYSIS OF 23 ZPR-3 FAST REACTOR CRITICAL EXPERIMENTS
 REPORT NUMBER..... NSENAO, 19, 259-273
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 64-07-00
 NSA-NUMBER 18:30963
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

OVER FIFTY FAST CRITICAL ASSEMBLIES HAVE BEEN STUDIED IN THE ZERO POWER REACTOR - III (ZPR-3) OF ARGONNE NATIONAL LABORATORY SINCE IT STARTED OPERATION IN 1955. ALL OF THESE ASSEMBLIES WERE FUELED WITH URANIUM-235 AND REFLECTED WITH DEPLETED URANIUM; THE CORE VOLUMES RANGED FROM 2 TO 660 LITERS AND THE CRITICAL MASSES RANGED FROM 26 TO 580 KILOGRAMS OF URANIUM-235. THE EXPERIMENTAL CHARACTERISTICS OF A REPRESENTATIVE GROUP OF 23 OF THESE ASSEMBLIES IN WHICH OXIDE, CARBIDE AND METALLIC FUELS WERE SIMULATED HAVE BEEN COMPARED WITH CALCULATED VALUES. THE PARAMETERS STUDIED WERE CRITICAL SIZE, CENTRAL FISSION RATIOS, PROMPT-NEUTRON LIFETIMES AND THE REACTIVITY EFFECTS OF SUBSTITUTION OF VARIOUS MATERIALS AT THE REACTOR CENTER. (AUTH).

714 ID-NUMBER ID-NUMBER 714

AUTHOR BRUNET, J. P. / CAIZERGUES, R. / CLOUET D'ORVAL, C. / KREMSER, J. / MORET
 BAILLY, J. / VERRIERE, P.
 TITLE PROSERPINE PLUTONIUM-239 AND PROSERPINE URANIUM-235 - COMPARISON OF
 EXPERIMENTAL RESULTS
 REPORT NUMBER..... CEA-R-2452
 DATE PUBLISHED ... 62-00-00
 NSA-NUMBER 18:42914
 SITE/PROGRAM FRANCE - PROSERPINE

ABSTRACT

THE PROSERPINE HOMOGENEOUS REACTOR CONSISTS OF A TANK, 25 CM DIA AND 30 CM HIGH, SURROUNDED BY A COMPOSITE REFLECTOR MADE OF BERYLLIUM OXIDE AND GRAPHITE. IN THIS TANK PLUTONIUM OR 90% ENRICHED URANIUM SOLUTIONS, THE FISSION SUBSTANCES BEING IN THE FORM OF A DISSOLVED SALT, CAN BE MADE CRITICAL. IN VARYING THE CONCENTRATION OF THE SOLUTION, CRITICAL MASSES WERE STUDIED AS A FUNCTION OF THE LEVEL OF THE LIQUID IN THE TANK. THE MINIMUM CRITICAL MASS IS 256 GM FOR PLUTONIUM AND 409 GM FOR URANIUM-235. IN THE RANGE OF THE CRITICAL CONCENTRATIONS STUDIED, THE NEUTRONIC PROPERTIES OF FISSIONABLE SOLUTIONS OF PLUTONIUM AND ENRICHED URANIUM WERE COMPARED FOR IDENTICAL GEOMETRIES. (AUTH).

716 ID-NUMBER ID-NUMBER 716

AUTHOR BENTON, F. D.
 TITLE MEASUREMENTS OF BUCKLINGS AND VOID EFFECTS IN HEAVY WATER MODERATED,
 ORGANIC OR WATER COOLED LATTICES OF URANIUM DIOXIDE ROD CLUSTERS
 REPORT NUMBER..... DP-873
 DATE PUBLISHED ... 64-06-00
 NSA-NUMBER 18:36777

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES
IN HEAVY WATER

ABSTRACT

MATERIAL BUCKLINGS FOR A VARIETY OF URANIUM-OXIDE ROD CLUSTERS ON A TRIANGULAR 9.33-INCH LATTICE PITCH IN DEUTERIUM-OXIDE WERE DETERMINED BY SUBSTITUTION EXPERIMENTS IN THE PROCESS DEVELOPMENT PILE. MEASUREMENTS WERE MADE WITH CLUSTERS OF 19, 31, AND 37 HALF-INCH URANIUM-OXIDE RODS IN WHICH THE COOLANT MEDIA WERE VARIED TO INCLUDE DEUTERIUM-OXIDE, WATER, ORGANICS, OR AIR. THE BUCKLINGS, WHICH WERE DETERMINED BOTH BY A ONE-GROUP PERTURBATION METHOD AND BY A TWO-GROUP FLUX MATCHING METHOD, RANGED FROM 0.80 TO 5.60 M⁻². (AUTH).

717 ID-NUMBER ID-NUMBER 717

AUTHOR BRUNA, J. G. / BRUNET, J. P. / CLOUET D'ORVAL, C. / KREMSER, J.

TITLE CRITICALITY EXPERIMENT ON A SOLUTION OF PLUTONIUM AND OF 90% ENRICHED URANIUM. EXPERIMENTAL RESULTS AND CALCULATIONS ON TANK NUMBER 2

REPORT NUMBER..... CEA-R-2453

DATE PUBLISHED ... 64-06-00

NSA-NUMBER 18:42915

SITE/PROGRAM FRANCE - PLUTONIUM AND URANIUM SOLUTIONS

ABSTRACT

EXPERIMENTS ON PLUTONIUM AND 90% ENRICHED URANIUM SOLUTIONS WERE MADE IN THE ALECTO REACTOR WITH A TANK OF EXTERNAL DIAMETER 300 MM. VARIOUS GEOMETRICS WERE TESTED FOR VARIABLE CONCENTRATIONS OF FISSIONABLE SALTS. THE CRITICAL MASS WAS STUDIED AS A FUNCTION OF THE CONCENTRATION IN VARIOUS REFLECTOR CONDITIONS (WATER, CONCRETE, WOOD) AND THE EXPERIMENTAL VALUES WERE COMPARED WITH CALCULATED VALUES. THE EFFECTS OF CADMIUM AS A REFLECTOR AND OF THE STAINLESS STEEL TANK WERE ALSO STUDIED.

718 ID-NUMBER ID-NUMBER 718

AUTHOR PRICE, G. A.

TITLE HEAVY WATER LATTICE PROJECT ANNUAL REPORT

REPORT NUMBER..... MITNE-46

DATE PUBLISHED ... 63-09-30

NSA-NUMBER 18:42923

SITE/PROGRAM MASSACHUSETTS INSTITUTE OF TECHNOLOGY - HEAVY WATER LATTICE PROJECT

ABSTRACT

THIS REPORT IS THE THIRD ANNUAL PROGRESS REPORT OF THE HEAVY WATER LATTICE PROJECT OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY. THE ORIGIN, EARLY HISTORY, AND MAIN FACILITIES OF THE PROJECT WERE DESCRIBED IN THE FIRST PROGRESS REPORT (NYO-9658, SEPTEMBER 3, 1961). THE SECOND PROGRESS REPORT (NY/-10,208, MITNE-26, SEPTEMBER 30, 1962) DESCRIBED THE EXPERIMENTAL METHODS ADOPTED OR DEVELOPED, AND THEIR APPLICATION TO THREE LATTICES OF ONE-INCH DIAMETER, NATURAL URANIUM LATTICES IN HEAVY-WATER. THAT REPORT ALSO INCLUDED THE INITIAL RESULTS OBTAINED FOR A LATTICE OF 0.25-INCH DIAMETER RODS OF URANIUM CONTAINING 1.03% URANIUM-235, CLAD IN ALUMINUM, IN A TRIANGULAR ARRAY WITH A SPACING OF 1.25 INCHES. THE PRESENT REPORT GIVES MORE EXTENSIVE RESULTS FOR THIS LATTICE AND FOR ANOTHER LATTICE OF THE SAME RODS WITH A SPACING OF 2.5 INCHES. (AUTH).

719 ID-NUMBER ID-NUMBER 719

AUTHOR DUERDEN, P. / MC CULLOCH, D. B. / BRITTLIFF, E.

TITLE BUCKLING AND INTEGRAL SPECTRUM MEASUREMENTS IN URANIUM-235/BERYLLIUM-OXIDE SUBCRITICAL ASSEMBLIES

REPORT NUMBER..... AAEC/E123

DATE PUBLISHED ... 66-07-19

NSA-NUMBER 18:44968

SITE/PROGRAM AUSTRALIA - URANIUM-233, URANIUM-235, PLUTONIUM-239 - BERYLLIUM OXIDE

ABSTRACT

THE AUSTRALIAN ATOMIC ENERGY COMMISSION'S FEASIBILITY STUDY OF A BERYLLIUM-OXIDE MODERATED HIGH TEMPERATURE GAS-COOLED REACTOR SYSTEM REQUIRES SURVEY CALCULATIONS USING COMPUTER CODES CAPABLE OF DEALING IN DETAILED MANNER WITH THE NEUTRON ENERGY SPECTRUM THROUGHOUT THE RANGE FROM FISSION TO THERMAL ENERGIES. CODES OF THIS TYPE (GMAC, SKATE, AND MULGA) HAVE BEEN DEVELOPED FOR THIS PURPOSE AT LUCAS HEIGHTS.

EXPERIMENTAL DATA ON BERYLLIUM-MODERATED SYSTEMS, AGAINST WHICH THESE CODES AND THE ADEQUACY OF THE NUCLEAR DATA USED HEREWITH MAY BE CHECKED, HAVE TO DATE BEEN RESTRICTED TO MEASUREMENTS OF THE MATERIALS BUCKLING OR REACTIVITY IN A

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

NUMBER OF URANIUM-235 FUELED SYSTEMS. THE PRESENT SERIES OF EXPERIMENTS WAS CARRIED OUT TO AUGMENT THE EXISTING DATA BY PROVIDING INTEGRAL SPECTRUM MEASUREMENTS TO TEST THE ADEQUACY OF THE SPECTRUM CALCULATIONS, AND TO CHECK THE TECHNIQUES OF BUCKLING MEASUREMENT AS A PRELIMINARY TO PROPOSED FUTURE EXPERIMENTS INCORPORATING RESONANCE ABSORBERS (URANIUM-238, THORIUM-232)

720 ID-NUMBER ID-NUMBER 720

AUTHOR HARPER, R. G.
 TITLE AN ANALYSIS OF EXPERIMENTS ON GRAPHITE MODERATED ASSEMBLIES FUELED WITH URANIUM, PLUTONIUM AND URANIUM-PLUTONIUM METAL
 REPORT NUMBER.... AEEW-R325
 DATE PUBLISHED ... 64-00-00
 SITE/PROGRAM UNITED KINGDOM, WINFRITH - URANIUM-PLUTONIUM-GRAPHITE - CALCULATIONS

ABSTRACT

SEVERAL SETS OF EXPERIMENTS HAVE BEEN STUDIED AS A JUSTIFICATION FOR THE NUCLEAR DATA AND COMPUTATIONAL MODELS, PARTICULARLY THE TRACER AND MINX COMPUTER CODES, CURRENTLY IN USE AT ATOMIC ENERGY ESTABLISHMENT WINFRITH FOR THE CALCULATION OF GRAPHITE MODERATED REACTORS.

BUCKLING MEASUREMENTS ARE COMPARED TO THEORY FOR SYSTEMS FUELLED WITH PLUTONIUM/ALUMINUM AND URANIUM-235/ALUMINUM SPIKES, AND WITH URANIUM AND URANIUM-PLUTONIUM METAL RODS. IN SOME CASES REACTION-RATES AND TEMPERATURE COEFFICIENTS ARE ALSO AVAILABLE, AND COMPARISONS WITH THESE ARE REPORTED.

AGREEMENT BETWEEN THEORY AND EXPERIMENT IS GENERALLY GOOD. THE STUDY DOES, HOWEVER, POINT TO SOME DEFECTS IN THE MODELS USED, AND SUGGESTS THAT THE VALUE OF ETA USED FOR PLUTONIUM (2.088 AT 2200 M/S) IS SLIGHTLY TOO LOW, AS WOULD BE EXPECTED FROM THE LATEST DIFFERENTIAL MEASUREMENTS.

721 ID-NUMBER ID-NUMBER 721

AUTHOR SPECHT, E. R.
 TITLE MATERIAL BUCKLINGS OF CRITICAL AND SUBCRITICAL URANIUM CARBIDE FUELED GRAPHITE ASSEMBLIES PART-2 THEORETICAL INTERPRETATION
 REPORT NUMBER.... NAA-SR-9772
 DATE PUBLISHED ... 64-08-01
 NSA-NUMBER 18:40784
 SITE/PROGRAM ATOMICS INTERNATIONAL - URANIUM(3%)CARBIDE - GRAPHITE

ABSTRACT

MATERIAL BUCKLINGS FOR URANIUM CARBIDE FUEL ELEMENTS, ENRICHED TO 3.02 WT% OF URANIUM-235, WERE OBTAINED FROM CRITICAL AND SUBCRITICAL ASSEMBLIES. THE FUEL ELEMENTS WERE PLACED IN A GRAPHITE ASSEMBLY ON TRIANGULAR LATTICE PITCHES OF 9, 11, AND 12 INCHES. FOUR-GROUP THEORY WAS USED TO INFER MATERIAL BUCKLINGS FROM 12 "TWO REGION" CRITICAL MASS MEASUREMENTS. MATERIAL BUCKLINGS WERE OBTAINED FROM 22 SUBCRITICAL ASSEMBLIES CONSISTING OF 31, 23, AND 19 CELLS SET AT PITCHES OF 9, 11, AND 12 INCHES. THE LARGE DIFFERENCES OBSERVED (UP TO $3.4M \pm (-2)$) BETWEEN THE CRITICAL AND UNCORRECTED SUBCRITICAL VALUES OF MATERIAL BUCKLING HAVE BEEN SHOWN TO BE DUE TO DIFFUSION ANISOTROPY AND THE USE OF CALCULATED RATHER THAN MEASURED RADIAL BUCKLINGS IN THE SUBCRITICAL EXPERIMENTS. MULTIGROUP (15 ENERGY GROUP) CELL CALCULATIONS GAVE MATERIAL BUCKLINGS WHICH AGREED VERY WELL WITH THOSE INFERRED FROM THE CRITICAL ASSEMBLIES.(AUTH).

722 ID-NUMBER ID-NUMBER 722

AUTHOR TACHON, J.
 TITLE NEUTRONIC STUDY OF A PLUTONIUM REACTOR, PROSERPINE - CORRELATIONS BETWEEN NEUTRONS IN A CHAIN REACTION
 REPORT NUMBER.... CEA-1547
 DATE PUBLISHED ... 60-00-00
 NSA-NUMBER 15:14025
 SITE/PROGRAM FRANCE - PROSERPINE

ABSTRACT

THE CRITICAL MASS AND KINETIC BEHAVIOR WITH CONSTANT AND VARIABLE TEMPERATURE OF A HOMOGENEOUS PLUTONIUM REACTOR ARE STUDIED BY THEORY AND EXPERIMENT. THE CORE IS A PLUTONIUM SULFATE SOLUTION IN LIGHT WATER, AND THE REFLECTOR IS BERYLLIUM OXIDE. THE LOWEST CRITICAL MASS IS 257.2 G OF PLUTONIUM. AN ABSOLUTE STANDARD OF REACTIVITY PERMITS THE MEASUREMENT OF THE EFFECTIVENESS OF DELAYED NEUTRONS. THE MEASUREMENT VALUES OF THE TEMPERATURE COEFFICIENT ARE COMPARED WITH AN EXACT CALCULUS IN TWO-GROUP THEORY, WHICH SHOWS THE POSITIVE CONTRIBUTION OF THE REFLECTOR. THE FLUCTUATIONS OF THE COUNTING RATE ARE MEASURED AGAINST REACTIVITY, TIME OF COUNTING, AND THE POSITIONS OF THE COUNTERS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

IN THE REACTOR. THE PROMPT-NEUTRON LIFETIME IS DEDUCED. THE IMPORTANCE OF DELAYED NEUTRONS IN THE CORRELATIONS IS PROVED AND CHECKS VERY WELL WITH THE CALCULUS USED. (AUTH).

723 ID-NUMBER ID-NUMBER 723

AUTHOR NAUDET, R. / CHABRILLAC, M. / LEDANOIS, G. / LOURME, P.
 TITLE CRITICAL EXPERIMENTS IN AQUILON WITH FUELS SLIGHTLY ENRICHED IN URANIUM
 235 OR IN PLUTONIUM
 REPORT NUMBER.... CEA-R-2477
 DATE PUBLISHED ... 64-08-00
 NSA-NUMBER 19:3511
 SITE/PROGRAM FRANCE - AQUILON

ABSTRACT

REACTIVITY COMPARISONS WERE MADE IN AQUILON II BETWEEN GEOMETRICALLY IDENTICAL LATTICES DIFFERING ONLY BY THE COMPOSITION OF THE FUEL. THE FUEL ELEMENTS CONSIST OF METALLIC URANIUM SINGLE RODS WITH EITHER SLIGHT DIFFERENCES OF THE ISOTOPIC COMPOSITION (0.69-0.71-0.83-0.86 PER CENT OF URANIUM-235) OR SLIGHT ADDITIONS OF PLUTONIUM (0.043 PER CENT). FIVE LATTICES PITCHES WERE USED, IN ORDER TO PRODUCE A LARGE VARIATION OF SPECTRUM. TWO ADDITIONAL SETS OF PLUTONIUM FUELS ARE PREPARED TO BE USED IN THE SAME CONDITIONS. THE DOUBLE COMPARISONS: NATURAL-ENRICHED VERSUS NATURAL-ENRICHED PLUTONIUM, ARE MADE IN SUCH A WAY THAT A VERY PRECISE INTERPRETATION IS PERMITTED. THE RESULTS ARE PERFECTLY CONSISTENT, WHICH SEEMS TO PROVE THAT THE CALCULATION METHODS ARE CONVENIENT.

724 ID-NUMBER ID-NUMBER 724

AUTHOR MAUNDERS, E. J.
 TITLE MEASUREMENTS OF BUCKLING AND PLUTONIUM-239/URANIUM-235 RELATIVE REACTION
 RATES IN AN UNDERMODERATED GRAPHITE ASSEMBLY FUELED WITH HIGHLY ENRICHED
 URANIUM-235 AND PLUTONIUM-239
 REPORT NUMBER.... AEEW-R348
 DATE PUBLISHED ... 64-07-00
 NSA-NUMBER 18:30957
 SITE/PROGRAM UNITED KINGDOM, WINFRITH - URANIUM-PLUTONIUM-GRAPHITE

ABSTRACT

A SMALL GRAPHITE STACK HAS BEEN CONSTRUCTED INTO WHICH BOTH PLUTONIUM AND HIGHLY ENRICHED URANIUM FUEL PLATES HAVE BEEN LOADED. WITH THIS ASSEMBLY IT HAS BEEN POSSIBLE TO ESTABLISH SAFE LOADING PROCEDURES, TO DETERMINE THE FLUX LEVELS IN SUCH UNDERMODERATED STACKS WHEN PLACED IN A CAVE OF THE SOURCE REACTOR NESTOR, TO DETERMINE THE REGION OVER WHICH AN EQUILIBRIUM SPECTRUM IS OBSERVED AND TO INVESTIGATE THE POSSIBILITY OF CARRYING OUT EXPONENTIAL EXPERIMENTS TO DETERMINE THE MATERIAL BUCKLINGS.

THIS REPORT GIVES A DETAILED ACCOUNT OF THE EXPERIMENTAL RESULTS OF THE FIRST TWO CORES WITH GRAPHITE AS A MODERATOR AND A COMPARISON IS MADE BETWEEN OBSERVATIONS AND CALCULATIONS USING EXISTING COMPUTER PROGRAMMES AND COMPILATIONS OF NUCLEAR DATA. THE FIRST CORE CONTAINED HIGHLY ENRICHED URANIUM FUEL PLATES GIVING ATOMIC RATIO OF GRAPHITE/URANIUM-235 OF 440 AND THE SECOND CORE CONTAINED PLUTONIUM FUEL PLATES GIVING A RATIO OF GRAPHITE/PLUTONIUM-239 ATOMS OF 920.

735 ID-NUMBER ID-NUMBER 735

AUTHOR SCHMID, L. C. / STINSON, W. P. / LIKALA, R. C. / WORDEN, J. R.
 TITLE EXPERIMENTS WITH PLUTONIUM DIOXIDE-URANIUM DIOXIDE FUEL ELEMENTS IN LIGHT
 WATER
 REPORT NUMBER.... HW-81659, 04-09
 DATE PUBLISHED ... 64-04-15
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM DIOXIDE ELEMENTS IN WATER

ABSTRACT

APPROACH TO CRITICAL AND EXPONENTIAL EXPERIMENTS HAVE BEEN COMPLETED FOR VOLUME RATIOS OF WATER TO PLUTONIUM-DIOXIDE/URANIUM-DIOXIDE MODERATOR OF 2.71, 3.79, AND 5.14. IN ADDITION, CRITICAL EXPERIMENTS HAVE BEGUN WITH THE LOADING WHICH HAS A RATIO OF 2.71. THESE EXPERIMENTS ARE THE FIRST REPORTED WITH THIS TYPE OF MIXED OXIDE FUEL MODERATED WITH WATER. THE EXPERIMENTS WERE CONDUCTED IN THE APPROACH TO CRITICAL FACILITY, USING HEXAGONAL LATTICES WHICH WERE REFLECTED WITH AN EFFECTIVELY INFINITE THICKNESS OF WATER IN ALL DIRECTIONS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

738 ID-NUMBER ID-NUMBER 738

AUTHOR JOHNSON, E. B. / CRONIN, D. F.
 TITLE CRITICAL DIMENSIONS OF AQUEOUS URANIUM DIOXIDE FLUORIDE SOLUTIONS
 CONTAINING 4.9 PERCENT URANIUM-235 ENRICHED URANIUM
 REPORT NUMBER.... ORNL-3714, 31
 DATE PUBLISHED ... 64-12-00
 NSA-NUMBER 19:16819
 SITE/PROGRAM OAK RIDGE - URANYL(4.9%)FLUORIDE - WATER

ABSTRACT

THE CRITICAL DIMENSIONS OF AQUEOUS SOLUTIONS OF 4.9% ENRICHED URANYL FLUORIDE HAVE BEEN MEASURED. EXPERIMENTS WERE DONE WITH SOLUTIONS HAVING A HYDROGEN-TO-URANIUM-235 ATOMIC RATIO AS LOW AS 500, APPROXIMATELY THAT FOR MINIMUM CRITICAL MASS AND NEAR THAT FOR MINIMUM CRITICAL VOLUME AT THIS ENRICHMENT. THE SOLUTION WAS CONTAINED IN CYLINDRICAL ALUMINUM OR STEEL VESSELS.

IN ANOTHER SERIES OF EXPERIMENTS, AS MANY AS 25 CYLINDERS OF SOLUTION 24.1 CM IN DIAMETER WERE ARRANGED IN PLANAR ARRAYS, WITH THE UNITS IN A SQUARE LATTICE.

739 ID-NUMBER ID-NUMBER 739

AUTHOR JANKOWSKI, F. J.
 TITLE RESEARCH EXPERIENCE WITH PLASTIC MODERATED CRITICAL ASSEMBLIES
 REPORT NUMBER.... GENEVA-2, 12, 747-762
 CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
 ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958
 DATE PUBLISHED ... 58-09-00
 SITE/PROGRAM BATTELLE MEMORIAL INSTITUTE - PLASTIC MODERATED ASSEMBLIES

ABSTRACT

PLASTIC-MODERATED CRITICAL ASSEMBLIES ARE BEING USED EXTENSIVELY TO STUDY WATER-MODERATED REACTOR SYSTEMS AND TO A LESSER EXTENT TO STUDY ORGANIC-MODERATED REACTORS. THE USE OF PLASTIC IS POSSIBLE BECAUSE PLASTICS MAY BE SELECTED WHICH HAVE NUCLEAR PROPERTIES SIMILAR TO THE LIQUID BEING STUDIED. FOR EXAMPLE, POLYETHYLENE WITH TWO HYDROGEN ATOMS FOR EACH CARBON ATOM RESEMBLES WATER WITH THE OXYGEN REPLACED BY CARBON. BY CHOOSING THE PROPER DENSITY OF POLYETHYLENE FOR AN EXPERIMENT, THE NUCLEAR PROPERTIES OF WATER ARE DUPLICATED TO A HIGH DEGREE. LIKEWISE, POLYSTYRENE, WOULD BE EXPECTED TO HAVE NUCLEAR PROPERTIES FAIRLY CLOSE TO DIPHENYL.(AUTH).

PLASTIC-MODERATED CRITICAL ASSEMBLIES ARE BEING USED EXTENSIVELY TO STUDY WATER-MODERATED REACTOR SYSTEMS AND TO A LESSER EXTENT TO STUDY ORGANIC-MODERATED REACTORS. THE USE OF PLASTIC IS POSSIBLE BECAUSE PLASTICS MAY BE SELECTED WHICH HAVE NUCLEAR PROPERTIES SIMILAR TO THE LIQUID BEING STUDIED. FOR EXAMPLE, POLYETHYLENE WITH TWO HYDROGEN ATOMS FOR EACH CARBON ATOM RESEMBLES WATER WITH THE OXYGEN REPLACED BY CARBON. BY CHOOSING THE PROPER DENSITY OF POLYETHYLENE FOR AN EXPERIMENT, THE NUCLEAR PROPERTIES OF WATER ARE DUPLICATED TO A HIGH DEGREE. LIKEWISE, POLYSTYRENE, C8H8, WOULD BE EXPECTED TO HAVE NUCLEAR PROPERTIES FAIRLY CLOSE TO DIPHENYL, C6H5.

PLASTIC-MODERATED ASSEMBLIES ARE VERSATILE AND FLEXIBLE. BECAUSE THE CONFIGURATION AND COMPOSITIONS CAN BE MODIFIED RAPIDLY AND EASILY, A LARGE NUMBER OF TESTS CAN BE PERFORMED IN A REASONABLE LENGTH OF TIME. THIS QUALITY IS VALUABLE WHEN IT IS NECESSARY TO MODIFY CONDITIONS TO REACH A GIVEN RESULT OR TO MAKE A SURVEY OVER A LARGE RANGE OF CONDITIONS.

THE ACCESSIBILITY OF A PLASTIC-MODERATED REACTOR CORE PERMITS WORK TO BE PERFORMED MORE RAPIDLY. THERE IS NO TANK SURROUNDING THE CORE AS THERE WOULD BE IN A LIQUID SYSTEM. IT IS POSSIBLE TO REACH THE CORE AND THE CORE COMPONENTS TO MEASURE FLUX, POWER, TEMPERATURE DISTRIBUTIONS, AND ANY OTHER QUANTITIES OF INTEREST. IT IS ALSO POSSIBLE TO EASILY INSERT SAMPLES AT ANY POINT IN THE CORE FOR REACTIVITY TESTS.

740 ID-NUMBER ID-NUMBER 740

AUTHOR INGRAM, G. / ABSALOM, R. M. / ARNOLD, M. J. / BAKER, A. R.
 TITLE THE FIRST CORE OF ZEBRA
 REPORT NUMBER.... AEEW-R315
 DATE PUBLISHED ... 63-10-00
 NSA-NUMBER 17:23543
 SITE/PROGRAM UNITED KINGDOM, WINFRITH - ZEBRA

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

TO COMMISSION THE REACTOR AND TO TEST THE EXPERIMENTAL TECHNIQUES, THE FIRST CORE BUILT IN ZEBRA WAS A MOCK-UP OF ZPR-3 ASSEMBLY 11. THE CORE CONTAINED 9.7% BY VOLUME OF URANIUM-235 DILUTED WITH URANIUM-238 AND WAS SURROUNDED BY A NATURAL URANIUM REFLECTOR. THE EXPERIMENTS CARRIED OUT INCLUDED MEASUREMENTS OF CRITICAL MASS, FISSION RATIOS, PERTURBATIONS AND ACTIVATIONS AT THE CORE CENTRE, RELATIVE FISSION RATE MEASUREMENTS THROUGHOUT THE CORE AND BLANKET AND MEASUREMENTS OF THE MEAN PROMPT NEUTRON LIFETIME USING THE ROSSI-ALPHA METHOD. THE TECHNIQUES EMPLOYED ARE DESCRIBED AND THE RESULTS COMPARED WITH THOSE FROM ZPR-3 ASSEMBLY 11 AND WITH THEORETICAL ESTIMATES BASED ON THE 16 GROUP YIFIAH, OKRENT AND MOLDAUER DATA SET.(AUTH).

741 ID-NUMBER ID-NUMBER 741

AUTHOR HILLIG, O. R. / LATHAM, D. W.
 TITLE MATERIAL BUCKLINGS OF CRITICAL AND SUBCRITICAL URANIUM CARBIDE FUELED GRAPHITE ASSEMBLIES. PART 1. EXPERIMENT
 REPORT NUMBER.... NAA-SR-9771
 DATE PUBLISHED .. 64-12-01
 SITE/PROGRAM ATOMICS INTERNATIONAL - URANIUM(3%)CARBIDE - GRAPHITE

ABSTRACT

A SERIES OF CRITICAL AND SUBCRITICAL EXPERIMENTS HAVE BEEN PERFORMED TO DETERMINE VALUES OF MATERIAL BUCKLING AND K(EFF) FOR GRAPHITE ASSEMBLIES FUELED WITH SLIGHTLY ENRICHED (3.02 WT%), URANIUM CARBIDE FUEL ELEMENTS. LATTICE ARRANGEMENTS HAVE BEEN STUDIED WHICH INCLUDED CONTROL CHANNEL MOCKUPS FOR TRIANGULAR LATTICE PITCHES OF 9, 11 AND 12 INCHES. EXPERIMENTS HAVE BEEN PERFORMED TO DETERMINE CRITICAL MASS FOR TWO-REGION (URANIUM-CARBIDE AND URANIUM-METAL-FUELED) ASSEMBLIES AND K(EFF) FOR SUBCRITICAL, URANIUM CARBIDE FUELED ASSEMBLIES. EXPONENTIAL EXPERIMENTS HAVE BEEN CARRIED OUT TO DETERMINE MATERIAL BUCKLING FOR SUBCRITICAL ASSEMBLIES CONTAINING URANIUM CARBIDE FUEL ELEMENTS. ADDITIONAL ASSEMBLIES OF VARYING SIZE HAVE BEEN USED TO STUDY DIFFUSION ANISOTROPY AND THE APPARENT DEPENDENCE OF MATERIAL BUCKLING UPON ASSEMBLY SIZE. THE EXPONENTIAL STUDIES HAVE BEEN CORRECTED FOR THESE EFFECTS.

744 ID-NUMBER ID-NUMBER 744

AUTHOR BROOMFIELD, A. M. / ABSALOM, R. M. / ARNOLD, M. J. / BAKER, A. R. / FURNEAUX, D. / INGRAM, G. / PATTENDEN, S. K. / PATTERSON, C. R. / STEVENSON, J. M.
 TITLE THE SECOND CORE OF ZEBRA
 REPORT NUMBER.... AEEW-R410
 DATE PUBLISHED .. 65-00-00
 SITE/PROGRAM UNITED KINGDOM, WINFRITH - ZEBRA

ABSTRACT

A COPY OF THIS REPORT IS NOT YET AVAILABLE IN THE SYSTEM

745 ID-NUMBER ID-NUMBER 745

AUTHOR LAUBY, J. H.
 TITLE SUMMARY OF WATER MODERATED EXPERIMENTS WITH 1.8 WT% PLUTONIUM-ALUMINUM FUEL IN THE PRCF
 REPORT NUMBER.... BNWL-0149, 05-17
 DATE PUBLISHED .. 65-07-15
 SITE/PROGRAM HANFORD - PLUTONIUM RODS IN WATER

ABSTRACT

CRITICAL EXPERIMENTS HAVE BEEN CONDUCTED IN THE PLUTONIUM RECYCLE CRITICAL FACILITY (PRCF) WITH 1.82 WT% PLUTONIUM-ALUMINIUM FUEL. THE CRITICAL ASSEMBLY WAS MODERATED WITH LIGHT WATER. RESULTS OF THESE EXPERIMENTS WILL PROVIDE COMPARISONS TO MEASUREMENTS MADE WITH ENRICHED URANIUM, MIXED OXIDES OF PLUTONIUM AND URANIUM, AND PLUTONIUM CONTAINING DIFFERENT ISOTOPIC CONCENTRATIONS. THEY WILL ALSO FURNISH TESTS OF ANALYTICAL METHODS FOR CALCULATING REACTOR PARAMETERS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

747 ID-NUMBER ID-NUMBER 747

AUTHOR SKEEN, D. R.
 TITLE FOIL ACTIVATION STUDIES IN TWO PLUTONIUM CRITICAL SYSTEMS
 REPORT NUMBER..... BNWL-0149, 48-56
 DATE PUBLISHED ... 65-07-15
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER ; HANFORD - PLUTONIUM DIOXIDE -
 POLYSTYRENE COMPACTS

ABSTRACT

INTRODUCTION: EXPERIMENTS WERE PERFORMED IN TWO SEPARATE CRITICAL ASSEMBLIES TO PROVIDE NEUTRON ENERGY DEPENDENT DATA FOR CALCULATIONAL COMPARISONS. IN THESE EXPERIMENTS, SIX SETS EACH OF GOLD AND COPPER PIN-TYPE DETECTORS WERE SHIELDED WITH SOLUTIONS CONTAINING VARIOUS CONCENTRATIONS OF BORON AND IRRADIATED IN TWO SEPARATE CRITICAL ASSEMBLIES. CALCULATIONS WERE THEN MADE WITH THE IBM 7090 CODES, THERMOS-1 AND DTF-2, TO CALCULATE THE RELATIVE RELATIVE ACTIVITIES OF THE FOILS, AND COMPARISONS WERE MADE WITH THE EXPERIMENTAL REACTION RATES. (AUTH).

748 ID-NUMBER ID-NUMBER 748

AUTHOR QUILICI, R. E.
 TITLE ARMY GAS COOLED REACTOR SYSTEMS PROGRAM SUMMARY OF NUCLEAR PHYSICS
 EXPERIMENTS
 REPORT NUMBER..... IDO-28631
 DATE PUBLISHED ... 65-01-00
 SITE/PROGRAM BATTELLE MEMORIAL INSTITUTE - GAS COOLED REACTOR STUDIES ; AEROJET GENERAL
 NUCLEONICS - GAS COOLED REACTOR

ABSTRACT

STUDIES AT THE OAK RIDGE SCHOOL OF REACTOR TECHNOLOGY (ORSORT) IN 1954, AND BY THE SANDERSON- PORTER CO. IN 1955 ESTABLISHED THE FEASIBILITY OF THE DEVELOPMENT OF A MOBILE NUCLEAR POWER PLANT FOR MILITARY USE. THE ARMY GAS-COOLED REACTOR SYSTEMS PROGRAM (AGCRSP) WAS INITIATED IN 1956 TO DEVELOP SUCH A POWER PLANT. THE NUCLEAR REACTORS WERE BUILT AND OPERATED UNDER THIS PROGRAM:

THE GCRC-I EXPERIMENTAL REACTOR TO PROVIDE CORE AND FUEL ELEMENT INFORMATION FOR THE DESIGN OF A DEMONSTRATION POWER PLANT.

THE ML-1 DEMONSTRATION POWER PLANT.

NUCLEAR EXPERIMENTS WERE PERFORMED WITH CRITICAL ASSEMBLIES AT BATTELLE MEMORIAL INSTITUTE (BMI), IN THE GCRC-I REACTOR, AND IN THE ML-1 REACTOR. THE RESULTS OF THIS WORK WERE DOCUMENTED IN A NUMBER OF REPORTS WHICH PROVIDE DETAILED DISCUSSIONS OF THE EXPERIMENTS AND THE VARIOUS ASPECTS OF THE DEVELOPMENTAL WORK PERFORMED; THIS REPORT BRIEFLY SUMMARIZES THE ENTIRE PROGRAM OF CRITICAL EXPERIMENTS.

750 ID-NUMBER ID-NUMBER 750

AUTHOR BROWN, C. L. / LLOYD, R. C. / BIERMAN, S. R. / CLAYTON, E. D.
 TITLE EXPONENTIAL EXPERIMENTS AND NEUTRON MULTIPLICATION MEASUREMENTS WITH 1.25
 PERCENT ENRICHED N-REACTOR FUEL ELEMENTS IN LIGHT WATER
 REPORT NUMBER..... BNWL-0052
 DATE PUBLISHED ... 65-03-00
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

INTRODUCTION: A SERIES OF EXPONENTIAL AND NEUTRON MULTIPLICATION EXPERIMENTS HAVE BEEN PERFORMED ON SPIKE ENRICHED N-REACTOR FUEL ELEMENTS. THE SPIKE ENRICHED FUEL ELEMENT IS A TUBE ASSEMBLY CONSISTING OF A 1.25 WEIGHT PERCENT ENRICHED OUTER TUBE AND AN 0.95 WEIGHT PERCENT ENRICHED INNER TUBE. THE PURPOSE OF THE EXPERIMENTS WAS TO PROVIDE NEEDED DATA FOR NUCLEAR SAFETY GUIDANCE IN PROCESSING AND STORING THE SPIKE ENRICHED FUEL IN N-REACTOR DEPARTMENT. (AUTH.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

752 ID-NUMBER ID-NUMBER 752

AUTHOR WHITE, J. D./ RICHEY, C. R.
 TITLE CRITICAL EXPERIMENTS WITH PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS
 REPORT NUMBER.... HW-84808
 DATE PUBLISHED ... 65-00-00
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS WITH PLUTONIUM-DIOXIDE-POLYSTYRENE COMPACTS AT A HYDROGEN-TO- PLUTONIUM ATOMIC RATIO OF 15 HAS RECENTLY BEEN COMPLETED. THE DATA FROM THIS SERIES OF EXPERIMENTS WERE OBTAINED TO EVALUATE THE RELATIVE EFFECTIVENESS ON CRITICALITY OF VARIOUS COMPOSITE REFLECTORS AND SHIELDING MATERIALS AT THE SURFACE OF A CRITICAL ASSEMBLY CORE.

755 ID-NUMBER ID-NUMBER 755

AUTHOR THOMAS, J. T.
 TITLE EXPERIMENTAL AND CALCULATED SYSTEM CRITICALITY
 REPORT NUMBER.... IAEA-STOCK.-1965, 149-175
 CONFERENCE SYMPOSIUM ON CRITICALITY CONTROL OF FISSILE MATERIALS HELD BY THE INTERNATIONAL ATOMIC ENERGY AGENCY AT STOCKHOLM, 1-5 NOVEMBER 1965
 DATE PUBLISHED ... 65-11-00
 NSA-NUMBER 20:3378
 SITE/PROGRAM OAK RIDGE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

A CONTINUING PROGRAMME DIRECTED TO THE NEUTRONICS OF URANIUM-235 SYSTEM CRITICALITY HAS BEEN IN PROGRESS FOR A NUMBER OF YEARS IN THE UNITED STATES OF AMERICA. THE EXPERIMENTS WERE DESIGNED TO PROVIDE BASIC CRITICALITY DATA DESCRIBING ARRAYS SUSCEPTIBLE TO SIMPLE DESCRIPTION: ELEMENTARY GEOMETRY AND HOMOGENEOUS FUEL REGIONS. SUCH DATA FALL NATURALLY INTO A CLASS WHICH LENDS ITSELF DIRECTLY TO ANALYSES AND, AT THE SAME TIME, MAY BE APPLIED TO NUCLEAR SAFETY EVALUATIONS. THE COMPONENT VARIABLES EXAMINED INCLUDED MASS, SHAPE, MODERATION, AND THE URANIUM-235 CONTENT OF THE URANIUM, WHILE THE ARRAY VARIABLES STUDIED WERE SHAPE, MODERATION, DEGREE OF REFLECTION AND THE NUMBER OF UNITS AND THEIR SPACING. DATA FROM FOUR SERIES OF EXPERIMENTS AND REPRESENTATIVE CALCULATIONS UTILIZING TWO MONTE CARLO CODES ARE GIVEN.

UNREFLECTED TWO- AND THREE-COMPONENT CRITICAL ASSEMBLIES OF COAXIAL URANIUM(93%) METAL DISCS WITH DIAMETERS BETWEEN 17.78 CM AND 31.10 CM WERE STUDIED. THE UNIT MASS AS A FUNCTION OF SEPARATION WAS DETERMINED.

CRITICAL THREE-DIMENSIONAL ARRAYS OF AS MANY AS 64 UNITS OF URANIUM(93.2) METAL CYLINDERS RANGING FROM 10.5 TO 26.2 KG, IN FIVE SIZES, WERE EMPLOYED TO EXAMINE THE EFFECTS OF ARRAY MODERATION, REFLECTION, SHAPE AND UNIT PERTURBATION.

FIVE-LITRE COMPONENTS OF AQUEOUS URANYL NITRATE(93%) SOLUTION, AT A CONCENTRATION OF 415 G OF URANIUM PER LITRE, CONTAINED IN RIGHT CIRCULAR CYLINDERS OF METHACRYLATE PLASTIC WERE ASSEMBLED IN THREE-DIMENSIONAL ARRAYS. AS MANY AS 125 UNITS WERE USED TO DETERMINE THE NUMBER REQUIRED FOR CRITICALITY AS A FUNCTION OF THEIR SPACING AND THE DEGREE OF ARRAY REFLECTION.

CYLINDERS OF AQUEOUS URANYL FLUORIDE(5%) SOLUTION, AT A CONCENTRATION 901 G OF URANIUM PER LITRE, 24.1 CM DIAMETER AND UP TO 142.0 CM HIGH WERE ASSEMBLED TO CRITICALITY IN TRIANGULAR AND SQUARE PATTERNS IN PLANAR GEOMETRY.

CALCULATIONS WITH OSR, A GENERAL-PURPOSE MONTE CARLO NEUTRON TRANSPORT CODE DEVELOPED AT THE OAK RIDGE NATIONAL LABORATORY, YIELDS MULTIPLICATION CONSTANTS IN THE RANGE 0.971 TO 1.028; GEM, A MONTE CARLO NEUTRONICS CODE DEVELOPED BY THE AUTHORITY HEALTH AND SAFETY BRANCH (U.K.A.E.A.), YIELDS VALUES IN THE RANGE 1.000 TO 1.032.

756 ID-NUMBER ID-NUMBER 756

AUTHOR RICHEY, C. R./ WHITE, J. D.
 TITLE CRITICAL EXPERIMENTS WITH PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS
 REPORT NUMBER.... BNWL-0095
 DATE PUBLISHED ... 65-00-00
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

MEASURED THERMAL-NEUTRON SPECTRA FOR SEVERAL HOMOGENEOUS, LIGHT WATER AND POLYETHYLENE MODERATED SYSTEMS HAVE BEEN COMPARED TO SPECTRA CALCULATED BY THEORETICAL METHODS PRESENTLY IN USE. WHEN PLOTTED AS A FUNCTION OF ENERGY, THE FLUXES PRODUCED BY THESE MODELS APPEAR TO BE SIMILAR IN SHAPE TO THOSE MEASURED. A MORE REALISTIC MEASURE OF THE ADEQUACY OF THE MODELS IS TO COMPARE AVERAGE THERMAL GROUP CROSS SECTIONS. PREVIOUSLY, AVERAGE CROSS SECTIONS COMPUTED

III. BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

WITH THE MODELS WERE COMPARED TO THOSE COMPUTED WITH THE MODEL WHICH APPEARED TO YIELD THE MOST CORRECT SPECTRUM. IN THIS WORK, AVERAGE THERMAL GROUP CROSS SECTIONS (CHOSEN AS CROSS SECTIONS FOR NEUTRONS WITH ENERGIES BETWEEN 0 AND 0.683 EV) WERE OBTAINED BY INTEGRATING ENERGY-DEPENDENT CROSS SECTIONS OVER THE MEASURED SPECTRA. THESE WERE THEN COMPARED WITH THE CORRESPONDING PARAMETERS OBTAINED USING THE THEORETICAL SPECTRA. TO CONFINE THE DIFFERENCES OBSERVED TO THOSE CAUSED BY FLUX SHAPE, ALL ENERGY DEPENDENT CROSS SECTIONS WERE TAKEN FROM THE SAME SOURCE, THE R. B. U. BASIC LIBRARY, AND WERE ASSUMED TO BE WITHOUT ERROR. (AUTH).

757 ID-NUMBER ID-NUMBER 757

AUTHOR ORR, W. L. / STERNBERG, H. I. / DEROMIX, P.
 TITLE A COMPARISON OF ANALYSIS WITH EXPERIMENT FOR THE SAXTON PLUTONIUM CRITICAL EXPERIMENTS
 REPORT NUMBER..... TANSO, 08, 439-440
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 65-11-00
 SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - SAXTON REACTOR - URANIUM AND PLUTONIUM OXIDES WITH WATER

ABSTRACT

THE PURPOSE OF THE SAXTON PLUTONIUM PROGRAMS IS TO DEVELOP INFORMATION CONCERNING THE USE OF PLUTONIUM-ENRICHED FUEL IN PRESSURIZED-WATER REACTOR SYSTEMS THROUGH THE DESIGN, FABRICATION AND OPERATION OF A PARTIAL CORE OF PLUTONIUM-DIOXIDE - URANIUM-DIOXIDE FUEL IN THE SAXTON REACTOR. AS A PART OF THIS PROGRAM, A SERIES OF DESIGN-ORIENTED CRITICAL EXPERIMENTS WAS CARRIED OUT AT THE WESTINGHOUSE REACTOR EVALUATION CENTER USING URANIUM-DIOXIDE FUELS ENRICHED TO 5.74 WT% URANIUM-235 AND PLUTONIUM-DIOXIDE - URANIUM-DIOXIDE FUELS CONTAINING 6.6 WT% PLUTONIUM-DIOXIDE IN NATURAL URANIUM-DIOXIDE.

758 ID-NUMBER ID-NUMBER 758

AUTHOR NONE
 TITLE FARET CRITICALS
 REPORT NUMBER..... ANL-7082
 DATE PUBLISHED ... 65-08-24
 NSA-NUMBER 20:3319
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

EXPERIMENTS WITH CORE F OF ASSEMBLY 46 OF ZPR-3, A MOCK-UP OF A POSSIBLE MULTIFUEL-ZONED CORE LOADING FOR FARET, WERE DONE. THE FARET CORE DESIGN SIMULATED CONSISTS OF A CENTRAL ZONE OF 7 OXIDE- FUELED PLUTONIUM-DIOXIDE - URANIUM-DIOXIDE SUBASSEMBLIES, A THIRD SUBASSEMBLY RING OF 12 CARBIDE- FUELED PLUTONIUM-DIOXIDE - URANIUM-DIOXIDE ELEMENTS, THE FOURTH RING, WITH 18 SUBASSEMBLIES, CONTAINING THE OXIDE FUEL, AND THE FIFTH RING COMPOSED OF 12 MORE OXIDE SUBASSEMBLIES ALTERNATING WITH 12 SUBASSEMBLIES OF A ZIRCONIUM-PLUTONIUM-URANIUM ALLOY METAL FUEL. CORE 46D (SEE PROGRESS REPORT FOR JUNE 1965, ANL-7071, P. 16), AN EARLIER MOCK-UP DESIGN OF THIS MULTIZONE SYSTEM WAS FOUND TO BE TOO REACTIVE. A SUBSEQUENT DESIGN, CALLED 46E, WAS STARTED IN EARLY JULY, BUT WAS DISCONTINUED WHEN THE INDICATED CRITICAL VOLUME WAS FOUND TO BE TOO LARGE TO REPRESENT THE 61- SUBASSEMBLY FARET SYSTEM. A READJUSTMENT OF THE ZONE FUEL ENRICHMENTS PROVIDED THE CORE F DESIGN AND THE DESIRED MOCK-UP GEOMETRY. EXPERIMENTS COMPLETED WITH THE 46F CORE INCLUDE FUEL INTERCHANGES IN THE DIFFERENT CORE ZONES AND MEASUREMENTS OF REACTIVITY WORTH OF MOCK-UP FARET BORON-CARBIDE CONTROL RODS.

759 ID-NUMBER ID-NUMBER 759

AUTHOR DUBOVSKII, B. G. / KAMAEV, A. V. / KUZNETSOV, F. M. / VLADYKOV, G. M. / POPOV, G. A. / PALAMARCHUK, YU. D.
 TITLE CRITICAL PARAMETERS FOR AQUEOUS SOLUTIONS OF URANIUM NITRATE
 REPORT NUMBER..... JAABA, 19, 775-781
 JOURNAL JOURNAL OF NUCLEAR ENERGY
 DATE PUBLISHED ... 65-00-00
 SITE/PROGRAM USSR - URANYL NITRATE SOLUTIONS

ABSTRACT

RESULTS ARE GIVEN FOR EXPERIMENTAL DETERMINATIONS OF THE CRITICAL PARAMETERS FOR AQUEOUS SOLUTIONS OF URANYL-NITRATE.

BY TRANSFORMATION OF THE GEOMETRIC PARAMETER, CRITICAL DIMENSIONS HAVE BEEN OBTAINED FOR REACTORS IN THE SHAPE OF A SPHERE, AN INFINITE CYLINDER AND AN INFINITE PLANE LAYER. TRANSFORMATION OF THE GEOMETRIC PARAMETER WAS MADE USING EXTRAPOLATION AND THE EFFECTIVE INTRODUCTION OF REFLECTORS EXPERIMENTALLY. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

761 ID-NUMBER ID-NUMBER 761

AUTHOR BRITTLIFF, E./ DUERDEN, P.
 TITLE BUCKLING AND INTEGRAL SPECTRUM MEASUREMENTS IN URANIUM-233/BERYLLIUM OXIDE
 SUBCRITICAL ASSEMBLIES
 REPORT NUMBER..... AAEC/E145
 DATE PUBLISHED ... 65-11-00
 SITE/PROGRAM AUSTRALIA - URANIUM-233, URANIUM-235, PLUTONIUM-239 - BERYLLIUM OXIDE

ABSTRACT

AS A FURTHER STEP IN THE STUDY OF BERYLLIUM-OXIDE MODERATED REACTOR SYSTEMS, BUCKLING AND FISSION RATE MEASUREMENTS HAVE BEEN MADE WITH URANIUM-233 / BERYLLIUM-OXIDE SYSTEMS. SIMILAR WORK ON URANIUM-235 / BERYLLIUM-OXIDE AND URANIUM-233 / BERYLLIUM-OXIDE / FERTILE MATERIAL HAS BEEN PREVIOUSLY REPORTED.

762 ID-NUMBER ID-NUMBER 762

AUTHOR HENNELLY, E. J./ PARKINSON, T. F./ ROGERS, W. B.
 TITLE BUCKLING MEASUREMENTS ON NATURAL URANIUM - HEAVY WATER LATTICES AT
 TEMPERATURES UP TO 215 DEGREE CENTIGRADE
 REPORT NUMBER..... TANSO, 03, 021-023
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 60-06-00
 SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES
 IN HEAVY WATER

ABSTRACT

EXPONENTIAL BUCKLING MEASUREMENTS ON LATTICES OF NATURAL URANIUM TUBES IN DEUTERIUM-OXIDE WERE MADE IN THE PRESSURIZED SUBCRITICAL EXPERIMENT (PSE) AT THE SAVANNAH RIVER LABORATORY. THE METAL FUEL TUBES WERE 1.957 INCH OD, 1.387 INCH ID AND WERE CLAD WITH 0.030 INCH OF X8001 ALUMINUM ALLOY.

763 ID-NUMBER ID-NUMBER 763

AUTHOR ADAMSON, J. / ABSALOM, R. M. / ARNOLD, M. J. / BAKER, A. R. / BROOMFIELD,
 A. M. / FURNEAUX, D. / INGRAM, G. / PATTENDEN, S. K. / PATTERSON, C. R. /
 STEVENSON, J. M.
 TITLE THE THIRD CORE OF ZEBRA
 REPORT NUMBER..... AEEW-R461
 DATE PUBLISHED ... 65-10-00
 SITE/PROGRAM UNITED KINGDOM, WINFRITH - ZEBRA

ABSTRACT

THIS REPORT DESCRIBES THE PHYSICAL STUDY OF THE THIRD CORE BUILT IN ZEBRA. IT WAS IN FACT THE FIRST CORE IN ZEBRA TO BE FUELED WITH PLUTONIUM. THE ONLY SIGNIFICANT DILUENT WAS NATURAL URANIUM, THE ATOMIC RATIO OF PLUTONIUM-239 TO URANIUM-238 BEING ABOUT 1:9. THE ASSEMBLY HAD A CRITICAL MASS OF 81 KG PLUTONIUM-239. PREVIOUS EXPERIENCE HAD LED TO THE BELIEF THAT NONE OF THE MULTIGROUP DATA SETS IN USE IN THE UK WOULD PREDICT THE CRITICAL MASS OF A PLUTONIUM SYSTEM CORRECTLY. THIS WAS CONFIRMED IN THE STUDY OF THE CRITICALITY OF THIS CORE. VARIOUS CROSS-SECTION AND SPECTRAL INDEX MEASUREMENTS ARE DESCRIBED AND THE RESULTS COMPARED WITH THE PREDICTIONS OF THE DATA SETS.

768 ID-NUMBER ID-NUMBER 768

AUTHOR KOLAR, O. C. / MORTON, J. R. / PRUVOST, N. L.
 TITLE INTERACTION IN ARRAYS OF FISSIONABLE MATERIALS
 REPORT NUMBER..... IAEA-STOCK.-1965, 315-335
 CONFERENCE SYMPOSIUM ON CRITICALITY CONTROL OF FISSIONABLE MATERIALS HELD BY THE
 INTERNATIONAL ATOMIC ENERGY AGENCY AT STOCKHOLM, 1-5 NOVEMBER 1965
 DATE PUBLISHED ... 65-11-00
 NSA-NUMBER 20:2938
 SITE/PROGRAM LIVERMORE - PLUTONIUM ARRAYS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

A PROGRAMME TO STUDY THE INTERACTION EFFECT IN ARRAYS OF FISSIONABLE MATERIALS HAS BEEN INSTITUTED AT THE LAWRENCE RADIATION LABORATORY. THE PROGRAMME CONSISTS OF BOTH EXPERIMENTAL AND THEORETICAL EFFORTS. THE PARTICULAR ARRAYS THAT ARE BEING STUDIED EXPERIMENTALLY ARE COMPOSED OF PLUTONIUM METAL UNITS. ARRAY GEOMETRIES ARE SIMPLE; THE BASIC UNITS ARE CYLINDERS AND THE ARRAYS ARE CUBICAL. BARE ARRAYS ARE BEING STUDIED, AS WELL AS THOSE WITH INTERNAL MODERATION OR EXTERNAL REFLECTION. 130 BASIC UNITS ARE AVAILABLE SO THAT ARRAYS OF SIZE UP TO 5 X 5 X 5 CAN BE STUDIED. THE PURPOSES OF THE PROGRAMME ARE TWO-FOLD: (1) TO PROVIDE CLEAN, CRITICAL DATA TO USE IN THE DEVELOPMENT AND NORMALIZATION OF COMPUTATIONAL TECHNIQUES; AND (2) THE DATA AS SUCH ARE EXPECTED TO BE USEFUL FOR INTERPOLATION AND EXTRAPOLATION FOR APPLICATION TO ACTUAL SYSTEMS OF INTEREST. THE BASIC ARRAY UNIT IS A 3 KG CYLINDER OF PLUTONIUM METAL, 4.62 CM HIGH, 6.53 CM IN DIAMETER, AND A DENSITY OF 19.54 G/CC. THE HEIGHT-TO-DIAMETER RATIO WAS CHOSEN SO THAT A DOUBLE UNIT CONSISTING OF TWO BASIC UNITS, ONE ON TOP OF THE OTHER, WOULD HAVE THE SAME SHAPE FACTOR AS A SINGLE BASIC UNIT. A BRIEF DESCRIPTION OF THE CANNING, ASSEMBLY EQUIPMENT, AND THE EXPERIMENTAL BUILDING IS PRESENTED. A SHORT DISCUSSION OF THE SAFETY EVALUATION (START-UP ACCIDENT, STEP INSERTION OF REACTIVITY) IS ALSO GIVEN. CALCULATIONS PERTINENT TO THE PROGRAMME HAVE BEEN PERFORMED USING BOTH THE GEM AND SORS NEUTRON MONTE CARLO ELECTRONIC COMPUTER PROGRAMMES. EXPERIMENTAL RESULTS FROM ARRAYS CONSISTING OF TWO UNITS UP TO THE MAXIMUM NUMBER ARE PRESENTED.

774 ID-NUMBER ID-NUMBER 774

AUTHOR BUSSELMAN, G. J.
 TITLE PHYSICS ANALYSIS OF A URANIUM-ALUMINUM POLYETHYLENE SYSTEM
 REPORT NUMBER.... BNWL-0149, 27-32
 DATE PUBLISHED ... 65-07-15
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM-ALUMINUM DISKS - BORATED POLYETHYLENE

ABSTRACT

ONE GOAL OF THE PHOENIX FUEL PROGRAM IS TO DEVELOP METHODS FOR CALCULATING THE NUCLEAR CHARACTERISTICS OF PLUTONIUM FUELED THERMAL SYSTEMS. IN ORDER TO CHECK VARIOUS CALCULATIONAL SCHEMES, A SERIES OF EXPERIMENTS HAVE BEEN SELECTED TO COVER THE VARIABLES OF INTEREST. THE EXPERIMENTS EMPLOY PLUTONIUM-ALUMINUM CIRCULAR FUEL PLATES IN CONJUNCTION WITH BORATED POLYETHYLENE DISCS STACKED IN A CLUSTER OF ALUMINUM TUBES. THE EXPERIMENT CONSISTS OF DETERMINING THE AMOUNT OF BORON NECESSARY TO ADD TO THE MODERATOR TO ACHIEVE A K(INF) OF UNITY FOR THE PLUTONIUM-ALUMINUM POLY SYSTEM.

IN THE FIRST EXPERIMENT, URANIUM-235 RATHER THAN PLUTONIUM WAS USED TO TRY OUT THE EXPERIMENTAL TECHNIQUES AND CALCULATIONAL METHODS WITH A SYSTEM WHICH HAS NEITHER THE LOW-LYING RESONANCE STRUCTURE OF PLUTONIUM NOR THE CONTAMINATION PROBLEMS OF A PLUTONIUM EXPERIMENT. (AUTH).

777 ID-NUMBER ID-NUMBER 777

AUTHOR BROWN, C. L./ LLOYD, R. C.
 TITLE MEASUREMENTS OF MATERIAL BUCKLINGS FOR 1.002, 1.25 AND 1.95 PERCENT WEIGHT URANIUM-235 ENRICHED URANIUM TUBE LATTICES IN LIGHT WATER
 REPORT NUMBER.... BNWL-0193, 45-56
 DATE PUBLISHED ... 65-10-15
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

MATERIAL BUCKLINGS AND EXTRAPOLATION DISTANCES HAVE BEEN MEASURED FOR LIGHT WATER LATTICES OF 1.002, 1.25, AND 1.95 WT% URANIUM-235 ENRICHED URANIUM TUBES, AND 1.002 WT%/1.002 WT% AND 1.25 WT%/0.95 WT% URANIUM-235 ENRICHED URANIUM TUBE-IN-TUBE ASSEMBLIES. THE PURPOSE OF THESE MEASUREMENTS WAS TO PROVIDE NEEDED CRITICALITY SAFETY DATA FOR THE GENERAL ELECTRIC COMPANY, N- REACTOR DEPARTMENT, WHO ARE FABRICATING, STORING, AND TRANSPORTING TUBULAR FUELS; AND TO PROVIDE ADDITIONAL EXPERIMENTAL DATA FOR CORRELATION TO THEORETICAL METHODS.

778 ID-NUMBER ID-NUMBER 778

AUTHOR PRICE, G. A./ WINDSOR, H.
 TITLE URANIUM-233 DIOXIDE - THORIUM DIOXIDE LATTICE EXPERIMENTS
 REPORT NUMBER.... BNL-00954
 DATE PUBLISHED ... 65-12-31
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - URANIUM-233 - THORIUM DIOXIDE LATTICE

ABSTRACT

A SERIES OF EXPONENTIAL EXPERIMENTS ON ZIRCALOY-CLAD URANIUM-233 DIOXIDE-THORIUM DIOXIDE FUELED ELEMENTS MODERATED WITH WATER AND WATER SOLUTIONS OF BORIC ACID WAS COMPLETED. PRELIMINARY ANALYSIS OF THE RESULTS WAS CARRIED OUT AND PREPARATIONS FOR TWO SERIES OF HEAVY WATER MODERATED EXPONENTIAL EXPERIMENTS UTILIZING THE SAME FUEL WERE BEGUN.

III. BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

779 ID-NUMBER ID-NUMBER 779

AUTHOR CLAYTON, E. D. / RICHEY, C. R. / LLOYD, R. C. / BIERMAN, S. R. / CARTER, L. L.
 TITLE CRITICALITY RESEARCH ON PLUTONIUM
 REPORT NUMBER..... IAEA-STOCK.-1965, 215-233
 CONFERENCE SYMPOSIUM ON CRITICALITY CONTROL OF FISSILE MATERIALS HELD BY THE INTERNATIONAL ATOMIC ENERGY AGENCY AT STOCKHOLM, 1-5 NOVEMBER 1965
 DATE PUBLISHED ... 65-11-00
 NSA-NUMBER 20:3368
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

BASED ON THE ANALYSES OF CRITICALITY DATA FROM RECENT EXPERIMENTS HOMOGENEOUS, HYDROGENOUS MIXTURES OF PLUTONIUM AT AN HYDROGEN/PLUTONIUM RATIO OF 15, PREVIOUSLY ESTIMATED CURVES FOR CRITICAL DIMENSIONS OF HOMOGENEOUS WATER MODERATED PLUTONIUM IN THE UNDERMODERATED RANGE HAVE BEEN REVISED SIGNIFICANTLY USING TRANSPORT CALCULATIONS CONFIRMED BY THE EXPERIMENTS. CURVES OF INFINITE CYLINDER DIAMETERS AND SLAB THICKNESSES, SPHERE VOLUMES, AND MASSES, ARE PRESENTED FOR THE CONCENTRATION RANGE FROM 0.1 TO 10 KG/LITRE. COMPUTED CURVES ARE GIVEN TO SHOW THE EFFECT OF PLUTONIUM-240 ON CRITICALITY, TOGETHER WITH EXPERIMENTAL DATA POINTS AT 2.2 PERCENT AND 8 PERCENT PLUTONIUM-240. MEASURED DECAY CONSTANTS FROM PULSED NEUTRON SOURCE AND NOISE ANALYSIS EXPERIMENTS ON CRITICAL AND SUBCRITICAL PLUTONIUM SYSTEM ARE COMPARED WITH COMPUTED VALUES FOR HYDROGEN/PLUTONIUM ATOMIC RATIOS OF 15:1068. AN ANALYSIS OF CRITICAL DATA ON PLUTONIUM SOLUTIONS HAS BEEN MADE SHOWING THE EFFECT OF NITRATE ON CRITICALITY FOR REFLECTED SPHERES WITH NITRATE AND PLUTONIUM CONCENTRATIONS EXTENDING TO SEVERAL HUNDRED GRAMS PER LITRE. THE RESULTS OF A SUBCRITICAL INTERACTION EXPERIMENT PERFORMED WITH CANS OF DRY PLUTONIUM DIOXIDE, POWDER IN A LOW DENSITY REFLECTED CUBIC ARRAY ARE REPORTED. THE AVERAGE DENSITY OF PLUTONIUM DIOXIDE IN THE ARRAY WAS 1.16 G/CM³; THE ESTIMATED CRITICAL MASS WAS ABOUT 300 KG. (AUTH).

780 ID-NUMBER ID-NUMBER 780

AUTHOR CLOUET D'ORVAL, C. / DEILGAT, E. / HONELLE, M. / LECORCHE, P.
 TITLE EXPERIMENTAL RESEARCH IN FRANCE ON CRITICALITY PROBLEMS
 REPORT NUMBER..... IAEA-STOCK.-1965, 193-213
 CONFERENCE SYMPOSIUM ON CRITICALITY CONTROL OF FISSILE MATERIALS HELD BY THE INTERNATIONAL ATOMIC ENERGY AGENCY AT STOCKHOLM, 1-5 NOVEMBER 1965
 DATE PUBLISHED ... 65-11-00
 NSA-NUMBER 20:35688
 SITE/PROGRAM FRANCE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

BEFORE 1964, SOME OF FRANCE'S EXPERIMENTAL FACILITIES FOR CRITICALITY STUDIES WERE INSTALLED AT SACLAY. HERE, FUNDAMENTAL EXPERIMENTS WERE CARRIED OUT WITH SOLUTIONS OF PLUTONIUM, URANIUM-235 AND URANIUM-233 IN CYLINDRICAL GEOMETRIES, WHICH WERE EITHER BARE OR WERE REFLECTED WITH DIFFERENT TYPES OF REFLECTOR (PROSERPINE AND ALECTO). SINCE 1962 EXPERIMENTS HAVE BEEN CARRIED OUT WITH RIG B AT THE CRITICALITY STATION OF THE VALDUC RESEARCH CENTRE WITH A VIEW TO STUDYING THE STORAGE OF PLUTONIUM SOLUTIONS IN ANNULAR CYLINDERS (500 MM X 300 MM, 500 MM X 200 MM AND 500 MM X 350 MM); OTHER SPECIAL EXPERIMENTS HAVE BEEN DEVOTED TO THE SAFETY OF APPARATUS CONTAINING PLUTONIUM NITRATE IN A HOMOGENEOUS SOLUTION. THE FRENCH PROGRAMME PROVIDES FOR THE CONTINUATION OF THE EXPERIMENTS CARRIED OUT WITH RIG B (INTERACTION OF 2-9 CYLINDERS WITH A DIAMETER OF 250 MM), THE BRINGING INTO OPERATION OF CASTOR AND POLLUX WITH A VIEW TO DETERMINING THE COUPLING COEFFICIENTS BETWEEN TWO 300-MM CYLINDERS CONTAINING URANIUM-235 NITRATE, THE BRINGING INTO SERVICE OF RIG D (STUDYING OF THE SAFETY OF A PLUTONIUM METAL SOLUTION) AND FINALLY FOR THE CARRYING OUT OF VERY SUB-CRITICAL PULSED- NEUTRON-SOURCE EXPERIMENTS AIMED AT PROVIDING INFORMATION ON CRITICAL PARAMETERS.

781 ID-NUMBER ID-NUMBER 781

AUTHOR BRUNA, J. G. / BRUNET, J. P. / CAIZERGUES, R. / CLOUET D'ORVAL, C. / VERRIERE, P.
 TITLE RESULTS OF HOMOGENEOUS CRITICAL EXPERIMENTS CARRIED OUT WITH PLUTONIUM-239, URANIUM-235 AND URANIUM-233
 REPORT NUMBER..... IAEA-STOCK.-1965, 235-248
 CONFERENCE SYMPOSIUM ON CRITICALITY CONTROL OF FISSILE MATERIALS HELD BY THE INTERNATIONAL ATOMIC ENERGY AGENCY AT STOCKHOLM, 1-5 NOVEMBER 1965
 DATE PUBLISHED ... 65-11-00
 NSA-NUMBER 21:36441
 SITE/PROGRAM FRANCE - PLUTONIUM AND URANIUM SOLUTIONS

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

CRITICAL EXPERIMENTS CARRIED OUT AT SACLAY ON ALECTO ASSEMBLIES HAVE MADE IT POSSIBLE TO COMPARE THE PROPERTIES OF THREE FISSION ISOTOPES, PLUTONIUM-239, URANIUM-235 AND URANIUM-233, IN SIMILAR GEOMETRIES. ON THE BASIS OF THE RESULTS OBTAINED AN ATTEMPT WAS MADE TO DETERMINE EMPIRICALLY THE SLOWING-DOWN AREA AS A FUNCTION OF CONCENTRATION, THE MULTIPLICATION FACTOR BEING CALCULATED BY USING, FOR THE CROSS-SECTIONS, A SECONDARY DIFFERENTIAL THERMALIZING MODEL DEVELOPED AT SACLAY FOR LIGHT WATER. SOME EXPERIMENTS INVOLVED ATTEMPTS TO DETERMINE THE LIFETIMES OF PROMPT NEUTRONS BY MEANS OF A PULSED-SOURCE METHOD AND TO DEDUCE INFORMATION ON THE ABSORPTION AND FISSION CROSS-SECTIONS IN A HYDROGENATED MEDIUM. AFTER CARRYING OUT VARIOUS GEOMETRICAL CONVERSIONS WHICH MAKE IT POSSIBLE TO GO FROM CRITICAL DIMENSIONS IN CYLINDRICAL GEOMETRY TO CRITICAL DIMENSIONS IN SPHERICAL GEOMETRY, WE HAVE BEEN ABLE TO COMPARE THE CRITICAL MASSES OBTAINED IN ALECTO WITH VARIOUS FOREIGN RESULTS ON THE ONE HAND AND THE FRENCH CRITICALITY GUIDE CURVES ON THE OTHER.

782 ID-NUMBER ID-NUMBER 782

AUTHOR SERDULA, K. J. / GREEN, R. E.
 TITLE LATTICE MEASUREMENTS WITH 19-ELEMENT NATURAL URANIUM METAL ASSEMBLIES.
 PART 1 - BUCKLINGS FOR A RANGE OF SPACINGS WITH HEAVY WATER AND HELIUM COOLANTS
 REPORT NUMBER.... AECL-2516
 DATE PUBLISHED ... 65-10-00
 SITE/PROGRAM CANADA, CHALK RIVER NUCLEAR LABORATORIES - HEAVY WATER LATTICES

ABSTRACT

BUCKLINGS DERIVED FROM ACTIVATION MEASUREMENTS IN THE ZED-2 REACTOR ARE GIVEN FOR 19-ELEMENT NATURAL URANIUM METAL ASSEMBLIES. MEASUREMENTS MADE IN TRIANGULAR ARRAYS OF 55 ASSEMBLIES AT PITCHES IN THE RANGE 20 TO 40 CM. COOLANTS USED WERE: (1) DEUTERIUM-OXIDE OF MODERATOR PURITY, (2) HELIUM TO SIMULATE A VOIDED CONDITION. BUCKLINGS OBTAINED WITH HELIUM AS COOLANT ARE HIGHER THAN THOSE FOR DEUTERIUM-OXIDE COOLANT FOR THE PITCHES INVESTIGATED. (AUTH).

784 ID-NUMBER ID-NUMBER 784

AUTHOR MC CULLOCH, D. B. / DUERDEN, P. / BRITTLIFF, E.
 TITLE BUCKLING AND INTEGRAL SPECTRUM MEASUREMENTS IN URANIUM-235 FUELED
 SUBCRITICAL ASSEMBLIES MODERATED BY BERYLLIUM OXIDE/FERTILE MATERIAL MIXTURES
 REPORT NUMBER.... AAEC/E146
 DATE PUBLISHED ... 65-12-00
 NSA-NUMBER 20:36418
 SITE/PROGRAM AUSTRALIA - URANIUM-233, URANIUM-235, PLUTONIUM-239 - BERYLLIUM OXIDE

ABSTRACT

A SERIES OF NEAR-HOMOGENEOUS SUBCRITICAL EXPERIMENTS IS BEING CARRIED OUT USING URANIUM-235, URANIUM-233, AND PLUTONIUM FUELS DILUTED WITH PURE BERYLLIUM-OXIDE, OR WITH BERYLLIUM-OXIDE / NATURAL URANIUM, OR BERYLLIUM-OXIDE / THORIA MIXTURES.

BUCKLING AND FISSION RATE MEASUREMENTS HAVE ALREADY BEEN REPORTED FOR URANIUM-235 FUEL AND BERYLLIA. THIS REPORT DESCRIBES SIMILAR MEASUREMENTS FOR SYSTEMS EMPLOYING THE SAME URANIUM-235 / ALUMINUM ALLOY FUEL STRIPS AND A 5 WT% MIXTURE OF NATURAL URANIUM OXIDE OR THORIUM OXIDE IN BERYLLIUM-OXIDE.

787 ID-NUMBER ID-NUMBER 787

AUTHOR KRASIN, A. K. / INYUTIN, E. I.
 TITLE HOMOGENEOUS CRITICAL ASSEMBLY WITH A PROFILED FUEL CHARGE
 REPORT NUMBER.... SOVIET ATOMIC ENERGY VOL. 18 NO. 2
 JOURNAL SOVIET ATOMIC ENERGY
 DATE PUBLISHED ... 65-02-00
 SITE/PROGRAM USSR - URANYL NITRATE SOLUTIONS

ABSTRACT

THE AUTHORS OF THE PRESENT ARTICLE PRODUCED A HOMOGENEOUS CRITICAL ASSEMBLY WITH A PROFILED FUEL CHARGE FOR THE PURPOSE OF EQUALIZING THE ENERGY RELEASE IN THE CORE. THE CRITICAL ASSEMBLY CONSTITUTED A SIX-ZONE CYLINDRICAL ZERO-POWER REACTOR. THE REACTOR CORE WAS DIVIDED INTO FIVE COAXIAL ZONES; THE SIXTH (EXTERNAL) ZONE, ACTED AS A PHYSICALLY INFINITE REFLECTOR.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE FISSIONABLE MATERIAL (90%-ENRICHED URANIUM) WAS USED IN THE FORM OF AN AQUEOUS SOLUTION OF URANYL NITRATE ACIDIFIED WITH NITRIC ACID. SOLUTIONS WITH DIFFERENT FUEL CONCENTRATIONS ENTERED THE CORRESPONDING REACTOR ZONES THROUGH POLYETHYLENE PIPES.

788 ID-NUMBER ID-NUMBER 788

AUTHOR ANDERSSON, T. L. / BRUNFELTER, B. / CECCHI, P. F. / HELLSTRAND, E. /
KOCKUM, J. / LONDEN, S. O. / TIREN, L. I.

TITLE A SUMMARY REPORT ON ASSEMBLY 3 OF FRO

REPORT NUMBER..... AE-233

DATE PUBLISHED ... 66-06-00

SITE/PROGRAM SWEDEN - FRO ZERO ENERGY FAST REACTOR (URANIUM(20%) - GRAPHITE)

ABSTRACT

THE THIRD CORE OF THE ZERO ENERGY FAST REACTOR FRO CONSISTED OF 20% ENRICHED URANIUM DILUTED TO 29 VOLUME % WITH GRAPHITE AND HAD A VOLUME OF 50 LITRES. LIKE PREVIOUS CORES IT WAS SURROUNDED BY A THICK COPPER REFLECTOR. THE REPORT SUMMARIZES MEASUREMENTS OF CRITICAL MASS, CONTROL ROD REACTIVITIES, FINE STRUCTURE FLUX VARIATIONS AND CONVERSION RATIO. IN PARTICULAR, EFFECTS ASSOCIATED WITH THE HETEROGENEOUS ARRANGEMENT OF THE URANIUM AND GRAPHITE PLATES ARE EXAMINED.(AUTH)

790 ID-NUMBER ID-NUMBER 790

AUTHOR WHEELER, R. C. / ABSALOM, R. M. / BAKER, A. R. / BROOMFIELD, A. M. /
FURNEAUX, D. / INGRAM, G. / JOWITT, D. / PATTENDEN, S. K. / PATTERSON, C.
R. / SMITH, M. F. / STEVENSON, J. M.

TITLE ZEBRA CORE 5: STUDIES OF A MIXED CRITICAL CORE WITH A CENTRAL DILUTE
PLUTONIUM REGION

REPORT NUMBER..... AEEW-R481

DATE PUBLISHED ... 66-05-00

SITE/PROGRAM UNITED KINGDOM, WINFRITH - ZEBRA

ABSTRACT

ZEBRA CORE 5 WAS A MIXED CRITICAL ASSEMBLY USED PRIMARILY FOR THE MEASUREMENT OF DOPPLER COEFFICIENTS IN A CENTRAL HOT LOOP. THIS REPORT CONTAINS THE RESULTS OF THE SPECTRA MEASUREMENTS, CRITICAL MASSES, CONTROL ROD CALIBRATIONS, PERTURBATION CROSS-SECTIONS, REACTION RATE RATIOS, DOPPLER COEFFICIENT MEASUREMENTS WITH SMALL SAMPLES AND OTHER CORE DATA. SOME PRELIMINARY RESULTS FROM SODIUM ACTIVATION MEASUREMENTS ARE ALSO GIVEN. A COMPARISON IS MADE BETWEEN THE RESULTS AND CALCULATIONS BASED ON FD1 AND FD2 DATA SETS. IT WAS FOUND THAT THE LATTER SET GAVE A CLOSER PREDICTION OF MOST QUANTITIES. THE FLUX WAS FOUND TO BE UNDERESTIMATED IN THE LOW ENERGY REGIONS WHERE THE DOPPLER EFFECT IS IMPORTANT. THE 5J RESULTS ARE OF DIRECT APPLICATION TO THE PFR SYSTEM, BECAUSE THE SPECTRUM THERE WAS A CLOSE REPRESENTATION OF PFR. THE OTHER ASSEMBLIES PROVIDED A RANGE OF COMPOSITION AND NEUTRON SPECTRA AROUND THAT OF THE PFR, AND THE COMPARISONS BETWEEN EXPERIMENT AND CALCULATION ARE THEREFORE ALSO OF VALUE TO THE UNDERSTANDING OF THAT SYSTEM.

792 ID-NUMBER ID-NUMBER 792

AUTHOR SERDULA, K. J.

TITLE LATTICE MEASUREMENTS WITH 28 - ELEMENT NATURAL URANIUM DIOXIDE FUEL
ASSEMBLIES PART 1. BUCKLINGS FOR A RANGE OF SPACINGS WITH THREE COOLANTS

REPORT NUMBER..... AECL-2606

DATE PUBLISHED ... 66-07-00

SITE/PROGRAM CANADA, CHALK RIVER NUCLEAR LABORATORIES - HEAVY WATER LATTICES

ABSTRACT

BUCKLINGS DERIVED FROM ACTIVATION MEASUREMENTS IN THE ZED-2 REACTOR ARE GIVEN FOR 28-ELEMENT NATURAL URANIUM-OXIDE FUEL ASSEMBLIES. MEASUREMENTS WERE MADE IN DEUTERIUM-OXIDE-MODERATED TRIANGULAR ARRAYS OF 55 ASSEMBLIES AT PITCHES IN THE RANGE 20 TO 40 CM. THE THREE "COOLANTS" USED WERE.

- (1) DEUTERIUM-OXIDE OF MODERATOR PURITY.
- (2) HELIUM TO SIMULATE A VOIDED CONDITION.
- (3) HB-40, AN ORGANIC LIQUID.

BUCKLINGS OBTAINED WITH HELIUM AS COOLANT ARE GREATER THAN THOSE FOR DEUTERIUM-OXIDE AND HB-40 COOLANTS FOR THE PITCHES INVESTIGATED.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

MACROSCOPIC VARIATIONS OF THE INDIUM-CADMIUM RATIO WERE MEASURED WITH DEUTERIUM-OXIDE AND HB- 40 COOLANTS WITHIN THE RANGE OF PITCHES STUDIED. (AUTH).

793 ID-NUMBER ID-NUMBER 793

AUTHOR JONES, L. L./ ROMESBURG, H. C.
 TITLE CRITICAL DIMENSION OF URANIUM-235 AQUEOUS SOLUTIONS CONTAINING URANIUM-238 OR THORIUM-232
 REPORT NUMBER..... WAPD-TM-0632
 DATE PUBLISHED ... 66-09-00
 NSA-NUMBER 21:1543
 SITE/PROGRAM WESTINGHOUSE, BETTIS ATOMIC POWER LABORATORY - URANIUM(93%)OXIDE - THORIUM OXIDE

ABSTRACT

THE PURPOSE OF THIS ANALYSIS WAS TO PROVIDE CRITICALITY DATA FOR HOMOGENEOUS WATER MODERATED AND REFLECTED SYSTEMS CONTAINING HIGHLY ENRICHED URANIUM-DIOXIDE AND THORIA. THE DATA WILL BE USED TO ESTABLISH FUEL HANDLING AND STORAGE CRITERIA FOR FINELY DIVIDED MIXTURES AND ALLOYS OF HIGHLY ENRICHED URANIUM-DIOXIDE + THORIA. HOMOGENEOUS, WATER REFLECTED AND MODERATED SPHERES OF THORIA CONTAINING A WIDE RANGE OF HIGHLY ENRICHED URANIUM-DIOXIDE WT% HAVE BEEN ANALYZED BY FOUR-GROUP DIFFUSION THEORY UTILIZING THE ONE-DIMENSIONAL CODE WANDA. THE FAST-GROUP CONSTANTS WERE OBTAINED FROM THE MUFT 5 CODE WHICH WEIGHTS A 54-GROUP MICROSCOPIC CROSS-SECTION SET OVER A SPECTRUM DETERMINED BY THE BUCKLING AND MATERIAL COMPOSITION AND COALESCESES THESE INTO THREE FAST-GROUP CONSTANTS. THE THERMAL-GROUP CONSTANTS WERE OBTAINED WITH THE KATE 1 CODE USING THE "MIXED NUMBER DENSITY" OPTION.

STEARIC ACID AND SUGAR WERE COMPARED WITH WATER FOR EFFECTIVENESS OF MODERATION AND REFLECTION. WATER PROVED TO BE THE BEST MODERATOR THUS FAR, BUT SUGAR (AT THEORETICAL DENSITY) PROVED TO BE SUPERIOR TO WATER AS A REFLECTOR.(AUTH).

795 ID-NUMBER ID-NUMBER 795

AUTHOR LABAUVE, R. J./ BATTAT, M. E.
 TITLE CRITICALITY AND CENTRAL REACTIVITY CALCULATIONS USING ENDF/B DATA
 REPORT NUMBER..... LA-DC-9216
 DATE PUBLISHED ... 68-04-04
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS ; LOS ALAMOS - PLUTONIUM METAL SPHERES - CALCULATIONS ; ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

A SERIES OF CRITICALITY CALCULATIONS HAS BEEN PERFORMED FOR SELECTED EXPERIMENTAL ASSEMBLIES TO TEST THE CATEGORY I, ENDF/B NEUTRON DATA. THESE ASSEMBLIES INCLUDE JEZEBEL (PLUTONIUM CORE), TOPSY (ENRICHED URANIUM CORE WITH NATURAL URANIUM REFLECTOR), AND ZPR-3 ASSEMBLY 48 (PLUTONIUM FUEL, SOFT SPECTRUM). CENTRAL REACTIVITY WORTHS WERE ALSO COMPUTED FOR SEVERAL MATERIALS OF INTEREST IN FAST REACTOR DESIGN. IN THE COURSE OF OBTAINING MULTIGROUP CONSTANTS FOR INPUT TO THE LOS ALAMOS SCIENTIFIC LABORATORY CODES USED IN THESE CALCULATIONS, SEVERAL ENDF/B RETRIEVAL AND PROCESSING CODES WERE EMPLOYED. THESE INCLUDE DAMMET, A CODE FOR REARRANGING AND ALTERING THE MODE OF THE STANDARD BCD ENDF/B LIBRARY TAPE; ETOE, A CODE FOR PREPARING AN M*(C+2) LIBRARY TAPE; AND M*(C+2), A CODE FOR GENERATING MULTIGROUP CONSTANTS FROM MICROSCOPIC NEUTRON DATA. CALCULATIONAL RESULTS HAVE BEEN COMPARED WITH EXPERIMENT AS WELL AS RESULTS OBTAINED USING OTHER NUCLEAR DATA LIBRARIES. (AUTH).

798 ID-NUMBER ID-NUMBER 798

AUTHOR LIIKALA, R. C. / STINSON, W. P. / WORDEN, J. R.
 TITLE CRITICAL MASSES AND BUCKLINGS OF PLUTONIUM DIOXIDE-URANIUM DIOXIDE-WATER SYSTEMS
 REPORT NUMBER..... TANSO, 07, 216
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 64-11-00
 NSA-NUMBER 19:3531
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM DIOXIDE ELEMENTS IN WATER

ABSTRACT

THE RESULTS OF SUBCRITICAL EXPERIMENTS AND ANALYTICAL CORRELATIONS ARE DESCRIBED FOR PLUTONIUM- DIOXIDE - URANIUM-DIOXIDE RODS MODERATED WITH WATER. THE CORRELATION IS THE FIRST REPORTED WITH THIS TYPE OF FUEL, AND THE RESULTS ARE IMPORTANT AS A CHECK ON THE ANALYTICAL TECHNIQUES USED IN CALCULATING SUCH SYSTEMS. THE RODS, 0.372 +/- 0.004 INCH DIAM AND 48.50 +/- 0.07 INCH LONG, WERE LOADED AT SPACINGS OF 0.55, 0.60, 0.71, 0.80, 0.90, OR 0.93 INCH IN

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

HEXAGONAL LATTICES WHICH WERE COMPLETELY REFLECTED WITH WATER. THE RODS CONTAIN VIBRATIONALLY-COMPACTED 1.50 WT% PLUTONIUM-DIOXIDE IN URANIUM-DIOXIDE AND ARE CLAD WITH 0.027 +/- 0.002 INCH THICK ZIRCALOY-2.

799 ID-NUMBER ID-NUMBER 799

AUTHOR UOTINEN, V. O. / WILLIAMS, L. D.
 TITLE CRITICAL EXPERIMENTS WITH PLUTONIUM DIOXIDE - URANIUM DIOXIDE FUEL RODS
 REPORT NUMBER..... BNWL-0340, 09
 DATE PUBLISHED ... 66-10-15
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM DIOXIDE ELEMENTS IN WATER

ABSTRACT

CRITICAL EXPERIMENTS ARE BEING CONDUCTED IN THE PRCF USING WATER MODERATOR AND 0.5 INCH DIAMETER 2 WT% PLUTONIUM-DIOXIDE - URANIUM-DIOXIDE FUEL RODS. CRITICALITY HAS BEEN ACHIEVED WITH A TWO-ZONE LOADING IN WHICH THE INNER ZONE CONTAINED PLUTONIUM WITH 24 WT% PLUTONIUM-240 AND THE OUTER ZONE CONTAINED PLUTONIUM WITH 16 WT% PLUTONIUM-240. THE INNER ZONE CONTAINED 121 RODS AND THE TOTAL NUMBER OF RODS REQUIRED FOR CRITICALITY WAS 353.4.

801 ID-NUMBER ID-NUMBER 801

AUTHOR IRVING, D. C. / MIHALCZO, J. T.
 TITLE MONTE CARLO CALCULATIONS FOR ENRICHED URANIUM METAL ASSEMBLIES
 REPORT NUMBER..... TANSO, 07, 287-288
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 64-11-00
 NSA-NUMBER 19:3561
 SITE/PROGRAM OAK RIDGE - GEOMETRICALLY COMPLICATED URANIUM METAL PIECES

ABSTRACT

THE CAPABILITY OF THE GENERAL GEOMETRY SUBROUTINE GEOM AS USED IN THE O5R CODE FOR HANDLING COMPLICATED THREE-DIMENSIONAL GEOMETRIES EXACTLY HAS BEEN TESTED IN A SERIES OF CALCULATIONS OF UNMODERATED AND UNREFLECTED CRITICAL ASSEMBLIES OF 93.2% URANIUM-235-ENRICHED URANIUM METAL. THE UPPER SECTION OF EACH ASSEMBLY WAS BUILT ON A 30-INCH DIAMETER STAINLESS-STEEL DIAPHRAGM, AND THE LOWER SECTION WAS SUPPORTED BY A LOW-MASS FRAME THAT COULD BE RAISED REMOTELY.

802 ID-NUMBER ID-NUMBER 802

AUTHOR HILLIG, O. R. / LATHAM, D. W.
 TITLE MATERIAL BUCKLINGS OF URANIUM CARBIDE FUELED GRAPHITE ASSEMBLIES - MEASUREMENTS
 REPORT NUMBER..... TANSO, 07, 295
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 64-11-00
 NSA-NUMBER 19:3566
 SITE/PROGRAM ATOMICS INTERNATIONAL - URANIUM(3%)CARBIDE - GRAPHITE

ABSTRACT

CRITICAL AND SUBCRITICAL EXPERIMENTS, IN SUPPORT OF THE ADVANCED SODIUM GRAPHITE REACTOR (ASGR) PROGRAM, HAVE BEEN PERFORMED TO DETERMINE VALUES OF MATERIAL BUCKLING FOR GRAPHITE ASSEMBLIES FUELED WITH SLIGHTLY-ENRICHED (3.02 WT%), URANIUM CARBIDE-FUEL ELEMENTS. THESE EXPERIMENTS PROVIDE THE FIRST DATA AVAILABLE FOR COMPARISON WITH RESULTS OF CALCULATIONS.

803 ID-NUMBER ID-NUMBER 803

AUTHOR PRICE, G. A. / WINDSOR, H. / TUNNEY, W. J. / HELLSTRAND, E.
 TITLE ORGANIC COOLED, HEAVY WATER MODERATED URANIUM-233 FUELED LATTICE EXPERIMENTS
 REPORT NUMBER..... BNL-50012-(T-434)
 DATE PUBLISHED ... 66-08-25
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - URANIUM-233 - HEAVY WATER (ORGANIC COOLED)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

MEASUREMENTS OF MATERIAL BUCKLING AND THERMAL NEUTRON FLUX DISTRIBUTIONS WERE MADE IN EXPONENTIAL LATTICES CONTAINING THE "KILO-ROD" FUEL PINS. THE PURPOSE OF THESE MEASUREMENTS WAS TO PROVIDE A FEW DEFINITIVE DATA POINTS WHICH CAN BE USED TO VERIFY DESIGN CALCULATIONS FOR LARGE POWER REACTORS UTILIZING URANIUM-233 AND THORIUM FUEL WITH ORGANIC COOLANT AND HEAVY WATER MODERATOR. CONSEQUENTLY, A FEW LATTICES WERE CHOSEN WHICH WERE CONSISTENT WITH THE CONCEPTUAL DESIGN OF SUCH A REACTOR. AFTER CONSULTATION WITH REPRESENTATIVES OF THE BABCOCK AND WILCOX COMPANY, THE "KILO-ROD" FUEL PINS ARE NOT PARTICULARLY WELL SUITED FOR THESE EXPERIMENTS BECAUSE OF THEIR HIGH URANIUM-233 CONTENT AND SHORT ACTIVE FUEL LENGTH. CONSEQUENTLY, STAINLESS STEEL CANISTERS WERE INCORPORATED IN THE DESIGN TO REDUCE THE MATERIAL BUCKLING AND TO ALLOW FULL UTILIZATION OF THE 800 "KILO-ROD" FUEL PINS WHICH WERE AVAILABLE. IN ADDITION, IT WAS DECIDED TO MAKE THE MEASUREMENTS IN A BARE ASSEMBLY, I.E. UNREFLECTED ASSEMBLY, IN ORDER TO MINIMIZE THE EFFECTS OF NEUTRON SPECTRAL TRANSIENTS. (AUTH).

804 ID-NUMBER ID-NUMBER 804

AUTHOR HANSEN, L. E./ CLAYTON, E. D.
 TITLE CRITICALITY OF PLUTONIUM COMPOUNDS IN THE UNDERMODERATED RANGE HYDROGEN - PLUTONIUM LESS THAN 20
 REPORT NUMBER..... NUAPA, 03, 481-487
 JOURNAL NUCLEAR APPLICATIONS AND TECHNOLOGY
 DATE PUBLISHED ... 66-08-00
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS - CALCULATIONS

ABSTRACT

EXPERIMENTAL CRITICALITY DATA DO NOT EXIST FOR MOST PLUTONIUM COMPOUNDS. TO OBTAIN GUIDELINES FOR NUCLEAR CRITICALITY SAFETY USE, A SURVEY UTILIZING TRANSPORT-THEORY CALCULATIONS WAS MADE TO DETERMINE THE CRITICAL MASSES OF BARE AND WATER-REFLECTED SPHERES AS A FUNCTION OF DENSITY AND HYDROGEN/PLUTONIUM RATIO FOR 12 OF THESE COMPOUNDS IN THE UNDERMODERATED RANGE (HYDROGEN/PLUTONIUM LESS THAN OR EQUAL TO 20). THE COMPOUNDS CONSIDERED WERE: PLUTONIUM DIHYDRIDE, PLUTONIUM TRIHYDRIDE, PLUTONIUM NITRIDE, PLUTONIUM CARBIDE, PLUTONIUM TRICARBIDE, PLUTONIUM DIOXIDE, PLUTONIUM TRIOXIDE, PLUTONIUM TRIFLUORIDE, PLUTONIUM TRICHLORIDE, PLUTONIUM TETRANITRATE, PLUTONIUM OXALATE. ALSO DERIVED WERE CORE DENSITY EXPONENTS WHICH PERMIT CRITICAL MASSES TO BE PREDICTED FOR COMPOUNDS WITH DENSITIES RANGING DOWN TO ONE-FIFTH OF THEIR THEORETICAL VALUES. THE VALIDITY OF THE CALCULATIONS WAS EXAMINED BY COMPARING RESULTS WITH THE LIMITED CRITICALITY DATA ON HOMOGENEOUS PLUTONIUM DIOXIDE SYSTEMS IN THE UNDERMODERATED RANGE. COMPARISONS WERE ALSO MADE FOR PLUTONIUM METAL SYSTEMS AND FOR THREE HETEROGENEOUS PLUTONIUM-FUELED ASSEMBLIES. (AUTH).

805 ID-NUMBER ID-NUMBER 805

AUTHOR DUERDEN, P.
 TITLE BUCKLING AND INTEGRAL SPECTRUM MEASUREMENTS IN PLUTONIUM-239/BERYLLIUM OXIDE SUBCRITICAL ASSEMBLIES
 REPORT NUMBER..... AAEC/E177
 DATE PUBLISHED ... 67-06-00
 SITE/PROGRAM AUSTRALIA - URANIUM-233, URANIUM-235, PLUTONIUM-239 - BERYLLIUM OXIDE

ABSTRACT

IN A STUDY OF BERYLLIUM OXIDE MODERATED REACTOR SYSTEMS, BUCKLING AND FISSION RATE MEASUREMENTS HAVE BEEN MADE WITH PLUTONIUM-239 / BERYLLIUM-OXIDE SYSTEMS. SIMILAR WORK ON URANIUM- 235 / BERYLLIUM-OXIDE, URANIUM-235 / BERYLLIUM OXIDE / FERTILE MATERIAL AND URANIUM-233 / BERYLLIUM OXIDE ASSEMBLIES HAS ALREADY BEEN REPORTED.

806 ID-NUMBER ID-NUMBER 806

AUTHOR WOODCOCK, E. R.
 TITLE CRITICAL ASSEMBLIES OF INFINITE SLABS OF HIGHLY ENRICHED URANIUM AND WATER
 REPORT NUMBER..... AHSB-17
 DATE PUBLISHED ... 59-06-00
 NSA-NUMBER 13:22206
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

CRITICALITY FACTORS OF SINGLE AND INTERACTING INFINITE SLABS OF HIGHLY ENRICHED URANIUM SEPARATED AND REFLECTED BY WATER OR BY MIXTURES OF URANIUM AND WATER WERE STUDIED. A NUMBER OF CRITICAL ASSEMBLIES WERE CALCULATED INCLUDING, IN PARTICULAR, THE CHANGES IN CRITICALITY AS THE URANIUM SLABS DISSOLVE INTO THE SURROUNDING WATER. MINIMUM CRITICAL LOADINGS OF URANIUM AS A FUNCTION OF CORE SLAB THICKNESS WERE ESTIMATED FOR SYSTEMS IN WHICH HETEROGENEITIES OCCUR ONLY ACROSS THE PLANE OF THE SLAB. THE EFFECT OF HETEROGENEITIES IN THE PLANE OF THE SLAB IS DISCUSSED AND IT IS CONCLUDED THAT THESE CAN, IN CERTAIN CIRCUMSTANCES, INCREASE THE CRITICALITY OF THE SYSTEM. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

807 ID-NUMBER ID-NUMBER 807

AUTHOR ERNST, B. B.
 TITLE CRITICAL MASSES OF OIL REFLECTED ENRICHED URANIUM METAL ASSEMBLIES WITH POLYURETHANE CENTERS
 REPORT NUMBER.... RFP-1017
 DATE PUBLISHED ... 67-09-06
 SITE/PROGRAM ROCKY FLATS - URANIUM(93%) METAL - SPHERES

ABSTRACT

THE CRITICAL MASSES OF OIL REFLECTED, ENRICHED URANIUM SPHERICAL ASSEMBLIES OF URANIUM INSIDE RADII, 0.0-, 4.017-, 8.010-, AND 12.011 CM WITH A LOW-DENSITY FOAM IN THE CENTRAL CAVITY WERE MEASURED TO BE 24.3-, 31.65-, 52.1-, AND 81.3-KILOGRAMS. CRITICAL MASSES WERE DETERMINED BY RECIPROCAL MULTIPLICATION MEASUREMENTS ON FULLY REFLECTED ASSEMBLIES AND ARE COMPARED WITH CALCULATIONS. (AUTH.).

808 ID-NUMBER ID-NUMBER 808

AUTHOR JOHNSON, E. B./ CRONIN, D. F.
 TITLE CRITICAL DIMENSIONS OF AQUEOUS URANIUM DIOXIDE FLUORIDE SOLUTIONS CONTAINING 4.9 PERCENT URANIUM-235 ENRICHED URANIUM
 REPORT NUMBER.... TANSO, 07. 301-303
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 64-11-00
 NSA-NUMBER 19:3014
 SITE/PROGRAM OAK RIDGE - URANYL(4.9%)FLUORIDE - WATER

ABSTRACT

THE CRITICAL DIMENSIONS OF AQUEOUS SOLUTIONS OF URANIUM-235 HAVE BEEN MEASURED AS A PART OF THE OAK RIDGE NATIONAL LABORATORY PROGRAM OF CRITICAL EXPERIMENTS PROVIDING DATA USEFUL IN AUTHENTICATING NUCLEAR REACTOR CALCULATIONS AND IN ESTABLISHING SPECIFICATIONS FOR CHEMICAL PROCESSES AND FOR TRANSPORT AND STORAGE OF FISSILE MATERIALS.

809 ID-NUMBER ID-NUMBER 809

AUTHOR LIKALA, R. C. / WORDEN, J. R. / REARDON, W. A.
 TITLE AN ANALYSIS OF URANIUM FUELED LIGHT WATER MODERATED CRITICAL EXPERIMENTS
 REPORT NUMBER.... HW-81659, 26-32
 DATE PUBLISHED ... 64-04-15
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER - CALCULATIONS ; WESTINGHOUSE, ATOMIC POWER DIVISION - YANKEE REACTOR - URANIUM DIOXIDE - WATER - CALCULATIONS

ABSTRACT

A DETAILED ANALYSIS OF FIVE URANYL NITRATE CRITICAL SOLUTION EXPERIMENTS AND SIX 2.70 WT% ENRICHED URANIUM DIOXIDE CRITICAL EXPERIMENTS HAS BEEN MADE. THE CRITICAL SOLUTION EXPERIMENTS WERE ANALYZED TO DETERMINE THE RELIABILITY OF THE URANIUM CROSS SECTION DATA UTILIZED, THEREBY ELIMINATING ONE OF THE POTENTIAL UNCERTAINTIES IN THE ANALYSIS OF THE HETEROGENEOUS EXPERIMENTS.

810 ID-NUMBER ID-NUMBER 810

AUTHOR CLAYTON, E. D./ LLOYD, R. C.
 TITLE ENRICHED URANIUM - GRAPHITE LATTICES
 REPORT NUMBER.... HW-43441, 33-36
 DATE PUBLISHED ... 56-05-31
 SITE/PROGRAM HANFORD - URANIUM(1%) - GRAPHITE LATTICES

ABSTRACT

IN ORDER TO OBTAIN INFORMATION ON POSSIBLE LATTICE DESIGNS USING ENRICHED URANIUM AND FOR CHECKING LATTICE THEORY, A SERIES OF EXPONENTIAL EXPERIMENTS INVOLVING THE USE OF ENRICHED URANIUM (1.007% BY WEIGHT URANIUM-235) IN GRAPHITE LATTICES HAS BEEN UNDERTAKEN. THESE MEASUREMENTS ARE BEING MADE IN SMALL EXPONENTIAL PILES, THE LATTICE SECTION BEING ABOUT FOUR FEET ON A SIDE AND SIX FEET IN HEIGHT.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

811 ID-NUMBER ID-NUMBER 811

AUTHOR LLOYD, R. C.
 TITLE ENRICHED URANIUM, GRAPHITE LATTICES
 REPORT NUMBER..... HW-47012
 DATE PUBLISHED ... 56-11-05
 NSA-NUMBER 11:5493
 SITE/PROGRAM HANFORD - URANIUM(1%) - GRAPHITE LATTICES

ABSTRACT

THE THERMAL TEST REACTOR WAS PUT IN OPERATION AND THE INITIAL CALIBRATIONS ARE DESCRIBED. MEASUREMENTS OF BUCKLINGS OF ENRICHED URANIUM-GRAPHITE LATTICES ARE REPORTED. RESULTS ARE ALSO GIVEN FOR LIGHT WATER-ENRICHED URANIUM LATTICES. A HIGH TEMPERATURE EXPONENTIAL EXPERIMENT IS DESCRIBED. CALCULATED CURVES FOR THE BUCKLINGS OF SOME SPECIAL GRAPHITE LATTICES ARE GIVEN.

812 ID-NUMBER ID-NUMBER 812

AUTHOR BLOCK, E. Z.
 TITLE ENRICHED URANIUM - WATER LATTICES
 REPORT NUMBER..... HW-48893
 DATE PUBLISHED ... 57-03-06
 SITE/PROGRAM HANFORD - ENRICHED URANIUM - WATER LATTICES

ABSTRACT

A SERIES OF BUCKLING MEASUREMENTS HAVE BEEN PERFORMED IN THE WATER-MODERATED LATTICES IN WHICH GRANULAR BISMUTH OCCUPIED THE CENTRAL VOID VOLUME OF ENRICHED, CORED, FUEL ELEMENTS. THESE EXPERIMENTS WERE CARRIED OUT TO INVESTIGATE THE EFFECTS OF NEUTRON STREAMING IN THE ASSEMBLIES PREVIOUSLY MEASURED WITH AIR IN THE CORE.

814 ID-NUMBER ID-NUMBER 814

AUTHOR LLOYD, R. C.
 TITLE NUCLEAR SAFETY SPECIFICATIONS FOR ENRICHED URANIUM IN THE 1.25-2 PERCENT RANGE
 REPORT NUMBER..... HW-55879, 09-11
 DATE PUBLISHED ... 58-04-29
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

BUCKLING MEASUREMENTS WERE MADE WITH 1.6 PER CENT ENRICHED URANIUM AND WATER MODERATED SYSTEMS TO DETERMINE CRITICAL MASSES FOR NUCLEAR SAFETY SPECIFICATIONS. THE FUEL ELEMENTS WERE 1.39 INCHES IN O.D. WITH 0.464 INCH I.D.; THEY WERE PLACED IN 35 ALUMINUM TUBING WHICH WAS 1.5 INCHES IN O.D. WITH A 0.049-INCH WALL THICKNESS; FIVE EIGHT-INCH FUEL ELEMENTS WERE PLACED IN EACH TUBE. THE LOADINGS OF THESE FUEL RODS INTO HEXAGONAL LATTICE FRAMEWORKS WERE MADE BY CRITICAL APPROACH TECHNIQUES. THE NEUTRON FLUX WAS MEASURED WITH FOUR BF3 COUNTERS PLACED AT VARIOUS POSITIONS IN THE ASSEMBLY.

815 ID-NUMBER ID-NUMBER 815

AUTHOR WORDEN, J. R. / LIIKALA, R. C. / REARDON, W. A.
 TITLE AN ANALYSIS OF PLUTONIUM LIGHT WATER CRITICAL EXPERIMENTS
 REPORT NUMBER..... HW-81659, 33-44
 DATE PUBLISHED ... 64-04-15
 SITE/PROGRAM HANFORD - PLUTONIUM RODS IN WATER - CALCULATIONS

ABSTRACT

A DETAILED ANALYSIS OF THREE SETS OF CRITICAL EXPERIMENTS, THE 1.8 WT% LX, THE 2 WT% HX, AND THE 5 WT% LX, HAS BEEN MADE. THESE EXPERIMENTS ALL INVOLVED CRITICAL APPROACHES USING PLUTONIUM- ALUMINUM RODS IN LIGHT WATER AT VARIOUS LATTICE SPACINGS.

THREE AREAS OF POTENTIAL DIFFICULTY IN THE ANALYSIS OF PLUTONIUM SYSTEMS WERE STUDIED: (1) THE BASIC CROSS SECTION DATA, (2) CALCULATION OF THE SPACE-ENERGY DISTRIBUTION OF THERMALIZED NEUTRONS IN A LATTICE CELL, AND (3) METHODS OF CALCULATING THE NEUTRON ABSORPTION RATE IN THE 1.056 EV RESONANCE OF PLUTONIUM-240.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

816 ID-NUMBER ID-NUMBER 816

AUTHOR RICHEY, C. R. / WHITE, J. D. / LLOYD, R. C. / CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS WITH PLUTONIUM DIOXIDE-POLYSTYRENE COMPACTS
 REPORT NUMBER..... HW-81659, 45-48
 DATE PUBLISHED ... 64-04-15
 NSA-NUMBER 18:36778
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

THE PRESENT SERIES OF CRITICAL EXPERIMENTS WITH PLUTONIUM-DIOXIDE - POLYSTYRENE COMPACTS AT A HYDROGEN-TO-PLUTONIUM ATOMIC RATIO OF 15 HAS BEEN COMPLETED. THESE DATA ARE APPLICABLE TO THE CRITICALITY OF WET POWDERS, PRECIPITATES, SLURRIES, POLYMERS, ETC. THAT ARE ENCOUNTERED IN THE HANDLING AND PROCESSING OF PLUTONIUM. THE PLUTONIUM CONCENTRATION OF THE FUEL COMPACTS IN THIS FIRST SERIES OF EXPERIMENTS WAS 1.2 GRAMS/CC (2.2% PLUTONIUM-240) AND THE DENSITY OF THE POLYSTYRENE WAS 0.913 GRAMS/CC.

817 ID-NUMBER ID-NUMBER 817

AUTHOR ENDRES, G. W. R./ WOOD, D. E.
 TITLE MATERIAL BUCKLINGS OF GRAPHITE-URANIUM LATTICES
 REPORT NUMBER..... HW-60220, 27-32
 DATE PUBLISHED ... 59-04-20
 SITE/PROGRAM HANFORD - URANIUM(1%) - GRAPHITE LATTICES

ABSTRACT

MATERIAL BUCKLING MEASUREMENTS FOR SEVERAL DIFFERENT LATTICES WITH 1.92-INCH AND 2.5-INCH DIAMETER NATURAL URANIUM FUEL ELEMENTS HAVE BEEN COMPLETED. THE MEASUREMENTS WERE MADE IN EXPONENTIAL PILES HAVING DIMENSIONS OF 4 FEET X 4 FEET OR 4 FEET X 5 FEET IN CROSS SECTION. BUCKLINGS WERE DETERMINED USING BOTH AIR AND WATER COOLANTS.

818 ID-NUMBER ID-NUMBER 818

AUTHOR PRICE, G. A.
 TITLE URANIUM-WATER LATTICE COMPILATION PART 1. BNL EXPONENTIAL ASSEMBLIES
 REPORT NUMBER..... BNL-50035-(T-449)
 DATE PUBLISHED ... 66-12-30
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - SLIGHTLY ENRICHED URANIUM - WATER LATTICES

ABSTRACT

A COPY OF THIS REPORT IS NOT YET AVAILABLE IN THE SYSTEM

819 ID-NUMBER ID-NUMBER 819

AUTHOR RAFFETY, S. J.
 TITLE HOMOGENEOUS CRITICAL ASSEMBLIES OF LOW ENRICHMENT URANIUM TETRAFLUORIDE IN PARAFFIN
 REPORT NUMBER..... ORNL-4143, 28-29
 DATE PUBLISHED ... 67-08-00
 SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN

ABSTRACT

THE PROGRAM OF CRITICAL EXPERIMENTS WITH HOMOGENEOUS HYDROGEN-MODERATED ASSEMBLIES OF LOW- ENRICHMENT URANIUM-TETRAFLUORIDE IN PARAFFIN REPORTED PREVIOUSLY HAS BEEN EXTENDED TO INCLUDE A MIXTURE OF 2% URANIUM-235-ENRICHED URANIUM-TETRAFLUORIDE AND PARAFFIN WITH A HYDROGEN TO URANIUM- 235 ATOMIC RATIO OF 614 AND A MIXTURE OF 3% URANIUM-235-ENRICHED URANIUM-TETRAFLUORIDE AND PARAFFIN WITH A HYDROGEN TO URANIUM-235 ATOMIC RATIO OF 277.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

820 ID-NUMBER ID-NUMBER 820

AUTHOR DEBRUE, J. / MEWISSEN, L. / MOTTE, F. / BASSELIER, J. / DELRUE, R. /
FOSSOUL, E. / HAUBERT, N. / LAMOTTE, H. / STIEVENART, M. / VAN DEYCK, D.
TITLE RESULTS OF SUBCRITICAL EXPERIMENTS CARRIED OUT ON 5 PERCENT ENRICHED
WATER/URANIUM DIOXIDE LATTICES
REPORT NUMBER..... EURAEC-1882
DATE PUBLISHED ... 67-00-00
NSA-NUMBER 22:35593
SITE/PROGRAM FRANCE - URANIUM(5%)DIOXIDE - WATER LATTICE

ABSTRACT

THE RESULTS OF ALL THE DIFFERENT TYPES OF MEASUREMENTS CARRIED OUT ON SUBCRITICAL ASSEMBLIES USING URANIUM DIOXIDE WITH A 5% URANIUM-235 ENRICHMENT IN THE THETIS REACTOR AT THE CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE (CEN) AT MOL ARE PRESENTED. THE LATTICES STUDIED WERE OF THE SQUARE PITCH TYPE AND THE WATER/URANIUM DIOXIDE RATIO HAD SUCCESSIVELY THE FIVE FOLLOWING VALUES: 1.51, 2.63, 4.13, 6.33 AND 9.35. THE MAXIMUM NUMBER OF FUEL ELEMENTS AVAILABLE WAS 500, THESE HAVING A USEFUL LENGTH OF 376.5 MM AND A USEFUL DIAMETER OF 7.6 MM. THE CLADDING IS STEEL (304) WITH A THICKNESS OF 0.2 MM.

821 ID-NUMBER ID-NUMBER 821

AUTHOR BOYNTON, A. R. / PLUMLEE, K. E. / REDMAN, W. C. / ROBINSON, W. R. /
STANFORD, G. S.
TITLE HIGH CONVERSION (HI-C) CRITICAL EXPERIMENT
REPORT NUMBER..... ANL-7110, 082-084
DATE PUBLISHED ... 65-12-00
NSA-NUMBER 21:30091
SITE/PROGRAM ARGONNE NATIONAL LABORATORY - HIGH CONVERSION CRITICAL EXPERIMENT

ABSTRACT

THE HIGH CONVERSION CRITICAL EXPERIMENT PROGRAM (HI-C) WAS UNDERTAKEN TO EXTEND THE RANGE OF INVESTIGATIONS WITH LIGHT WATER-MODERATED, SLIGHTLY ENRICHED, URANIUM OXIDE CORES INTO THE VERY UNDERMODERATED REGION OF SMALL HYDROGEN/URANIUM-238 ATOM RATIOS. THE RESULTS OF CRITICAL AND MICRO- PARAMETER MEASUREMENTS IN ASSEMBLIES HAVING HYDROGEN/URANIUM-238 ATOM RATIOS FROM 5 DOWN TO 1 HAVE BEEN REPORTED.

822 ID-NUMBER ID-NUMBER 822

AUTHOR PHELPS, J.
TITLE MINIMUM REFLECTION CRITICAL FACILITY
REPORT NUMBER..... BNL-50023-(S-69)
DATE PUBLISHED ... 66-12-31
SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - URANIUM(93%) - GRAPHITE

ABSTRACT

THIS FACILITY HAS BEEN USED FOR A SERIES OF EXPERIMENTS WITH A SEMIHOMOGENEOUS DISTRIBUTION OF URANIUM-235 IN A GRAPHITE MODERATOR MATRIX. THE ASSEMBLIES STUDIED HAVE BEEN LARGE RECTANGULAR ARRAYS, MOUNTED ON A V-FRAME STRUCTURE ON A PLATFORM ABOUT 20 FEET ABOVE GROUND LEVEL.

THE EXPERIMENTS HAVE BEEN DESIGNED TO BE AS NEAR AS POSSIBLE TO IDEAL HOMOGENEOUS STRUCTURES OF THE SIMPLEST KIND TO FACILITATE THEIR USE IN TESTS OF CALCULATIONAL METHODS AND CROSS SECTIONS. THUS THE FUEL HAS BEEN RELATIVELY THIN URANIUM-ALUMINUM ALLOY, WITH LOW NEUTRON SELF-ABSORPTION, SANDWICHED BETWEEN GRAPHITE LAYERS. MEASUREMENTS HAVE INCLUDED A WIDE VARIETY OF PARAMETERS OF INTEREST IN THE TESTING OF THEORY: CRITICAL SIZE, BUCKLING (BY FLUX TRAVERSES), THE MODERATOR-TO- FUEL NEUTRON DISADVANTAGE FACTOR, THE PROMPT NEUTRON GENERATION TIME, THE TEMPERATURE COEFFICIENT, SPECTRAL INDICES, ETC.

THE MEASUREMENTS HAVE BEEN MADE ON SIX ASSEMBLIES WITH A RANGE OF ABOUT 23,000 TO 950 IN ATOM RATIOS OF CARBON TO URANIUM-235. DURING THE PAST YEAR, THE FINAL MEASUREMENTS IN THIS PROGRAM HAVE BEEN COMPLETED. THESE WERE MADE ON THE MOST HEAVILY FUELED ASSEMBLY OF THE SET. THE CRITICAL DIMENSIONS WERE FOUND TO BE 38.7 X 40.0 X 72.0 INCH, AND THE CRITICAL MASS WAS 63 KG URANIUM-235. THE EXACT CARBON/URANIUM-235 ATOM RATIO WAS 958.

THE BUCKLING WAS DEDUCED FROM MEASUREMENTS OF BOTH THE THERMAL AND EPITHERMAL FLUX DISTRIBUTIONS, AND WAS FOUND TO BE $(20.82 \pm 0.14) \times 10^{-4} \text{ CM}^{-2}$. THIS NUMBER MUST STILL BE CORRECTED SLIGHTLY FOR THE EFFECTS OF RESIDUAL RETURN OF LEAKAGE NEUTRONS AND OF PERTURBATION BY THE CONTROL ROD GUIDES. THE FORMER CORRECTION HAS BEEN MEASURED; THE LATER HAS BEEN MEASURED WITH ALL ASSEMBLIES BUT THE LAST ONE OF THE SET.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

826 ID-NUMBER ID-NUMBER 826

AUTHOR UOTINEN, V. O. / WILLIAMS, L. D.
 TITLE CRITICAL EXPERIMENTS IN PLUTONIUM DIOXIDE-URANIUM DIOXIDE-WATER LATTICES
 REPORT NUMBER..... BNWL-0400
 DATE PUBLISHED ... 67-04-15
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM DIOXIDE ELEMENTS IN WATER

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS HAS BEEN PERFORMED IN THE PLUTONIUM RECYCLE CRITICAL FACILITY (PRCF) USING HALF-INCH DIAMETER URANIUM-DIOXIDE-2 WT% PLUTONIUM-DIOXIDE FUEL RODS MODERATED WITH WATER. THE FUEL RODS ARE 36 INCHES LONG, 0.508 INCHES IN DIAMETER, COVERED WITH A ZIRCALOY-2 SLEEVE 0.030 INCHES THICK, AND EACH ROD CONTAINS AN AVERAGE OF 1128 GRAMS OF URANIUM-DIOXIDE-PLUTONIUM DIOXIDE MIXTURE. THE RODS WERE LOADED IN A HEXAGONAL LATTICE WITH A PITCH OF 0.85 INCHES WHICH CORRESPONDS TO A MODERATOR-TO-OXIDE VOLUME RATIO OF 1.83.

827 ID-NUMBER ID-NUMBER 827

AUTHOR LLOYD, R. C. / SKEEN, D. R. / CLAYTON, E. D.
 TITLE CRITICALITY OF PLUTONIUM NITRATE SOLUTIONS IN SPHERICAL GEOMETRY
 REPORT NUMBER..... HW-83187, 10-20
 DATE PUBLISHED ... 64-07-15
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

CRITICAL MASS STUDIES WERE PERFORMED WITH PLUTONIUM NITRATE SOLUTIONS IN SPHERICAL GEOMETRY. THE RESULTS OF PREVIOUS SOLUTION EXPERIMENTS ARE GIVEN IN EARLIER QUARTERLY REPORTS. CRITICAL ASSEMBLY VESSELS WITH DIAMETERS OF 11.5 AND 15.2 INCHES WERE USED IN THE CURRENT EXPERIMENTS. THE 11.5 INCH VESSEL WAS REFLECTED WITH WATER AND WITH CONCRETE, WHEREAS THE 15.2 INCH VESSEL WAS UNREFLECTED.

IN ADDITION TO THE CRITICAL MASS DETERMINATION, GOLD FOIL IRRADIATIONS WERE PERFORMED TO DETERMINE THE EFFECTIVE EXTRAPOLATION LENGTHS AND CRITICAL BUCKLINGS FOR THE RESPECTIVE SYSTEMS. (AUTH).

828 ID-NUMBER ID-NUMBER 828

AUTHOR MIHALCZO, J. T.
 TITLE GEOMETRICALLY COMPLICATED CRITICAL ASSEMBLIES OF 93.2 PERCENT ENRICHED URANIUM METAL
 REPORT NUMBER..... ORNL-3714, 33
 DATE PUBLISHED ... 64-12-00
 NSA-NUMBER 19:16814
 SITE/PROGRAM OAK RIDGE - GEOMETRICALLY COMPLICATED URANIUM METAL PIECES

ABSTRACT

THE CAPABILITY OF THE O5R CODE FOR HANDLING COMPLICATED GEOMETRIES EXACTLY HAS BEEN TESTED IN A SERIES OF CALCULATIONS OF UNMODERATED AND UNREFLECTED CRITICAL ASSEMBLIES OF 93.2 WT% URANIUM-235 -ENRICHED URANIUM METAL

829 ID-NUMBER ID-NUMBER 829

AUTHOR SEHGAL, B. R.
 TITLE ANALYSIS OF SOME URANIUM-235-GRAPHITE CRITICAL EXPERIMENTS
 REPORT NUMBER..... TANSO, 10, 535-536
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 67-11-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - URANIUM(93%) - GRAPHITE - CALCULATIONS

ABSTRACT

A SERIES OF GRAPHITE-MODERATED CRITICAL EXPERIMENTS WITH 93 PERCENT ENRICHED URANIUM-ALUMINUM FUEL PLATES HAS BEEN COMPLETED AT BROOKHAVEN. IN FOUR OF THESE EXPERIMENTS THE FUEL WAS 0.015-INCH THICK AND THE CARBON/URANIUM-235 ATOM RATIOS VARIED FROM 5700 TO 23000. THESE CORES WERE BARE, OF SIMPLE GEOMETRY, NEARLY HOMOGENEOUS, AND PRIMARILY THERMAL. CRITICAL BUCKLINGS AND SPECTRAL INDEXES WERE MEASURED AMONG OTHER PARAMETERS. A THEORETICAL ANALYSIS OF THESE MEASUREMENTS IS ATTEMPTED IN THIS NOTE. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

830 ID-NUMBER ID-NUMBER 830

AUTHOR LEAMER, R. D. / ORR, W. L. / STOVER, R. L. / TAYLOR, E. G. / TOBIN, J. P.
/ VUKMIR, A.

TITLE PLUTONIUM DIOXIDE-URANIUM DIOXIDE FUELED CRITICAL EXPERIMENTS

REPORT NUMBER..... WCAP-3726-1

DATE PUBLISHED ... 67-07-00

NSA-NUMBER 21:38672

SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - SAXTON REACTOR - URANIUM AND
PLUTONIUM OXIDES WITH WATER

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS USING MIXED-OXIDE PLUTONIUM FUELS WAS CARRIED OUT AT THE WESTINGHOUSE REACTOR EVALUATION CENTER (WREC). TWO PLUTONIUM FUELS WITH A VARIATION IN THE PLUTONIUM-240 ISOTOPIC CONTENT AND ONE LOW ENRICHMENT URANIUM FUEL WERE USED IN AN EXPERIMENTAL PROGRAM WHICH INCLUDED BUCKLING, REACTIVITY, AND POWER DISTRIBUTION MEASUREMENTS.

BUCKLING MEASUREMENTS WERE MADE IN FIVE CLEAN LATTICES WITH THE 8% PLUTONIUM-240 FUEL AND TWO CLEAN LATTICES WITH THE 24% PLUTONIUM-240 FUEL. WITH THE 8% PLUTONIUM-240 FUEL, BUCKLING MEASUREMENTS WERE MADE IN TWO LATTICES AT TWO DIFFERENT BORON CONCENTRATIONS. THE REACTIVITY WORTHES OF VOIDS, WATER HOLES, AND CONTROL RODS IN DIFFERENT TEST ARRAYS WERE DETERMINED IN SINGLE AND MULTI-REGION CORES. WATER HOLE AND WATER SLOT POWER PEAKING EFFECTS WERE MEASURED IN CLEAN AND BORATED CORES. POWER DISTRIBUTION MEASUREMENTS WERE MADE IN CORES CONTAINING CONCENTRIC REGIONS OF THE DIFFERENT FUELS, MULTI-REGION SLAB CORES, AND IN CORES CONTAINING INTERSPERSED FUELS.(AUTH).

831 ID-NUMBER ID-NUMBER 831

AUTHOR VOLPE, J. J./ HARDY, J./ KLEIN, D.

TITLE A COMPARISON OF THERMAL NEUTRON ACTIVATION MEASUREMENTS AND MONTE CARLO
CALCULATIONS IN LIGHT-WATER-MODERATED URANIUM CELLS

REPORT NUMBER..... WAPD-TM-0932

DATE PUBLISHED ... 70-03-00

SITE/PROGRAM WESTINGHOUSE, BETTIS ATOMIC POWER LABORATORY - URANIUM(93%) RODS, URANIUM(.
75%) SLAB IN WATER

ABSTRACT

THERMAL DISADVANTAGE FACTORS AND SPECTRAL INDICES HAVE BEEN MEASURED IN A VARIETY OF LATTICES. ONE SERIES CONTAINED SLIGHTLY ENRICHED URANIUM RODS IN HEXAGONAL GEOMETRY; ANOTHER USED NATURAL URANIUM FUEL IN SLAB GEOMETRY. BOTH TYPES EMPLOYED WATER AS THE MODERATOR. THE DETECTORS USED WERE DYSPROSIUM-164, LUTETIUM-176, AND PLUTONIUM-239. FULL ENERGY RANGE (0 TO 10 MEV) MONTE CARLO CALCULATIONS WITH EXPLICIT CELL GEOMETRY REPRESENTATIONS WERE PERFORMED USING THE RECAP PROGRAM. IN ADDITION, THERMAL ENERGY RANGE (0 TO 0.625 EV) CALCULATIONS WERE OBTAINED WITH THE MONTE CARLO PROGRAM MARC AS WELL AS WITH THE INTEGRAL TRANSPORT THEORY CODE THERMOS. THE PURPOSE OF THESE INVESTIGATIONS WAS TO TEST THE ADEQUACY OF THE VARIOUS WATER SCATTERING KERNEL MODELS--NELKIN, KOPPEL, AND HAYWOOD--FOR A BROAD RANGE OF THERMAL FLUX CHARACTERISTICS: FROM A SOFT MODERATOR SPECTRUM WITH A STEEP SPATIAL GRADIENT TO A VERY HARD SPECTRUM WHICH WAS RELATIVELY FLAT AS A FUNCTION OF POSITION.

THE CONCLUSIONS OBTAINED WERE AS FOLLOWS: CALCULATED SPECTRAL INDICES USING THE HAYWOOD KERNEL WERE 2 TO 3 PERCENT HIGHER THAN EXPERIMENT, ON THE AVERAGE, IN THE FUEL REGION OF THESE CELLS. USE OF THE KOPPEL KERNEL REMOVED MOST OF THIS DISAGREEMENT IN THE CASE OF LUTETIUM-176, BUT THE COMPARISON FOR PLUTONIUM-239 REMAINED UNCHANGED. ON THE BASIS OF THESE RESULTS, THE THERMAL FLUX SPECTRUM OBTAINED WITH THE HAYWOOD MODEL APPEARS TO BE SLIGHTLY TOO HARD. WITH REGARD TO THE DISADVANTAGE FACTORS, GOOD AGREEMENT WAS GENERALLY OBTAINED BETWEEN THEORY AND MEASUREMENT EXCEPT FOR THE TIGHTEST LATTICES. THE CALCULATED DISADVANTAGE FACTORS WERE FOUND TO BE INSENSITIVE TO THE KERNEL MODEL SELECTED. THE EFFECTS FROM THE SELECTION OF CROSS-SECTION DATA USED IN THE CALCULATIONS WERE STUDIED BY SWITCHING TO CURRENT ENDF/B VALUES. THE LUTETIUM-176 AND PLUTONIUM-239 ACTIVATION SHAPES DIFFER BY SEVERAL PERCENT FROM THOSE USED IN THIS REPORT. THE RESULT WAS LESS THAN 1.5-PERCENT CHANGE IN ANY THEORETICAL VALUE AND A FURTHER WIDENING OF THE DISADVANTAGE FACTOR DISAGREEMENT IN THE TIGHTEST LATTICE. THE EFFECTS FROM INCLUDING THERMAL SCATTERING PATTERN TREATMENTS ABOVE P-1, AS WELL AS A SPATIALLY DEPENDENT AND ANISOTROPIC SOURCE-TO-THERMAL DESCRIPTION, WERE FOUND TO BE SMALL (LESS THAN 2 PERCENT) IN THESE CELLS.

THE GENERAL CONCLUSION IS THAT CURRENT BOUND PROTON SCATTERING KERNELS WERE FOUND TO PROVIDE AN ADEQUATE DESCRIPTION OF THE THERMAL FLUX CHARACTERISTICS IN A WIDE VARIETY OF LATTICES. THE ONLY EXCEPTIONS OCCURRED IN THE TIGHTEST LATTICES, WHERE CALCULATED DISADVANTAGE FACTORS WERE AS MUCH AS 6 PERCENT HIGHER THAN EXPERIMENT. IT IS NOT BELIEVED THAT EXPERIMENTAL FOIL EFFECTS ARE THE SOURCE OF DIFFICULTY, SINCE THE RESULTS OF EXTENSIVE PERTURBATION STUDIES HAVE BEEN INCLUDED IN THE MEASURED VALUES. THE TIGHT LATTICE DISADVANTAGE FACTOR DISCREPANCIES, THEREFORE, ARE UNRESOLVED AT THE PRESENT TIME. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

832 ID-NUMBER ID-NUMBER 832

AUTHOR MIHALCZO, J. T.
 TITLE CRITICAL EXPERIMENTS AND CALCULATIONS WITH REFLECTED ANNULAR CYLINDERS OF URANIUM(93.2) METAL
 REPORT NUMBER..... ORNL-3714, 36
 DATE PUBLISHED ... 64-12-00
 NSA-NUMBER 19:16819
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

WORK WITH ANNULAR CYLINDERS OF URANIUM METAL ENRICHED TO 93.2% HAS BEEN EXTENDED TO INCLUDE STUDIES OF THE EFFECT OF GRAPHITE AND POLYETHYLENE REFLECTORS. IN SOME CASES THE CENTRAL CAVITY WAS FILLED WITH REFLECTOR MATERIAL.

833 ID-NUMBER ID-NUMBER 833

AUTHOR RUSCH, G. K. / BOHME, R. / DATES, L. R. / GRIFONI, S. / KATO, W. Y. / MAIN, G. W. / MEISTER, H. / NOZAWA, M. / STOVER, R. L.
 TITLE INVESTIGATIONS OF A 600 LITRE URANIUM CARBIDE CORE (ZPR-6 ASSEMBLY NO. 2)
 REPORT NUMBER..... ANL-7010, 091-110
 DATE PUBLISHED ... 65-01-00
 NSA-NUMBER 19:31459
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6

ABSTRACT

ZPR-6 ASSEMBLY NO. 2 WAS A NOMINAL 600-LITER URANIUM CARBIDE CORE USED PRIMARILY FOR SODIUM VERSUS VOID-REACTIVITY WORTH STUDIES. THE CORE WAS REFLECTED BOTH AXIALLY AND RADially WITH A 30-CM THICK BLANKET OF DEPLETED URANIUM. THE HEIGHT OF THE BARE CORE, NEGLECTING THE 1.6-MM STAINLESS STEEL GAP AT THE INTERFACE OF THE HALVES DUE TO THE DRAWER ENDS, WAS 91.4 CM. THIS CONFIGURATION CONTAINED 550.5 KG OF URANIUM-235 AND HAD AN EXCESS REACTIVITY OF 0.205%

834 ID-NUMBER ID-NUMBER 834

AUTHOR PONOMAREV-STEPNOI, N. N. / LOWAKIN, S. S.
 TITLE STUDY OF A CRITICAL ASSEMBLY CONTAINING A BERYLLIUM MODERATOR
 REPORT NUMBER..... JAABA, 19, 291-298
 JOURNAL JOURNAL OF NUCLEAR ENERGY
 DATE PUBLISHED ... 65-04-00
 SITE/PROGRAM USSR - URANIUM(10%) - BERYLLIUM

ABSTRACT

EXPERIMENTS CARRIED OUT ON URANIUM-BERYLLIUM CRITICAL ASSEMBLIES ARE DESCRIBED IN WHICH WERE DETERMINED THE SQUARE OF THE SLOWING DOWN LENGTH, UP TO THE ENERGY AT WHICH THE SLOWING DOWN SPECTRUM CHANGES OVER TO A THERMAL NEUTRON SPECTRUM, AND ALSO THE MULTIPLICATION FOR FAST NEUTRONS FROM FISSION AND FROM THE REACTION $Be(n,2n)$. ALLOWANCE BEING MADE FOR ABSORPTION DURING THE SLOWING DOWN PROCESS. MULTIGROUP CRITICAL ASSEMBLY CALCULATIONS WERE MADE USING THE VALUES OF THE PARAMETERS MEASURED AND GOOD AGREEMENT WAS OBTAINED BETWEEN THE CALCULATED AND EXPERIMENTAL DATA.

836 ID-NUMBER ID-NUMBER 836

AUTHOR MC CRELESS, T. G. / SMITH, D. R. / JARVIS, G. A. / DUFFEY, D.
 TITLE NEUTRONIC ISOLATION CHARACTERISTICS OF CONCRETE, LEAD, WOOD POLYETHYLENE AND BERYLLIUM
 REPORT NUMBER..... TANSO, 08, 441
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 65-11-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) SLABS - ISOLATION VALUES OF VARIOUS MATERIALS

ABSTRACT

CRITICAL-APPROACH EXPERIMENTS HAVE BEEN CONDUCTED TO DETERMINE THE ISOLATING EFFECTIVENESS OF CONCRETE, LEAD, WOOD, POLYETHYLENE AND BERYLLIUM. THE LOS ALAMOS COMET ASSEMBLY MACHINE WAS USED TO DETERMINE THE CHANGE IN CRITICAL THICKNESS OF A REFERENCE SLAB OF ENRICHED (93.2 WT% URANIUM-235) URANIUM WITH AND WITHOUT AN ADDITIONAL ENRICHED-URANIUM

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SLAB BEYOND AN ISOLATOR 8-INCH THICK. THIS CHANGE IN CRITICAL THICKNESS IS A MEASURE OF THE NEUTRON INTERACTION BETWEEN THE URANIUM UNITS. THE LESSER THE EFFECTIVE NEUTRON INTERACTION, THE BETTER THE ISOLATOR.

837 ID-NUMBER ID-NUMBER 837

AUTHOR WHITE, J. D./ RICHEY, C. R.

TITLE NEUTRON INTERACTION BETWEEN MULTIPLYING MEDIA SEPARATED BY VARIOUS MATERIALS

REPORT NUMBER.... TANSO, 08, 441-442

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 65-11-00

SITE/PROGRAM HANFORD - PLUTONIUM - ISOLATION WORTHS OF VARIOUS MATERIALS ; HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

THE QUANTITY OF MATERIAL NECESSARY TO EFFECTIVELY ISOLATE MULTIPLYING MEDIA IS A PRIMARY CONCERN TO THE SAFE AND EFFICIENT DESIGN OF SHIPPING CONTAINERS AND THE STORAGE REGULATIONS FOR FISSIONABLE ISOTOPES. IN A SERIES OF CRITICAL EXPERIMENTS CONDUCTED AT THE BATTELLE-NORTHWEST CRITICAL MASS LABORATORY, THE EFFECTIVE ISOLATION THICKNESS WAS DETERMINED FOR SEVERAL MATERIALS. THOSE MATERIALS TESTED WERE INSERTED AT THE INTERFACE OF TWO MULTIPLYING MEDIA THAT COMPRISED THE FUEL CORE OF A CRITICAL ASSEMBLY. THE CRITICAL LENGTH OF THE FUEL CORE WAS THEN DETERMINED AS A FUNCTION OF TEST-MATERIAL THICKNESS, I.E. THE EFFECTIVE ISOLATION THICKNESS BEING DEFINED AS THAT THICKNESS FOR WHICH THE CRITICAL CORE LENGTH APPROACHES AN ASYMPTOTIC VALUE. FIGURE 1 SHOWS THE RESULTING CURVES FOR POLYETHYLENE, BORATED POLYETHYLENE (10 WEIGHT PERCENT BORON), AND COMPRESSED WOOD $\rho = 1.341$ GRAMS/CM³. (AUTH).

838 ID-NUMBER ID-NUMBER 838

AUTHOR MIHALCZO, J. T.

TITLE CRITICAL URANIUM METAL ANNULI REFLECTED WITH POLYTHENE AND GRAPHITE

REPORT NUMBER.... TANSO, 08, 442-443

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 65-11-00

SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

THE PREVIOUSLY REPORTED WORK WITH ANNULAR CYLINDERS OF URANIUM METAL ($\rho = 18.76$ G/CM³) ENRICHED TO 93.2 PERCENT IN URANIUM-235 HAS BEEN EXTENDED TO INCLUDE THE EFFECTS OF REFLECTING MATERIALS. ANNULI WITH OUTSIDE DIAMETERS AS LARGE AS 15 INCHES AND INSIDE DIAMETERS AS SMALL AS 7 INCHES WERE ASSEMBLED TO DELAYED CRITICAL WITH THE CENTRAL CAVITY FILLED WITH HLM TYPE GRAPHITE ($\rho = 1.73$ G/CM³), BERYLLIUM ($\rho = 1.83$ G/CM³), OR PLEXIGLAS $\rho = 1.18$ G/CM³. IN SOME CASES THE OUTER SURFACES OF THE ANNULI WERE REFLECTED WITH UP TO 18 INCHES OF GRAPHITE OR AT LEAST 5.75 INCHES OF POLYETHYLENE ($\rho = 0.92$ G/CM³), BOTH WITH AND WITHOUT A REFLECTING MATERIAL IN THE CENTER OF THE ANNULI. SOME OF THE RESULTS FOR THE GRAPHITE- AND POLYETHYLENE-REFLECTED EXPERIMENTS ARE SHOWN.

MULTIPLICATION CONSTANTS OF SOME OF THE UNREFLECTED AND GRAPHITE-REFLECTED EXPERIMENTS WERE CALCULATED BY MULTIGROUP TRANSPORT-THEORY METHODS USING THE S-N METHOD IN THE S-8 APPROXIMATION AND THE 16-GROUP CROSS SECTIONS OF HANSEN AND ROACH FOR THE URANIUM-235 AND URANIUM-238 ISOTOPES. FISSION OF URANIUM-234 AND URANIUM-236 WAS INCLUDED AND THE ABSORPTION AND SCATTERING OF THESE ISOTOPES WERE ASSUMED TO BE THE SAME AS THOSE OF URANIUM-238. HANSEN AND ROACH CROSS SECTIONS WERE USED FOR THE CROSS SECTIONS OF THE REFLECTING MATERIALS. THE TDC AND DDC CODES PLUS A MODIFICATION OF THE DDC CODE WERE USED IN THE CALCULATIONS. TABLE I GIVES THE RESULTS OF SOME OF THE EXPERIMENTS AND THE CALCULATED MULTIPLICATION FACTORS. THE AGREEMENT BETWEEN CALCULATIONS AND EXPERIMENTS IS GOOD AND VERIFIES THAT THE S-N TRANSPORT-THEORY METHODS, TOGETHER WITH THE HANSEN AND ROACH 16- GROUP CROSS SECTIONS, ARE ADEQUATE FOR THE CALCULATION OF CARBON-REFLECTED URANIUM METAL ANNULI. (AUTH).

839 ID-NUMBER ID-NUMBER 839

AUTHOR BROWN, C. L./ LLOYD, R. C.

TITLE RECENT EXPONENTIAL AND CRITICAL EXPERIMENTS WITH SLIGHTLY ENRICHED URANIUM METAL TUBES IN LIGHT WATER

REPORT NUMBER.... TANSO, 08, 443-444

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 65-11-00

SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

EXPONENTIAL AND CRITICAL-APPROACH EXPERIMENTS WERE PERFORMED ON SEVERAL SLIGHTLY ENRICHED URANIUM METAL TUBES AND TUBE-IN-TUBE COMBINATIONS IN LIGHT WATER. EXPONENTIAL MEASUREMENTS WERE PERFORMED ON 1) 1.002 WEIGHT PERCENT URANIUM-235 ENRICHED URANIUM TUBES; 2) 1.002 WEIGHT PERCENT URANIUM-235 ENRICHED TUBES CONTAINING AN INNER TUBE OF 1.002 WEIGHT PERCENT URANIUM-235; 3) 1.25 WT% URANIUM-235- ENRICHED TUBES, AND 4) 1.25 WT% URANIUM-235-ENRICHED TUBES CONTAINING AN INNER TUBE OF 0.95 WEIGHT PERCENT URANIUM-235. CRITICAL-APPROACH MEASUREMENTS WERE PERFORMED ON 1.95 WEIGHT PERCENT ENRICHED-URANIUM TUBES. THE DIMENSIONS OF THE TUBES AND THE RESULTS OF THE EXPERIMENTS ARE PRESENTED. (AUTH).

840 ID-NUMBER ID-NUMBER 840

AUTHOR LLOYD, R. C. / RICHEY, C. R. / CLAYTON, E. D. / SKEEN, D. R.

TITLE CRITICALITY STUDIES WITH PLUTONIUM SOLUTIONS

REPORT NUMBER..... TANSO, 08, 444-445

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED... 65-11-00

SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

A SERIES OF CRITICALITY EXPERIMENTS HAS BEEN PERFORMED AT THE HANFORD CRITICAL MASS LABORATORY WITH PLUTONIUM (4.6 WT% PLUTONIUM-240 NITRATE) SOLUTIONS IN THIN STAINLESS-STEEL SPHERES OF 11.5-, 14- AND 15.2-INCH DIAMETER VARIOUS TYPES OF NEUTRON REFLECTORS USED IN THE EXPERIMENTS WERE WATER, CONCRETE, PARAFFIN AND STAINLESS STEEL. CRITICALITY DATA WERE ALSO OBTAINED WITH THE 15.2-INCH SPHERE UNREFLECTED. THE EFFECT OF PARTIAL REFLECTION BY CONCRETE AND THE EFFECT OF AN AIR GAP BETWEEN THE CORE AND ITS REFLECTOR WERE ALSO EXAMINED. CRITICAL PLUTONIUM CONCENTRATIONS WERE MEASURED IN THE RANGE FROM 24 TO 435 G PLUTONIUM/LITER, DEPENDING ON THE NITRIC ACID MOLARITY (0.2 TO 7.7 MOLAR) AND THE CONDITION OF NEUTRON REFLECTION.

RESULTS OF THE MEASUREMENTS WITH THE 11.5- AND 15.2- INCH-DIAM SPHERES ARE GIVEN. CRITICAL EXPERIMENTS WITH THE 14-INCH-DIAM SPHERE WERE PREVIOUSLY REPORTED. MINIMUM CRITICAL VOLUMES FOR THE PLUTONIUM NITRATE SOLUTION CONTAINING 4.6 WT% PLUTONIUM-240, WHEN BARE AND WATER REFLECTED, WERE DETERMINED FROM INTERPOLATION OF THE DATA TO BE ABOUT 22 AND 11 LITERS, RESPECTIVELY, FOR A PLUTONIUM CONCENTRATION OF 175 +/- 25 G PLUTONIUM/LITER. A CONCRETE REFLECTOR WAS FOUND TO BE SOMEWHAT MORE EFFECTIVE THAN WATER ON THE 14-INCH SPHERE, BUT SLIGHTLY LESS EFFECTIVE ON THE 11.5- INCH SPHERE WHERE THE CONCENTRATION OF PLUTONIUM WAS GREATER. NEUTRON-FLUX MEASUREMENTS MADE IN THE 11.5-INCH AND THE 15.2-INCH SPHERE WERE USED TO DETERMINE EXTRAPOLATION LENGTHS AND HENCE, CRITICAL BUCKLINGS FOR THE SOLUTIONS. A TYPICAL FLUX PLOT IS SHOWN. THE EFFECT OF A STAINLESS-STEEL SHELL ON CRITICALITY WAS ALSO EVALUATED IN SEVERAL EXPERIMENTS BY THE ADDITION OF EXTRA SHELLS THAT PERMITTED A SUBSEQUENT EXTRAPOLATION TO ZERO SHELL THICKNESS.

MULTIGROUP DIFFUSION THEORY WAS USED TO COMPUTE CRITICALITY FOR SOME OF THE PLUTONIUM NITRATE SOLUTIONS IN THE EXPERIMENTS. THE RESULTS ARE SHOWN IN TABLE I WHERE THE COMPUTED VALUES OF K-EFF SHOULD BE UNITY TO BE IN AGREEMENT WITH THE EXPERIMENT. THE GAMTEC-II COMPUTER CODE WAS USED TO CALCULATE THE EIGHTEEN-GROUP CONSTANTS UTILIZED IN THE MULTIGROUP CALCULATION. THE CRITICALITY CALCULATIONS ARE IN GOOD AGREEMENTS WITH EXPERIMENTAL DATA. (AUTH).

841 ID-NUMBER ID-NUMBER 841

AUTHOR ALBERTSON, D. G./ BUSSELMAN, G. J.

TITLE ANALYSIS AND MEASUREMENT OF PLUTONIUM ALUMINUM-POLYTHENE SYSTEMS IN THE PCTR

REPORT NUMBER..... TANSO, 08, 448-449

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED... 65-11-00

SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

A SERIES OF EXPERIMENTS WITH HYDROGEN-MODERATED PLUTONIUM SYSTEMS HAS BEEN PERFORMED IN THE PHYSICAL CONSTANTS TESTING REACTOR. THE BORON CONCENTRATION REQUIRED TO REDUCE THE INFINITE MULTIPLICATION FACTOR, TO UNITY WAS MEASURED FOR VARIOUS PLUTONIUM-240 CONCENTRATIONS, FUEL PLATE THICKNESSES, AND MODERATOR-TO-FUEL RATIOS. THE MEASURED VALUES OF THE BORON CONCENTRATION WERE COMPARED TO THEORETICAL PREDICTIONS TO CHECK THE ACCURACY OF CALCULATIONAL METHODS AND PARAMETERS. THE PRINCIPAL COMPONENTS FOR THESE EXPERIMENTS WERE PLUTONIUM-ALUMINUM (20 WT% PLUTONIUM), PURE POLYETHYLENE, AND BORATED POLYETHYLENE (0.90 WT% NATURAL BORON). ALL THREE MATERIALS WERE IN THE FORM OF DISKS, 1.960-INCHES IN DIAMETER AND 0.020-INCH THICK.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

843 ID-NUMBER ID-NUMBER 843

AUTHOR BOYNTON, A. R.
 TITLE EXPERIMENTAL THERMAL DISADVANTAGE FACTORS IN SOME VERY UNDERMODERATED 3 PERCENT ENRICHED WATER - URANIUM OXIDE LATTICES
 REPORT NUMBER..... TANSO, 08, 249
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 65-06-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - HIGH CONVERSION CRITICAL EXPERIMENT

ABSTRACT

AS A PART OF THE HIGH CONVERSION CRITICAL EXPERIMENT (HI-C) AT ARGONNE NATIONAL LABORATORY, THE THERMAL DISADVANTAGE FACTOR (ZETA) HAS BEEN MEASURED IN FIVE LATTICES THAT HAD WATER-TO-URANIUM OXIDE-VOLUME RATIOS FROM 0.96 DOWN TO 0.16. THE DATA OBTAINED IN THESE CORES INDICATE THAT (ZETA) DOES NOT DECREASE MONOTONICALLY WITH DECREASING WATER-TO-URANIUM OXIDE-VOLUME RATIO BUT POSSESSES A MINIMUM AND INCREASES AS THE LATTICE PITCH DECREASES BEYOND A CERTAIN VALUE.

THE FUEL IN THESE CORES WAS 3.04 WT% ENRICHED URANIUM IN THE FORM OF 10.17 G/CM³ URANIUM DIOXIDE PELLETS OF 0.935-CM DIAMETER LOADED TO 122-CM LENGTH IN 1.057-CM OUTSIDE DIAMETER CLADDING TUBES OF 0.0496-CM-THICK STAINLESS STEEL. BOTH SQUARE AND TRIANGULAR LATTICE PITCHES WERE USED. (AUTH.).

845 ID-NUMBER ID-NUMBER 845

AUTHOR GREEN, R. E./ SERDULA, K. J./ BIGHAM, C. B.
 TITLE EXPERIMENTAL LATTICE PARAMETERS FOR 28-ROD CLUSTERS OF NATURAL URANIUM DIOXIDE IN HEAVY WATER
 REPORT NUMBER..... TANSO, 08, 253-254
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 65-06-00
 SITE/PROGRAM CANADA, CHALK RIVER NUCLEAR LABORATORIES - HEAVY WATER LATTICES

ABSTRACT

REACTOR-PHYSICS PARAMETERS HAVE BEEN MEASURED FOR HEAVY WATER MODERATED, NATURAL URANIUM DIOXIDE LATTICES SIMILAR TO THOSE PLANNED FOR THE 500-MEGAWATT(ELECTRICAL) CANDU-TYPE REACTORS AT PICKERING, ONTARIO.

THE FUEL ASSEMBLIES WERE COMPOSED OF 28-PIN FUEL BUNDLES MOUNTED IN TWO CONCENTRIC TUBES SIMULATING THE PRESSURE AND CALANDRIA TUBES OF THE POWER REACTOR. EACH FUEL PIN CONSISTED OF A 47.7- CM LENGTH OF SINTERED URANIUM DIOXIDE PELLETS (1.42-CM DIAMETER) OF DENSITY 10.45 GRAMS/CM³ SHEATHED IN ZIRCALOY-2 (1.52-CM OUTSIDE DIAMETER X 0.45-MM WALL). SYMMETRIC RINGS OF 4, 8 AND 16 PINS ON DIAMETERS OF 2.33, 5.30 AND 8.41 CM RESPECTIVELY FORMED THE 28-PIN BUNDLE. ALUMINUM MOUNTING PLATES AND ZIRCALOY END CAPS INCREASED IN OVER-ALL BUNDLE LENGTH TO 49.7 CM. FIVE BUNDLES MOUNTED IN A 65S-AL "PRESSURE TUBE" (12.78-CM OUTSIDE X 2.96-MM WALL) AND A 50S-AL "CALANDRIA TUBE" (12.74-CM OUTSIDE DIAMETER X 1.39-MM WALL) FORMED A FUEL ASSEMBLY. (AUTH.).

846 ID-NUMBER ID-NUMBER 846

AUTHOR REARDON, W. A./ LLOYD, R. C.
 TITLE SHAPE PERTURBATIONS IN CRITICAL EXPERIMENTS
 REPORT NUMBER..... TANSO, 03, 070-071
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 60-06-00
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

WHEN MAKING HETEROGENEOUS CRITICAL MASS MEASUREMENTS, SEVERAL PERTURBATIONS OF UNKNOWN MAGNITUDE ARE USUALLY PRESENT, SUCH AS THE EFFECT OF AN IRREGULAR OUTER BOUNDARY. CRITICAL APPROACH TYPE MEASUREMENTS WERE MADE WITH CIRCULAR, ELLIPTIC, AND RECTANGULAR CYLINDERS TO TRY TO EVALUATE SOME OF THE EFFECTS.

THE OBJECTIVES WERE SPECIFICALLY:

- A) TO DETERMINE THE EFFECT OF THE IRREGULAR OUTER BOUNDARY ON THE MEASURED CRITICAL MASS.
- B) TO OBTAIN INFORMATION ON THE EFFECT OF GEOMETRY ON THE EXTRAPOLATION DISTANCE.

C) TO EXAMINE THE FEASIBILITY OF MORE ACCURATELY DETERMINING THE EFFECTIVE RADIUS OF THE EXTRAPOLATED CRITICAL CYLINDER BY INTRODUCING A SHAPE DEFORMATION WHICH IS THEN SUCCESSIVELY DECREASED AND PUT TO ZERO, AND:

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

D) TO COMPARE THE THEORETICAL BUCKLING FORMULATIONS WITH EXPERIMENTS. THE URANIUM RODS USED IN THESE EXPERIMENTS WERE 23.5 INCHES LONG, 0.175 INCH IN DIAMETER, AND ENRICHED TO 3.063 PERCENT IN URANIUM-235. THEY WERE ENCASED IN 0.025-INCH WALL LUCITE TUBES AND WERE ARRANGED IN A 0.5-INCH TRIANGULAR LATTICE; THE RESULTING WATER/URANIUM (TOTAL) VOLUME RATIO WAS 8.0. THE ASSEMBLIES WERE BOTH FULLY REFLECTED AND MODERATED WITH WATER.

THE CRITICAL MASSES WERE CALCULATED USING THE RELATION BETWEEN THE BUCKLING AND THE SEMI-AXIS OF ELLIPSES GIVEN AS TABLES BY GAST AND BOURNIA, AND VALUES OF MATERIAL BUCKLING AND REFLECTOR SAVINGS GIVEN BY LLOYD, ET AL. . THE RESULTS ARE SUMMARIZED.

THE BUCKLINGS SHOWN IN THE TABLE WERE EVALUATED FROM THE ASSUMED REFLECTOR SAVING, THE CALCULATED VALUES OF THE SEMI-AXIS OF THE CRITICAL ASSEMBLIES, AND THE TABLES OF REFERENCE 1.

FROM THE LIST OF CRITICAL MASSES IT CAN BE CONCLUDED THAT APPRECIABLE DEFORMATIONS IN SHAPE DO NOT INTRODUCE LARGE ERRORS INTO THE CRITICAL MASS DETERMINATION.

BECAUSE OF AN UNCERTAINTY IN LAMBDA, OF THE ORDER OF 0.2 CM, ONE CONCLUDES THAT UNLESS THE SHAPE DEFORMATIONS ARE MORE PRONOUNCED THAN THOSE INTRODUCED (I.E., LONG THIN SLABS ETC.), THE VALUE OF LAMBDA IS NOT A STRONG FUNCTION OF SHAPE FOR THESE RELATIVELY SMALL ASSEMBLIES.

THE METHOD USED TO CALCULATE THE CRITICAL MASS OF THE ELLIPSES APPEARS NOT TO BE ADEQUATE FOR THE LARGER ECCENTRICITIES. (AUTH).

847 ID-NUMBER ID-NUMBER 847

AUTHOR MIHALCZO, J. T.

TITLE NEUTRON AGE AND NON-LEAKAGE PROBABILITY FOR A 2 PERCENT URANIUM-235
ENRICHED URANIUM TETRAFLUORIDE - PARAFFIN MIXTURE WITH A HYDROGEN/URANIUM
RATIO OF 404

REPORT NUMBER.... TANSO, 03, 074-075

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 60-06-00

SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN

ABSTRACT

THE NEUTRON AGE AND NONLEAKAGE PROBABILITY FOR A MIXTURE OF 2 PERCENT URANIUM-235 ENRICHED URANIUM TETRAFLUORIDE AND PARAFFIN WITH A HYDROGEN/URANIUM-235 ATOMIC RATIO OF 404 HAVE BEEN DETERMINED FROM CRITICAL EXPERIMENTS AT THE OAK RIDGE NATIONAL LABORATORY CRITICAL FACILITY. THESE EXPERIMENTS ARE A CONTINUATION OF A PROGRAM REPORTED PREVIOUSLY. THE MATERIAL IS A HOMOGENEOUS MIXTURE WHICH CONTAINS 85 WT% URANIUM TETRAFLUORIDE AND 15 WT% PARAFFIN AND HAS A DENSITY OF 3.45 G/CC.

THE RESULTING VALUE FOR THE PROMPT-NEUTRON AGE TO THERMAL WAS DETERMINED TO BE $28.2 \pm 1.0 \text{ CM}^2$ AND THAT FOR THE NONLEAKAGE PROBABILITY, $P(B)$, TO BE 0.8362 ± 0.0048 . THE RECIPROCAL OF $P(B)$, FROM EQUATION (1), IS $K\text{-INFINITY}$ AND IS EQUAL TO 1.196. THE RESULT OF THE CRITICAL EXPERIMENTS ARE GIVEN. (AUTH).

848 ID-NUMBER ID-NUMBER 848

AUTHOR HURLEY, T. J./ O'NEILL, G. F.

TITLE EXPERIMENTAL LATTICES PARAMETERS FOR HEAVY WATER - NATURAL URANIUM LATTICES

REPORT NUMBER.... TANSO, 03, 075-076

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 60-06-00

SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES
IN HEAVY WATER

ABSTRACT

THE PROCESS DEVELOPMENT PILE (PDP) AT THE SAVANNAH RIVER LABORATORY IS BEING USED TO OBTAIN AN EXTENSIVE SERIES OF PRECISE DATA FOR HEAVY-WATER-MODERATED LATTICES OF NATURAL URANIUM METAL. THE LARGE SIZE (16 FEET DIAMETER, 15 FEET HIGH) OF THE PDP TANK PRACTICALLY ELIMINATES EDGE EFFECTS EVEN AT VERY WIDE LATTICE PITCHES AND THEREFORE PROVIDES DATA OF UNUSUALLY HIGH ACCURACY FOR DETAILED TESTS OF VARIOUS CALCULATIONAL METHODS.

THE MEASUREMENTS WERE MADE IN 99.75 MOL% DEUTERIUM-OXIDE WITH CLUSTERS OF NATURAL URANIUM.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

849 ID-NUMBER ID-NUMBER 849

AUTHOR DAVIS, M. V./ THIELE, A. W.
 TITLE AN ENRICHED URANIUM DIOXIDE - ZIRCONIUM DIHYDRIDE CRITICAL ASSEMBLY
 REPORT NUMBER..... TANSO, 03, 104-105
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 60-06-00
 SITE/PROGRAM ATOMICS INTERNATIONAL - SNAP CORES (ZIRCONIUM HYDRIDE)

ABSTRACT

A CRITICAL ASSEMBLY HAS BEEN BUILT TO OBTAIN BASIC NUCLEAR PARAMETERS NECESSARY FOR THE DESIGN OF COMPACT REACTORS FOR THE SNAP PROGRAM. THE ASSEMBLY CONSISTS OF TWO HEMISPHERES, SEPARATED ON A HORIZONTAL PLANE. A MACHINE WAS CONSTRUCTED THAT PROVIDED RIGID SUPPORT TO THE UPPER HEMISPHERE AND LIFTED THE LOWER HEMISPHERE AT RATES THAT WOULD RESULT IN AN APPROXIMATELY CONSTANT REACTIVITY INSERTION RATE. A PORTION OF THE REFLECTOR ON THE LOWER HEMISPHERE WAS MOVABLE TO PROVIDE FINE ADJUSTMENTS IN THE REACTIVITY.

THE FUEL MODERATOR MATERIAL WAS PREPARED BY BLENDING 8 WT% URANIUM DIOXIDE (93.2 PERCENT URANIUM-235 IN URANIUM) IN ZIRCONIUM HYDRIDE POWDER AND COMPRESSING TO FORM SMALL BLOCKS. IDENTICAL SETS OF BLOCKS WITH AND WITHOUT URANIUM DIOXIDE WERE PREPARED. INITIALLY, THE ASSEMBLY WAS LOADED WITH BLOCKS OF ZIRCONIUM HYDRIDE ONLY AND WAS FUELED BY SUBSTITUTING URANIUM DIOXIDE-ZIRCONIUM HYDRIDE BLOCKS MAINTAINING A SPHERICAL LOADING. THE CORE IS REFLECTED BY A BERYLLIUM AND A GRAPHITE LAYER AROUND THE CORE. (AUTH).

850 ID-NUMBER ID-NUMBER 850

AUTHOR HARTFIELD, R. A. / FINN, H. F. / NEWHOLD, R. J. / VOLLMER, R. H.
 TITLE CRITICAL EXPERIMENTS IN SLAB GEOMETRIES
 REPORT NUMBER..... TANSO, 03, 109
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 60-06-00
 SITE/PROGRAM ALLIS-CHALMERS CRITICAL FACILITY - PATHFINDER NUCLEAR POWER PLANT

ABSTRACT

THE ALLIS-CHALMERS CRITICAL FACILITY IS PRESENTLY BEING USED TO ESTABLISH THE FIRST CORE DESIGN PARAMETERS OF THE PATHFINDER NUCLEAR POWER PLANT BEING BUILT FOR THE NORTHERN STATES POWER CO. PATHFINDER IS A BOILING WATER REACTOR WITH A CENTRALLY LOCATED INTEGRAL NUCLEAR SUPERHEATER, DESIGNED TO DELIVER STEAM AT 540 PSIG AND 825 DEGREES F AND RATED AT 66 MWE. THE FIRST SERIES OF EXPERIMENTS WERE PERFORMED ON BOILER LATTICES ONLY, UTILIZING SLAB GEOMETRIES THAT WERE BUILT UP ON THE CORE PERIPHERY. THESE SLAB EXPERIMENTS HAVE LED INTO THE FULL SCALE MOCKUPS AND EXTENSIVE CRITICAL EXPERIMENTS REQUIRED BY THE INTEGRAL SUPERHEATER AND AXIAL VARIATION OF FUEL LOADING IN PATHFINDER.

THE BOILER FUEL RODS USED IN THE SLAB EXPERIMENTS ARE URANIUM-DIOXIDE, 0.388 INCH OD AND 17 INCH LONG COMPLETELY JACKETED IN A 0.040 INCH CLADDING OF X8001 ALUMINUM (NOMINAL COMPOSITION 1% NICKEL, 0.5% IRON, REMAINDER ALUMINUM). THE AVERAGE FUEL ENRICHMENT FOR A FULL CORE LOADING CAN BE VARIED FROM 1.3% TO 1.9% URANIUM-235, BUT ONLY TWO ENRICHMENTS, 1.8% AND 1.59% WERE INVESTIGATED DURING INITIAL SLAB EXPERIMENTS.

853 ID-NUMBER ID-NUMBER 853

AUTHOR WHITE, J. D./ RICHEY, C. R.
 TITLE NEUTRON INTERACTION BETWEEN MULTIPLYING MEDIA SEPARATED BY VARIOUS MATERIALS
 REPORT NUMBER..... BNWL-0193, 57-67
 DATE PUBLISHED ... 65-10-15
 SITE/PROGRAM HANFORD - PLUTONIUM - ISOLATION WORTHS OF VARIOUS MATERIALS ; HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

THIS REPORT GIVES THE RESULTS OF A SERIES OF CRITICAL EXPERIMENTS IN WHICH THE ISOLATING PROPERTIES OF VARIOUS MATERIALS WERE INVESTIGATED. THOSE MATERIALS TESTED WERE PLACED AT THE INTERFACE BETWEEN TWO ARRAYS OF MULTIPLYING MEDIA THAT COMPRISED THE CORE OF A CRITICAL ASSEMBLY. THE CRITICAL LENGTH OF THE FUEL CORE WAS THEN DETERMINED AS A FUNCTION OF THE TEST MATERIAL THICKNESS; THE EFFECTIVE ISOLATION THICKNESS OF A MATERIAL WAS TAKEN TO BE THAT THICKNESS FOR WHICH THE FUEL CORE CRITICAL LENGTH APPROACHED AN ASYMPTOTIC VALUE. COMPARATIVE DATA WERE ALSO OBTAINED ON THE REFLECTOR SAVINGS ASSOCIATED WITH THE VARIOUS TEST MATERIALS, WHERE THE REFLECTOR SAVINGS IS DEFINED AS THE DECREASE IN LENGTH DUE TO THE PRESENCE OF THE REFLECTOR.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

854 ID-NUMBER ID-NUMBER 854

AUTHOR THOMAS, J. T.
 TITLE CRITICAL PARAMETERS OF URANIUM-235 ENRICHED SOLUTIONS IN SPHERICAL GEOMETRY
 REPORT NUMBER.... ORNL-1926, 06-07
 DATE PUBLISHED ... 55-09-07
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

DIFFERENT SIZED SPHERICAL VESSELS MADE OF TYPE 2S ALUMINUM ARE BEING USED TO INVESTIGATE SEVERAL NUCLEAR PARAMETERS OF 93.2% URANIUM-235-ENRICHED URANYL FLUORIDE AQUEOUS SOLUTIONS OVER A WIDE RANGE OF CONCENTRATIONS. THE EXPERIMENTS ARE PERFORMED WITH AND WITHOUT A WATER REFLECTOR. PARAMETERS BEING INVESTIGATED INCLUDE THE VARIATION OF THE CRITICAL MASS AND CRITICAL VOLUME WITH CONCENTRATION, ALONG WITH A DETERMINATION OF THEIR MINIMAL VALUES. THE NEUTRON FLUX AND THE FISSION RATE DISTRIBUTION AS A FUNCTION OF THE CONCENTRATION ARE ALSO BEING MEASURED. SOME OF THE CRITICAL SPHERES ARE ONLY PARTLY FILLED.

855 ID-NUMBER ID-NUMBER 855

AUTHOR CRONIN, D. F./ THOMAS, J. T.
 TITLE CRITICAL PARAMETERS OF SLIGHTLY ENRICHED URANIUM SOLUTIONS IN SPHERICAL GEOMETRY
 REPORT NUMBER.... ORNL-1926, 07-08
 DATE PUBLISHED ... 55-09-07
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER ; OAK RIDGE - URANYL(4.9%)FLUORIDE - WATER

ABSTRACT

THE CRITICAL PARAMETERS OF AQUEOUS URANIUM-235 ENRICHED SOLUTIONS IN CYLINDRICAL GEOMETRY WERE DETERMINED IN SEVERAL EXPERIMENTS. IN ONE EXPERIMENT ALUMINUM AND STAINLESS STEEL CYLINDERS OF VARIOUS SIZES CONTAINING VARIOUS CONCENTRATIONS OF THE SOLUTION WERE INVESTIGATED FOR THE UNREFLECTED, HALF-WATER-REFLECTED, AND TOTALLY WATER-REFLECTED ASSEMBLIES. IN ANOTHER EXPERIMENT TO INVESTIGATE THE SAFETY OF PIPE JOINTS, A 90-DEGREE CROSS WAS MADE FROM ALUMINUM TUBING AND TESTED WITH AND WITHOUT A WATER REFLECTOR. A THIRD EXPERIMENT WAS DESIGNED TO DETERMINE THE EFFECT OF ADDING A LATTICED SOLID POISON (STEEL) TO A SOLUTION CONTAINED IN A STAINLESS STEEL CYLINDER; THE ASSEMBLY WAS WATER-REFLECTED.

THE CRITICAL PARAMETERS OF AQUEOUS URANIUM-235, ENRICHED SOLUTIONS CONTAINED IN THE ANNULAR SPACE BETWEEN TWO CYLINDERS OF VARIOUS SIZES WERE ALSO STUDIED. THE EXPERIMENTAL VARIATIONS INCLUDED CHANGING THE CONTENTS OF THE ANNULI AND TESTING THE ASSEMBLIES WITH AND WITHOUT WATER REFLECTORS.

THE VARIATION WITH CONCENTRATION OF THE CRITICAL PARAMETERS OF AQUEOUS URANIUM-235-ENRICHED SOLUTIONS CONTAINED IN SPHERES IS BEING INVESTIGATED. THE SPHERES, WHICH VARY IN SIZE, ARE EITHER FILLED OR PARTLY FILLED WITH THE SOLUTION, AND THE EXPERIMENTS ARE PERFORMED WITH AND WITHOUT A WATER REFLECTOR. THE VARIATION WITH CONCENTRATION OF THE CRITICAL PARAMETERS OF SLIGHTLY ENRICHED URANIUM SOLUTIONS CONTAINED IN SPHERES WAS ALSO INVESTIGATED. THE ASSEMBLIES WERE TESTED WITH AND WITHOUT A WATER REFLECTOR.

THE CRITICAL HEIGHT OF AN ENRICHED URANYL-FLUORIDE SOLUTION CONTAINED IN A 9-INCH DIAMETER CYLINDER WAS STUDIED AS A FUNCTION OF ITS DISTANCE FROM A CONCRETE NEUTRON REFLECTOR. INCREASING THE SEPARATION BETWEEN THE CONCRETE AND THE CYLINDER RESULTED IN AN INCREASE IN THE CRITICAL HEIGHT, WHICH APPROACHES THE UNREFLECTED VALUE AS A LIMIT AT A 2-FOOT SEPARATION.

856 ID-NUMBER ID-NUMBER 856

AUTHOR GILLEY, L. W.
 TITLE EFFECT OF CONCRETE AS A NEUTRON REFLECTOR
 REPORT NUMBER.... ORNL-1926, 08-09
 DATE PUBLISHED ... 55-09-07
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

A MEASUREMENT HAS BEEN MADE OF THE EFFECT OF CONCRETE AS A NEUTRON REFLECTOR. A 9-INCH- DIAMETER ALUMINUM CYLINDER WAS SO ARRANGED THAT IT COULD BE MADE CRITICAL WHEN CONTAINING ENRICHED URANYL FLUORIDE SOLUTION WITH NO REFLECTOR, WITH AN EFFECTIVELY INFINITE WATER REFLECTOR, OR WHEN LOCATED AT VARIOUS DISTANCES FROM A CONCRETE SLAB. THIS SLAB WAS 4X4X0.5 FEET THICK AND CONSISTED OF BLOCKS OF SHIELDING CONCRETE HAVING A DENSITY OF 2.14 G/CC. THE SOLUTION HAD A CONCENTRATION CORRESPONDING TO AN HYDROGEN/URANIUM-235 RATIO OF 74, AND ITS CRITICAL HEIGHT WAS PARAMETER SENSITIVE TO THE SEVERAL EXPERIMENTAL ARRANGEMENTS.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

860 ID-NUMBER ID-NUMBER 860

AUTHOR LUDEWIG, H.
 TITLE AN ANALYSIS OF FOUR METAL CORES USING ENDF/B VERSION 2 DATA
 REPORT NUMBER..... BNL-RP-1010
 DATE PUBLISHED ... 70-06-00
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

THE ANALYSIS OF FOUR LASL METAL CORES IS DISCUSSED. EXPERIMENTAL DETAILS PERTINENT TO THE ANALYSIS ARE GIVEN. THREE OF THE CORES WERE PLUTONIUM METAL AND ONE WAS URANIUM METAL. ALL THE PLUTONIUM CORES WERE FABRICATED FROM DELTA-PHASE METAL WHICH HAS A DENSITY OF APPROXIMATELY 15.61 GRAMS/CC.

862 ID-NUMBER ID-NUMBER 862

AUTHOR MIHALCZO, J. T./ KINNEY, W. E.
 TITLE EXPERIMENTS AND CALCULATIONS ON URANIUM MOLYBDENUM ALLOY CRITICAL ASSEMBLIES
 REPORT NUMBER..... ORNL-3858, 19
 DATE PUBLISHED ... 65-11-00
 SITE/PROGRAM OAK RIDGE - ORNL FAST BURST REACTOR (FBR) - HEALTH PHYSICS RESEARCH REACTOR (HPRR)

ABSTRACT

(SEE IDN 34)

863 ID-NUMBER ID-NUMBER 863

AUTHOR LLOYD, R. C./ CLAYTON, E. D.
 TITLE NEUTRON INTERACTION EXPERIMENTS WITH BOTTLES OF URANIUM-233 SOLUTIONS
 REPORT NUMBER..... BNWL-0340, 51-56
 DATE PUBLISHED ... 66-10-15
 SITE/PROGRAM HANFORD - URANIUM-233 SOLUTIONS

ABSTRACT

SUBCRITICAL NEUTRON INTERACTION EXPERIMENTS WERE PERFORMED WITH BARE AND LUCITE REFLECTED ARRAYS OF BOTTLES OF URANIUM-233 SOLUTION. THE EFFECT ON CRITICALITY OF ADDING LUCITE MODERATOR BETWEEN THE BOTTLES WAS ALSO STUDIED. THESE EXPERIMENTS PROVIDE DATA FOR NUCLEAR SAFETY GUIDANCE IN HANDLING, STORAGE, AND SHIPMENT OF THIS MATERIAL AND FOR CHECKING INTERACTION CALCULATIONS.

864 ID-NUMBER ID-NUMBER 864

AUTHOR LLOYD, R. C./ CLAYTON, E. D.
 TITLE BASIC CRITICALITY EXPERIMENTS WITH PLUTONIUM NITRATE SOLUTIONS IN SLAB GEOMETRY
 REPORT NUMBER..... BNWL-0340, 56-58
 DATE PUBLISHED ... 66-10-15
 NSA-NUMBER 21:2374
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

A CRITICALITY VESSEL OF UNIQUE DESIGN WAS INSTALLED AT THE CRITICAL MASS LABORATORY. IT IS A SLAB VESSEL SUCH THAT ITS THICKNESS CAN BE VARIED THROUGHOUT A RANGE OF 3 TO 9 INCHES, WHICH IS MADE POSSIBLE BY USE OF A WELDED STAINLESS STEEL BELLINGS. THE SIDES OF THE SLAB ARE MADE OF .067 INCH STAINLESS STEEL SHEET WELDED TO THE BELLINGS. STRUCTURAL RIGIDITY OVER THE SLAB'S LARGE THIN SIDES (42 X 42 INCHES) IS ACCOMPLISHED BY MEANS OF A LOW DENSITY LATTICE REINFORCEMENT.

CRITICALITY EXPERIMENTS ARE BEING CARRIED OUT WITH THE ADJUSTABLE SLAB ASSEMBLY TO DETERMINE CRITICAL THICKNESSES OF BARE AND WATER REFLECTED "INFINITE" SLABS OF PLUTONIUM NITRATE SOLUTIONS.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

865 ID-NUMBER ID-NUMBER 865

AUTHOR ALEKSENKO, U. N. / BUINITSKAYA, V. I. / ZASLAVSKII, V. V. / ZVONOV, N. V. / ET AL
 TITLE CRITICAL EXPERIMENTS WITH THE ORGANIC COOLANTS MONO-ISOPROPYLDIPHENYL AND GAS OIL
 REPORT NUMBER..... AECL-2330, 218-232
 DATE PUBLISHED ... 64-00-00
 SITE/PROGRAM USSR - ORGANIC COOLED MODERATORS

ABSTRACT

THE NEUTRON PHYSICS FOR POLYPHENYL-TYPE MODERATORS IS SIMILAR TO THAT FOR WATER MODERATORS. SINCE WE ALREADY HAVE RELIABLE CALCULATIONS FOR HEAVY-WATER MODERATORS, THE SIMILARITY CAN BE USED TO SIMPLIFY THE CALCULATIONS FOR ORGANIC-MODERATED REACTORS. HOWEVER, CERTAIN PECULIARITIES IN THE MOLECULAR STRUCTURE AND THE DIFFERENT ATOMIC COMPOSITIONS OF ORGANIC MODERATORS COMPARED WITH THAT OF WATER GIVE THE ORGANIC MODERATORS SPECIAL CHARACTERISTICS FROM THE POINT OF VIEW OF THEIR MODERATING PROPERTIES. BECAUSE OF THIS, THE COMPUTATIONAL METHODS USED AT PRESENT IN THE CASE OF HEAVY WATER MODERATED REACTORS WERE IN NEED OF MODIFICATION AND EXPERIMENTAL VERIFICATION BEFORE THEY COULD BE APPLIED TO THE COMPUTATION OF A URANIUM ORGANIC-MODERATOR LATTICE.

IT WAS THOUGHT THAT THE SIMPLEST AND MOST RELIABLE WAY TO ACHIEVE THIS WAS TO CONDUCT A NUMBER OF COMPARATIVE CRITICAL EXPERIMENTS USING BOTH AQUEOUS AND ORGANIC MODERATORS, SELECTING THE SIMPLEST POSSIBLE GEOMETRY FOR THE HEAT-EXCHANGING ELEMENTS WHICH WOULD THEN READILY LEND ITSELF TO A MATHEMATICAL TREATMENT. WITH THIS IN MIND, WE HAVE CONDUCTED CRITICAL EXPERIMENTS USING FUEL ELEMENTS OF TYPE EK-10 (THESE ARE STANDARD FUEL ELEMENTS USED IN REACTORS OF TYPE VVR-S) AND THE ORGANIC MODERATORS MONO-ISOPROPYLDIPHENYL (WHICH IS A PRODUCT OF THE ALKYLATION OF DIPHENYL) AND GASOIL (A STRAIGHT DISTILLATION FRACTION OF NATURAL OIL REPRESENTING A MIXTURE OF AROMATIC NAPHTHENE AND PARAFFIN HYDROCARBONS) AS WELL AS AN AQUEOUS MODERATOR. THE RESULTS OF THESE EXPERIMENTS LED TO THE CONSTRUCTION OF AN EXPERIMENTAL ORGANIC-MODERATED REACTOR OR WHICH BECAME CRITICAL AND BEGAN OPERATING IN 1960. THE OUTPUT CAPACITY OF THE REACTOR WAS 300 KILOWATTS. THE MAIN RESULTS OF THESE CRITICAL EXPERIMENTS, THE DESCRIPTION OF THE OR REACTOR AND THE RESULTS OF SEVERAL MEASUREMENTS CARRIED OUT ON THIS REACTOR ARE DESCRIBED BELOW.

WE HAVE CONDUCTED CRITICAL EXPERIMENTS USING FUEL ELEMENTS OF TYPE EK-10 (THESE ARE STANDARD FUEL ELEMENTS USED IN REACTORS OF TYPE VVR-S) AND THE ORGANIC MODERATORS MONO-ISOPROPYLDIPHENYL (WHICH IS A PRODUCT OF THE ALKYLATION OF DIPHENYL) AND GASOIL (A STRAIGHT DISTILLATION FRACTION OF NATURAL OIL REPRESENTING A MIXTURE OF AROMATIC NAPHTHENE AND PARAFFIN HYDROCARBONS) AS WELL AS AN AQUEOUS MODERATOR. THE MAIN RESULTS OF THESE CRITICAL EXPERIMENTS, THE DESCRIPTION OF THE OR REACTOR AND THE RESULTS OF SEVERAL MEASUREMENTS CARRIED OUT ON THIS REACTOR ARE DESCRIBED BELOW.

867 ID-NUMBER ID-NUMBER 867

AUTHOR FOX, J. K./ MARABLE, J. H.
 TITLE CRITICALITY DATA FOR URANIUM-ALUMINUM SLUG LATTICES IN WATER
 REPORT NUMBER..... ORNL-1715, 13-14
 DATE PUBLISHED ... 54-07-14
 SITE/PROGRAM OAK RIDGE - URANIUM SLUGS - WATER (HANFORD FUEL ELEMENTS)

ABSTRACT

REGULAR LATTICES OF URANIUM-ALUMINUM ALLOY SLUGS WERE FLOODED WITH AN EFFECTIVELY INFINITE WATER REFLECTOR IN ORDER TO DETERMINE THE NUMBER OF SLUGS REQUIRED FOR CRITICALITY AS A FUNCTION OF THE LATTICE SPACING. THESE SLUGS ARE 1.015 INCH IN DIAMETER AND 12.00 INCH IN LENGTH AND CONSIST OF AN ALLOY OF ALUMINUM AND 93.3% ENRICHED URANIUM-235. THE MASS OF URANIUM-235 IN EACH SLUG IS 22.3 GRAMS, WHICH IS 5% OF THE TOTAL SLUG MASS. THESE EXPERIMENTS ARE SIMILAR TO THOSE OF A MORE EXTENSIVE PROGRAM REPORTED PREVIOUSLY.

868 ID-NUMBER ID-NUMBER 868

AUTHOR FOX, J. K.
 TITLE CRITICAL PARAMETERS OF SOLUTIONS OF URANIUM-235 ENRICHED URANYL NITRATE IN CYLINDRICAL CONTAINERS
 REPORT NUMBER..... ORNL-3193
 DATE PUBLISHED ... 61-09-01
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

CRITICAL EXPERIMENTS WHICH EXTEND THE EXISTING DATA ON FISSIONABLE SOLUTIONS HAVE BEEN PERFORMED WITH SOLUTIONS OF URANYL-NITRATE AT TWO URANIUM-235 ENRICHMENTS. THE FIRST MATERIAL CONSISTED OF A SOLUTION OF URANYL-NITRATE ENRICHED TO 93.15 WT% IN URANIUM-235. IN A DEUTERIUM-OXIDE WATER MIXTURE CONTAINING 70.1 WT% DEUTERIUM-OXIDE. THE URANIUM-235 CONCENTRATION IN THIS SOLUTION WAS 105.9 G PER LITER, THE SPECIFIC GRAVITY 1.226, THE HYDROGEN/URANIUM-235 ATOMIC RATIO 70.9, AND THE DEUTERIUM/URANIUM-235 ATOMIC RATIO 166.3.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

871 ID-NUMBER ID-NUMBER 871

AUTHOR BLOCK, E. Z.
 TITLE CLUSTER ROD LATTICES WITH NATURAL URANIUM
 REPORT NUMBER..... HW-43441, 37
 DATE PUBLISHED ... 56-05-31
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

BUCKLING MEASUREMENTS WITH CLUSTERS OF SIX AND SEVEN 0.925 INCH RODS IN A 0.25 INCH LATTICE WERE REPORTED IN HW-42182. THE BUCKLINGS FOR A FIVE ROD CLUSTER HAVE NOW BEEN DETERMINED, WHICH COMPLETES THIS SERIES OF MEASUREMENTS IN THE 14 INCH LATTICE. THE DRY BUCKLING VALUE FOR THE FIVE ROD CLUSTER IS $83 \times 10^{-6} \text{ CM}^{-2}$, AND THE WET VALUE (WATER IN THE PROCESS TUBE) IS $-69 \times 10^{-6} \text{ CM}^{-2}$.

FOR THE PURPOSE OF EXTENDING THESE MEASUREMENTS TO ANOTHER LATTICE SPACING AN EXPONENTIAL PILE (ABOUT 5 FEET X 8 FEET X 7 FEET) HAS BEEN BUILT WITH A LATTICE SPACING OF 10 3/8 INCHES. THE BUCKLING IS TO BE DETERMINED FOR A FIVE, SIX, AND SEVEN ROD CLUSTER WITH AND WITHOUT WATER IN THE PROCESS TUBE. THUS FAR THE DRY FIVE ROD CLUSTER HAS BEEN MEASURED AND A VALUE OF $63 \times 10^{-6} \text{ CM}^{-2}$ OBTAINED FOR THE BUCKLING.

872 ID-NUMBER ID-NUMBER 872

AUTHOR BLOCK, E. Z./ CLAYTON, E. D.
 TITLE BUCKLING MEASUREMENTS WITH ENRICHED FUEL ELEMENTS IN LIGHT WATER
 REPORT NUMBER..... HW-47012, 12-19
 DATE PUBLISHED ... 56-11-00
 NSA-NUMBER 11:5493
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

A SERIES OF EXPONENTIAL MEASUREMENTS HAVE BEEN PERFORMED WHICH INVOLVED THE USE OF TWO DIFFERENT TYPES OF ENRICHED FUEL ELEMENTS IN LIGHT WATER. ONE TYPE (1.44 PER CENT BY WEIGHT URANIUM-235) HAD AN O.D. OF 1.34 INCHES AND A LENGTH OF 8 INCHES. THE SECOND TYPE WAS A HOLLOW FUEL ELEMENT (1.66 INCHES O.D., 0.94 INCHES I.D.) OF ENRICHMENT 1.007 PERCENT BY WEIGHT URANIUM-235; THE LENGTH OF EACH OF THESE ELEMENTS WAS 4 INCHES.

873 ID-NUMBER ID-NUMBER 873

AUTHOR LLOYD, R. C.
 TITLE ENRICHED URANIUM - GRAPHITE LATTICES
 REPORT NUMBER..... HW-48893
 DATE PUBLISHED ... 57-03-06
 NSA-NUMBER 11:8116
 SITE/PROGRAM HANFORD - URANIUM(1%) - GRAPHITE LATTICES

ABSTRACT

EXPONENTIAL PILE MEASUREMENTS WERE CONDUCTED IN THE SMALL (ABOUT 4 FEET X 4 FEET X 6 FEET) GRAPHITE PILES WITH ENRICHED URANIUM; THE URANIUM ENRICHMENTS USED WERE 1.44 PER CENT BY WEIGHT URANIUM-235, AND 0.94 PER CENT BY WEIGHT URANIUM-235. BUCKLING MEASUREMENTS WERE CONTINUED WITH THE 0.94 PER CENT MATERIAL WHICH WAS IN THE FORM OF 1.34-INCH O. D. SOLID FUEL ELEMENTS, 6 INCHES IN LENGTH; THE ALUMINUM JACKETED DIMENSIONS WERE 1.44-INCH O. D. AND 6.375 INCHES IN LENGTH. MEASUREMENTS WERE TAKEN WITH AND WITHOUT WATER IN THE COOLING ANNULUS. THE MEASUREMENTS FLUX WAS SUPPLIED BY TWO 0.5-GRAM RA-BE NEUTRON SOURCES AND A SMALL BORON-TRIFLUORIDE COUNTER WAS USED FOR NEUTRON DETECTION.

874 ID-NUMBER ID-NUMBER 874

AUTHOR YOUNG, W. R./ BENNETT, R. A.
 TITLE ANALYSIS OF FTR PHASE B CRITICAL EXPERIMENTS, PART 2, ZPR-3 ASSEMBLIES 52A, B, C, D, E, AND F
 REPORT NUMBER..... BNWL-1139
 DATE PUBLISHED ... 70-02-00
 NSA-NUMBER 24:18696
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

CRITICAL EXPERIMENTS IN SUPPORT OF THE DESIGN OF THE FAST FLUX TEST REACTOR HAVE BEEN CARRIED OUT IN ZPR-3 ASSEMBLIES 48, 48A, 51, AND 52A, B, C, D, E, AND F, BY PERSONNEL OF ARGONNE NATIONAL LABORATORY. THIS REPORT PRESENTS THE RESULTS AND ANALYSIS OF THE EXPERIMENTS PERFORMED IN ASSEMBLIES 52A, B, C, D, E, AND F. (AUTH).

876 ID-NUMBER ID-NUMBER 876

AUTHOR LLOYD, R. C.
 TITLE BUCKLING MEASUREMENTS FOR FUEL ELEMENTS IN A RANDOM ARRAY
 REPORT NUMBER..... HW-55879, 12
 DATE PUBLISHED ... 58-04-29
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

BUCKLING MEASUREMENTS OF FUEL ELEMENTS IN A RANDOM ARRAY WERE CONTINUED. TWO HUNDRED AND TWENTY-FIVE CANNED I & E ELEMENTS OF 1.44 PER CENT ENRICHED URANIUM WERE DROPPED RANDOMLY INTO A TANK, WHICH WAS WATER FILLED AND REFLECTED ON THE SIDES AND BOTTOM. THE URANIUM SLUGS WERE 1.37 INCHES O. D. AND 0.48 I.D. AND EIGHT INCHES LONG. THE CANNED DIMENSIONS WERE 1.47 INCHES O.D., 0.37 INCH I.D. AND 8.6 INCHES LONG.

877 ID-NUMBER ID-NUMBER 877

AUTHOR ENGESSER, F. C./ LILLEY, J. R.
 TITLE PLUTONIUM SPIKE ENRICHMENT
 REPORT NUMBER..... HW-55879, 18-23
 DATE PUBLISHED ... 58-04-29
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

THE INFINITE MEDIUM, THERMAL NEUTRON MULTIPLICATION FACTOR, $K(INF)$, HAS BEEN OBTAINED EXPERIMENTALLY FOR A HEAVY-WATER MODERATED, AIR-COOLED UNIT CELL (SUPERCCELL) WHICH IS ACTUALLY A CONFIGURATION OF SEVEN FUEL ASSEMBLIES HAVING AN EIGHT-INCH SPACING. THE CENTRAL COLUMN OF THE SUPERCCELL CONTAINS A 19-ROD CLUSTER OF PLUTONIUM-ALUMINUM FUEL ELEMENTS AND IS SURROUNDED BY SIX NEAREST NEIGHBORS OF 19-ROD CLUSTERS OF URANIUM OXIDE FUEL ELEMENTS. THIS $K(INF)$ YIELDS INFORMATION CONCERNING THE EFFECT OF UNIFORMLY DISTRIBUTED ENRICHMENT COLUMNS ON THE MULTIPLICATION CONSTANT OF A LATTICE AND IS FURNISHED IN SUPPORT OF THE DESIGN STUDIES FOR THE PLUTONIUM RECYCLE TEST REACTOR. THE VALUE OBTAINED FOR $K(INF)$ OF THE SUPERCCELL WAS 1.126 WITH A MINIMUM STANDARD DEVIATION OF FIVE MK AND AN ESTIMATED MAXIMUM ERROR OF 10 MK. THIS RESULT MAY BE COMPARED TO THE $K(INF)$ OF 19-ROD CLUSTERS IN WHICH THE PLUTONIUM-ALUMINUM ELEMENTS ARE MIXED WITH URANIUM-OXIDE FUEL ELEMENTS. THE REACTIVITY ADVANTAGE IN SEPARATING THE PLUTONIUM FROM THE URANIUM RESULTS IN ABOUT A 20 PER CENT SAVING IN FUEL FOR THE SAME $K(INF)$.

878 ID-NUMBER ID-NUMBER 878

AUTHOR LILLEY, J. R./ ENGESSER, F. C.
 TITLE $K(INF)$ MEASUREMENTS FOR A THREE PIECE, ANNULAR URANIUM DIOXIDE FUEL ELEMENT IN AN 8 INCH TRIANGULAR HEAVY WATER LATTICE
 REPORT NUMBER..... HW-55879, 24-25
 DATE PUBLISHED ... 58-04-29
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF $K(INF)$

ABSTRACT

IN SUPPORT OF DESIGN STUDIES FOR THE PLUTONIUM RECYCLE TEST REACTOR, MEASUREMENTS OF THE INFINITE MULTIPLICATION FACTOR, $K(INF)$, OF DEUTERIUM-OXIDE MODERATED LATTICES ARE BEING CONTINUED IN THE PHYSICAL CONSTANTS TESTING REACTOR. THE LATEST MEASUREMENTS WERE MADE ON A URANIUM-OXIDE FUEL ELEMENT CONSISTING OF A CENTRAL ROD AND TWO CONCENTRIC ANNULI OF FUEL. IN ADDITION, THE THERMAL UTILIZATION, WAS MEASURED.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

879 ID-NUMBER ID-NUMBER 879

AUTHOR LLOYD, R. C./ CLAYTON, E. D./ HANDLER, H. E.
 TITLE CRITICALITY PARAMETERS FOR LATTICES WITH 1.6 PERCENT ENRICHED URANIUM RODS
 IN LIGHT WATER
 REPORT NUMBER..... HW-56919
 DATE PUBLISHED ... 58-07-21
 NSA-NUMBER 13:4798
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

MEASUREMENTS OF THE NUMBER OF FUEL RODS REQUIRED FOR CRITICALITY FOR SEVERAL LATTICES WITH 1.6 PER CENT ENRICHED URANIUM RODS AND LIGHT WATER MODERATOR AND REFLECTOR HAVE BEEN COMPLETED USING THE "APPROACH-TO-CRITICALITY" METHOD. THE EXPERIMENTS WERE PERFORMED USING THE STAINLESS-STEEL APPROACH TANK AND AUXILIARY EQUIPMENT RECENTLY INSTALLED IN THE 305-B BUILDING FOR SIMILAR CRITICALITY STUDIES ON HETEROGENEOUS SYSTEMS WITH THREE PER CENT ENRICHED URANIUM. THE PURPOSES OF THESE MEASUREMENTS WERE TWOFOLD: (1.) TO COMPARE THEIR RESULTS WITH THE NUMBER OF FUEL RODS FOR CRITICALITY PREDICTED BY PREVIOUS EXPONENTIAL EXPERIMENTS AS A CHECK ON THE VALIDITY OF THE LATTER FOR SMALL SYSTEMS. (2.) TO CHECK THE INSTRUMENTATION AND MECHANICAL APPARATUS ASSOCIATED WITH THE APPROACH TANK AND TO DEVELOP A SAFE, RELIABLE EXPERIMENTAL TECHNIQUE USING LATTICES WITH REASONABLY WELL-KNOWN PROPERTIES IN PREPARATION FOR THE INVESTIGATIONS OF THE THREE PER CENT ENRICHED LATTICES.

880 ID-NUMBER ID-NUMBER 880

AUTHOR NEELEY, V. I.
 TITLE MEASUREMENT OF K(INF) FOR 2 PERCENT ENRICHED URANIUM TETRAFLUORIDE-
 PARAFFIN MIXTURE
 REPORT NUMBER..... HW-60220, 35-45
 DATE PUBLISHED ... 59-04-20
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

NUCLEAR SAFETY SPECIFICATIONS FOR SAFE HANDLING AND STORAGE OF LOW ENRICHED MATERIALS HAVE BEEN BASED ON K(INF) MEASUREMENTS MADE IN THE PCTR. THE TECHNIQUES OF THE PCTR K(INF) MEASUREMENTS HAVE NOT ALWAYS BEEN FULLY UNDERSTOOD; FOR THIS REASON IT WAS DECIDED THAT A PCTR K(INF) EXPERIMENT SHOULD BE CONDUCTED ON A MATERIAL FOR WHICH THE VALUE OF K(INF) COULD BE CHECKED INDEPENDENTLY FROM CRITICAL MASS EXPERIMENTS.

AT THE TIME OF CONCEPTION OF THIS EXPERIMENT, THE OAK RIDGE NATIONAL LABORATORY WAS DOING A SERIES OF CRITICALITY EXPERIMENTS ON HYDROGEN-MODERATED 2 PER CENT ENRICHED URANIUM-TETRAFLUORIDE AND HAD AVAILABLE AT THAT TIME SOME MATERIAL MODERATED AT A HYDROGEN TO URANIUM-235 ATOMIC RATIO OF 195. IT WAS DECIDED THAT THIS MATERIAL WOULD BE USED FOR THESE EXPERIMENTS. A THEORETICAL CALCULATION OF K(INF) FOR THIS MATERIAL GAVE THE VALUE OF K(INF) AS 1.23.

881 ID-NUMBER ID-NUMBER 881

AUTHOR LLOYD, R. C./ SMITH, R. B./ CLAYTON, E. D.
 TITLE CRITICALITY MEASUREMENTS OF HETEROGENEOUS 3.1 PERCENT ENRICHED URANIUM-
 WATER SYSTEMS
 REPORT NUMBER..... HW-60220, 47-51
 DATE PUBLISHED ... 59-04-20
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

THE CRITICAL APPROACH MEASUREMENTS WITH 3.063 PER CENT ENRICHED URANIUM RODS IN LIGHT WATER WERE CONTINUED. MEASUREMENTS FOR THE 0.925 AND 0.600-INCH DIAMETER RODS WERE PREVIOUSLY MADE AND REPORTED. CRITICAL APPROACH MEASUREMENTS FOR THE 0.300-INCH DIAMETER RODS HAVE NOW BEEN COMPLETED AND ARE REPORTED HERE. THESE MEASUREMENTS WERE CARRIED OUT IN THE SAME MANNER AS DESCRIBED FOR THE TWO LARGER SIZES IN EARLIER REPORTS. THE 0.300-INCH RODS WERE ENCASED IN 0.031-INCH WALL LUCITE TUBES AND INSERTED INTO LATTICE FRAMEWORKS HAVING HEXAGONAL PATTERNS.

LATTICES WERE MODERATED AND COMPLETELY REFLECTED BY LIGHT WATER. REFLECTION ON THE FUEL ROD ENDS WAS COMPLETED BY 8-INCH LONG LUCITE SLUGS LOADED ABOVE AND BELOW THE FUEL IN EACH TUBE.

APPROACHES WERE CARRIED TO WITHIN 96 PER CENT OF THE EXTRAPOLATED CRITICAL LOADING. THE REPORTED CRITICAL LOADINGS WERE OBTAINED FROM A LEAST SQUARE FIT TO THE NEUTRON MULTIPLICATION DATA FROM ABOUT 85 TO 96 PER CENT OF THE CRITICAL LOADING. THE POISONING EFFECTS OF THE SOURCE, ITS HOLDER, AND SAFETY ROD GUIDE TUBES WERE DETERMINED AND CORRECTIONS APPLIED TO THE EXTRAPOLATED CRITICAL LOADING TO GIVE THE NUMBER OF FUEL RODS WHICH WOULD BE CRITICAL IN A CLEAN LATTICE.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

882 ID-NUMBER ID-NUMBER 882

AUTHOR NEELEY, V. I./ BERBERET, J. A.
 TITLE MEASUREMENTS OF K(INF) FOR 3 PERCENT ENRICHED URANIUM FLUORIDE-HYDROGEN
 MODERATED SYSTEMS
 REPORT NUMBER.... HW-60220, 52-54
 DATE PUBLISHED ... 59-04-20
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

THE PROCESSING OF POWER REACTOR FUELS OF ENRICHMENTS UP TO 3 PER CENT HAS BEEN SCHEDULED FOR FACILITIES AT HAPO. VALUES OF K(INF) AT THIS ENRICHMENT ARE REQUIRED FOR URANIUM-TRIOXIDE AND URANYL-NITRATE HYDROGEN-MODERATED SYSTEMS TO PERMIT THE SPECIFICATION OF CRITICALLY SAFE CONDITIONS FOR THIS OPERATION. EXPERIMENTS HAVE BEEN UNDER WAY FOR APPROXIMATELY THE LAST 10 MONTHS TO DETERMINE THE MAXIMUM VALUE OF K(INF) AND THE HYDROGEN-TO-URANIUM RATIO AT WHICH THIS MAXIMUM OCCURS FOR URANIUM-TRIOXIDE SYSTEMS.

883 ID-NUMBER ID-NUMBER 883

AUTHOR LLOYD, R. C.
 TITLE EXPONENTIAL MEASUREMENTS WITH 1.25 PERCENT ENRICHED URANIUM
 REPORT NUMBER.... HW-60220, 55-57
 DATE PUBLISHED ... 59-04-20
 NSA-NUMBER 13:22628
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

A SERIES OF EXPONENTIAL EXPERIMENTS WERE MADE WITH 1.25 PER CENT ENRICHED URANIUM FUEL ELEMENTS TO OBTAIN FURTHER CRITICAL MASS INFORMATION ON SLIGHTLY ENRICHED URANIUM. THE FUEL ELEMENTS WERE 1.336-INCH OD, 0.500-INCH ID, AND 7.5 INCHES LONG. SIX ELEMENTS WERE LOADED INTO AN ALUMINUM TUBE HAVING A 1.402-INCH OD AND A 0.028-INCH WALL THICKNESS TO FORM A FUEL ROD. SMALL ALUMINUM TUBES CONTAINING WATER WERE POSITIONED IN THE CORE OF THE ROD FOR THE WET MEASUREMENT. THESE TUBES WERE 0.492-INCH OD WITH A 0.020-INCH WALL THICKNESS. THE EXPONENTIAL FLUX MEASUREMENTS WERE MADE WITH 55 FUEL RODS IN EACH LATTICE.(AUTH).

884 ID-NUMBER ID-NUMBER 884

AUTHOR JOHNSON, E. B.
 TITLE CRITICAL LATTICES OF URANIUM(4.89) METAL RODS IN WATER
 REPORT NUMBER.... ORNL-4143, 31-32
 DATE PUBLISHED ... 67-08-00
 SITE/PROGRAM OAK RIDGE - URANIUM(4.89%) METAL RODS IN WATER (LATTICES)

ABSTRACT

THE CRITICAL DIMENSIONS OF LATTICES OF URANIUM(4.89) METAL RODS ARE REPORTED. ALL THE AVAILABLE RODS ARE 30 CM LONG AND HAVE DIAMETERS OF 1.31, 2.07, AND 2.49 CM. LATTICES OF 30- AND 60- CM HEIGHT HAVE BEEN ASSEMBLED IN BOTH SQUARE AND TRIANGULAR PATTERNS.

885 ID-NUMBER ID-NUMBER 885

AUTHOR WEBSTER, J. W./ JOHNSON, E. B.
 TITLE CRITICALITY OF AQUEOUS SOLUTIONS OF 5 PERCENT ENRICHED URANIUM
 REPORT NUMBER.... ORNL-4134, 32
 DATE PUBLISHED ... 67-08-00
 SITE/PROGRAM OAK RIDGE - URANYL(4.9%)FLUORIDE - WATER

ABSTRACT

AS PART OF THE CONTINUING CRITICALITY-SAFETY PROGRAM AT THE CRITICAL EXPERIMENTS FACILITY, A COMPARISON HAS BEEN MADE OF THE ANALYTICAL AND EXPERIMENTAL RESULTS DESCRIBING THE CRITICALITY OF AN AQUEOUS 4.98% ENRICHED URANYL-FLUORIDE SOLUTION. A SINGLE SPHERE, A SINGLE CYLINDER, AND ARRAYS OF CYLINDERS WERE STUDIED; STRUCTURAL MATERIALS WERE MINIMIZED.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

886 ID-NUMBER ID-NUMBER 886

AUTHOR MAGNUSON, D. W.
 TITLE ENRICHED URANIUM METAL AND POLYETHYLENE CRITICAL EXPERIMENTS FOR
 HYDROGEN/URANIUM-235 RATIOS FROM 0 TO 5
 REPORT NUMBER.... ORNL-4134, 32-34
 DATE PUBLISHED ... 67-08-00
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) - POLYETHYLENE SLABS

ABSTRACT

IN A CONTINUING PROGRAM FOR PROVIDING CRITICAL PARAMETERS FOR NUCLEAR CRITICALITY SAFETY, CRITICAL EXPERIMENTS IN RECTANGULAR GEOMETRY HAVE BEEN PERFORMED FOR HYDROGEN TO URANIUM-235 ATOMIC RATIOS RANGING FROM 0 TO 5 USING LAYERS OF ENRICHED URANIUM METAL AND POLYETHYLENE.

889 ID-NUMBER ID-NUMBER 889

AUTHOR MORTON, J. R. / PIERCE, G. A. / GARDNER, L. L. / BALL, C. J.
 TITLE SUMMARY REPORT OF CRITICAL EXPERIMENTS PLUTONIUM ARRAY STUDIES, PHASE I
 REPORT NUMBER.... UCRL-50175
 DATE PUBLISHED ... 66-12-22
 SITE/PROGRAM LIVERMORE - PLUTONIUM ARRAYS

ABSTRACT

A SERIES OF SMALL-SCALE 3-DIMENSIONAL ARRAYS OF 3-KG CYLINDRICAL ALPHA-PLUTONIUM BILLETS HAS BEEN STUDIED. THE PARAMETER MEASURED WAS THE SURFACE-TO-SURFACE SPACING OF THE BILLETS AT THE CRITICAL CONDITION. THE FOLLOWING SYSTEMS WERE STUDIED: 2 X 2 X 2 ARRAYS BARE, REFLECTED AND MODERATED; 2 X 2 ARRAYS OF 6-KG PAIRS BARE AND MODERATED; 3 X 3 X 3 ARRAYS BARE AND REFLECTED; AND 3 X 3 X 3 ARRAYS CONTAINING SEVERAL PERTURBATIONS. MULTIPLICATION MEASUREMENTS ARE ALSO REPORTED FOR AN EXTENSIVE GROUP OF IRREGULAR ARRAYS, WHICH WERE RELEVANT TO THE OPERATIONAL SAFETY OF THE PROGRAM.

890 ID-NUMBER ID-NUMBER 890

AUTHOR GREEN, R. E. / KAY, R. E. / OKAZAKI, A. / CASINI, G. / METZDORF, H. J. /
 PAILLON, M.
 TITLE EXPERIMENTAL BUCKLINGS FOR SEVEN-ROD CLUSTERS OF NATURAL URANIUM CARBIDE
 IN HEAVY WATER MODERATOR
 REPORT NUMBER.... TANSO, 09, 123-124
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 66-06-00
 SITE/PROGRAM CANADA, CHALK RIVER NUCLEAR LABORATORIES - HEAVY WATER LATTICES

ABSTRACT

BUCKLINGS FOR HEAVY WATER-MODERATED LATTICE OF SEVEN-ROD NATURAL URANIUM CARBIDE CLUSTERS HAVE BEEN MEASURED IN THE ZED-2 CRITICAL FACILITY AT CHALK RIVER. TWENTY-FIVE COMPLETE FUEL ASSEMBLIES BORROWED FROM EURATOM AT ISPRA (BEING STUDIED THERE AS PART OF THE ORGEL PROJECT) WERE USED IN THE EXPERIMENTS. EACH CLUSTER CONTAINED SEVEN 3-M LONG RODS OF 2.52-CM DIAM URANIUM CARBIDE OF DENSITY 13.54 G/CM³ SHEATHED IN ALUMINUM (2.55-CM I.D., 1.0-MM WALL). THE CLUSTER ARRANGEMENT WAS A CENTRAL PENCIL PLUS SIX ON A 5.90-CM DIAM CIRCLE; EACH CLUSTER WAS CONTAINED IN AN ALUMINUM "PRESSURE TUBE" (9.10-CM I.D., 2.0-MM WALL) AND "CALANDRIA TUBE" (10.10-CM I.D., 1.5-MM WALL), ALSO ALUMINUM.

THE BUCKLINGS WERE DETERMINED USING THE SUBSTITUTION METHOD, IN WHICH UP TO 25 URANIUM CARBIDE ASSEMBLIES SUCCESSIVELY REPLACED REFERENCE FUEL AT THE CENTER OF A LARGE CORE OF THE LATTER. THE DIFFERENCE IN BUCKLING BETWEEN TEST AND REFERENCE REGIONS WAS DERIVED FROM THE OBSERVED CHANGES IN CRITICAL MODERATOR LEVEL. WE HAVE USED 19-ROD URANIUM DIOXIDE CANDU-TYPE BUNDLES FOR OUR REFERENCE FUEL.

MEASUREMENTS WERE MADE AT ROOM TEMPERATURE IN SQUARE LATTICES AT SEVERAL PITCHES IN THE RANGE 20 TO 32 CM, WITH THE URANIUM CARBIDE CLUSTERS HAVING FOUR DIFFERENT "COOLANTS": HEAVY WATER; AIR; HB-40 (GREEN AND BIGHAM); AND DOWTHERM A. THE REFERENCE FUEL ALWAYS HAD HEAVY WATER COOLANT.

THE CRITICAL HEIGHT MEASUREMENTS WERE ANALYZED BY FOUR DIFFERENT METHODS.

- 1) A SIMPLIFIED PERSSON METHOD USING ONLY 5 AND 9 CLUSTER SUBSTITUTIONS.
- 2) A ONE-GROUP STATISTICAL WEIGHT METHOD THAT USED A COBALT WIRE ABSORBER TO DETERMINE THE CHANGE IN RADIAL BUCKLING WITH CRITICAL HEIGHT FOR OUR REFLECTED SYSTEM.
- 3) A TWO-GROUP, TWO-REGION HOMOGENEOUS DIFFUSION-THEORY METHOD DEVELOPED AT EURATOM AND INCORPORATED IN THE COMPUTER PROGRAM BERTHE.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

4) A HETEROGENEOUS SOURCE-SINK METHOD, THE MICRETE PROGRAM DESCRIBED IN ANOTHER PAPER AT THIS CONFERENCE.

THE RESULTS ARE TABULATED AS THE DIFFERENCE BETWEEN THE BUCKLINGS OF THE TEST AND REFERENCE FUELS FOR THE ACTUAL EXPERIMENTAL CONDITIONS, TO COMPARE THE VARIOUS METHODS OF ANALYSIS. ALSO GIVEN ARE BUCKLINGS FOR THE REFERENCE FUEL AS DETERMINED BY FLUX MAPPING. IT IS SEEN THAT ALL METHODS GIVE THE SAME RESULTS WITHIN ABOUT $\pm 0.10 M^{+2}$ FOR ALL BUT THE AIR-COOLED CLUSTERS, WHERE IT IS FELT THAT THE ONE-GROUP METHODS OF ANALYSIS AS USED HERE DO NOT PROPERLY ALLOW FOR THE CHANGES IN DIFFUSION COEFFICIENTS.

THE VARIOUS METHODS OF ANALYSIS WERE TESTED BY DOING SUBSTITUTION EXPERIMENTS WITH FUEL ASSEMBLIES FOR WHICH BUCKLINGS HAD BEEN DETERMINED FROM FLUX-MAPPING EXPERIMENTS IN LARGE CORES. THE RESULTS OF THESE TEST CASES SHOWED THAT THE HETEROGENEOUS METHOD GAVE THE BEST AGREEMENT WITH THE FLUX-MAPPING EXPERIMENTS AND, THEREFORE, BUCKLING VALUES ARE DERIVED FROM THIS METHOD OF ANALYSIS. THESE FINAL VALUES HAVE BEEN CORRECTED TO MODERATOR CONDITIONS OF 25 DEGREES C AND 99.63 AT% HEAVY WATER. WE BELIEVE THE ERRORS TO BE LESS THAN OR EQUAL TO $\pm 0.10 M^{+2}$. (AUTH).

891 ID-NUMBER ID-NUMBER 891

AUTHOR LIIKALA, R. C./ STINSON, W. P.
 TITLE EXPERIMENTAL AND ANALYTICAL RESULTS FOR PLUTONIUM DIOXIDE-URANIUM DIOXIDE-
 WATER LATTICES
 REPORT NUMBER..... TANSO, 09, 127-128
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 66-06-00
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM DIOXIDE ELEMENTS IN WATER

ABSTRACT

THE RESULTS OF SUBCRITICAL EXPERIMENTS AND ANALYTICAL CORRELATIONS FOR PLUTONIUM-DIOXIDE- URANIUM-DIOXIDE LIGHT-WATER LATTICES ARE DESCRIBED. THE FUEL RODS ARE 0.030-INCH THICK ZIRCALOY TUBES WITH A 0.508-INCH I.D. FILLED WITH VIBRATORY COMPACTED 2 WEIGHT PERCENT PLUTONIUM-DIOXIDE- URANIUM-DIOXIDE TO A LENGTH OF 36.0 INCH EACH ROD CONTAINS AN AVERAGE OF 1128 G OF PLUTONIUM- DIOXIDE-URANIUM-DIOXIDE. THE URANIUM IN URANIUM-DIOXIDE IS NATURAL, AND THE ISOTOPIC COMPOSITIONS OF THE PLUTONIUM ARE, BY WEIGHT, 91.62 PERCENT PLUTONIUM-239, 7.65 PERCENT PLUTONIUM-240, 0.70 PERCENT PLUTONIUM-241, 0.03 PERCENT PLUTONIUM-242, AND 81.11 PERCENT PLUTONIUM-239, 16.54 PERCENT PLUTONIUM-240, 2.15 PERCENT PLUTONIUM-241, 0.20 PERCENT PLUTONIUM-242, AND 71.76 PERCENT PLUTONIUM- 239, 23.50 PERCENT PLUTONIUM-240, 4.08 PERCENT PLUTONIUM-241, 0.66 PERCENT PLUTONIUM-242. THE RODS WERE LOADED IN HEXAGONAL LATTICES AT SPACINGS COVERING THE RANGE OF MODERATOR-TO-PLUTONIUM-DIOXIDE- URANIUM-DIOXIDE VOLUME RATIOS OF 0.61 TO 9.7. ALL LATTICES WERE COMPLETELY REFLECTED WITH WATER.

THE EXPERIMENTAL PROCEDURES ARE IDENTICAL TO THOSE UTILIZED PREVIOUSLY IN THE DETERMINATION OF CRITICAL MASSES AND BUCKLINGS OF 1.5 WEIGHT PERCENT PLUTONIUM-DIOXIDE-URANIUM-DIOXIDE-WATER LATTICES.

THE RESULTS OF EXPERIMENTAL AND THEORETICAL ANALYSIS ARE SHOWN. VARIATIONS WITH LATTICE SPACING AND PLUTONIUM-240 CONCENTRATION ARE APPARENT IN CALCULATED MULTIPLICATIONS. THE MULTIPLICATIONS AND NUMBERS OF RODS FOR CRITICAL WERE OBTAINED FROM A ONE-DIMENSIONAL FOUR-ENERGY GROUP-DIFFUSION THEORY CALCULATION ASSUMING A TWO-REGION REACTOR CONSISTING OF A HOMOGENEOUS CORE AND WATER REFLECTOR. AXIAL LEAKAGE EFFECTS WERE ACCOUNTED FOR WITH TRANSVERSE BUCKLINGS. CROSS SECTIONS FOR THE HOMOGENIZED LATTICE WERE OBTAINED FROM UNIT CELL CALCULATIONS UTILIZING THE HRG CODE FOR NONTHERMAL EFFECTS, AND THE THERMOS CODE FOR THERMAL EFFECTS. DANCOFF FACTORS TAKEN FROM PUBLISHED TABLES WERE USED FOR THE RESONANCE SHADOWING CORRECTIONS IN THE HRG CODE. THE NELKIN SCATTERING MODEL FOR HYDROGEN WAS USED IN THE THERMAL CALCULATIONS. ALL MICROSCOPIC CROSS SECTIONS ARE TAKEN FROM THE BNW MASTER LIBRARY. THE THERMAL CROSS SECTIONS FOR PLUTONIUM-239 ARE THE EARLIER RECOMMENDED SET OF SHER IN WHICH η OF PLUTONIUM-239 = 2.093.

MORE RECENT EVALUATIONS RESULT IN A VALUE FOR η OF PLUTONIUM-239 = 2.115. IF THE LATTER SETS AND PROBABLY THE MORE CORRECT CROSS-SECTION DATA FOR PLUTONIUM-239 WERE USED, THE MULTIPLICATIONS WOULD ALL BE APPROX. 1 PERCENT HIGHER. THUS, ANY CALCULATED MULTIPLICATIONS NEAR AND/OR AT UNITY PROBABLY ARE THE RESULT OF COMPENSATING ERRORS IN THE THEORETICAL METHODS.

RESULTS OF CALCULATIONS FOR THE 1.5 WEIGHT PERCENT PLUTONIUM-DIOXIDE-URANIUM-DIOXIDE-WATER EXPERIMENTS, AND FOR THE SAXTON CRITICAL EXPERIMENTS USING 6.6 WEIGHT PERCENT PLUTONIUM-DIOXIDE- URANIUM-DIOXIDE RODS, CONFIRM THIS CONCLUSION. (AUTH).

892 ID-NUMBER ID-NUMBER 892

AUTHOR BOYNTON, A. R./ PENNINGTON, E. M.
 TITLE CRITICAL EXPERIMENTS AND CALCULATIONS IN SOME VERY UNDERMODERATED,
 SLIGHTLY ENRICHED, URANIUM OXIDE/WATER LATTICES
 REPORT NUMBER..... TANSO, 09, 129
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 66-06-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - HIGH CONVERSION CRITICAL EXPERIMENT

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE HIGH CONVERSION CRITICAL EXPERIMENT (HI-C) AT ARGONNE NATIONAL LABORATORY WAS INITIATED TO EXTEND THE RANGE OF INVESTIGATIONS WITH LIGHT-WATER-MODERATED, SLIGHTLY ENRICHED, OXIDE CORES. LATTICES HAVE BEEN ASSEMBLED THAT HAD HYDROGEN-TO-URANIUM-238 ATOM RATIOS OF FROM 4.16 TO 0.50. THE FUEL WAS 3.04 WT% ENRICHED URANIUM IN THE FORM OF 10.17 G/CM³ URANIUM DIOXIDE PELLETS OF 0.935-CM DIAMETER LOADED TO 122-CM LENGTH IN CLADDING TUBES OF EITHER 1.058-CM O.D., 0.048-CM THICK ALUMINUM, OR 1.057-CM O.D., 0.0496-CM THICK STAINLESS STEEL. BOTH SQUARE AND TRIANGULAR LATTICE PITCHES WERE USED.

THE MODIFIED CONVERSION RATIO, URANIUM-238 TO URANIUM-235 FISSION RATIO ($\Delta(28)$), URANIUM-238 CAPTURE CADMIUM RATIO, AND THERMAL DISADVANTAGE FACTOR HAVE BEEN MEASURED IN THE FULL RANGE OF LATTICES, WHILE CRITICAL BUCKLINGS AND REFLECTOR SAVINGS HAVE BEEN MEASURED IN THE LOOSER ASSEMBLIES. THE MEASUREMENTS OF LATTICE AND CELL PARAMETERS WERE CARRIED OUT AS PREVIOUSLY DESCRIBED.

CALCULATIONS OF FOUR-GROUP CONSTANTS, MATERIAL BUCKLING, REFLECTOR SAVINGS, AND VARIOUS CELL PARAMETERS WERE PERFORMED. CONSTANTS FOR THREE FAST GROUPS WITH LOWER ENERGY BOUNDARIES AT 1.35 MEV, 1.23 KEV, AND 0.414 EV WERE OBTAINED WITH THE GAM-I CODE, WHILE THOSE FOR THE THERMAL GROUP WERE FOUND USING THERMOS. THE P-1 OPTION WAS USED IN GAM-I, WHILE THE NELKIN KERNEL FOR HYDROGEN IN WATER WAS USED IN THERMOS. AN EXTRA SCATTERING REGION WAS USED IN THERMOS TO MOCK-UP THE ISOTROPIC RETURN CONDITION AT THE UNIT-CELL OUTER BOUNDARY. BOTH EXPERIMENTAL AND CALCULATED RESULTS ARE GIVEN.

CALCULATED CRITICAL BUCKLINGS OBTAINED BY FUNDAMENTAL MODE CALCULATIONS OF FOUR-GROUP DIFFUSION THEORY DIFFER ONLY SLIGHTLY FROM EXPERIMENTAL BUCKLINGS, IN CONTRAST TO PRELIMINARY CALCULATIONS WHICH YIELDED VALUES MUCH HIGHER THAN EXPERIMENT. THIS IMPROVED AGREEMENT IS ATTRIBUTED TO THE REPLACEMENT OF URANIUM-235 AND URANIUM-238 CROSS SECTIONS IN THE ORIGINAL GAM-I LIBRARY BY VERSIONS OBTAINED FROM HANFORD. RADIAL REFLECTOR SAVINGS WERE OBTAINED USING THE ARGONNE MULTIGROUP DIFFUSION-THEORY CODE REX. AGREEMENT WITH EXPERIMENT IS GOOD. THE URANIUM-238-TO-URANIUM-235 FISSION RATIO WAS CALCULATED USING THE FOUR-GROUP CONSTANTS AND FLUXES. AGREEMENT WITH EXPERIMENT IS POOR. THE EXPLANATION FOR THE DISCREPANCY IS NOT KNOWN; IT MAY BE CAUSED BY INADEQUACIES IN CROSS SECTIONS OR BY SOME SYSTEMATIC EXPERIMENTAL ERROR. THE CALCULATED VALUES OF THE MODIFIED CONVERSION RATIO ARE IN REASONABLE AGREEMENT WITH EXPERIMENT.

IMPROVEMENTS COULD BE MADE IN THE THEORETICAL METHODS USED IN THE STUDY, ALTHOUGH THOSE USED HERE SHOULD BE REASONABLY ACCURATE. HOWEVER, EVEN WITH VERY GOOD METHODS, THE THEORETICAL STUDY OF TIGHTLY PACKED, LIGHT-WATER-MODERATED LATTICES IS DIFFICULT. THIS IS BECAUSE NONTHERMAL EVENTS ARE OF CONSIDERABLE IMPORTANCE, AND INACCURACIES IN CROSS-SECTION DATA PRODUCE LARGE UNCERTAINTIES IN THE CALCULATIONS. (AUTH).

893 ID-NUMBER ID-NUMBER 893

AUTHOR OLSON, R. L./ GRAVES, W. E.
 TITLE CRITICAL EXPERIMENTS WITH HIGHLY BURNED-UP PLUTONIUM IN HEAVY WATER
 REPORT NUMBER.... TANSO, 09, 181-182
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 SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES
 IN HEAVY WATER

ABSTRACT

PLUTONIUM WITH LARGE FRACTIONS OF PLUTONIUM-240, PLUTONIUM-241, AND PLUTONIUM-242 WAS PREPARED AS AN INTERMEDIATE STEP IN A SAVANNAH RIVER PROGRAM TO PRODUCE 3 KG OF CURIUM-244. THIS MATERIAL AFFORDED AN OPPORTUNITY TO INVESTIGATE THE REACTOR PHYSICS OF THE HIGHER PLUTONIUM ISOTOPES BY COMPARING PLUTONIUM WITH A WIDE RANGE OF ISOTOPE COMPOSITIONS IN HEAVY WATER-MODERATED CRITICALS IN THE PROCESS DEVELOPMENT PILE (PDP).

TWO PLUTONIUM COMPOSITIONS WERE USED, AS LISTED IN FIG. 1, WHICH ALSO SHOWS THE DESIGNS OF THE COEXTRUDED ALUMINUM FUEL ASSEMBLIES. THE EXPERIMENTAL LATTICES CONSISTED OF 19 OF THESE FUEL ASSEMBLIES IN HEXAGONAL ARRAYS AT 12.12- OR 14.00-INCH PITCHES. TO PROVIDE AN EASILY CALCULATED RADIAL BOUNDARY, THE FUEL LATTICES WERE EXTENDED FOR TWO ADDITIONAL RINGS WITH NONFISSIONING IRON- LITHIUM ASSEMBLIES HAVING VERY NEARLY THE SAME ABSORPTION CROSS SECTION AS THE FUEL.

THE EXPERIMENTS CONSISTED PRIMARILY OF CRITICAL MODERATOR HEIGHT MEASUREMENTS AND FLUX TRAVERSES TO DETERMINE THE LATTICE BUCKLINGS, $B(M)^{+2}$ AT VARIOUS UNIFORM TEMPERATURES BETWEEN 20 AND 50 DEGREES C. THE LATTICES HAD A BOTTOM REFLECTOR COMPOSED OF HEAVY WATER AND THE ALUMINUM EXTENSIONS OF THE FUEL TUBES. THIS REFLECTOR COULD BE IGNORED IN DETERMINING THE AXIAL BUCKLING FROM THE FLUX TRAVERSES BY CHOOSING DATA SUFFICIENTLY FAR FROM THE BOUNDARY. THIS PROCEDURE WAS CHECKED BY CALCULATIONS OF REFLECTOR SAVINGS USING THE FLOG FOUR-GROUP CODE WITH CELL PARAMETERS CALCULATED WITH THE HAMMER CODE. THE DETERMINATION OF THE ISOTHERMAL TEMPERATURE COEFFICIENTS REQUIRED THE ESTIMATION OF TEMPERATURE EFFECTS ON RADIAL BUCKLING, AND ON BOTTOM EXTRAPOLATION DISTANCE. THE EFFECT ON $B(R)^{+2}$ WAS CALCULATED WITH THE SRL-HERESY CODE. THE CHANGE IN THE BOTTOM EXTRAPOLATION DISTANCE WAS CALCULATED WITH THE FLOG CODE.

THE PRIMARY PURPOSE OF THE EXPERIMENTS WAS TO PERMIT COMPARISONS WITH PARAMETERS CALCULATED BY THE HAMMER CODE. THESE COMPARISONS INDICATE ONLY FAIR AGREEMENT IN THE ESTIMATES OF $B(M)^{+2}$ AND AN OVER-ESTIMATE OF THE TEMPERATURE COEFFICIENTS IN THE HEAVY ISOTOPE LATTICES. PLUTONIUM CROSS SECTIONS USED IN THE CALCULATIONS ARE BEING REEXAMINED TO DETERMINE IF CHANGES WITHIN THE CROSS- SECTION UNCERTAINTIES CAN MATCH THE EXPERIMENTAL RESULTS. (AUTH).

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

894 ID-NUMBER ID-NUMBER 894

AUTHOR JOHNSON, E. B.
 TITLE CRITICAL PARAMETERS OF URANIUM (1.95) METAL CYLINDRICAL ANNULI
 REPORT NUMBER..... TANSO, 09, 185-186
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 66-06-00
 SITE/PROGRAM OAK RIDGE - URANIUM(1.95,3.85%) METAL CYLINDRICAL ANNULI IN WATER

ABSTRACT

EXPERIMENTS HAVE BEEN PERFORMED AT THE ORNL CRITICAL EXPERIMENTS FACILITY TO DETERMINE THE CRITICAL PARAMETERS OF LATTICES OF CYLINDRICAL ANNULI OF URANIUM ENRICHED TO 1.95 PERCENT IN URANIUM-235.

IN THE FIRST SERIES OF EXPERIMENTS, THE DIMENSIONS OF THE UNITS WERE 7.2-INCH O.D., 2.6-INCH I. D., AND 40-INCHES LONG, WITH AN AVERAGE MASS OF 442 KG, OF WHICH 8.6 KG WAS URANIUM-235. A TOTAL OF 25 UNITS WAS AVAILABLE. FOR THE NEXT SERIES, THE O.D. WAS REDUCED TO 6.2 INCH, WHICH DECREASED THE MASS OF A UNIT TO 308 KG (6.0 KG OF URANIUM-235); THE OTHER DIMENSIONS WERE UNCHANGED.

THE UNITS WERE LATTICED IN WATER BOTH SQUARE AND TRIANGULAR PATTERNS TO DETERMINE THE CRITICAL NUMBER AS A FUNCTION OF SPACING. WITH THE UNITS THAT WERE 7.2-INCH O.D., IT WAS FOUND THAT THE MINIMUM FOR EACH PATTERN OCCURRED AT A WATER-TO-URANIUM VOLUME RATIO OF 0.65, AND THAT THE CRITICAL NUMBER OF UNITS ARRANGED IN A TRIANGULAR PATTERN WAS HALF THAT REQUIRED FOR A SQUARE PATTERN. FOR THE 6.2-INCH-O.D. UNITS, THE MINIMUM WAS FOUND AT A WATER-TO-URANIUM VOLUME RATIO OF 0.8, AND THE DIFFERENCE BETWEEN THE CRITICAL NUMBER OF UNITS ARRANGED IN SQUARE AND TRIANGULAR PATTERNS WAS APPRECIABLY REDUCED.

IN SEVERAL CRITICAL LATTICES, WATER WAS EXCLUDED FROM THE 2.6-INCH-DIAMETER CENTRAL REGION OF EACH ANNULUS BY INSERTING COAXIAL STYROFOAM CYLINDERS (DENSITY = 0.024 G/CM³) OF THREE DIFFERENT DIAMETERS. IN ALL CASES, EXCLUSION OF WATER FROM THE CENTRAL REGION DECREASED THE REACTIVITY. FOR EXAMPLE, THE PRESENCE OF A 1.55-INCH-DIAMETER STYROFOAM CYLINDER IN EACH ANNULUS OF A LATTICE INCREASED THE CRITICAL NUMBER OF UNITS FROM 10 TO 12.5, AND SHIFTED THE POSITION OF THE MINIMUM VOLUME RATIO FROM 0.65 TO 0.60 AT A SURFACE SEPARATION OF 1 INCH IN TRIANGULAR PATTERN. (AUTH).

895 ID-NUMBER ID-NUMBER 895

AUTHOR PRICE, G. A. / WINDSOR, H. / TUNNEY, W. J. / HELLSTRAND, E.
 TITLE ORGANIC-COOLED HEAVY-WATER MODERATED URANIUM-233 FUELED LATTICE EXPERIMENTS
 REPORT NUMBER..... TANSO, 09, 518-519
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 66-10-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - URANIUM-233 - HEAVY WATER (ORGANIC COOLED)

ABSTRACT

TO PROVIDE DATA FOR EVALUATING THE URANIUM-233-THORIUM CYCLE IN ORGANIC-COOLED HEAVY-WATER- MODERATED REACTORS, MEASUREMENTS OF MATERIAL BUCKLING AND THERMAL-NEUTRON DISTRIBUTIONS WERE MADE IN SEVERAL EXPONENTIAL ASSEMBLIES. FUEL ELEMENTS WERE COMPOSED OF 31 AND 24 "KILOROD" FUEL PINS (97 WT% THORIUM-DIOXIDE + 3 WT% URANIUM-233-DIOXIDE, 8.96 GRAMS PER CC DENSITY, ZIRCALOY-2 CLAD, 0.499- INCH O.D., 0.430-INCH I.D.) ON 0.6767-INCH PITCH IN A STAINLESS-STEEL CANISTER (4.509-INCH O.D., 4. 265-INCH I.D.). THE 24-PIN ELEMENT CONTAINED A SOLID ALUMINUM PLUG 1.755-INCH IN DIAMETER DOWNTHERM-A WAS USED AS THE COOLANT IN THE FUEL ELEMENT. THE STAINLESS-STEEL CANISTER SERVED TO REDUCE THE MATERIAL BUCKLING. OTHERWISE, THE MATERIAL BUCKLING WOULD HAVE BEEN TOO LARGE TO PERMIT MEANINGFUL MEASUREMENTS TO BE MADE IN THESE CLUSTER GEOMETRIES.

896 ID-NUMBER ID-NUMBER 896

AUTHOR LLOYD, R. C./ CLAYTON, E. D.
 TITLE INTERACTING ARRAYS OF CONTAINERS WITH URANIUM-233 SOLUTION
 REPORT NUMBER..... TANSO, 10, 188-189
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 67-06-00
 SITE/PROGRAM HANFORD - URANIUM-233 SOLUTIONS

ABSTRACT

SUBCRITICAL NEUTRON INTERACTION EXPERIMENTS WERE PERFORMED WITH BARE AND LUCITE-REFLECTED ARRAYS OF BOTTLES OF URANIUM-233 SOLUTION. THE EFFECT ON CRITICALITY OF ADDING LUCITE MODERATOR BETWEEN THE BOTTLES WAS ALSO STUDIED. THESE EXPERIMENTS PROVIDE DATA FOR NUCLEAR SAFETY GUIDANCE IN HANDLING, STORAGE, AND SHIPMENT OF THIS MATERIAL, AND FOR CHECKING INTERACTION CALCULATIONS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE URANIUM-233 WAS IN THE FORM OF URANYL NITRATE HEXAHYDRATE AT A CONCENTRATION OF ABOUT 330 G URANIUM-233 LITER; THE URANIUM WAS CONTAINED IN THREE-LITER POLYETHYLENE BOTTLES. THE MOLARITY OF THE SOLUTION WAS ABOUT 0.53. THE BOTTLES WERE 17.75-INCH HIGH, 4.7-INCH O.D., WITH A WALL THICKNESS OF 0.100 INCH THE AVERAGE SOLUTION HEIGHT WAS ABOUT 11.5 INCHES -- 960 G OF URANIUM/BOTTLE.

THE EFFECT OF MODERATION WAS DETERMINED BY PLACING LUCITE PLATES OF DIFFERENT THICKNESS BETWEEN BOTTLES OF THE ARRAYS. THIS WAS DONE FOR THE 2 X 2 BOTTLE REFLECTED ARRAY AND FOR THE 3 X 3 AND 4 X 4 BOTTLE BARE ARRAYS. THE THICKNESS OF LUCITE BETWEEN BOTTLES GIVING THE LARGEST REACTIVITY INCREASE IN THE REFLECTED ARRAY WAS ABOUT ONE INCH, AND IN THE BARE ARRAY ABOUT TWO INCHES. (AUTH).

898 ID-NUMBER ID-NUMBER 898

AUTHOR BROWN, C. L./ HANSEN, L. E./ TOFFER, H.
 TITLE EXPERIMENTAL BUCKLING MEASUREMENTS WITH 2.1 PERCENT ENRICHED URANIUM TUBES
 IN LIGHT WATER
 REPORT NUMBER..... TANSO, 10, 191-192
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 67-06-00
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

EXPONENTIAL AND CRITICAL APPROACH EXPERIMENTS WITH 1.002, 1.25, AND 1.95 WT% URANIUM-235 ENRICHED URANIUM TUBES IN LIGHT WATER WERE REPORTED IN 1965. ALTHOUGH THESE EXPERIMENTS NEARLY DOUBLED THE CRITICALITY DATA AVAILABLE ON TUBULAR FUELS, THE ENRICHMENTS AND TUBE SIZES COVERED WERE STILL TOO FEW FOR THEORETICAL CORRELATIONS AND EXTRAPOLATION TO DIFFERENT TUBE SIZES AT HIGHER ENRICHMENTS. THE EXPERIMENTS DESCRIBED IN THE PRESENT PAPER EXTEND THE CRITICALITY DATA TO 2.1 WT% URANIUM-235 ENRICHED URANIUM TUBES OF TWO SIZES: 2.33-IN O.D., 1.77-INCH I.D.; AND 1.38-INCH O.D., 0.63-INCH I.D. EXPERIMENTAL RESULTS ARE ALSO GIVEN OF A SPECIAL SERIES OF CRITICALITY EXPERIMENTS, WHICH INCLUDE TWO MIXED LATTICES OF 0.95 AND 2.1 WT% URANIUM-235 ENRICHED TUBES, A POISONED LATTICE, AND A LATTICE CONTAINING LITHIUM-ALUMINATE TARGET RODS. THE RESULTS OF THE MEASUREMENTS ARE PRESENTED.

MATERIAL BUCKLINGS AND EXTRAPOLATION DISTANCES WERE OBTAINED USING STANDARD EXPONENTIAL AND CRITICAL APPROACH TECHNIQUES. THE TUBES WERE ARRANGED IN COLUMNS IN A HEXAGONAL PATTERN AND SEVERAL LATTICE SPACINGS MEASURED FOR EACH FUEL. THE 2.33-INCH-O.D. FUEL COLUMNS WERE 26.5-INCHES LONG, THE SAME LENGTH AS THE FUEL TUBES. THE LENGTH OF THE 1.38-INCH O.D. FUEL COLUMNS WAS 49 INCHES, BEING COMPRISED OF SEVEN 7-INCH LONG FUEL ELEMENTS IN ALUMINUM CANS. EXTRAPOLATION DISTANCES WERE DETERMINED BY MEASURING RELAXATION LENGTHS IN THREE ASSEMBLIES OF DIFFERENT DIAMETERS. IN THE CRITICAL APPROACH EXPERIMENTS, THE NUMBER OF TUBES FOR CRITICALITY WAS DETERMINED FROM THE EXTRAPOLATION OF INVERSE MULTIPLICATION CURVES FOR EACH LATTICE. EACH LATTICE CONTAINED UP TO 96 PERCENT OF THE NUMBER OF TUBES FOR CRITICALITY.

EXPONENTIAL MEASUREMENTS WITH MIXED ENRICHMENTS WERE PERFORMED WITH 0.95 AND 2.1 WT% ENRICHED TUBES IN AN ALTERNATING TUBE ARRANGEMENT AND IN AN ALTERNATING RING ARRANGEMENT. ONLY THE 2.2-INCH LATTICE PITCH WAS MEASURED. USING THE EXTRAPOLATION DISTANCE MEASURED FOR THE 2.1 WT% TUBES ALONE (6.68 CM), MATERIAL BUCKLINGS WERE ESTIMATED TO BE 58.85 M⁻² AND 60.14 M⁻² FOR THE ALTERNATING TUBE AND RING ARRANGEMENTS, RESPECTIVELY, COMPARED TO 29.3 M⁻² FOR 0.95 WT% TUBES ALONE, AND 96.64 M⁻² FOR 2.1 WT% TUBES ALONE. IT IS INTERESTING TO NOTE THAT FOR THE MIXED LATTICES, THE ESTIMATED CRITICAL NUMBER OF TUBES IN THE ALTERNATING TUBE AND ALTERNATING RING FUEL ARRANGEMENT ARE EQUAL WITHIN THE UNCERTAINTY OF THE EXPERIMENT. FIRM CONCLUSIONS, HOWEVER, CANNOT BE DRAWN WITHOUT MEASUREMENTS OF ADDITIONAL FUEL PATTERNS AND LATTICE SPACINGS.

MEASUREMENTS WITH 2.1 WT% ENRICHED 2.33-INCH-O.D. TUBES CONTAINING 1.0-INCH-O.D. LITHIUM ALUMINATE OXIDE TARGETS WERE MADE IN FOUR LATTICES. THE LITHIUM ALUMINATE CONTAINED 10.5 WT% LITHIUM. THE ADDITION OF THE TARGET ROD TO THE 2.1 WT% TUBES INCREASED THE CRITICAL MASS BY A FACTOR OF ABOUT 20.

THE POISONED LATTICES CONSISTED OF A 6:1 RATIO OF 2.1 WT% ENRICHED URANIUM 2.33-INCH-O.D. TUBES AND 2.4-INCH-O.D. CANS CONTAINING GROUND PYREX GLASS. EACH CAN WAS SURROUNDED BY A RING OF SIX URANIUM TUBES. ONLY THE 2.8-INCH LATTICE PITCH WAS MEASURED AND SEVEN RINGS FILLED THE LATTICE. THE EXPONENTIAL MEASUREMENT INDICATES A BUCKLING OF 34.04 M⁻² AND 140 FUEL TUBES FOR CRITICALITY (COMPARED TO 28.3 TUBES FOR CRITICALITY IN THE 2.8-INCH LATTICE WITHOUT POISON).

THE HAMMER CODE WAS USED TO COMPUTE MATERIAL BUCKLINGS AND CRITICAL MASSES. CALCULATIONS WERE MADE BOTH WITH AND WITHOUT SEGHAL RESONANCE PARAMETERS FOR URANIUM-238. THE CRITICAL NUMBER OF TUBES FOR MIXED AND POISONED LATTICES WERE COMPUTED USING HFN AND EXTERMINATOR. MULTIGROUP CONSTANTS (18 ENERGY GROUPS) WERE OBTAINED USING A MODIFIED VERSION OF THE HAMMER CODE. THE RESULTS OF CALCULATIONS COMPLETED TO DATE ARE GIVEN. (AUTH).

899 ID-NUMBER ID-NUMBER 899

AUTHOR SEHGAL, B. R./ WINDSOR, H./ TUNNEY, W. J.
 TITLE MEASUREMENTS AND ANALYSES OF SOME URANIUM-233 DIOXIDE-THORIUM DIOXIDE
 WATER LATTICE EXPERIMENTS
 REPORT NUMBER..... TANSO, 10, 193-194
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 67-06-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - URANIUM-233 - THORIUM DIOXIDE LATTICE

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

MEASUREMENTS, INTERPRETATION, AND ANALYSES OF A SERIES OF EXPONENTIAL WATER-MODERATED UNIFORM LATTICE EXPERIMENTS WITH 3 PERCENT URANIUM-233 THORIUM-232 OXIDE RODS ARE REPORTED IN THIS NOTE. THE FUEL IS VIBRATORILY COMPACTED TO A DENSITY OF 8.96 G/CM³ IN ZIRCALOY-2 TUBES OF 1.27-CM O.D. AND 0.8-MM WALL THICKNESS.

BUCKLINGS WERE MEASURED BY BOTH THE MODIFIED VARIABLE LOADING AND THE FLUX SHAPE TECHNIQUES. THE INTERPRETATION INCLUDED SMOOTHING OF THE MEASUREMENTS AND USE OF CALCULATIONS TO CORRECT FOR THE NONASYMPTOTIC BEHAVIOR OF THE LATTICES. THE INTERPRETED RESULTS ARE QUOTED AS "BEST" VALUES.

THE STANDARD CADMIUM RATIO TECHNIQUE WAS USED FOR THE MEASUREMENT OF $\rho(02)$, THE RATIO OF EPI- TO SUBCADMIUM CAPTURES IN THORIUM-232. THE 27.4-DAY HALF-LIFE PALLADIUM-233 PRODUCED IN THORIUM DIOXIDE WAFERS WAS GAMMA COUNTED. THE DIFFERENTIAL TECHNIQUE WAS USED TO DETERMINE $\zeta(DY)$ THE DYSPROSIUM THERMAL DISADVANTAGE FACTOR. DYSPROSIUM ALUMINUM FOILS 1.19-MM DIAM X 0.127-MM THICK WERE DISTRIBUTED THROUGHOUT A UNIT CELL.

THE HAMMER CODE USED IN THE ANALYSES. THIS CODE COMBINES THE CODES THERMOS, ZUT, TUZ, FOG, AND A MODIFIED MUFT IN WHICH A COLLISION-PROBABILITY CELL CALCULATION IS DONE FOR THE EPITHERMAL FLUX.

THE THERMAL CROSS-SECTION LIBRARY IS CONSTRUCTED TO CONFORM WITH THE EVALUATED CROSS SECTIONS REPORTED IN BNL-325. THE GASKET-FLANGE KERNEL IS USED FOR HYDROGEN. THE RESONANCE PARAMETERS FOR URANIUM-233 AND THORIUM-232 ARE TAKEN FROM BNL-325. THE EPITHERMAL SMOOTH CROSS SECTIONS FOR URANIUM-233 ARE CONSTRUCTED TO NORMALIZE TO THE TOTAL FISSION AND CAPTURE INTEGRALS RECOMMENDED BY FEINER AND THOSE FOR THORIUM-233 ARE BASED ON AN ANALYSIS OF THORIUM-232 RESONANCE INTEGRAL.

THE RESULTS FOR K-EFF AT THE "BEST" $B(M) \approx 2$ VALUES AND THE CALCULATED AND MEASURED VALUES FOR REFLECTOR SAVINGS λ ARE SHOWN. THE MEASURED AND CALCULATED RESULTS FOR $\rho(02)$ AND $\zeta(DY)$ ARE SHOWN.

IT IS SEEN THAT THE EXPERIMENTAL $\zeta(DY)$ IS ABOUT 2 PERCENT LOWER THAN THE CALCULATED VALUES AND THAT THE K-EFF INCREASES WITH VOLUME RATIO AND DECREASES WITH POISON CONCENTRATION. THE LATTER TREND IS PARTIALLY REMOVED IF THE CALCULATED VALUES OF $\zeta(DY)$ ARE REDUCED BY 2 PERCENT. THE CALCULATED $\rho(2)$ AND GAMMA VALUES ARE IN GOOD AGREEMENT WITH EXPERIMENTS. IT SEEMS, HOWEVER, THAT THE CAPTURES IN THE THERMAL RANGE MAY BE UNDERESTIMATED. (AUTH).

900 ID-NUMBER ID-NUMBER 900

AUTHOR BARDES, R. G. / GILLETTE, E. M. / NIRSCHL, R. J. / TRAYLOR, R. C.

TITLE EXPERIMENTAL AND ANALYTICAL DETERMINATION OF THE REACTIVITY WORTHS OF URANIUM-233, URANIUM-235, URANIUM-236 AND NEPTUNIUM-237 SAMPLES IN A SERIES OF URANIUM-235-GRAPHITE CRITICAL ASSEMBLIES

REPORT NUMBER..... TANSO, 10, 198

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 67-06-00

SITE/PROGRAM GENERAL ATOMICS - GRAPHITE CRITICAL ASSEMBLY (HTGR)

ABSTRACT

AS PART OF AN AEC PROGRAM DIRECTED TOWARD PROVIDING A SECURE TECHNICAL FOUNDATION FOR THE DEVELOPMENT OF LARGE HIGH-TEMPERATURE GAS-COOLED REACTORS, GENERAL ATOMIC HAS CONSTRUCTED A SERIES OF NEARLY HOMOGENEOUS, ENRICHED URANIUM-GRAPHITE CRITICAL ASSEMBLIES HAVING VARYING DEGREES OF SPECTRAL HARDNESS. THE CENTRAL REACTIVITY WORTHS OF A NUMBER OF MATERIALS OF INTEREST TO LARGE HTGR SYSTEMS HAVE BEEN MEASURED IN THREE OF THESE CORES TO DATE.

THE HTGR CRITICAL ASSEMBLY CONSISTS OF TWO ALUMINUM HONEYCOMB SECTIONS MOUNTED ON A SPLIT BED ASSEMBLY. THE FUEL ELEMENTS USED IN THESE ASSEMBLIES CONSIST OF FULLY ENRICHED URANIUM-GRAPHITE COMPACTS LOADED INTO ALUMINUM TUBES. THE RADIAL REFLECTORS WERE CONSTRUCTED FROM CYLINDRICAL GRAPHITE COLUMNS. NO AXIAL REFLECTOR WAS PRESENT. THE ASSEMBLIES WERE DESIGNED TO PROVIDE A SIMPLE CYLINDRICAL GEOMETRY, THUS MAKING AN ANALYTICAL MODEL SPATIALLY SEPARABLE. THEREFORE, IN ANALYZING THE EXPERIMENTAL RESULTS, THE MAJOR EMPHASIS WAS ON THE ENERGY DEPENDENCE OF THE PROBLEM. TABLE I SHOWS THE VALUES OF SOME OF THE PERTINENT CORE PARAMETERS. THE NOMINAL AXIAL DIMENSION IS 180 CM.

THE SPECIAL ELEMENTS USED IN THE REACTIVITY WORTH MEASUREMENTS CONSISTED OF GRAPHITE COMPACTS CONTAINING THE ISOTOPES URANIUM-233, URANIUM-235, URANIUM-236, AND NEPTUNIUM-237 LOADED INTO SEALED ALUMINUM TUBES. THESE ELEMENTS WERE SUBSTITUTED IN PLACE OF A SPECIAL ALL-GRAPHITE ELEMENT AT THE CENTRAL LOCATION AND THE CHANGE IN REACTIVITY MEASURED USING CALIBRATED CONTROL RODS. MEASUREMENTS WERE ALSO MADE ON A SERIES OF BORON- AND GOLD-LOADED SPECIAL ELEMENTS THAT WERE USED AS STANDARDS.

THE ANALYSIS OF THE EXPERIMENTAL RESULTS WAS CARRIED OUT USING THE ONE-DIMENSIONAL MULTIGROUP DIFFUSION CODE GAZE. THE SPECIAL ELEMENTS WERE REPRESENTED EXPLICITLY AS THE CENTRAL ZONE IN A 30-GROUP RADIAL CALCULATION. THE GAM AND GATHER CODES WERE USED TO AVERAGE THE MULTIGROUP CROSS SECTIONS. THE CALCULATED REACTIVITY WORTH OF THE SPECIAL ELEMENTS WAS DERIVED FROM DIFFERENCES IN THE EFFECTIVE MULTIPLICATION CONSTANT OF A SERIES OF THESE GAZE CALCULATIONS IN WHICH ONLY THE CENTRAL ZONE WAS CHANGED.

THE EXPERIMENTAL AND ANALYTICAL RESULTS FOR URANIUM-235 ARE SHOWN IN FIG. 1. SIMILAR RESULTS FOR URANIUM-233, URANIUM-236, AND NEPTUNIUM-237 ARE SHOWN IN TABLE II. THE CROSS SECTIONS USED IN ANALYZING THESE RESULTS ARE DISCUSSED IN THE REFERENCES.

THE AGREEMENT IN THE CASES OF THE BORON AND GOLD STANDARDS WAS GENERALLY VERY GOOD, THUS GIVING CONFIDENCE IN THE METHODS USED.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

IN VIEW OF THE DISCREPANCIES BETWEEN CALCULATION AND MEASUREMENT IN THE CASE OF THE EIGENVALUES AND REACTIVITY COEFFICIENTS OF URANIUM-235. SOME OF THE ABOVE RESULTS HAVE BEEN REANALYSED USING THE ENDF/B FILE DATA FOR URANIUM-235. THE DATE, THE RESULTS ARE VERY ENCOURAGING THE ABOVE DISCREPANCIES HAVING BEEN VIRTUALLY ELIMINATED; HOWEVER, THEY ARE NOT YET COMPLETE. (AUTH)

902 ID-NUMBER ID-NUMBER 902

AUTHOR BAXTER, A./ CLAYTON, E. D./ HANSEN, L. E.
 TITLE STUDIES OF CRITICAL ASSEMBLIES OF HOMOGENEOUS MIXTURES OF PLUTONIUM OXIDE AND POLYSTYRENE
 REPORT NUMBER..... TANSO, 10, 536
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 67-11-00
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

A SERIES OF CRITICALITY EXPERIMENTS HAS BEEN CONDUCTED AT THE PACIFIC NORTHWEST (PNL) PLUTONIUM CRITICAL MASS LABORATORY WITH PLUTONIUM DIOXIDE/POLYSTYRENE COMPACTS WITH A HYDROGEN TO PLUTONIUM RATIO OF 5. THESE EXPERIMENTS WERE PART OF THE GENERAL ATOMIC GAS-COOLED FAST REACTOR (GCFR) PROGRAM TO CHECK CALCULATIONAL METHODS AND BASIC NEUTRONIC DATA USED IN THE GCFR DESIGN; AND WERE ALSO PART OF THE PNL PROGRAM TO DETERMINE CRITICAL SIZES OF PLUTONIUM MIXTURES OVER THE ENTIRE RANGE OF DENSITIES POSSIBLE IN SEPARATION PLANTS.

THE EXPERIMENTS CONSISTED OF THE MEASUREMENT OF THE CRITICAL SIZE AND MASS OF THESE FUEL COMPACTS STACKED AS RECTANGULAR PRISMS OF NEAR-CUBIC GEOMETRY. FLUX DISTRIBUTIONS IN THE FUEL BLOCKS WERE MEASURED WITH MANGANESE-COPPER WIRES, AND PLUTONIUM-239 AND URANIUM-235 FISSION RATIOS WERE OBTAINED. THE REACTIVITY EFFECTS OF THE RESONANCE ABSORBER ELEMENTS DYSPROSIUM, HAFNIUM, AND GADOLINIUM, WHICH ARE BEING CONSIDERED AS POISONS TO CONTROL THE CONSEQUENCES OF STEAM OR WATER ENTRY INTO THE GCFR CORE, WERE ALSO MEASURED BY STACKING THIN LAYERS OF THESE MATERIALS IN THE CRITICAL ASSEMBLIES.

A SERIES OF CRITICALITY EXPERIMENTS HAS BEEN CONDUCTED AT THE PACIFIC NORTHWEST (PNL) PLUTONIUM CRITICAL MASS LABORATORY WITH PLUTONIUM DIOXIDE/POLYSTYRENE COMPACTS WITH HYDROGEN TO PLUTONIUM RATIO OF 5 AS FUEL. THESE EXPERIMENTS WERE PART OF THE GENERAL ATOMIC GAS-COOLED FAST REACTOR (GCFR) PROGRAM TO CHECK CALCULATIONAL METHODS AND BASIC NEUTRONIC DATA USED IN THE GCFR DESIGN; AND WERE ALSO PART OF THE PNL PROGRAM TO DETERMINE CRITICAL SIZES OF PLUTONIUM MIXTURES OVER THE ENTIRE RANGE OF DENSITIES POSSIBLE IN SEPARATION PLANTS.

THE EXPERIMENTS CONSISTED OF THE MEASUREMENT OF THE CRITICAL SIZE AND MASS OF THESE FUEL COMPACTS STACKED AS RECTANGULAR PRISMS OF NEAR-CUBIC GEOMETRY.

903 ID-NUMBER ID-NUMBER 903

AUTHOR THOMAS, J. T.
 TITLE CRITICALITY OF URANIUM-233 AQUEOUS NITRATE SOLUTION IN REFLECTED AND UNREFLECTED ARRAYS
 REPORT NUMBER..... TANSO, 10, 538-539
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 67-11-00
 SITE/PROGRAM OAK RIDGE - URANIUM-233 SYSTEMS

ABSTRACT

URANIUM-233 NITRATE SOLUTION AT A CONCENTRATION OF 333 G URANIUM/LITER (325 G URANIUM- 233/LITER) WAS UTILIZED IN A BRIEF STUDY TO DETERMINE THE CRITICAL PARAMETERS OF ARRAYS OF SUBCRITICAL COMPONENTS EACH CONTAINING 4.30 LITERS OF SOLUTION. THE DATA ARE DIRECTLY APPLICABLE TO NUCLEAR SAFETY SPECIFICATION AND SERVE AS BASES TO EVALUATE MODELS AND METHODS OF COMPUTING SUCH SYSTEMS. SIMILAR EXPERIMENTS WITH URANIUM-235 HAVE BEEN REPORTED. THE CONTAINERS WERE CYLINDRICAL, FABRICATED OF 0.25-MM-THICK STAINLESS STEEL, AND HAD OUTSIDE DIAMETERS AND HEIGHTS OF 18.28 AND 17.67 CM, RESPECTIVELY. THE CAPACITY OF A CONTAINER WAS 4.63 LITERS. THE SOLUTION HAD A SPECIFIC GRAVITY OF 1.468, AN HYDROGEN:URANIUM-233 ATOMIC RATIO OF 73, AND THE URANIUM ISOTOPIC CONTENT REPORTED IN TABLE I.

ALL ASSEMBLED ARRAYS WERE THREE-DIMENSIONAL, HAVING AN EQUAL NUMBER OF UNITS ALONG THE THREE DIRECTIONS OF THE ARRAY. EACH CYLINDER WAS SUPPORTED IN AN ARRAY, WITH ITS AXIS VERTICAL, BY A 1.6- MM-THICK ALUMINUM PLATE POSITIONED IN SPACE ON FOUR STAINLESS-STEEL RODS OF 5-MM DIAMETER THE REFLECTOR MATERIAL SURROUNDING AN ARRAY OF CYLINDERS WAS POLYETHYLENE ($\rho = 0.93 \text{ g/cm}^3$), USED IN A 15.2-CM THICKNESS ONLY AND LOCATED FROM THE PERIPHERAL CYLINDERS OF THE ARRAY OF DISTANCE EQUAL TO ONE-HALF THE SURFACE SEPARATION BETWEEN CYLINDERS. THE CENTER-TO-CENTER SPACING OF THE UNITS IN 8- AND 27-UNIT ARRAYS FOR BOTH THE REFLECTED AND THE UNREFLECTED CONDITIONS ARE PRESENTED.

TABLE I.

ISOTOPIC ANALYSIS OF URANIUM.

ISOTOPE WT PERCENT ISOTOPE WT PERCENT.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

URANIUM-233 97.54 URANIUM-236 0.001.

URANIUM-234 1.047 URANIUM-238 1.386 .

URANIUM-235 0.026 URANIUM-232 (6.47 PPM).

MONTE CARLO CALCULATIONS OF THE UNREFLECTED ARRAYS USING THE KENO CODE WITH THE HANSEN-ROACH 16-GROUP CROSS-SECTION SET FOR URANIUM-233 HAVE BEEN ACCOMPLISHED AND AGREE WELL WITH EXPERIMENT. THESE VALUES OF K-EFF ARE ALSO GIVEN. (AUTH).

905 ID-NUMBER ID-NUMBER 905

AUTHOR BIERMAN, S. R./ HESS, G. M.

TITLE MINIMUM CRITICAL URANIUM-235 ENRICHMENT FOR URANYL NITRATE HYDROGENOUS SYSTEMS

REPORT NUMBER..... TANSO, 10, 539-540

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 67-11-00

SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

THE CRITICAL PARAMETERS OF SLIGHTLY ENRICHED URANIUM SYSTEMS ARE STRONGLY DEPENDENT ON BOTH THE ENRICHMENT AND DEGREE OF MODERATION. PREVIOUS EXPERIMENTS PERFORMED IN THE PHYSICAL CONSTANTS TEST REACTOR (PCTR) OF BATTELLE-NORTHWEST HAVE SHOWN THE MINIMUM CRITICAL URANIUM-235 ENRICHMENT OF HOMOGENEOUS MIXTURES OF URANIUM TRIOXIDE IN WATER TO BE 1.034 +/- 0.010 WT% ADDITIONAL EXPERIMENTS WITH 3.04 WT% ENRICHED URANIUM TRIOXIDE AND URANYL NITRATE HYDROGENOUS MIXTURES ESTABLISHED THAT THE PRESENCE OF THE NITRATE RADICAL HAD A PRONOUNCED EFFECT ON CRITICALITY. THE 3.04 WT% ENRICHED URANIUM TRIOXIDE HAD A MAXIMUM K(INF) OF 1.35, AS COMPARED TO 1.15 FOR THE 3.04 WT% ENRICHED URANYL NITRATE. SUBSEQUENT CALCULATIONS HAVE INDICATED THE MINIMUM CRITICAL ENRICHMENT FOR URANYL NITRATE TO BE ABOUT 2 WT%

THE MINIMUM CRITICAL ENRICHMENT IS THE ENRICHMENT REQUIRED TO OBTAIN AN INFINITE NEUTRON MULTIPLICATION FACTOR OF UNITY UNDER CONDITIONS OF OPTIMUM MODERATION. KNOWLEDGE OF THE ENRICHMENT VALUE AND THE HYDROGEN/URANIUM RATIO OF THE HOMOGENEOUS MIXTURE THAT GIVES THE MAXIMUM K(INF) OF UNITY PROVIDES A FUNDAMENTAL POINT FOR COMPARISON WITH REACTOR THEORY. A FIRM KNOWLEDGE OF THIS ENRICHMENT VALUE IS ALSO OF CONSIDERABLE INTEREST FOR CRITICALITY CONTROL PURPOSES IN PROCESSING AND HANDLING SLIGHTLY ENRICHED URANYL NITRATE SOLUTIONS. BELOW THIS ENRICHMENT A SELF-SUSTAINING NEUTRON CHAIN REACTION WOULD BE IMPOSSIBLE AND THE PROBLEMS ASSOCIATED WITH NUCLEAR SAFETY WOULD BE GREATLY REDUCED IN SITUATIONS WHERE THIS ENRICHMENT IS NOT EXCEEDED. CONSEQUENTLY, A SERIES OF MEASUREMENTS WAS MADE IN THE PCTR TO DETERMINE THE ENRICHMENT AT WHICH K(INF) IS JUST UNITY AT OPTIMUM MODERATION. THE RESULTS OF THESE EXPERIMENTS ARE PRESENTED GRAPHICALLY. THE NORMAL PCTR NULL REACTIVITY TECHNIQUE WAS EMPLOYED TO OBTAIN THESE RESULTS, EXCEPT THAT A NEGATIVE NEUTRON POISON APPROACH HAD TO BE TAKEN IN THOSE SYSTEMS HAVING A K(INF) LESS THAN UNITY. THE MINIMUM CRITICAL ENRICHMENT IS 2.104 +/- 0.010 WT% AND OCCURS AT A HYDROGEN/URANIUM RATIO OF ABOUT EIGHT. THIS ENRICHMENT IS WITHIN 1 PERCENT OF THAT CALCULATED BY RIDGWAY. (AUTH).

906 ID-NUMBER ID-NUMBER 906

AUTHOR WINDSOR, H./ TUNNEY, W. J.

TITLE REACTOR PHYSICS PARAMETERS OF URANIUM-233 DIOXIDE-THORIUM DIOXIDE LATTICES IN HEAVY WATER

REPORT NUMBER..... TANSO, 10, 595-596

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 67-11-00

SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - URANIUM-233 - THORIUM DIOXIDE LATTICE

ABSTRACT

THE MEASUREMENT OF REACTOR PHYSICS PARAMETERS OF UNIFORM LATTICES OF 3 PERCENT URANIUM-233 DIOXIDE - 97 PERCENT THORIUM DIOXIDE FUEL RODS MODERATED WITH DEUTERIUM OXIDE ARE REPORTED IN THIS NOTE. THE FUEL IS VIBRATORILY COMPACTED TO A DENSITY OF 8.96 G/CM³ IN ZIRCALOY-2 TUBES OF 1.27-CM- O.D. AND 0.8-MM WALL THICKNESS AS DESCRIBED IN DETAIL IN A PREVIOUS REPORT.

THE DEUTERIUM OXIDE MODERATED EXPERIMENTS WERE CARRIED OUT IN A 75.405-CM-I.D. TANK SURROUNDED WITH 0.635-CM BORAL SHEET. A 15.24-CM PARAFFIN REFLECTOR WAS INSTALLED OUTSIDE THE BORAL SHEET FOR THE 11.481-, 6.510-, 3.759-, AND 2.170-CM-PITCH LATTICES. THIS REFLECTOR WAS NOT PRESENT FOR THE REST OF THE LATTICES; CONSEQUENTLY, IT WAS NECESSARY TO ACCOUNT FOR ROOM-RETURN EFFECT IN THE BUCKLING ANALYSES OF THESE LATTICES.

MEASUREMENTS WERE MADE OF THE DYSPROSIUM DISADVANTAGE FACTOR, THE RATIO OF EPI- TO SUBCADMIUM CAPTURE RATIO IN THORIUM-232, AND THE RATIO OF FISSION IN THORIUM-232 TO FISSION IN URANIUM-233.

THE TECHNIQUE OF MEASURING THE FAST FISSION RATIO MAKES USE OF THE SENSITIVITY OF SOME PLASTICS TO RADIATION DAMAGE FROM ENERGETIC CHARGED PARTICLES AS DESCRIBED BY FLEISCHER ET AL. THE PLASTIC FOILS ARE USED TO RECORD THE FISSIONS THAT OCCUR IN ADJACENT THIN FILMS OF URANIUM-233 AND THORIUM-232 THAT ARE SIMULTANEOUSLY EXPOSED BETWEEN FUEL PELLETS IN FLUX SYMMETRIC POSITIONS IN THE LATTICE. THE THIN FILMS WERE ELECTRO DEPOSITED ON 0.025-MM X 1.08-CM STEEL OR PLATINUM

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

WITH THORIUM- 232 FILM THICKNESS OF 200 MICROGRAM/CM², AND URANIUM-233 FILM THICKNESSES OF 0.5 MICROGRAM/CM², AND THE PLASTIC USED WAS 0.152-MM X 1.08-CM "LEXAN"

EACH FISSION THAT OCCURRED IN THE THIN FILM CAUSED A DAMAGED AREA IN THE PLASTIC THAT RESULTED IN A SHORT TRACK WHEN ETCHED IN SODIUM HYDROXIDE. THE PLASTIC WAS THEN PHOTOGRAPHED RESULTING IN A 170 X BLOWUP FROM WHICH THE TRACKS WERE COUNTED VISUALLY. THIS COUNT YIELDED THE RELATIVE FISSION RATE IN THE TWO THIN FILMS THAT HAD BEEN CALIBRATED PREVIOUSLY BY ABSOLUTE ALPHA COUNTING. (AUTH).

910 ID-NUMBER ID-NUMBER 910

AUTHOR DAVEY, W. G.

TITLE INTERCOMPARISON OF CALCULATIONS FOR A DILUTE PLUTONIUM-FUELED FAST CRITICAL ASSEMBLY (ZPR-3 ASSEMBLY 48)

REPORT NUMBER..... ANL-7320, 057-065

CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS, 10-13 OCTOBER 1966, ARGONNE, ILLINOIS

DATE PUBLISHED ... 66-10-10

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

IN CONNECTION WITH THE PRESENT CONFERENCE, AN INTERNATIONAL GROUP OF ESTABLISHMENTS WHICH ARE ACTIVE IN THE FIELD OF FAST REACTORS WAS INVITED TO PARTICIPATE IN A COMPARISON OF THE CALCULATED AND MEASURED PARAMETERS OF A PLUTONIUM-FUELED, SOFT-SPECTRUM, SIMPLE-GEOMETRY CRITICAL ASSEMBLY TO BE CONSTRUCTED IN ARGONNE NATIONAL LABORATORY'S ZERO POWER REACTOR-3 (ZPR-3) IN THE SUMMER OF 1966. THE STUDY OF THIS ASSEMBLY, NO. 48, IN THE ZPR-3 SERIES, IS STILL IN PROGRESS. A SUMMARY OF THE CALCULATED DATA AND THE MEASUREMENTS OBTAINED, UP TO THE PRESENT DATE, IS PRESENTED HERE.

INTRODUCTION: ZPR-3 ASSEMBLY 48 IS THE FIRST OF A SERIES OF COMPARITIVELY SIMPLE, PLUTONIUM- FUELED CRITICAL ASSEMBLIES WHICH, ALTHOUGH NOT OF A LARGE CRITICAL MASS, WILL HAVE SPECTRA BROADLY SIMILAR TO FAST POWER REACTORS OF SEVERAL THOUSAND-LITER CORE VOLUMES. THIS IS ACHIEVED BY THE USE OF GRAPHITE TO MODERATE THE NEUTRON SPECTRUM.

ONE OF THE MAJOR CRITERIA ADOPTED IN THE DESIGN OF THIS SERIES WAS THE MAXIMUM SIMPLICITY OF CORE DESIGN CONSISTENT WITH OBTAINING MAXIMUM UTILIZATION OF THE PLUTONIUM INVENTORY, SUITABLE NEUTRON SPECTRA, AND COMPOSITIONS OF REACTOR INTEREST. ASSEMBLY 48, THEREFORE, CONTAINS THE SAME COMPOSITION IN EVERY DRAWER IN THE CORE, A FEATURE WHICH IS BELIEVED TO BE OF GREAT IMPORTANCE IN AIDING THE ANALYSIS. THE CORE CONTAINS BOTH PLUTONIUM AND PLUTONIUM-URANIUM ALLOY AS FUEL, AND DEPLETED URANIUM IS ADDED TO BRING THE URANIUM-TO-PLUTONIUM RATIO UP TO A VALUE OF APPROXIMATELY 4. (AUTH).

911 ID-NUMBER ID-NUMBER 911

AUTHOR GREEBLER, P./ GYOREY, G. L./ HUTCHINS, B. A./ SEGAL, B. M.

TITLE IMPLICATIONS OF RECENT FAST CRITICAL EXPERIMENTS ON BASIC FAST REACTOR DESIGN DATA AND CALCULATIONAL METHODS

REPORT NUMBER..... ANL-7320, 066-079

CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS, 10-13 OCTOBER 1966, ARGONNE, ILLINOIS

DATE PUBLISHED ... 66-10-10

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

RECENT EXPERIMENTAL INFORMATION FROM DILUTE, PLUTONIUM-FUELED CRITICAL ASSEMBLIES WAS USED TO TEST AND TO PROVIDE GUIDANCE FOR IMPROVING FAST REACTOR DESIGN DATA AND CALCULATIONAL METHODS. MOST OF THE EXPERIMENTAL DATA USED IN THIS STUDY ARE TAKEN FROM ZPR-3 ASSEMBLY 47 (THE SEFOR CORE MOCKUP). THE IMPORTANT NUCLEAR REACTOR PARAMETERS WERE CALCULATED WITH A NUMBER OF VARIATIONS IN NUCLEAR DATA AND CALCULATIONAL TECHNIQUES. AN ANALYSIS OF THE EXPERIMENTAL AND CALCULATED RESULTS SHOWS THAT BY CAREFUL ADJUSTMENT OF THE IMPORTANT CROSS SECTIONS, WELL WITHIN EXPERIMENTAL UNCERTAINTIES, AND BY IMPROVED ACCURACY IN THE CALCULATIONAL METHODS, A MUCH CLOSER AGREEMENT CAN BE ACHIEVED BETWEEN CALCULATIONS AND EXPERIMENTS THAN THAT HERETOFORE REPORTED.

A COMPLETE EVALUATION WAS MADE OF THE CROSS-SECTION AND RESONANCE PARAMETER DATA FOR PLUTONIUM- 239, THE MOST IMPORTANT ISOTOPE IN THIS CASE. THE NEW DATA YIELD GOOD AGREEMENT WITH THE CRITICAL MASS OF ASSEMBLY 47. THEY RESULT IN A CALCULATED PLUTONIUM-239 DOPPLER EFFECT THAT IS ESSENTIALLY ZERO, IN AGREEMENT WITH MEASURED VALUES. A TWO-DIMENSIONAL CALCULATION OF THE NEUTRON LIFETIME, USING GROUP CONSTANTS THAT ADEQUATELY ACCOUNT FOR THE SPATIAL VARIATION OF THE NEUTRON SPECTRUM, YIELDS A SIGNIFICANT IMPROVEMENT OVER THAT BASED ON A ONE- DIMENSIONAL MODEL.

THOSE ADJUSTMENTS IN NUCLEAR DATA WHICH HAD THE GREATEST EFFECT ON ASSEMBLY 47 RESULTS WERE THEN USED TO CALCULATE THE IMPORTANT PARAMETERS OF ZPR-3 ASSEMBLY 48. THEIR EFFECTS ON ASSEMBLY 48 RESULTS CAN THEN BE ANALYZED AS THE EXPERIMENTAL RESULTS FOR THIS ASSEMBLY BECOME AVAILABLE. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

912 ID-NUMBER ID-NUMBER 912

AUTHOR FILLMORE, F. L./ SPECHT, E. R./ VERNON, A. R./ OTTEWITTE, E. H.
 TITLE THE EVALUATION OF BASIC CROSS-SECTION DATA BY ANALYSIS OF FAST CRITICAL ASSEMBLIES
 REPORT NUMBER..... ANL-7320, 080-087
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS, 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS ; LOS ALAMOS - PLUTONIUM METAL SPHERES - CALCULATIONS ; LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS

ABSTRACT

CALCULATIONS OF THE PROPERTIES OF A NUMBER OF FAST CRITICAL ASSEMBLIES ARE BEING CARRIED OUT AS PART OF A CONTINUING PROGRAM FOR TESTING AND EVALUATING MULTIGROUP CROSS SECTIONS FOR FAST REACTOR CALCULATIONS. THE EXPERIMENTS INCLUDED IN THE PRESENT ANALYSIS HAVE BEEN CHOSEN TO COVER A WIDE RANGE OF FUEL MATERIALS AND REACTOR SPECTRA. THIS INCREASES THE ABILITY TO IDENTIFY ERRORS ACCORDING TO THE MATERIAL AND ENERGY RANGE IN WHICH THEY OCCUR. THE ASSEMBLIES STUDIED INCLUDE A NUMBER OF URANIUM-235 FUELED ZPR-3 ASSEMBLIES; ZPR-3-45 AND 45A, DRIVEN PLUTONIUM ASSEMBLIES WHICH WERE MAINLY USED FOR DOPPLER MEASUREMENTS; THE SEFOR MOCKUP, ZPR-3-47; THE PLUTONIUM-FUELED ASSEMBLY, ZPR-3-48; ZEBRA CORE 5; THE SMALL FAST ASSEMBLIES POPSY AND JEZEBEL (FUELED WITH METALLIC PLUTONIUM), AND GODIVA (FUELED WITH METALLIC URANIUM). THE PROPERTIES EXAMINED INCLUDE CRITICAL MASS, DOPPLER EFFECT, FISSION RATIOS, AND THE REACTIVITY WORTHS OF VARIOUS MATERIAL REPLACEMENTS.

THE PROPERTIES OF THE SMALL FAST ASSEMBLIES DEPEND ONLY ON THE HIGH-ENERGY DATA; THEY ARE PRACTICALLY INDEPENDANT OF CROSS SECTIONS BELOW 100 KEV. HOWEVER, THE LARGER ASSEMBLIES REQUIRE ACCURATE DATA DOWN TO ABOUT 100 EV. ALL OF THE MULTIGROUP CROSS SECTIONS HAVE BEEN CONSTRUCTED USING BASIC MICROSCOPIC CROSS-SECTION DATA TAKEN FROM THE ATOMICS INTERNATIONAL EVALUATED NUCLEAR DATA FILE AND HAVE NOT BEEN ADJUSTED TO FORCE AGREEMENT WITH THE CRITICAL-ASSEMBLY DATA. FOR THE LARGE, SOFT-SPECTRUM ASSEMBLIES, THE CROSS SECTIONS WERE WEIGHTED BY A FINE-GROUP SPECTRUM CALCULATED FOR EACH ASSEMBLY.

EARLIER RESULTS DISCLOSED CERTAIN DEFICIENCIES IN THE CROSS SECTIONS CONTAINED IN THE DATA FILE. SUBSEQUENTLY, MANY OF THESE CROSS SECTIONS WERE REVISED AND UPDATED, RESULTING IN SIGNIFICANT IMPROVEMENTS IN THE AGREEMENT BETWEEN THE CALCULATIONS AND THE EXPERIMENTAL RESULTS. (AUTH).

916 ID-NUMBER ID-NUMBER 916

AUTHOR BATTAT, M. E./ LABAUVE, R. J.
 TITLE COMPARISON OF MULTIGROUP CROSS-SECTION SETS USED IN REACTOR CALCULATIONS
 REPORT NUMBER..... ANL-7320, 130-134
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS, 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM LOS ALAMOS - PLUTONIUM METAL SPHERES - CALCULATIONS ; ARGONNE NATIONAL LABORATORY - ZPR-6 - CALCULATIONS

ABSTRACT

IN ORDER TO PROVIDE A COMMON BASIS FOR COMPARING VARIOUS NEUTRON MULTIGROUP CROSS-SECTION SETS, CALCULATIONAL MODELS OF TWO WELL-DEFINED CRITICAL EXPERIMENTS HAVE BEEN SPECIFIED. THE CRITICAL ASSEMBLIES CHOSEN FOR THIS STUDY WERE THE JEZEBEL (PLUTONIUM) ASSEMBLY AND THE 610-LITER ZPR-6 (ASSEMBLY NO. 2) URANIUM CARBIDE CORE. THE HANSEN-ROACH 16-GROUP AND RUSSIAN 26-GROUP CROSS-SECTION SETS WERE USED FOR THE INITIAL COMPARISONS. CALCULATIONS WERE MADE TO DETERMINE THE CRITICAL CORE VOLUMES AND CENTRAL REACTIVITY WORTHS BY USE OF THE DTF-IV TRANSPORT CODE IN THE S-8 APPROXIMATION AND ASSUMING SPHERICAL GEOMETRY. IN ADDITION, TWO TYPES OF PERTURBATION-THEORY CALCULATIONS WERE MADE TO ARRIVE AT CENTRAL REACTIVITY WORTHS FOR "SMALL" SAMPLES. THE FIRST OF THESE IS USED TO COMPUTE WORTHS IN TERMS OF SIMPLE ATOMIC PERTURBATION CROSS SECTIONS. THE SECOND IS BASED ON TRANSPORT PERTURBATION THEORY, USING REAL AND ADJOINT CURRENTS AND FLUXES, WITH RESULTS EXPRESSED IN TERMS OF $\Delta K/K$ -ATOM.

WHEREVER AVAILABLE, EXPERIMENTAL DATA ARE PRESENTED FOR COMPARISON WITH CALCULATIONS. CENTRAL REACTIVITY WORTHS HAVE BEEN CALCULATED FOR THE FOLLOWING MATERIALS: PLUTONIUM-239, PLUTONIUM-240, URANIUM-238, URANIUM-235, DEPLETED URANIUM, IRON, NICKEL, CHROMIUM, SODIUM, TANTALUM, ALUMINUM, MOLYBDENUM, AND BORON. IN THE CASE OF ZPR-6, THE REACTIVITY EFFECT OF VOIDING THE CORE SODIUM WAS ALSO CALCULATED. (AUTH).

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

917 ID-NUMBER ID-NUMBER 917

AUTHOR BARLEON, L./ BAYER, A./ BRUCKNER, C./ BURKART, K./ FIEG, G./ KUHN, D./
KUSSMAUL, G./ MEISTER, H./ SEUFERT, H./ STEGEMANN, D./ WERLE, H.

TITLE EVALUATION OF REACTOR PHYSICS EXPERIMENTS ON THE COUPLED FAST-THERMAL
ARGONAUT REACTOR STARK.

REPORT NUMBER..... ANL-7320, 137-158

CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
10-13 OCTOBER 1966, ARGONNE, ILLINOIS

DATE PUBLISHED ... 66-10-10

SITE/PROGRAM GERMANY - STARK (COUPLED FAST-THERMAL ZERO POWER REACTOR)

ABSTRACT

STARK IS A COUPLED ZERO-POWER REACTOR CONSISTING OF A SUPERCRITICAL FAST CORE DRIVEN BY A SURROUNDING LIGHT-WATER-MODERATED THERMAL ZONE. FOUR DIFFERENT FAST CORE LOADINGS, CONTAINING UP TO 107 KG URANIUM-235, HAVE BEEN INVESTIGATED SO FAR, ONE OF THEM WITH A CARBON-HYDROXIDE ADMIXTURE TO SIMULATE THE SPECTRUM OF A STEAM-COOLED REACTOR.

A NUMBER OF EXPERIMENTS HAVE BEEN PERFORMED TO OBTAIN INFORMATION ON THE NEUTRON SPECTRUM IN THE FAST ZONE. SPATIAL DISTRIBUTIONS OF REACTION RATES WERE DETERMINED BY FISSION-CHAMBER AND FOIL TECHNIQUES; DIFFERENTIAL NEUTRON SPECTRA WERE STUDIED BY PROTON-RECOIL PROPORTIONAL COUNTERS; REACTIVITY WORTHS OF SAMPLES WERE MEASURED IN THE FAST CORE WITH A SQUARE-WAVE PILE OSCILLATOR. ALSO, INTEGRAL PARAMETERS OF THE ENTIRE SYSTEM WERE OBTAINED BY VARIOUS KINETIC METHODS.

THE EXPERIMENTAL RESULTS ARE COMPARED WITH ONE-DIMENSIONAL DIFFUSION AND SULFUR-4 CALCULATIONS USING THE RUSSIAN 26-GROUP CROSS-SECTION SET. THE EXPERIMENTAL DATA GIVE NO INDICATION OF LARGER DEVIATIONS FROM THE CALCULATED SPECTRA IN THE KEV AND MEV-REGIONS, WHEREAS DISCREPANCIES WERE FOUND IN THE REGION OF LOWER EV. THE INTEGRAL REACTOR PARAMETERS (NEUTRON LIFETIME, CRITICAL MASS, AND PARTITION OF REACTOR POWER BETWEEN THE ZONES) WERE FOUND TO AGREE REASONABLY WELL WITH THE CALCULATION. (AUTH).

918 ID-NUMBER ID-NUMBER 918

AUTHOR ANDERSSON, T. L./ BJOREUS, L./ HELLSTRAND, E./ HAGGBLOW, H./ LONDEN, S. O.
/ TIREN, L. I./ KOCKUM, J.

TITLE EXPERIMENTAL AND THEORETICAL WORK AT THE ZERO-ENERGY FAST REACTOR FRO

REPORT NUMBER..... ANL-7320, 159-185

CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
10-13 OCTOBER 1966, ARGONNE, ILLINOIS

DATE PUBLISHED ... 66-10-10

SITE/PROGRAM SWEDEN - FRO ZERO ENERGY FAST REACTOR (URANIUM(20%) - GRAPHITE)

ABSTRACT

THE FIRST FAST REACTOR IN SWEDEN, FRO, HAS BEEN IN OPERATION SINCE FEBRUARY 1964. IT IS A SPLIT-TABLE MACHINE WITH VERTICAL FUEL ELEMENTS. A QUANTITY OF 120 KILOGRAM URANIUM-235 IS AVAILABLE AS FUEL, FABRICATED INTO METALLIC PLATES OF 20 PERCENT ENRICHMENT. OF THE FIRST FIVE CORES STUDIED THREE (NUMBERS 1, 2, AND 4) CONSISTED OF UNDILUTED FUEL. CORE NO. 3 WAS DILUTED WITH GRAPHITE (29 V%) AND NO. 5 WITH GRAPHITE (29 PERCENT) AND POLYTHENE (7.5 PERCENT). ALL ASSEMBLIES HAD A THICK REFLECTOR OF COPPER EXCEPT FOR NO. 4, WHICH HAD A URANIUM REFLECTOR.

AMONG THE EXPERIMENTS CARRIED OUT WITH FRO THE FOLLOWING ITEMS ARE DEALT WITH IN THIS PAPER: CRITICAL MASS, REACTION RATIOS, CENTRAL REACTIVITY COEFFICIENTS, AND HETEROGENEITY EFFECTS. MEASUREMENTS OF REACTIVITY WORTHS OF MULTIPLYING AS WELL AS ABSORBING CONTROL RODS ARE ALSO SUMMARIZED, INCLUDING STUDIES OF INTERACTION EFFECTS AND STREAMING IN EMPTY CHANNELS. RECENTLY, SPECTROMETRY WORK WITH PROTON-RECOIL COUNTERS AND DOPPLER MEASUREMENTS BY MEANS OF FOIL ACTIVATION HAVE BEEN INITIATED. THE LATTER HAVE BEEN CARRIED OUT AT 590 DEGREE CENTIGRADE, AND PRELIMINARY RESULTS FOR URANIUM-235 AND URANIUM-238 HAVE BEEN OBTAINED.

THE EXPERIMENTAL RESULTS HAVE BEEN ANALYZED WITH VARIOUS MODELS. THE SPECTRUM PROGRAMME SPENG, WHICH INCLUDES A DATA LIBRARY, HAS BEEN USED TO CALCULATE CORE AND REFLECTOR FINE-STRUCTURE SPECTRA AND TO DERIVE MULTIGROUP CROSS-SECTIONS SETS FOR THE DIFFERENT ASSEMBLIES. FOR THE CRITICAL-SIZE AND FLUX CALCULATIONS THE DSN AND TDC TRANSPORT THEORY PROGRAMMES HAVE GENERALLY BEEN EMPLOYED, AND A SECOND-ORDER PERTURBATION CODE HAS BEEN USED TO ANALYZE THE CENTRAL REACTIVITY MEASUREMENTS.

THE EXPERIMENTS SHOW THAT THE SPECTRUM IN THE COPPER REFLECTOR IS SOFTER THAN PREDICTED, BUT APART FROM THIS DISCREPANCY GOOD AGREEMENT BETWEEN THEORY AND EXPERIMENT HAS GENERALLY BEEN OBTAINED, ESPECIALLY WHEN CRITICAL MASS IS CONCERNED.

ACCOUNTS OF A P-N METHOD USED IN CONNECTION WITH CONTROL ROD CALCULATIONS AND OF PULSED-SOURCE, ROSSI-ALPHA, AND VARIANCE-TO-MEAN MEASUREMENTS ARE GIVEN IN SEPARATE PAPERS AT THIS CONFERENCE. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

919 ID-NUMBER ID-NUMBER 919

AUTHOR BUTLER, D. K./ DOERNER, R. C./ KNAPP, W. G.
 TITLE MEASUREMENTS AND ANALYSIS OF ALUMINUM-, ALUMINUM TRIOXIDE-, AND BERYLLIUM
 OXIDE-, REFLECTED FAST CRITICAL EXPERIMENTS
 REPORT NUMBER.... ANL-7320, 186-194
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-9 (FAST ROCKET)

ABSTRACT

INTRODUCTION: THE ARGONNE NUCLEAR ROCKET PROGRAM WAS DEVELOPED AS A BACKUP EFFORT TO THE GRAPHITE ROCKET REACTOR PROGRAM AT LOS ALAMOS. AS AN ALTERNATE TO THE GRAPHITE SYSTEM, ARGONNE RECOMMENDED A REFRACTORY-METAL-BASED FAST REACTOR, SINCE THE REFRACTORY METALS HAVE POTENTIAL FOR OPERATION AT VERY HIGH TEMPERATURES. A FAST-NEUTRON SPECTRUM WOULD MAKE IT POSSIBLE TO USE MATERIALS WITH HIGH THERMAL-NEUTRON CROSS SECTIONS, AND TO OBTAIN CORES OF ANY DESIRED SIZE DOWN TO 20 LITERS OR LESS. INITIAL STUDIES LED TO THE CHOICE OF TUNGSTEN AS THE REFRACTORY METAL, POSSIBLY ALLOYED WITH RHENIUM WHERE ADDED STRENGTH OR TEMPERATURE PERFORMANCE WAS REQUIRED, AND OF URANIUM OXIDE AS THE NUCLEAR FUEL. THE STUDIES ALSO SHOWED THAT THE BEST SYSTEM WOULD PROBABLY HAVE A REFLECTOR THAT WOULD HELP FLATTEN THE POWER DISTRIBUTION AND IMPROVE NEUTRON ECONOMY. WITH WEIGHT AT A PREMIUM THE USE OF LIGHT REFLECTOR MATERIALS, INCLUDING ALUMINUM OXIDE, BERYLLIUM, AND BERYLLIUM OXIDE, WAS CONSIDERED MOST PROMISING. THE SERIES OF CRITICAL ASSEMBLIES DISCUSSED HERE WAS PERFORMED IN CONNECTION WITH THE PROGRAM FOR DEVELOPMENT OF A FAST TUNGSTEN REACTOR FOR NUCLEAR PROPULSION.

AT THE TIME, ALMOST NOTHING WAS KNOWN ABOUT THE NEUTRONICS OF SUCH SYSTEMS. A PROGRAM OF CRITICAL EXPERIMENTS WAS THEREFORE PLANNED TO OBTAIN SOME BASIC INFORMATION ABOUT FAST TUNGSTEN- BASED SYSTEMS. THE APPROACH SELECTED WAS TO BEGIN WITH SYSTEMS WHICH HAD ALREADY BEEN STUDIED, SUCH AS ASSEMBLIES 11 AND 22 OF ZPR-3 AND ASSEMBLY 1 OF ZPR-6. A SERIES OF CRITICAL CONFIGURATIONS WAS CONSTRUCTED IN WHICH ONLY A SINGLE CHANGE OF COMPOSITION WAS MADE FROM ONE ASSEMBLY TO THE NEXT.

THE EXPERIMENTS WERE PERFORMED WITH THE SPLIT-BED ASSEMBLY ZPR-9. THE CORES WERE MADE AS CLOSE APPROXIMATIONS TO CYLINDERS AS POSSIBLE IN THE RECTANGULAR DRAWERS OF THE ASSEMBLY. CRITICALITY WAS NORMALLY ACHIEVED BY VARYING THE CORE RADIUS.

IN EACH ASSEMBLY A NUMBER OF MEASUREMENTS WERE MADE. IN ADDITION TO CRITICALITY, DETERMINATIONS OF FISSION-RATE DISTRIBUTION, NEUTRON LIFETIME, AND CENTRAL AND SPATIAL REACTIVITY WORTHS WERE MADE. SOME TIME WAS ALSO SPEND STUDYING PROPERTIES RELATED TO CONTROL, INCLUDING THE EFFECT OF INSERTING A RING OF BORON INTO THE REFLECTOR NEAR THE CORE BOUNDARY.

MANY OF THE DETAILS OF THE EXPERIMENTS AND SOME OF THE CALCULATIONS HAVE BEEN REPORTED PREVIOUSLY. FINAL REPORTS SUMMARIZING ALL EXPERIMENTAL RESULTS ARE IN PREPARATION.

RATHER THAN GO OVER ALL DETAILS OF MEASUREMENTS, WE HAVE TRIED TO SELECT SOME RESULTS FOR WHICH WE HAVE MADE THEORETICAL COMPARISONS AND WHICH, WE THINK, SHOW WHAT HAS BEEN LEARNED AND WHAT IS YET TO BE LEARNED.

INCLUDED FOR DISCUSSION WILL BE: (1) CRITICALITY, (2) THE SPATIAL DISTRIBUTION OF FISSION RATES, AND (3) THE WORTHS OF VARIOUS MATERIALS AT THE CORE CENTER AND AS A FUNCTION OF RADIUS. (AUTH).

922 ID-NUMBER ID-NUMBER 922

AUTHOR ADAMSON, J./ ABSALOM, R. M./ BAKER, A. R./ INGRAM, G./ PATTENDEN, S. K./
 STEVENSON, J. M.
 TITLE ZEBRA 6: A DILUTE PLUTONIUM-FUELED ASSEMBLY
 REPORT NUMBER.... ANL-7320, 216-230
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM UNITED KINGDOM, WINFRITH - ZEBRA

ABSTRACT

ZEBRA 6 WAS A PLUTONIUM-FUELED FAST REACTOR WITH NATURAL URANIUM, GRAPHITE, AND SODIUM AS DILUENTS. THE CRITICAL MASS WAS 186 KILOGRAM OF PLUTONIUM-239 + PLUTONIUM-241. THE REPORT CONTAINS A SELECTION OF THE MEASUREMENTS PERFORMED, INCLUDING MAINLY TECHNIQUES WHICH WILL BE IMPORTANT IN THE STUDY OF THE PFR MOCKUP. THUS THE CRITICAL MASS AND THE REACTIVITY WORTH OF SODIUM, PROBABLY THE TOPICS OF MOST DIRECT IMPORTANCE, ARE DISCUSSED. MEASUREMENTS OF THE NEUTRON SPECTRUM AND THE GAMMA DOSE RATE THROUGH THE REACTOR ARE DESCRIBED. FROM PERTURBATION AND REACTION RATE MEASUREMENTS WITH PLUTONIUM-239 AND BORON-10, THE CAPTURE-TO-FISSION RATIO IN PLUTONIUM-239 IS OBTAINED. BECAUSE THE REFLECTOR CONTAINED MODERATING MATERIAL, HAVING A COMPOSITION NEARLY LIKE URANIUM CARBIDE, SOME ATTENTION IS GIVEN TO CROSS-SECTION MEASUREMENTS IN THE REFLECTOR.

THE RESULTS ARE COMPARED WITH CALCULATIONS USING DIFFUSION THEORY WITH THE FD2 MULTIGROUP CROSS-SECTION SET. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

923 ID-NUMBER ID-NUMBER 923

AUTHOR: RUSCH, G. K./ KARAM, R. A./ KATO, W. Y./ MAIN, G. W.
 TITLE: PHYSICS PARAMETERS OF LARGE DILUTE URANIUM CARBIDE CORES
 REPORT NUMBER.....: ANL-7320, 231-236
 CONFERENCE: INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ...: 66-10-10
 SITE/PROGRAM: ARGONNE NATIONAL LABORATORY - ZPR-6 ; ARGONNE NATIONAL LABORATORY - ZPR-9
 (FAST ROCKET)

ABSTRACT

INTRODUCTION: THE ARGONNE NATIONAL LABORATORY HAS INVESTIGATED THE PHYSICS CHARACTERISTICS OF A LARGE, DILUTE URANIUM CARBIDE REACTOR BY STUDYING ZPR-6 ASSEMBLIES 4Z AND 5, AND ZPR-9 ASSEMBLY 11. ASSEMBLIES 4Z AND 11 ARE ZONED CORE SYSTEMS WITH A CENTRAL REGION HAVING THE SAME COMPOSITION AS ASSEMBLY 5, A 2600-LITER CARBIDE REACTOR. ASSEMBLIES 4Z AND 11 WERE DESIGNED SO THAT BOTH THE NEUTRON-ENERGY SPECTRUM AND THE IMPORTANCE SPECTRUM AT THE CENTER OF THE CORE WOULD BE AS IDENTICAL AS POSSIBLE TO THOSE OF ASSEMBLY 5.

THE TWO MAIN PURPOSES OF THESE ASSEMBLIES WERE (1) TO OBTAIN PHYSICS PARAMETERS OF LARGE, DILUTE CARBIDE CORES, AND (2) TO DETERMINE THE AREAS OF VALIDITY OF REACTOR PHYSICS PARAMETERS OBTAINED FROM ZONED-CORE MEASUREMENTS FOR A FULL-SCALE SYSTEM. THE MEASUREMENTS CONDUCTED ON THESE THREE ASSEMBLIES MAY BE DIVIDED INTO SEVEN CATEGORIES:

1. CRITICAL MASS;
2. NEUTRON ENERGY AND SPATIAL DISTRIBUTIONS OF THE REAL FLUXES;
3. SPATIAL DISTRIBUTION OF THE IMPORTANCE OF FISSION NEUTRONS;
4. SODIUM-VOID COEFFICIENT AND THE RADIAL REACTIVITY WORTH OF URANIUM-235, URANIUM-238, AND GRAPHITE;
5. REACTIVITY WORTHS OF A LARGE NUMBER OF MATERIALS AT THE CENTER OF THE CORE;
6. ROSSI-ALPHA;
7. DOPPLER-EFFECT MEASUREMENTS.

THIS PAPER DEALS PRINCIPALLY WITH THE DESCRIPTION OF THE CORES, CRITICAL MASSES, SODIUM- COEFFICIENT STUDIES, AND THE RADIAL REACTIVITY WORTHS OF CORE MATERIALS. A COMPANION PAPER DISCUSSES THE MEASUREMENTS MADE TO TEST THE VALIDITY OF ZONED-CORE MEASUREMENTS FOR SCALING UP TO FULL-SIZED REACTORS. A THIRD PAPER DISCUSSES SOME OF THE MEASUREMENTS OF THE DOPPLER EFFECT CONDUCTED WITH THESE CORES. (AUTH).

924 ID-NUMBER ID-NUMBER 924

AUTHOR: MIHALCZO, J. T.
 TITLE: PROMPT-NEUTRON TIME BEHAVIOR IN DELAYED-CRITICAL COUPLED URANIUM-METAL
 CYLINDERS
 REPORT NUMBER.....: ANL-7320, 237-241
 CONFERENCE: INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ...: 66-10-10
 SITE/PROGRAM: OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

PAIRS OF IDENTICAL, COAXIAL, 27.94-CENTIMETER-DIAMETER CYLINDERS OF UNMODERATED AND UNREFLECTED URANIUM METAL HAVE BEEN ASSEMBLED TO DELAYED CRITICALITY WITH LARGE SPACES BETWEEN THE FLAT SURFACES. THE URANIUM METAL WAS ENRICHED TO 93.15 WEIGHT PERCENT IN THE URANIUM-235 ISOTOPE. PROMPT-NEUTRON DECAY CONSTANTS OF THE ASSEMBLIES WERE MEASURED BY THE ROSSI-ALPHA TECHNIQUE, AND THE RESULTS AGREED WITH THOSE PREDICTED BY A METHOD IN WHICH A PAIR OF EQUATIONS REPRESENTED THE KINETICS OF A COUPLED-CORE ASSEMBLY. THE EQUATIONS NEGLECTED DELAYED NEUTRONS AND ASSUMED SPACE- INDEPENDENT KINETICS FOR EACH CYLINDER WITH A TIME LAG TO REPRESENT THE FLIGHT TIME OF NEUTRONS FROM ONE CYLINDER TO THE OTHER. MULTIPLICATION FACTORS CALCULATED FOR THE ASSEMBLIES USING S-8 TRANSPORT THEORY ALSO AGREED WITH THE EXPERIMENTAL VALUES. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

927 ID-NUMBER ID-NUMBER 927

AUTHOR BENZI, V./ CUPINI, E./ DE MATTEIS, A.
 TITLE MONTE CARLO ANALYSIS OF SMALL FAST CRITICAL ASSEMBLIES
 REPORT NUMBER..... ANL-7320, 278-298
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM LOS ALAMOS - PLUTONIUM METAL SPHERES - CALCULATIONS ; LOS ALAMOS -
 URANIUM(93%) METAL SPHERES - CALCULATIONS ; GENERAL COMPILATIONS OF
 CALCULATIONS OF EXPERIMENTS

ABSTRACT

AN ANALYSIS OF SEVERAL CRITICAL FAST ASSEMBLIES CONTAINING URANIUM OR PLUTONIUM AS FUEL, AND VARIOUS KINDS OF MATERIALS AS REFLECTORS, HAS BEEN PERFORMED BY MEANS OF A IBM-7094 MONTE CARLO CODE IN A MULTIGROUP APPROXIMATION. THE MAIN FEATURES OF THE MONTE CARLO STRATEGY ADOPTED IN THIS CODE ARE BRIEFLY SUMMARIZED. ELASTIC AND INELASTIC SCATTERING ARE SEPARATELY CONSIDERED, AND ANISOTROPY FOR THE ELASTIC SCATTERING HAS BEEN TAKEN INTO ACCOUNT. THE TWENTY-GROUP CROSS-SECTION SET ADOPTED FOR THE CALCULATION IS GIVEN. THE MULTIGROUP SET HAS BEEN OBTAINED ON THE BASIS OF MICROSCOPIC DATA ONLY, WITHOUT ANY A POSTERIORI ADJUSTMENT. IN THIS WAY IT IS HOPED THAT THE COMPARISON BETWEEN THE RESULTS OF CALCULATION AND EXPERIMENTS MAY BE USEFUL IN SETTING THE LIMITS OF CONFIDENCE BOTH FOR THE METHOD AND FOR THE CONSTANTS ADOPTED, AT LEAST FOR THE KIND OF CRITICAL ASSEMBLIES HERE CONSIDERED. (AUTH).

928 ID-NUMBER ID-NUMBER 928

AUTHOR THOMAS, J. T.
 TITLE MONTE CARLO CALCULATIONS OF FAST MULTICOMPONENT CRITICAL SYSTEMS
 REPORT NUMBER..... ANL-7320, 299-303
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

CRITICALITY STUDIES HAVE BEEN MADE OF THREE-DIMENSIONAL CUBOIDAL SYSTEMS OF URANIUM METAL CYLINDERS ENRICHED TO 93.2 WEIGHT-PERCENT URANIUM-235. THE SYSTEMS WERE COMPOSED OF NEARLY IDENTICAL, INDIVIDUALLY SUBCRITICAL COMPONENTS SPACED IN AIR. THE DEPENDENCE OF THE SYSTEM CRITICAL MASS UPON THE MASS AND SHAPE OF THE COMPONENTS WAS EXAMINED BY UTILIZING UNIT RANGING IN MASS FROM 10.5 TO 26.2 KG OF URANIUM AND WITH HEIGHT-TO-DIAMETER RATIOS FROM 0.47 TO 1.17.

THE CALCULATION OF SUCH ASSEMBLIES BY USUAL ANALYTIC TECHNIQUES IS NOT PRACTICABLE, BUT THE SYSTEMS ARE IDEALLY SUITED TO MONTE CARLO METHODS. THE MULTIPLICATION FACTORS OF A NUMBER OF THE EXPERIMENTS HAVE BEEN COMPUTED BY SEVERAL CODES AND THE RESULTS COMPARE FAVORABLY. THE ONE MOST EXTENSIVELY EMPLOYED, HOWEVER, HAS BEEN THE BRITISH GEM MONTE CARLO CODE. A BRIEF DESCRIPTION OF THE GEOMETRY INPUT AND THOSE FEATURES OF THE CODE APPLICABLE TO THE EXPERIMENTAL SYSTEMS INVESTIGATED WILL BE GIVEN IN THE PAPER AS WELL AS THE RESULTS OF TYPICAL EXPERIMENTS AND COMPARISON WITH COMPUTATION. THE COMPUTED VALUES OF $K(EFF)$ AGREE WITH EXPERIMENT TO WITHIN 1.5 PERCENT. (AUTH.).

936 ID-NUMBER ID-NUMBER 936

AUTHOR HELM, F./ TRAVELLI, A.
 TITLE CALCULATION OF THE SODIUM-VOID EFFECT IN LARGE CARBIDE CORES
 REPORT NUMBER..... ANL-7320, 369-374
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6

ABSTRACT

INTRODUCTION: FOR SAFETY REASONS, IT IS VERY IMPORTANT TO PREDICT THE SODIUM-VOID EFFECT IN THE DESIGN OF LARGE FAST POWER REACTORS. THE SODIUM-VOID COEFFICIENT WAS STUDIED IN DETAIL WITH ASSEMBLIES 2 AND 3 OF ZPR-6, WHICH REPRESENT IN THEIR COMPOSITION LARGE URANIUM-FUELED AND SODIUM-COOLED CARBIDE CORES. MEASUREMENTS WERE PERFORMED IN CENTRAL REGIONS OF DIFFERENT SIZES AND IN A LARGE NUMBER OF OFF-CENTER REGIONS THROUGHOUT THE CORES. CALCULATIONS OF THE SODIUM-VOID EFFECT AND OF ITS INDIVIDUAL COMPONENTS WERE MADE FOR THE EXPERIMENTAL REGIONS BY ONE- AND TWO-DIMENSIONAL DIFFUSION THEORY. PERTURBATION AND K -CALCULATIONS WERE USED IN ONE DIMENSION, WHILE ONLY PERTURBATION CALCULATIONS WERE USED IN TWO DIMENSIONS. THE RESULTS GIVEN BY THE VARIOUS CALCULATIONAL TECHNIQUES ARE COMPARED TO EACH OTHER AND TO THE EXPERIMENTAL VALUES (AUTH).

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

937 ID-NUMBER ID-NUMBER 937

AUTHOR MENEGHETTI, D.
 TITLE CALCULATIONAL STUDIES OF SODIUM-VOID REACTIVITY VARIATIONS DUE TO THIN SLAB HETEROGENEITIES IN FAST CRITICAL ASSEMBLIES
 REPORT NUMBER..... ANL-7320, 377-385
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS, 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6 - CALCULATIONS

ABSTRACT

FAST CRITICAL SYSTEMS AT THE ARGONNE ZERO-POWER REACTORS ZPR-3, 6, AND 9 ARE CONSTRUCTED OF DRAWERS CONTAINING PLATES OF VARIOUS BASIC MATERIALS. THE PLATES ARE PLACED IN SOME SEQUENCE RELATIVE TO EACH OTHER WITHIN A DRAWER. THESE HETEROGENEITIES CAUSE VARIATIONS OF SODIUM-VOID REACTIVITY VALUES WHICH DEPEND UPON THE INTRA-DRAWER PLATE CONFIGURATIONS. THE VARIATIONS OF SODIUM- VOID REACTIVITY CAN BE INTERPRETED AS ARISING FROM DIFFERENCES IN SPATIAL VARIATIONS OF MULTIGROUP FLUXES ACROSS THE DRAWER-CELL, DIFFERENCES IN EFFECTIVE RESONANCE SELF-SHIELDING OF THE HEAVY ISOTOPES IN THE LOWER ENERGY REGIONS, AND IN SOME CASES ALSO ANISOTROPIC LEAKAGE (STREAMING).

THE RESULTS OF CALCULATIONAL ANALYSES GENERALLY COMPARE FAVORABLY FOR A SERIES OF HETEROGENEOUS SODIUM-VOID EXPERIMENTS REPORTED FOR ZPR-6 ASSEMBLY NO. 3. WITH INCREASING THICKNESS OF UNSEPARATED SODIUM PLATE-REGIONS THERE RESULTED PERCEPTIBLY LESS-NEGATIVE CALCULATED VALUES THAN EXPERIMENTALLY REPORTED. THE DIFFERENCE IS ATTRIBUTED TO ANISOTROPIC LEAKAGE.

RESULTS ARE ALSO GIVEN OF CALCULATIONS OF THE EXCESS REACTIVITY, I.E., SMALLER CRITICAL MASS, OF THE HETEROGENEOUS ZPR-6 ASSEMBLY NO. 3 SYSTEM RELATIVE TO A HOMOGENEOUS SYSTEM. (AUTH).

940 ID-NUMBER ID-NUMBER 940

AUTHOR KARAM, R. A./ ANCARANI, A./ HELM, F./ KATO, W. Y./ MAIN, G. W./ RUSCH, G. K.
 TITLE EXPERIMENTAL VERIFICATION OF REACTOR PHYSICS PARAMETERS OF ZONED CORES
 REPORT NUMBER..... ANL-7320, 403-420
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS, 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-9 (FAST ROCKET) ; ARGONNE NATIONAL LABORATORY - ZPR-6

ABSTRACT

INTRODUCTION: CORE ZONING IS A TECHNIQUE WHEREBY THE TOTAL FUEL INVENTORY REQUIRED TO STUDY A LARGE FAST REACTOR CAN BE SUBSTANTIALLY REDUCED. THIS TECHNIQUE USUALLY COMPRISES A TEST ZONE, A BUFFER REGION, A DRIVER REGION, AND A REFLECTOR. THE COMPOSITION OF THE TEST ZONE IS USUALLY IDENTICAL TO THE COMPOSITION OF THE LARGE CORE WHOSE SPECTRUM IS TO BE DUPLICATED AT THE CENTER OF THE ZONED CORE. THE DRIVER REGION MUST NECESSARILY HAVE GREATER CONCENTRATION PER UNIT VOLUME OF THE FISSILE MATERIAL THAN IN THE TEST ZONE IF THE REDUCTION IN FUEL INVENTORY IS TO BE REALIZED. THE BUFFER REGION, BETWEEN THE TEST AND DRIVER ZONES, MUST BE TAILORED AS TO COMPOSITION AND THICKNESS IN SUCH A WAY THAT THE NEUTRON ENERGY AND IMPORTANCE SPECTRA AT THE CENTER OF EACH OF THE TEST ZONE AND THE FULL-SIZE CORE ARE THE SAME. THE COMPOSITION OF THE REFLECTOR CAN BE THE SAME FOR BOTH THE ZONED AND FULL-SIZE CORES.

THE CHOICE OF DILUENT MATERIALS AND THEIR CONCENTRATIONS IN THE DRIVER REGION IS, BY AND LARGE, A MATTER OF TASTE, ALTHOUGH THERE MAY BE A PARTICULAR COMPOSITION WHICH TENDS TO MINIMIZE THE CRITICAL MASS. THE CHOICE OF MATERIALS FOR THE BUFFER REGION, TO A LARGE MEASURE, DEPENDS ON THE NEUTRON SPECTRUM IN THE DRIVER. FOR EXAMPLE, IF THE NEUTRON SPECTRUM IN THE DRIVER IS HARDER IN THE ENTIRE ENERGY RANGE THAN IN THE TEST ZONE; THEN THE BUFFER REGION SHOULD GENERALLY HAVE AN INELASTIC SCATTERER FOR DEGRADING THE HIGH-ENERGY NEUTRONS AND AN ELASTIC SCATTERER FOR THE LOW-ENERGY NEUTRONS. THE DESIRABLE COMPOSITION IS USUALLY ARRIVED AT BY ADJUSTING THE CONCENTRATION OF ONE COMPONENT AT THE EXPENSE OF THE OTHER UNTIL THE SPECTRAL MATCHING IN THE TWO SYSTEMS IS ACHIEVED. THE THICKNESS OF THE BUFFER REGION IS USUALLY CHOSEN ACCORDING TO THE EASE WITH WHICH A SHELL CAN BE CONSTRUCTED, AND THIS DEPENDS ON THE PHYSICAL PROPERTIES OF THE FACILITY INVOLVED.

THIS CONCEPT OF ZONED CORES IS BEING EXPERIMENTALLY VERIFIED AT ARGONNE NATIONAL LABORATORY, AND THIS PAPER SHOULD BE CONSIDERED AS A PROGRESS REPORT RATHER THAN A FINISHED PIECE OF WORK, BECAUSE THE RESULTS ARE STILL SLOWLY COMING IN. THE EXPERIMENTAL PROGRAM INVOLVES THREE DIFFERENT ASSEMBLIES, TWO ZONED AND ONE FULL-SIZE CORES. THE TWO ZONED ASSEMBLIES CONSIST OF ONE WITH A LARGE TEST ZONE (RADIUS = 41.53 CM) AND ANOTHER WITH A RATHER SMALL TEST ZONE (RADIUS = 20.89 CM). THE LARGE ZONED CORE IS DESIGNATED AS ASSEMBLY NO. 42 OF ZPR-6 AND THE SMALLER CORE IS DESIGNATED AS ASSEMBLY NO. 11 OF ZPR-9. THE TEST ZONES OF BOTH CORES HAVE THE COMPOSITION OF A 2600-LITER REACTOR, THE FULL-SIZE SYSTEM, WHICH IS DESIGNATED AS ASSEMBLY NO. 5 OF ZPR-6.

THE MAJOR OBJECTIVE ASSOCIATED WITH THE ZONED CORES IS TO TEST, IN CONJUNCTION WITH THE FULL- SCALE SYSTEM, HOW WELL REACTOR PHYSICS PARAMETERS FOR ASSEMBLY NO. 5 CAN BE PREDICTED FROM THE ZONED-CORE MEASUREMENTS. ANOTHER IMPORTANT ASPECT OF ZONED CORES IS HOW SMALL CAN THEY BE BUILT AND STILL BE USEFUL. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

942 ID-NUMBER ID-NUMBER 942

AUTHOR BENNETT, E. F./ GOLD, R./ HUBER, R. J.
 TITLE SPECTRUM MEASUREMENTS IN A LARGE DILUTE PLUTONIUM FUELED FAST REACTOR
 REPORT NUMBER..... ANL-7320, 477-480
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

SPECTRUM MEASUREMENTS HAVE BEEN MADE AT THE CENTER OF THE ZPR-3 ASSEMBLY 48, A LARGE, DILUTE, PLUTONIUM-FUELED FAST REACTOR. THE SCHEDULING OF EXPERIMENTS FOR THIS ASSEMBLY ALLOWED FOR NEUTRON- SPECTROSCOPY MEASUREMENTS TO COMMENCE EARLY IN THE PROGRAM. IN THIS PAPER THE RESULTS OF TWO OF THESE MEASUREMENTS WILL BE DESCRIBED. THE TECHNIQUES ARE BY PROTON-RECOIL PROPORTIONAL COUNTING AND BY THE LITHIUM(N,ALPHA) TRITIUM REACTION. BOTH HAVE BEEN USED PREVIOUSLY FOR IN-CORE MEASUREMENTS AT ARGONNE, AND ARE TYPICAL OF IN-CORE SPECTROMETERS IN USE AND UNDER DEVELOPMENT AT ARGONNE AND ELSEWHERE. (AUTH).

INTRODUCTION: ASSEMBLY 48 OF ZPR-3 IS A PLUTONIUM-FUELED CRITICAL ASSEMBLY WHICH SIMULATES A CLASS OF LARGE POWER REACTORS. THE SCHEDULING OF EXPERIMENTS FOR THIS ASSEMBLY ALLOWED FOR NEUTRON- SPECTROSCOPY MEASUREMENTS TO COMMENCE EARLY IN THE PROGRAM. IN THIS PAPER THE RESULTS OF TWO OF THESE MEASUREMENTS WILL BE DESCRIBED. THE TECHNIQUES ARE BY PROTON-RECOIL PROPORTIONAL COUNTING AND BY THE LITHIUM(N,ALPHA) TRITIUM REACTION. BOTH HAVE BEEN USED PREVIOUSLY FOR IN-CORE MEASUREMENTS AT ARGONNE, AND ARE TYPICAL OF IN-CORE SPECTROMETERS IN USE AND UNDER DEVELOPMENT AT ARGONNE AND ELSEWHERE. (AUTH).

943 ID-NUMBER ID-NUMBER 943

AUTHOR TRAVELLI, A.
 TITLE A COMMENT ON THE COMPARISON OF THEORETICAL WITH EXPERIMENTAL NEUTRON
 SPECTRA IN FAST CRITICAL ASSEMBLIES
 REPORT NUMBER..... ANL-7320, 481-485
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

INTRODUCTION: THE EXPERIMENTAL DATA OBTAINED BY BENNETT IN THE MEASUREMENT OF CENTRAL NEUTRON SPECTRA IN FAST CRITICAL ASSEMBLIES HAVE A RESOLUTION OF 15-20 PERCENT IN ENERGY OVER THE ENERGY RANGE, WHICH EXTENDS APPROXIMATELY FROM 1 KEV TO 1.MEV. THE HIGH RESOLUTION, COMBINED WITH THE SMALL STATISTICAL ERROR OF THE DATA, MAKES IT POSSIBLE TO MEASURE, IN ADDITION TO THE MACROSCOPIC BEHAVIOR OF THE NEUTRON SPECTRUM, SOME OF THE MICROSCOPIC VARIATION OF THE SPECTRUM AT THOSE ENERGIES FOR WHICH RESONANCES OF THE LIGHT ELEMENTS CAUSE SHARP VARIATIONS OF THE TRANSPORT CROSS SECTION.

THE GREATER RESOLUTION OF THE EXPERIMENTAL SPECTRA RAISES THE QUESTION AS TO HOW ACCURATELY THE PRESENT ANALYTICAL METHODS CAN PREDICT THE MICROSCOPIC VARIATIONS OF THE SPECTRUM, AND ADDS CONSIDERABLE INTEREST TO THE COMPARISON OF EXPERIMENT WITH THEORY. IT IS THE PURPOSE OF THIS NOTE TO SHOW THE RESULTS OF TWO SUCH COMPARISONS, IN WHICH SOME DETAILED EXPERIMENTAL SPECTRA WERE MATCHED TO CORRESPONDING HIGH-RESOLUTION CALCULATIONS. (AUTH).

944 ID-NUMBER ID-NUMBER 944

AUTHOR BROWN, P. S.
 TITLE COMMENT ON SPECTRUM MEASUREMENTS IN A LARGE, DILUTE PLUTONIUM-FUELED FAST
 REACTOR
 REPORT NUMBER..... ANL-7320, 486-489
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

GENERAL ELECTRIC HAS BEEN WORKING ON A PROTON-RECOIL SPECTROMETER VERY SIMILAR TO THAT DEVELOPED BY E. BENNETT OF ANL. THE PREAMPLIFIER IS IDENTICAL TO THAT DESCRIBED BY BENNETT, BUT THE REMAINDER OF THE ELECTRONICS CONSISTS OF EQUIPMENT NORMALLY USED WITH SOLID-STATE DETECTORS. DISCRIMINATION IN PULSE RISE TIME IS USED TO SEPARATE GAMMA-BACKGROUND EFFECTS. PULSE HEIGHT IS FED TO THE Y AXIS OF A 4096-CHANNEL TWO-PARAMETER ANALYZER, AND THE DERIVATIVE OF THE PULSE RISE IS FED TO THE X AXIS, WHEREAS IN BENNETT'S SYSTEM THE RATIO OF THE DERIVATIVE TO THE PULSE HEIGHT IS FED TO THE X AXIS. THE NEUTRON EVENTS FALL ON THE DIAGONAL, FROM LOWER LEFT TO UPPER RIGHT, OF A TWO-PARAMETER ARRAY, AND THE GAMMA EVENTS FALL TO THE LEFT OF THE DIAGONAL. EXCELLENT DISCRIMINATION BETWEEN GAMMAS AND NEUTRONS HAS BEEN

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ACHIEVED. A COBALT-60 SOURCE IS USED TO PROVIDE A GAMMA BACKGROUND WHICH IS NORMALIZED TO THE GAMMA ONLY REGION OF THE TWO-PARAMETER ARRAY, THEREBY PERMITTING A CORRECTION FOR THE FEW GAMMA EVENTS WHICH FALL ALONG THE DIAGONAL. THE CHAMBERS ARE STAINLESS STEEL TUBES, ONE INCH IN DIAMETER BY 7 INCH LONG, WITH AN EFFECTIVE LENGTH OF 3 INCH THEY ARE FILLED WITH EITHER 3 ATM OF HYDROGEN GAS OR 4 ATM OF METHANE, AND CONTAIN SOME NITROGEN FOR CALIBRATION, WHICH IS DONE BY USE OF PROTONS WITH AN EFFECTIVE ENERGY OF 615 KEV PRODUCED BY THE THERMAL-NEUTRON REACTION NITROGEN-14(N,P) CARBON-14. THE HYDROGEN TUBES CONTAIN A SMALL AMOUNT OF METHANE FOR QUENCHING.

THE SPECTROMETER HAS BEEN USED TO MEASURE THE NEUTRON SPECTRUM AT THE CENTERS OF THE CORE AND THE URANIUM-238 BLANKET OF ZPR-3 ASSEMBLY 48. ALTHOUGH THE BLANKET MEASUREMENT WAS PERFORMED WITHOUT DIFFICULTY, HIGH DETECTOR COUNT RATES WERE ENCOUNTERED IN THE CORE, DUE TO THE APPRECIABLE PLUTONIUM-240 SPONTANEOUS-FISSION SOURCE, HAD SMALLER, LESS SENSITIVE CHAMBERS BEEN USED, THE COUNT RATE WOULD HAVE BEEN SUFFICIENTLY LOW. DISTORTION IN THE PROTON-RECOIL DATA MADE IT NECESSARY TO SEPARATE THE TABLE HALVES AND WITHDRAW ALL CONTROL RODS (I.E., FUEL) IN ORDER TO REDUCE THE COUNT RATE TO AN ACCEPTABLE LEVEL FOR THE CORE MEASUREMENTS. EVEN THEN, SOME DISTORTION REMAINED IN THE DATA, CONSISTING OF A SMALL FRACTION OF THE EVENTS FALLING TO THE RIGHT OF THE DIAGONAL, WHERE NO EVENTS SHOULD OCCUR. SUBSEQUENT ANALYSIS REVEALED THAT THESE EVENTS WERE CAUSED BY NEUTRONS, AND THAT COUNT-RATE-SENSITIVE COMPONENT, APPARENTLY IN THE RATE OF RISE CHANNEL OF THE ELECTRONICS, WAS AFFECTING THE DIFFERENTIATED PULSES GOING TO THE X AXIS OF THE ANALYZER. NO EVIDENCE COULD BE FOUND THAT PULSE HEIGHTS (I.E., PROTON ENERGIES) WERE BEING AFFECTED. HENCE, IT WAS ASSUMED THAT THE EVENTS TO THE RIGHT OF THE DIAGONAL COULD BE INCLUDED WITH THE PROTON PEAK AT THE DIAGONAL. THIS ASSUMPTION WAS APPARENTLY VALID SINCE THE PARTS OF THE SPECTRUM MEASURED AT DIFFERENT HIGH-VOLTAGE SETTINGS AND WITH DIFFERENT CHAMBERS AGREED AT THEIR END POINTS. (AUTH).

946 ID-NUMBER ID-NUMBER 946

AUTHOR WEALE, J. W./ BENJAMIN, P. W./ PATERSON, W. J.

TITLE A COMPARISON OF MEASURED AND CALCULATED ENERGY SPECTRA IN TWO VERA CORES

REPORT NUMBER.... ANL-7320, 501-505

CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
10-13 OCTOBER 1966, ARGONNE, ILLINOIS

DATE PUBLISHED ... 66-10-10

SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - VERA FAST REACTOR

ABSTRACT

SPECTRA HAVE BEEN MEASURED OVER THE WHOLE ENERGY RANGE IN TWO VERA FAST REACTOR ASSEMBLIES, DESIGNATED VERA 16Z5A AND VERA 17Z5J. IN PARTICULAR, THE LOW-ENERGY SPECTRA HAVE BEEN DETERMINED BY THE TIME-OF-FLIGHT TECHNIQUE, AND THIS HAS BEEN CHECKED IN ONE OF THE ASSEMBLIES AGAINST A PROPORTIONAL COUNTER USING PULSE-SHAPE DISCRIMINATION. THE MEASURED SPECTRA ARE COMPARED WITH SPECTRA CALCULATED BY MEANS OF THE FD1 AND FD2 DATA SETS, AND THESE ARE SHOWN TO BE IN ERROR IN PREDICTING TOO LOW A NEUTRON FLUX IN THE LOW-ENERGY RANGE. THE EXPERIMENTAL ASSEMBLIES ARE SIMILAR TO TWO ZEBRA ASSEMBLIES IN WHICH THE DOPPLER TEMPERATURE COEFFICIENT HAS BEEN MEASURED. (AUTH).

947 ID-NUMBER ID-NUMBER 947

AUTHOR KUCHLE, M./ MITZEL, F./ WATTECAMPS, E./ WERLE, H.

TITLE MEASUREMENTS OF NEUTRON SPECTRA AND DECAY CONSTANTS WITH THE FAST
SUBCRITICAL FACILITY SUAK

REPORT NUMBER.... ANL-7320, 506-523

CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
10-13 OCTOBER 1966, ARGONNE, ILLINOIS

DATE PUBLISHED ... 66-10-10

SITE/PROGRAM GERMANY - SUAK

ABSTRACT

SUAK IS A SMALL, UNREFLECTED FAST SUBCRITICAL FACILITY FUELLED WITH THIN PLATES OF 20 PERCENT ENRICHED URANIUM METAL. WITH A 200-KEV, PULSED NEUTRON GENERATOR, MEASUREMENTS OF THE PROMPT- NEUTRON DECAY CONSTANT AND OF THE NEUTRON SPECTRUM WERE PERFORMED. THE FIRST ASSEMBLY CONSISTED OF PURE URANIUM ONLY; THEN DIFFERENT AMOUNTS OF POLYETHYLENE WERE ADDED TO SHIFT THE NEUTRON SPECTRUM. THE NEUTRON SPECTRA AT THE CENTER AND AT THE SURFACE OF THE PURE URANIUM ASSEMBLY HAVE BEEN MEASURED BY THE TIME-OF-FLIGHT METHOD AND WITH A SERIES OF SPHERICAL PROTON-RECOIL PROPORTIONAL COUNTERS.

THE EXPERIMENTAL RESULTS WERE COMPARED WITH CALCULATIONS IN WHICH DIFFERENT APPROXIMATIONS AND CROSS SECTIONS WERE USED. THE EXPERIMENTAL NEUTRON LIFETIME WAS ALWAYS LONGER THAN THE CALCULATED ONE. THE DEVIATION AMOUNTS TO ONLY 4 PERCENT FOR THE PURE URANIUM ASSEMBLY AND TO ABOUT 30 PERCENT FOR THE HYDROGEN-MODERATED ASSEMBLIES. SITUATIONS WITH GOOD TIME-EIGENVALUES, WITH QUASI-MODES AND WHERE NO EXPONENTIAL COULD BE FOUND, WERE OBSERVED IN THE SUAK ASSEMBLIES IN AGREEMENT WITH THEORETICAL PREDICTIONS. DIFFERENT TYPES OF PULSED REACTIVITY DETERMINATIONS WERE USED. IN ADDITION, A MODULATED SOURCE TECHNIQUE WAS TRIED FOR THE DETERMINATION OF $1-K(EFF))/L$.

IN CONNECTION WITH THE MEASUREMENT OF THE SPECTRA BY THE TIME-OF-FLIGHT METHOD THE PROBLEMS OF BACKGROUND, DETECTOR EFFICIENCY, AND RESOLUTION CORRECTION ARE DISCUSSED.

THE CALIBRATION AND THE EVALUATION PROCEDURE OF DATA OBTAINED WITH THE PROTON-RECOIL DETECTOR ARE DESCRIBED. THE MEASURED SPECTRA OF THE FIRST ASSEMBLY OBTAINED BY BOTH METHODS AGREE RATHER WELL WITH EACH OTHER IN THE COMMON MEASURED ENERGY RANGE FROM 25 KEV TO 1.5 MEV BUT THE MEASURED SPECTRA ARE SOFTER THAN THE CALCULATED SPECTRA. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

950 ID-NUMBER ID-NUMBER 950

AUTHOR PERSIANI, P. J./ HESS, A. L./ KUCERA, D.
 TITLE THE CRITICAL EXPERIMENTS AND PRELIMINARY ANALYSIS OF MULTIFUELED,
 NONUNIFORM CORE LOADINGS FOR THE FARET PROGRAM
 REPORT NUMBER..... ANL-7320, 550-560
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

A SERIES OF SMALL, PLUTONIUM PLUS-URANIUM-235-FUELED FAST REACTOR CORES WITH STEEL RADIAL AND AXIAL REFLECTORS WERE CONSTRUCTED IN ARGONNE'S ZERO POWER REACTOR REACTOR-3 AS PART OF THE DESIGN PROGRAM FOR THE FARET REACTOR. THESE STUDIES, DESIGNATED ZPR-3 ASSEMBLY 46, WERE ESSENTIALLY MOCKUPS OF POSSIBLE LOADINGS OF THE FARET CORE. THE PRIMARY OBJECTIVE OF THE STUDIES WAS TO CONFIRM THE PHYSICS ANALYSIS OF MULTIFUELED, NONUNIFORM CORE LOADINGS AS WERE ENVISAGED FOR THE FARET SYSTEM.

A PRINCIPAL INTEREST IN THE STUDIES WAS TO ESTABLISH EXPERIMENTALLY THE PREDICTED REACTIVITY CONTROL AFFORDED BY THE CONTROL-ROD DESIGNS FOR FARET. THE AGREEMENT OBTAINED BETWEEN CALCULATIONS AND THE RESULTS OF EXPERIMENTS FOR CONTROL-ROD WORTH WAS SUFFICIENT TO ESTABLISH THE RANGE OF CONTROL POSSIBLE IN THE FARET REACTOR. OF EQUAL IMPORTANCE WAS THE SUBSTANTIATION OF THE NEUTRONIC BEHAVIOR OF A MIXED CORE IN FARET WHEN SUBASSEMBLIES OF DIFFERENT TYPES OF FUELS WERE INTERCHANGED. ANALYTICAL CALCULATIONS WERE DONE FOR ALL EXPERIMENTS, AND THE METHODS FOR ANALYSIS THAT WERE ADOPTED WILL BE DISCUSSED IN THE PAPER. THE AGREEMENT OF THE ANALYSES WITH THE EXPERIMENTAL RESULTS IS FOUND TO BE GENERALLY GOOD. A STUDY OF THE MIXED-CORE SYSTEMS AND THE COMPARISONS OF CALCULATIONS WITH RESULTS OF FUEL-EXCHANGE EXPERIMENTS IN THREE CORES INDICATE THAT THE BEHAVIOR OF A MIXED-CORE LOADING CAN BE UNDERSTOOD AS WELL AS THAT OF A UNIFORM CORE LOADING. (AUTH).

951 ID-NUMBER ID-NUMBER 951

AUTHOR MC VEAN, R. L./ GOIN, R. W./ WEITZBERG, A./ LERIDON, A. M./ KREMSER, J.
 TITLE CRITICAL ASSEMBLY MOCKUP OF THE SEFOR REACTOR IN ZPR-3
 REPORT NUMBER..... ANL-7320, 560-568
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

THE CRITICAL ASSEMBLY FOR THE SEFOR REACTOR, WHICH HAS BEEN BUILT IN ZPR-3, IS THE FIRST LARGE, PLUTONIUM FUELED CRITICAL ASSEMBLY TO BE BUILT IN THE FAST BREEDER PROGRAM. BERYLLIUM OXIDE HAS BEEN INCLUDED IN THE DESIGN OF THE 528-LITER CORE TO SOFTEN THE NEUTRON SPECTRUM TO MATCH MORE NEARLY THAT OF A LARGE POWER REACTOR AND TO ENHANCE THE DOPPLER EFFECT.

METAL FUEL PLATES ARE USED IN THE CORE. SODIUM CARBONATE, ALONG WITH SOME ALUMINUM, IS USED TO REPRESENT THE SODIUM COOLANT AND THE OXYGEN IN THE SEFOR OXIDE FUEL. THERE IS A REGION OF SODIUM AND STAINLESS STEEL BETWEEN THE CORE AND THE RADIAL REFLECTOR. THE REFLECTOR IS MADE OF NICKEL AND IS USED FOR CONTROL OF THE SEFOR REACTOR.

BECAUSE OF THE SEFOR DESIGN REQUIREMENT TO MINIMIZE THE EFFECTS OF AXIAL THERMAL EXPANSION, MEASUREMENTS WERE MADE IN THREE DIFFERENT CORE MOCKUPS. THE BASIC MEASUREMENTS WERE MADE IN A ONE- SEGMENT, OR REFERENCE CORE, AND SEVERAL OF THESE MEASUREMENTS WERE REPEATED IN MOCKUPS OF A TWO- SEGMENT FUEL ELEMENT CORE AND A THREE-SEGMENT FUEL ELEMENT CORE. (AUTH).

952 ID-NUMBER ID-NUMBER 952

AUTHOR REYNOLDS, A. B./ STEWART, S. L.
 TITLE APPLICATION OF THE SEFOR CRITICAL EXPERIMENTS AT ZPR-3 TO SEFOR
 REPORT NUMBER..... ANL-7320, 569-585
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
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 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS WAS PERFORMED WITH A MOCKUP OF SEFOR AT ZPR-3. ANALYSES OF THESE EXPERIMENTS AND THE APPLICATION OF THE RESULTS TO THE SEFOR DESIGN ARE DISCUSSED.

VALUES OF THE CRITICAL MASS WERE DETERMINED FOR 1-, 2-, AND 3-SEGMENT SEFOR FUEL DESIGNS IN ORDER TO HELP ESTABLISH THE PLUTONIUM ATOM FRACTION IN THE SEFOR FUEL.

REACTIVITY EFFECTS OF AXIAL FUEL EXPANSION WERE MEASURED WHICH LED TO SELECTION OF THE 2- SEGMENT DESIGN FOR SEFOR.

MEASUREMENTS OF THE REACTIVITY WORTH OF THE RADIAL REFLECTOR ESTABLISHED THE ADEQUACY OF THE SEFOR REFLECTOR-CONTROL SYSTEM.

THE DOPPLER COEFFICIENT WAS MEASURED. THE CALCULATED URANIUM-238 DOPPLER COEFFICIENT WAS IN AGREEMENT WITH THE EXPERIMENTAL VALUE; THE MEASURED PLUTONIUM-239 CONTRIBUTION TO THE SEFOR DOPPLER COEFFICIENT WAS NEAR ZERO. IT WAS DEMONSTRATED THAT THE SEFOR DOPPLER COEFFICIENT ($T(\Delta K)/\Delta T = -0.0085$) IS SIGNIFICANTLY MORE NEGATIVE THAN THE CONSERVATIVE VALUE ASSUMED FOR SAFEGUARDS ANALYSIS.

THE MAXIMUM POSITIVE REACTIVITY DUE TO LOSS OF SODIUM WAS MEASURED; THE MEASURED REACTIVITY WAS SMALL (+ 6 CENTS) AND CLOSE TO THE CALCULATED VALUE.

THE RATIO OF PROMPT-NEUTRON LIFETIME TO DELAYED NEUTRON FRACTION WAS MEASURED BOTH BY THE PULSED NEUTRON TECHNIQUE AND BY NOISE ANALYSIS. THE VALUES MEASURED BY THE TWO TECHNIQUES WERE IN AGREEMENT, AND, FOR A CALCULATED $\beta_{\text{EFFECTIVE}}$ OF 0.0033, GAVE $L=0.68$ MICRO SECONDS.

FISSION RATIOS, FISSION AND BORON TRAVERSES, AND PLUTONIUM WORTH DISTRIBUTIONS WERE MEASURED AND COMPARED WITH CALCULATIONS. (AUTH).

953 ID-NUMBER ID-NUMBER 953

AUTHOR KISTNER, G./ MIHALCZO, J. T.

TITLE CRITICAL EXPERIMENTS WITH A MOCKUP OF THE REPETITIVELY PULSED REACTOR SORA

REPORT NUMBER..... ANL-7320, 586-589

CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
10-13 OCTOBER 1966, ARGONNE, ILLINOIS

DATE PUBLISHED ... 66-10-10

SITE/PROGRAM OAK RIDGE - SORA REACTOR (FAST, PULSED, NAK)

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS HAS BEEN PERFORMED ON A CLOSE MOCKUP OF THE SORA REACTOR. SORA IS A SODIUM-POTASSIUM-COOLED, REPETITIVELY-PULSED FAST REACTOR WHICH WILL BE USED AS HIGH- INTENSITY NEUTRON SOURCE FOR TIME-OF-FLIGHT EXPERIMENTS. THE REACTIVITY OF THIS REACTOR IS PERIODICALLY VARIED BY MEANS OF A MOVABLE REFLECTOR. THOSE PARAMETERS WHICH ARE RELATED TO THE KINETICS OF THE REACTOR HAVE BEEN INVESTIGATED THOROUGHLY IN THE CRITICAL EXPERIMENTS.

THE TOTAL REACTIVITY VALUE OF THE MOVABLE REFLECTOR DETERMINES THE RATIO OF THE PEAK POWER TO THAT BETWEEN PULSES. THE REACTIVITY OF THE MOVABLE REFLECTOR AS A FUNCTION OF ITS POSITION AND THE PROMPT-NEUTRON DECAY CONSTANT DETERMINE THE HALF-WIDTH OF THE NEUTRON PULSES. THESE PARAMETERS HAVE BEEN MEASURED FOR BERYLLIUM AND FOR IRON REFLECTORS OF SEVERAL SIZES, AND FOR VARIOUS CORE AND REFLECTOR CONFIGURATIONS. IT HAS BEEN SHOWN, FOR EXAMPLE, THAT A 24-CM-HIGH, 7-CM-THICK, AND 21- CM- WIDE BERYLLIUM REFLECTOR OPERATING UNDER REACTOR DESIGN CONDITIONS WILL PRODUCE PULSES ABOUT 50 MICRO SECOND WIDE WITH A PEAK-TO-MINIMUM POWER RATIO OF APPROXIMATELY 4.E3.

954 ID-NUMBER ID-NUMBER 954

AUTHOR SMITH, J. C./ ATKINSON, H./ MC TAGGART, M. H.

TITLE THEORETICAL AND EXPERIMENTAL ANALYSIS OF REACTION RATE DISTRIBUTION IN THE
DOUNREAY FAST REACTOR

REPORT NUMBER..... ANL-7320, 590-604

CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
10-13 OCTOBER 1966, ARGONNE, ILLINOIS

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SITE/PROGRAM UNITED KINGDOM, DOUNREAY - DOUNREAY FAST REACTOR (DFR)

ABSTRACT

DURING INITIAL COMMISSIONING OF THE DOUNREAY FAST REACTOR (DFR) AN EXTENSIVE PROGRAMME OF PHYSICS MEASUREMENTS WAS CARRIED OUT AT LOW POWER, SUBSTANTIALLY CONFIRMING THE DESIGN PREDICTIONS. SINCE THAT TIME THE REACTOR HAS BEEN MODIFIED TO IMPROVE ITS PERFORMANCE AS AN IRRADIATION FACILITY, PRINCIPALLY BY INCREASING THE ENRICHMENT OF THE FUEL AND BY SUBSTITUTING NICKEL FOR NATURAL URANIUM IN THE BLANKET ADJACENT TO THE CORE. A SHORT PROGRAMME OF FLUX AND REACTION-RATE MEASUREMENTS EARLY IN 1965 SHOWED SERIOUS DISCREPANCIES BETWEEN THEORETICAL PREDICTIONS AND EXPERIMENTAL OBSERVATION.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE SUCCESS OF EARLIER THEORETICAL TREATMENT SUGGESTED THAT THE CAUSE OF THE FAILURE TO DEAL SATISFACTORILY WITH THE MODIFIED REACTOR MUST LIE IN INCORRECT DATA FOR NICKEL. AN EXTENSIVE PROGRAMME OF CALCULATIONS WAS UNDERTAKEN USING MORE UP-TO-DATE CROSS-SECTION SETS, NOTABLY THE FD2, A THIRTY-THREE-GROUP SET BASED ON THE ALDERMASTON/WINFRIETH DATA FILE AND THE RUSSIAN 26-GROUP SET OF ABAGYAN ET AL. THESE SHOWED CONSIDERABLY BETTER AGREEMENT THAN HAD BEEN OBTAINED WITH THE YOM 16- GROUP SET, BUT DISCREPANCIES BETWEEN THEORY AND EXPERIMENT STILL REMAINED.

AT THIS STAGE IT COULD NOT BE CLEARLY SEEN TO WHAT EXTENT THE DISCREPANCIES BETWEEN THEORY AND EXPERIMENT WERE DUE TO INADEQUACIES OF NUCLEAR DATA AND THE USE OF A DIFFUSION THEORY CODE OR TO THE NECESSARY GEOMETRICAL SIMPLIFICATIONS MADE IN ADAPTING A TWO-DIMENSIONAL CODE TO THE PROBLEM. IT WAS THEREFORE DECIDED TO CONSTRUCT ON THE VERA ASSEMBLY MACHINE AT A.W.R.E. ALDERMASTON AS ASSEMBLY WHICH WOULD APPROXIMATE TO DFR IN SIZE, CRITICAL MASS, AND SPECTRUM, BUT WOULD BE FREE OF THE DETAILED GEOMETRICAL COMPLEXITIES OF DFR AND WOULD AT THE SAME TIME ALLOW ACCESS FOR EXPERIMENTAL MEASUREMENT TO REGIONS WHERE THE CORRESPONDING POSITIONS IN DFR WERE ONLY ACCESSIBLE FOR RELATIVELY INACCURATE ACTIVATION TECHNIQUES.

AN ACCOUNT OF THE MEASUREMENTS MADE IN DFR AND VERA IS PRESENTED AND THE THEORETICAL INTERPRETATION IS DISCUSSED. (AUTH).

955 ID-NUMBER ID-NUMBER 955

AUTHOR MUELLER, R. E./ NIMS, J. B./ CALLEN, R. C.
 TITLE STATIC PHYSICS MEASUREMENTS IN THE FERMI REACTOR
 REPORT NUMBER..... ANL-7320, 605-628
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
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 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

THIS PAPER REVIEWS STATIC PHYSICS MEASUREMENTS WHICH HAVE BEEN MADE TO DATE IN THE FERMI REACTOR. BOTH LOW-POWER LESS THAN 1 MW(THERMAL) AND HIGH-POWER (1 MW(THERMAL)-200 MW(THERMAL)) MEASUREMENTS ARE DISCUSSED. IN THE CASE OF THE LOW-POWER MEASUREMENTS, EMPHASIS IS PLACED PRIMARILY ON THOSE EXPERIMENTS WHICH CAN BE DIRECTLY COMPARED WITH ZPR-3 CRITICAL EXPERIMENT DATA. IN PARTICULAR, RESULTS OF MEASUREMENTS MADE TO DETERMINE THE REACTOR CRITICAL MASS, REACTIVITY WORTHS OF FUEL AND BLANKET MATERIALS, SODIUM WORTH, FISSION DISTRIBUTIONS, AND CONTROL AND SAFETY ROD WORTHS ARE DISCUSSED. ALTHOUGH THE ZPR-3 MOCKUP WAS NOT AN EXACT REPRESENTATION OF THE ACTUAL REACTOR, THUS NECESSITATING IN SOME CASES CONSIDERABLE EXTRAPOLATION OF THE CRITICAL EXPERIMENT DATA, IT HAS BEEN FOUND THAT IN GENERAL THE MEASURED DATA OBTAINED AGREE VERY WELL WITH EXTRAPOLATIONS FROM CRITICAL EXPERIMENT RESULTS. HOWEVER, IN THE CASES OF THE MEASURED SODIUM WORTH AND GANGED SAFETY-ROD WORTH, AGREEMENT WAS POOR. THIS LEAD TO A MODIFICATION IN THE ORIGINAL INTERPRETATION OF THE CRITICAL EXPERIMENT DATA. AN ANOMALOUS REACTIVITY INCREASE WITH TIME WHICH WAS OBSERVED AT LOW POWER IS ALSO DISCUSSED. IN THE ABSENCE OF BURNUP THIS HAS BEEN RELATED TO TEMPERATURE EFFECTS IN THE REACTOR.

THE STATIC PHYSICS MEASUREMENTS WHICH HAVE BEEN MADE AT SUCCESSIVELY INCREASING POWER LEVELS IN THE HIGH-POWER TESTS (UP TO 100 MW THERMAL TO DATE) CANNOT BE DIRECTLY RELATED TO CRITICAL EXPERIMENT DATA. THESE CONSIST OF POWER-AND FLOW-COEFFICIENT MEASUREMENTS, ABSOLUTE POWER- CALIBRATION DATA, AND AN OBSERVED REACTIVITY DECREASE DURING POWER OPERATION WHICH CANNOT BE ACCOUNTED FOR BY BURNUP. THE MEASURED POWER-COEFFICIENT VALUE IS ABOUT 30 PERCENT SMALLER THAN HAD BEEN PREDICTED FOR THE REACTOR. THIS HAS BEEN ATTRIBUTED PRIMARILY TO ERRORS IN THE ASSUMED WORTH DISTRIBUTIONS USED IN THE PREDICTIONS. THE PRELIMINARY FLOW-COEFFICIENT DATA SEEMS TO INDICATE A SMALLER PROPORTION OF THE TOTAL FEEDBACK THAN EXPECTED AND IS DUE TO THE PROMPT, FLOW-INDEPENDENT, COMPONENT, HOWEVER, IT IS BELIEVED THAT THIS DIFFERENCE IS DUE TO LIMITATIONS IN THE EXPERIMENTAL DATA. THE ABSOLUTE POWER-CALIBRATION DATA WHICH HAVE BEEN OBTAINED FROM HEAT-BALANCE MEASUREMENTS AND FROM NUCLEAR CALIBRATION ARE IN GOOD AGREEMENT. THE ANOMALOUS REACTIVITY LOSS DURING POWER OPERATION HAS NOT YET BEEN EXPLAINED. HOWEVER, SINCE IT IS OF OPPOSITE SIGN THAN THE REACTIVITY GAIN OBSERVED DURING LOW-POWER OPERATION, IT QUITE POSSIBLY COULD BE DUE TO A REVERSAL OF THE EARLIER EFFECT. (AUTH).

965 ID-NUMBER ID-NUMBER 965

AUTHOR ENGELMANN, P./ BICKEL, W./ DAUNERT, U./ HABERMANN, F. W. A./ VAN VELZE, P.
 L./ WALZE, H./ WITTEK, G.
 TITLE CONSTRUCTION AND EXPERIMENTAL EQUIPMENT OF THE KARLSRUHE FAST CRITICAL
 FACILITY, SNEAK
 REPORT NUMBER..... ANL-7320, 725-733
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM GERMANY - SNEAK (FAST BREEDER)

ABSTRACT

CONSTRUCTION OF THE KARLSRUHE FAST CRITICAL FACILITY SNEAK WAS COMPLETED IN THE SUMMER OF 1966. A BRIEF DESCRIPTION OF ITS MAIN DESIGN FEATURES, ITS EXPERIMENTAL EQUIPMENT, AND THE METHODS USED FOR PRECISE REACTIVITY MEASUREMENTS ARE GIVEN.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SNEAK IS A FIXED VERTICAL ASSEMBLY WITH FUEL ELEMENTS SUSPENDED FROM A TOP GRID. HORIZONTAL AND VERTICAL CHANNELS MAY BE FORMED IN THE REACTOR. THE TWO HORIZONTAL CHANNELS WILL BE USED FOR A MATERIAL REPLACEMENT DRAWER WITH AUTOMATIC SAMPLE CHANGER, A DETECTOR OR MATERIAL TRAVERSE DEVICE, AND A PULSED NEUTRON SOURCE. FOUR VERTICAL CHANNELS CLOSE TO THE CORE CENTER ARE AVAILABLE FOR INSTALLATION OF A PILE OSCILLATOR. A GAS-HEATED LOOP IS BEING CONSTRUCTED FOR DOPPLER EXPERIMENTS.

FOUR METHODS USED IN SNEAK FOR PRECISE REACTIVITY MEASUREMENTS ARE COMPARED: THE ASYMPTOTIC PERIOD METHOD, THE PILE-OSCILLATOR METHOD, THE INVERSE KINETICS METHOD, AND THE AUTOROD METHOD. SOME DETAILS ARE GIVEN ABOUT THE EQUIPMENT AND DATA TREATMENT, IN PARTICULAR ABOUT MEASUREMENTS IN THE PRESENCE OF A SPONTANEOUS NEUTRON SOURCE. SIGNALS FROM LINEAR PULSE OR IONIZATION CHAMBER CHANNELS MAY BE COLLECTED EITHER BY A FOUR-CHANNEL DATA-ACQUISITION SYSTEM OR A 256-CHANNEL ANALYZER. A SPECIAL TECHNIQUE FOR STORING PERIODIC SIGNALS ENABLES ELIMINATION OF LINEAR DRIFT. (AUTH).

967 ID-NUMBER ID-NUMBER 967

AUTHOR ENGELMANN, P./ BOHME, R./ BRUHN, G./ DURAND-SMET, R./ FOELL, W. K./
HABERMANN, F. W. A./ SCHRODER, R./ WINTZER, D.

TITLE INITIAL EXPERIMENTS IN THE KARLSRUHE FAST CRITICAL FACILITY, SNEAK

REPORT NUMBER..... ANL-7320, 759-775

CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
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SITE/PROGRAM GERMANY - SNEAK (FAST BREEDER)

ABSTRACT

IN KARLSRUHE WORK IS CONTINUING ON THE DESIGN OF SODIUM- AND STEAM-COOLED FAST POWER REACTORS. IN SUPPORT OF THIS WORK, REACTOR PHYSICS EXPERIMENTS IN THE SNEAK FACILITY ARE PLANNED FOR A SYSTEM WITH A COMPOSITION TYPICAL OF A SODIUM-COOLED FAST PROTOTYPE REACTOR (SNEAK 2) AND A SYSTEM WITH A COMPOSITION TYPICAL FOR A MEDIUM SIZED STEAM-COOLED FAST REACTOR (SNEAK 3). THE EXPERIMENTAL PROGRAM CONCENTRATES ON MEASUREMENTS OF COOLANT REACTIVITY EFFECTS AND DOPPLER EFFECTS.

THE SHORTAGE OF PLUTONIUM FUEL HAS LED TO THE DESIGN OF A NUMBER OF ZONED CORES. MOST NEUTRON PHYSICS PARAMETERS OF A FULL PLUTONIUM SYSTEM CAN BE MEASURED WITH SUFFICIENT ACCURACY IN THESE CORES. HOWEVER, THE REACTIVITY EFFECT OF COOLANT LOSS FROM A LARGE ZONE IN THE CORE IS INFLUENCED NOTABLY BY THE URANIUM DRIVER. IN THE STEAM-COOLED SYSTEM THE REACTIVITY EFFECT OF CHANGES IN STEAM DENSITY DEPENDS MARKEDLY UPON THE ISOTOPIC COMPOSITION OF THE PLUTONIUM AND UPON FISSION PRODUCT POISONING. THEORETICAL INVESTIGATIONS SHOW THAT THE STEAM REACTIVITY EFFECT WILL ALSO BE INFLUENCED BY THE PLATE STRUCTURE OF THE SNEAK ASSEMBLY. SPECIAL EXPERIMENTS ARE PLANNED FOR THE DETERMINATION OF HETEROGENEITY, PLUTONIUM-240, AND FISSION PRODUCT EFFECTS. FOR THE LATTER, A SPECIAL FISSION PRODUCT MOCKUP HAS BEEN DESIGNED. (AUTH).

968 ID-NUMBER ID-NUMBER 968

AUTHOR HIROTA, J. / NOMOTO, S./ NAKAMURA, T./ IIJIMA, T./ HIRAOKA, T./ HIRAKAWA,
N.

TITLE THE JAERI FAST CRITICAL FACILITY

REPORT NUMBER..... ANL-7320, 776-784

CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
10-13 OCTOBER 1966, ARGONNE, ILLINOIS

DATE PUBLISHED ... 66-10-10

SITE/PROGRAM JAPAN - FAST CRITICAL ASSEMBLY (FCA)

ABSTRACT

THE FAST CRITICAL FACILITY, CALLED THE "FCA" IS NOW ALMOST COMPLETED AT THE JAPAN ATOMIC ENERGY RESEARCH INSTITUTE. THE MAIN FEATURES OF THE FACILITY AND THE EXPERIMENT PROGRAM ARE PRESENTED IN THIS PAPER.

THE MACHINE IS THE SPLIT-TABLE TYPE OF HORIZONTAL MATRIX STRUCTURE. THE MATRIX CONSISTS OF 35 ROWS BY 35 COLUMNS, BUT IT IS DESIGNED SO AS TO BE EASILY EXTENDED TO 51 ROWS BY 51 COLUMNS IN WHICH LARGE CORES UP TO 3000 LITER WITH A 50-CENTIMETER-THICK BLANKET CAN BE BUILT. THE FACILITY IS PROVIDED WITH A PULSED NEUTRON SOURCE OF 200-KEV. COCKCROFT-WALTON TYPE OF ACCELERATOR WHICH GENERATES NEUTRON BURSTS FROM 0.05- TO 10- WIDTH AT THE CENTER OF THE ASSEMBLY.

THE FACILITY WILL GO CRITICAL IN THE SPRING OF 1967, WITH 20 PERCENT ENRICHED URANIUM. THE EXPERIMENTAL PROGRAM WILL BE MAINLY CONCERNED WITH THE SODIUM-VOID AND THE DOPPLER EFFECTS IN LARGE FAST REACTORS. ACCORDINGLY, THE HETEROGENEITY EFFECT IN THE SODIUM-VOID EXPERIMENT IS NOW BEING THEORETICALLY STUDIED. REGARDING THE DOPPLER EXPERIMENT, AN INTERMEDIATE-ENERGY SYSTEM SUITABLY MODERATED IN ORDER TO ENHANCE THE DOPPLER EFFECT IS PROPOSED. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

969 ID-NUMBER ID-NUMBER 969

AUTHOR BENNETT, R. A./ HOFMANN, P. L./ LITTLE, W. W./ MAAS, L. L.
 TITLE FAST TEST REACTOR: CRITICAL EXPERIMENTS PROGRAM
 REPORT NUMBER..... ANL-7320, 785-793
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS,
 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

A CONCEPTUAL DESIGN OF THE FAST TEST REACTOR (FTR) IS BEING FORMULATED BY PACIFIC NORTHWEST LABORATORY (PNL). THE NUCLEAR ASPECTS OF THE FTR ARE SUFFICIENTLY COMPLEX THAT A CRITICAL- EXPERIMENT PROGRAM IS ESSENTIAL TO THE DEVELOPMENT OF THE FINAL DESIGN. TO ASSESS THE CURRENT UNCERTAINTIES IN CALCULATIONAL METHODS AND NUCLEAR DATA, PERTINENT FAST CRITICAL EXPERIMENTS SPANNING A WIDE RANGE OF NEUTRON SPECTRA HAVE BEEN EVALUATED. RESULTS OF CALCULATION OF SPECTRAL INDICES, REACTIVITY COEFFICIENTS, AND EFFECTIVE MULTIPLICATION CONSTANTS ARE PRESENTED, AND THEIR EFFECTS ON THE PLANNED FTR CRITICAL EXPERIMENTS PROGRAM ARE DISCUSSED.

FIVE MAJOR OBJECTIVES ESTABLISHED FOR THIS PROGRAM ARE TO (1) CONFIRM THE FLUX CAPABILITY OF THE FTR, (2) CONFIRM THE CONTROL STATIC CHARACTERISTICS OF THE FTR, (3) CONFIRM THE NUCLEAR SAFETY FEATURES OF THE FTR, (4) CONTRIBUTE INFORMATION FOR FTR SHIELD AND INSTRUMENT DESIGN, AND (5) PROVIDE DESIGN INFORMATION FOR THE PROPOSED NUCLEAR PROOF TEST FACILITY (ZERO-POWER SUPPORT ASSEMBLY FOR THE FTR).

TIME SCHEDULES AND A BRIEF SUMMARY OF THE CRITICAL EXPERIMENTS PROGRAM DICTATED BY THESE OBJECTIVES ARE PRESENTED. (AUTH).

970 ID-NUMBER ID-NUMBER 970

AUTHOR RICHEY, C. R./ WHITE, J. D./ LLOYD, R. C./ CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS WITH PLUTONIUM DIOXIDE POLYSTYRENE COMPACTS
 REPORT NUMBER..... HW-80020,31-37
 DATE PUBLISHED ... 64-01-15
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

A MAJOR PORTION OF THE EXPERIMENTAL EFFORT AT THE CRITICAL MASS LABORATORY DURING THE LATTER HALF OF 1963 HAS BEEN DIRECTED TOWARDS OBTAINING CRITICALITY DATA FOR PLUTONIUM DIOXIDE POLYSTYRENE COMPACTS. THE EXPERIMENTS CONDUCTED THUS FAR HAVE UTILIZED FUEL COMPACTS WITH A PLUTONIUM CONCENTRATION OF 1.12 GRAM/CC (2.2 PERCENT PLUTONIUM-240) AND A HYDROGEN-TO-PLUTONIUM ATOM RATIO OF 15; THE DENSITY OF THE POLYSTYRENE, HAVING THE GENERAL FORMULA OF CARBON(1)-HYDROGEN(1), IS 0.931 GRAMS/CC. A DESCRIPTION OF THE EXPERIMENTAL METHOD, EQUIPMENT, AND MUCH OF THE DATA THUS FAR ACCUMULATED HAS BEEN REPORTED IN THE TWO PRECEDING PHYSICS RESEARCH QUARTERLY REPORTS. THE EXPERIMENTAL EFFORT DURING THE LATER QUARTER OF 1963 HAS BEEN DIRECTED TOWARDS:

REDUCTION OF THE DATA TO THAT FOR "CLEAN" ARRAYS. THIS INVOLVED DETERMINING THE EFFECT ON CRITICALITY OF, (1) THE RUBBERIZED PLASTIC COATING ENCLOSING EACH FUEL COMPACT, AND (2) THE FUEL REMOVAL SAFETY AND CONTROL RODS.

OBTAINING COMPARATIVE DATA ON THE REFLECTOR SAVINGS OF LUCITE, WATER, AND A 3 PERCENT ENRICHED URANYL NITRATE SOLUTION (APPROXIMATELY 374 GRAMS URANIUM-LITER).

DETERMINATION OF THE DENSITY COEFFICIENT FOR THE PLUTONIUM DIOXIDE POLYSTYRENE COMPACTS. (AUTH.).

984 ID-NUMBER ID-NUMBER 984

AUTHOR ROTHE, R. E.
 TITLE THE INTERACTION BETWEEN POISONED AND UNPOISONED ELEMENTS IN A PERIODIC SLAB-CELL ARRAY
 REPORT NUMBER..... CONF-680909, 096-107
 CONFERENCE LIVERMORE ARRAY SYMPOSIUM 23-25 SEPTEMBER, 1968
 DATE PUBLISHED ... 68-09-23
 SITE/PROGRAM ROCKY FLATS - BORON/STAINLESS STEEL PLATES

ABSTRACT

THE DTF-IV TRANSPORT CODE IS USED TO EVALUATE THE INTERACTION BETWEEN BORON-POISONED SLABS AND URANIUM SOLUTION SLABS WHEN ARRANGED IN AN INFINITE PERIODIC ARRAY. THE CALCULATED RESULTS ARE COMPARED WITH EXPERIMENTAL RESULTS FROM A SYSTEM CLOSELY APPROXIMATING THE ONE CALCULATED. THE EXPERIMENTAL POISON SLABS ARE STAINLESS-STEEL PLATES CONTAINING

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1.02 WEIGHT PERCENT B; THE URANIUM SOLUTION CONTAINS 450.8 GRAMS U(93.19 WEIGHT PERCENT PER LITER. TWO APPARENT FAILURES OF TRANSPORT CODES TO PRODUCE PHYSICALLY POSSIBLE RESULTS ARE CITED. (AUTH).

985 ID-NUMBER ID-NUMBER 985

AUTHOR FINN, H. F./ PRUVOST, N. L.
 TITLE LIVERMORE PLUTONIUM ARRAY PROGRAM
 REPORT NUMBER..... CONF-680909, 108-112
 CONFERENCE LIVERMORE ARRAY SYMPOSIUM 23-25 SEPTEMBER, 1968
 DATE PUBLISHED ... 68-09-23
 SITE/PROGRAM LIVERMORE - PLUTONIUM ARRAYS

ABSTRACT

IN THE WINTER OF 1964 A PROGRAM WAS UNDERTAKEN AT THE LAWRENCE RADIATION LABORATORY TO DEVELOP THE ABILITY TO MAKE RELIABLE CALCULATIONS PERTAINING TO THE CRITICALITY SAFETY OF ARRAYS OF FISSILE MATERIAL. THE CALCULATIONAL TECHNIQUE SELECTED FOR THE PROGRAM WAS THE OSR NEUTRON MONTE CARLO CODE. SINCE EXPERIMENTS FOR CALCULATIONAL NORMALIZATION WERE CONSIDERED NECESSARY AND NO CRITICAL ARRAY MEASUREMENTS HAD YET BEEN MADE WITH PLUTONIUM-METAL UNITS, SUCH AN EXPERIMENTAL PROGRAM WAS BEGUN. BY DECEMBER 1964 THE DESIGN OF THE BASIC PLUTONIUM PART - A SOLID 3-KG PLUTONIUM CYLINDER WHICH COULD BE STACKED TO FORM A DOUBLE PART - HAD BEEN FINALIZED. SPECIFICATIONS OF THE EXPERIMENTAL PART AS WELL AS THOSE OF ITS OPTIONAL MODERATOR JACKETS APPEAR IN FIG. 1. THE EXPERIMENTAL PROGRAM HAS BEEN DIVIDED INTO TWO PARTS. PHASE I CONSISTED OF EXPERIMENTS PERFORMED BETWEEN AUGUST 1965 AND JUNE 1966 ON A 0.61-M*2 SPLIT-TABLE ASSEMBLY MACHINE. PHASE II EXPERIMENTS HAVE BEEN CONDUCTED SINCE DECEMBER 1966 ON A 4.55-M*2 MACHINE. TWENTY-TWO CRITICAL CONFIGURATIONS HAVE BEEN EXPERIMENTALLY DETERMINED TO DATE. (AUTH).

993 ID-NUMBER ID-NUMBER 993

AUTHOR KIEHN, R. M.
 TITLE SOME APPLICATIONS OF THE S-N METHOD
 REPORT NUMBER..... NSENAO, 04, 166-179
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 58-08-00
 SITE/PROGRAM LOS ALAMOS - PLUTONIUM METAL SPHERES - CALCULATIONS ; LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS

ABSTRACT

THE S-N TECHNIQUE, A METHOD DEvised BY B. G. CARLSON TO SOLVE THE TRANSPORT EQUATION, HAS BEEN APPLIED TO A NUMBER OF CRITICAL ASSEMBLY PROBLEMS. A COMPARISON OF COMPUTED AND EXPERIMENTAL RESULTS IS GIVEN. (AUTH).

994 ID-NUMBER ID-NUMBER 994

AUTHOR KLOVERSTROM, F. A./ DECK, R. M./ REYENGA, A. J.
 TITLE CRITICALITY AND PULSED-NEUTRON-SOURCE STUDIES ON AN EPITHERMAL GRAPHITE-URANIUM-235 HOMOGENEOUS UNREFLECTED SYSTEM
 REPORT NUMBER..... UCRL-5149
 DATE PUBLISHED ... 58-02-20
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

THE TEST SYSTEM IS CUBICAL, COMPOSED OF 0.004-INCH-THICK URANIUM-235 (93.2 PERCENT) FOILS SANDWICHED BETWEEN 0.5-INCH GRAPHITE PLATES. THE BARE CRITICAL DIMENSIONS ARE 42.5 INCH X 42.5 INCH X 47.1 INCH THE OVER-ALL GRAPHITE AND URANIUM-235 FUEL DENSITIES ARE 1.627 AND 0.1074 GRAM/CENTIMETER (**3), RESPECTIVELY. THE CRITICAL SYSTEM CONTAINS 4.29 KG OF ALUMINUM AND 54.1 LITERS OF VOID. SMALL URANIUM-235 TEST FOILS OF DIFFERENT THICKNESSES WERE IRRADIATED TO FIND THE RELATIVE VARIATION OF FISSION-FRAGMENT ACTIVITY WITH THICKNESS, WHICH IS A MEASURE OF SELF-SHIELDING IN THE FOILS. A SELF-SHIELDING EFFECT OF 10 PERCENT IS FOUND FOR THE FUEL FOIL THICKNESS USED, WHICH INCREASES THE ATOMIC CARBON/URANIUM-235 RATIO FROM 297 TO AN EFFECTIVE VALUE OF 327. A CORRECTION TO THE CRITICAL DIMENSIONS FOR THE CENTRAL AXIAL VOID (9.45 LITERS) DUE TO THE CONTROL SYSTEM IS DISCUSSED. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

995 ID-NUMBER ID-NUMBER 995

AUTHOR SNELL, A. H.
 TITLE CRITICALITY STUDIES ON ENRICHED URANIUM -- HEAVY WATER SYSTEMS
 REPORT NUMBER.... MONP-454
 DATE PUBLISHED ... 47-12-15
 SITE/PROGRAM OAK RIDGE - HOMOGENEOUS URANIUM-235 IN HEAVY WATER

ABSTRACT

THE CRITICAL MASSES FOR SYSTEMS CONSISTING OF URANIUM-235 DISSOLVED IN HEAVY WATER HAVE BEEN STUDIED FOR MEAN CONCENTRATIONS OF 2.58, 5.17 AND 10.35 GRAMS OF URANIUM-235 PER LITER. THE VALUES OBTAINED WERE RESPECTIVELY 1323, 930 AND 869 GRAMS URANIUM-235 IN ROUGHLY CYLINDRICAL GEOMETRY SURROUNDED WITH HEAVY WATER REFLECTOR ON ALL SIDES. THE EFFECTS OF VARIOUS HOLES AND THIMBLES PENETRATING THE LATTICE AND THE REFLECTOR ARE GIVEN. THE TEMPERATURE COEFFICIENTS WERE FOUND TO BE RESPECTIVELY $-0.85E-3$, $-0.59E-3$ AND $-0.47E-3$ IN TERMS OF $(\Delta K)/K$ PER DEGREE CENTIGRADE OVER THE RANGE 20-80 DEGREE CENTIGRADE. THE EFFECTIVENESS OF A SINGLE CONTROL ROD WAS MEASURED IN TERMS OF DISTRIBUTED POISON IN THE REACTOR AND IN TERMS OF GRAMS OF URANIUM-235. THE EFFICIENCY OF UTILIZATION OF THE LEAKAGE NEUTRONS IN A RING OF THORIUM RODS IN THE CYLINDRICAL PART OF THE REFLECTOR WAS MEASURED. NEUTRON DISTRIBUTIONS ARE GIVEN AS OBTAINED BY FOIL ACTIVATION IN THE VARIOUS MODIFICATION OF THE REACTOR. (AUTH).

998 ID-NUMBER ID-NUMBER 998

AUTHOR CREMER, C. C./ HUNTER, R. E./ BERLIJN, J. H./ WORLTON, D. R.
 TITLE COMPARISON OF CALCULATIONS WITH INTEGRAL EXPERIMENTS FOR PLUTONIUM AND URANIUM CRITICAL ASSEMBLIES
 REPORT NUMBER.... LA-3529
 DATE PUBLISHED ... 69-10-27
 NSA-NUMBER 24-6885
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS ; LOS ALAMOS - PLUTONIUM METAL SPHERES - CALCULATIONS

ABSTRACT

RESULTS OF COMPARISONS OF CALCULATED AND EXPERIMENTAL VALUES OF INTEGRAL EXPERIMENTS INVOLVING NEUTRON CROSS SECTIONS OF URANIUM-235, URANIUM-238, PLUTONIUM-239, AND PLUTONIUM-240 ARE PRESENTED. THESE COMPARISONS WERE MADE IN AN EFFORT TO OBTAIN MICROSCOPIC NEUTRON CROSS SECTIONS THAT WOULD YIELD CORRECT RESULTS WHEN USED IN NEUTRONICS CALCULATIONS OF FAST CRITICAL ASSEMBLIES. (AUTH).

1001 ID-NUMBER ID-NUMBER 1001

AUTHOR SNIDOW, N. L. / ANDERSON, R. C. / BATCH, M. L. / DE COULON, G. A. G. / LEWIS, R. H. / VANNOY, W. M.
 TITLE THORIUM URANIUM PHYSICS EXPERIMENTS FINAL REPORT
 REPORT NUMBER.... BAW-1191
 DATE PUBLISHED ... 60-05-00
 SITE/PROGRAM BABCOCK AND WILCOX CO. - THORIUM - URANIUM PHYSICS EXPERIMENT

ABSTRACT

THE THORIUM URANIUM PHYSICS EXPERIMENT (TUPE) IS A STUDY OF UNIFORM LATTICE CORES MODERATED WITH LIGHT WATER. TUPE CORES CONTAIN THORIUM OXIDE-URANIUM OXIDE PINS CLAD WITH ALUMINUM AND HAVE METAL-TO-WATER VOLUME RATIOS, M/W, RANGING FROM 0.3 TO 1.0.

CRITICAL EXPERIMENTS FOR THE CONSOLIDATED EDISON THORIUM REACTOR (CETR) HAVE PROVIDED DATA ON THORIUM OXIDE-URANIUM OXIDE FUEL, IN STAINLESS STEEL CLADDING, MODERATED WITH LIGHT WATER. THESE DATA ARE FOR CORES WITH M/W NEAR ONE - THE REGION OF INTEREST IN PRESSURIZED WATER REACTOR DESIGN. EXPERIMENTS AT ARGONNE NATIONAL LABORATORY (ANL) HAVE PROVIDED DATA ON SIMILAR FUEL IN ALUMINUM CLADDING MODERATED WITH HEAVY WATER. THESE DATA ARE FOR THE LOW METAL-TO-WATER VOLUME RATIOS THAT ACCOMPANY HEAVY WATER MODERATION.

TUPE IS INTENDED TO COMPLEMENT THESE DATA BY PROVIDING INFORMATION ON LATTICES WITH RATIOS BETWEEN THE CETR AND ANL VALUES - THE REGION OF INTEREST FOR BOILING WATER REACTOR DESIGN.

THE BASIC AIM OF THE TUPE PROJECT IS TO MEASURE LATTICE PARAMETERS OF CORES WITH RATIOS RANGING FROM 0.3 TO 1.0, AND TO COMPARE THE RESULTS WITH DIFFERENT THEORETICAL MODELS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1003 ID-NUMBER ID-NUMBER 1003

AUTHOR THALGOTT, F. W./ LONG, J. K./ DAVEY, W. G./ KATO, W. Y./ CARPENTER, S. G./
MOREWITZ, H. A./ BEST, G. H.

TITLE FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS

REPORT NUMBER..... GENEVA-3, 06, 124-136

CONFERENCE THIRD UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
ATOMIC ENERGY, GENEVA, SWITZERLAND, 31 AUGUST - 9 SEPTEMBER 1964

DATE PUBLISHED ... 64-09-00

SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS ;
ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 ; ATOMICS INTERNATIONAL -
ADVANCED EPITHERMAL THORIUM REACTOR ; LOS ALAMOS - LAMPRE (PLUTONIUM
FUELED FAST BREEDER)

ABSTRACT

A CONTINUING PROGRAM OF FAST REACTOR CRITICAL EXPERIMENTS TO FURTHER THE DEVELOPMENT OF ECONOMIC FAST POWER BREEDER REACTORS HAS BEEN CONDUCTED IN THE UNITED STATES SINCE THE SECOND INTERNATIONAL CONFERENCE. THESE STUDIES HAVE COVERED A BROAD RANGE OF REACTOR COMPOSITIONS. URANIUM-235 AND PLUTONIUM HAVE BEEN USED AS FUELS WITH URANIUM-238 TO STUDY THE PLUTONIUM-URANIUM BREEDER CYCLE. URANIUM-233 HAS BEEN USED AS A FUEL WITH THORIUM-232 TO STUDY THE URANIUM-THORIUM BREEDER CYCLE. CORES WITH VOLUMES AS LARGE AS 665 LITERS HAVE BEEN STUDIED IN FULL SIZE, WHILE LARGER CORES WERE STUDIED USING ZONED TECHNIQUES IN WHICH A SMALLER VOLUME OF A COMPOSITION SIMULATING A LARGE DILUTE FAST REACTOR IS SURROUNDED BY A MORE HIGHLY REACTIVE DRIVER ZONE. (AUTH).

1011 ID-NUMBER ID-NUMBER 1011

AUTHOR CLARK, H. K.

TITLE APPLICATION OF A SIMPLE, PRACTICAL METHOD FOR COMPUTING INTERACTION TO
ARRAYS FOUND EXPERIMENTALLY TO BE CRITICAL

REPORT NUMBER..... NSENAO, 20, 307-313

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 64-11-00

SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS - CALCULATIONS ; OAK RIDGE -
URANYL(92%)SALTS - WATER - CALCULATIONS

ABSTRACT

CALCULATIONS OF THE CRITICAL SIZES OF CUBIC ARRAYS OF INTERACTING FISSIONABLE UNITS ARE COMPARED WITH CRITICAL EXPERIMENTS. THE UNITS ARE OF TWO TYPES: VESSELS CONTAINING 5 LITERS OF AN AQUEOUS SOLUTION OF HIGHLY ENRICHED URANIUM, AND CYLINDERS OF HIGHLY ENRICHED URANIUM METAL. THE ARRAYS ARE SURROUNDED BY VARIOUS THICKNESSES OF HYDROGENOUS REFLECTORS. AGREEMENT BETWEEN CALCULATION AND EXPERIMENT IS REASONABLY GOOD. THE SIMILARITY OF THE RESULTS OBTAINED WITH THE WIDELY DIFFERING TYPES OF UNITS INVITES CONFIDENCE IN GENERAL APPLICATIONS OF THE METHOD OF CALCULATION. TABLES ARE PRESENTED FOR COMPUTING CRITICAL AND SAFE SIZES OF CUBIC ARRAYS OF 8, 27, 64, OR 125 IDENTICAL UNITS AS A FUNCTION OF THE ALBEDO OF THE REFLECTOR SURROUNDING THE ARRAY AND OF THE REACTIVITY OF AN INDIVIDUAL UNIT. (AUTH).

1015 ID-NUMBER ID-NUMBER 1015

AUTHOR ROGERS, W. B. / KINARD, F. E./

TITLE MATERIAL BUCKLING AND CRITICAL MASSES OF URANIUM RODS CONTAINING 3 WEIGHT
PERCENT URANIUM-235 IN WATER

REPORT NUMBER..... NSENAO, 20, 266-271

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 64-11-00

SITE/PROGRAM SAVANNAH RIVER - URANIUM(3%) RODS IN WATER

ABSTRACT

EXPONENTIAL EXPERIMENTS WITH LIGHT-WATER MODERATOR WERE CONDUCTED TO DETERMINE CRITICALITY STANDARDS FOR THE HANDLING OF URANIUM METAL ENRICHED TO 3 WEIGHT PERCENT URANIUM-235. THESE MEASUREMENTS, MADE WITH MASSIVE RODS 2 AND 3 INCH IN DIAMETER, WERE COMBINED WITH HANFORD MEASUREMENTS WITH SMALLER RODS TO PROVIDE CRITICAL BUCKLINGS AND MASSES FOR WATER-MODERATED LATTICES OVER A RANGE OF ROD DIAMETERS FROM LESS THAN 0.15 INCH TO MORE THAN 3 INCH. SUBCRITICAL BUCKLING MEASUREMENTS ARE COMPARED WITH THE MORE CONVENTIONAL APPROACH-TO-CRITICAL METHOD. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1018 ID-NUMBER ID-NUMBER 1018

AUTHOR DAVENPORT, D. E.
 TITLE EXPONENTIAL EXPERIMENTS IN GRAPHITE SYSTEMS
 REPORT NUMBER.... GENEVA-1, 05, 309-316
 CONFERENCE FIRST UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
 ATOMIC ENERGY, GENEVA, SWITZERLAND, 8-20 AUGUST 1955
 DATE PUBLISHED ... 55-08-00
 SITE/PROGRAM HANFORD - URANIUM(1%) - GRAPHITE LATTICES

ABSTRACT

THE FIRST EXPONENTIAL EXPERIMENTS IN THE UNITED STATES WITH GRAPHITE - URANIUM SYSTEMS WERE BEGUN IN 1941. THIS SERIES OF MEASUREMENTS HAD AS ITS SINGLE-MINDED OBJECTIVE THE DISCOVERY OF THE LATTICE WHICH WOULD MOST LIKELY PERMIT CONSTRUCTION OF A CHAIN-REACTING PILE FOR PLUTONIUM PRODUCTION. MORE THAN FIFTY LATTICES WERE MEASURED IN A PERIOD OF THREE YEARS. MOST OF THE MEASUREMENTS WERE MADE UNDER THE HANDICAPS OF A SHORTAGE OF TIME AND MATERIALS. THE HANFORD LATTICE WAS CHOSEN ON THE BASIS OF THESE MEASUREMENTS. THESE EXPERIMENTS ARE NOW MOSTLY OF HISTORIC IMPORTANCE BECAUSE OF THEIR LIMITED NATURE AND NECESSARILY COMPLEX EXPERIMENTAL ARRANGEMENTS.

WHEN ADDITIONAL REACTOR CONSTRUCTION WAS UNDERTAKEN AT HANFORD, A NEW SERIES OF EXPONENTIAL MEASUREMENTS WAS BEGUN. SINCE THE STATE OF PILE THEORY STILL PRECLUDED CALCULATION OF IMPROVED REACTOR DESIGNS. THESE EXPONENTIAL EXPERIMENTS WERE DIRECTED TOWARD TWO MAIN OBJECTIVES: (1) FINDING A BETTER WATER-COOLED GRAPHITE LATTICE FOR PLUTONIUM PRODUCTION IN VIEW OF THE INCREASE IN QUALITY OF AVAILABLE MATERIALS AND THE CHANGING DEFINITION OF THE OPTIMUM LATTICE, AND (2) PROVIDING IMPROVED KNOWLEDGE OF LATTICE THEORY, BOTH FOR ITS OWN SAKE AND TO PERMIT MORE ACCURATE LATTICE CALCULATIONS FOR FUTURE REACTOR DESIGNS. TO DATE, THESE MEASUREMENTS HAVE INCLUDED NEARLY 100 EXPONENTIAL EXPERIMENTS USING NATURAL URANIUM.

IN ORDER TO AID THE DESIGN OF SODIUM-COOLED GRAPHITE POWER REACTORS, AN NEW SERIES OF EXPONENTIAL EXPERIMENTS WAS STARTED IN THE NORTH AMERICAN AIRCRAFT LABORATORIES IN DOWNEY, CALIFORNIA, IN 1954. THE MEASUREMENTS HAVE INCLUDED NATURAL AND ENRICHED URANIUM RODS ARRANGED SINGLY AND IN CLUSTERS IN THE GRAPHITE MATRIX. SINCE THE MEASUREMENTS HAVE JUST BEEN INITIATED, THERE IS ONLY A SMALL QUANTITY OF DATA YET AVAILABLE.

1019 ID-NUMBER ID-NUMBER 1019

AUTHOR KOUTS, H. / PRICE, G. A. / DOWNES, K. / SHER, R. / WALSH, V.
 TITLE EXPONENTIAL EXPERIMENTS WITH SLIGHTLY ENRICHED URANIUM RODS IN ORDINARY
 WATER
 REPORT NUMBER.... GENEVA-1, 05, 183-202
 CONFERENCE FIRST UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
 ATOMIC ENERGY, GENEVA, SWITZERLAND, 8-20 AUGUST 1955
 DATE PUBLISHED ... 55-08-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - SLIGHTLY ENRICHED URANIUM - WATER LATTICES

ABSTRACT

A REVIEW OF EXPONENTIAL EXPERIMENTS WITH SLIGHTLY ENRICHED URANIUM RODS IN LIGHT WATER, DURING THE PERIOD FROM 1944 TO 1955. MEASUREMENTS WERE DONE AT THE OAK RIDGE NATIONAL LABORATORY, BROOKHAVEN NATIONAL LABORATORY, AND WESTINGHOUSE.

1030 ID-NUMBER ID-NUMBER 1030

AUTHOR GRAVES, W. E. / FIKE, H. R. / O'NEILL, G. F.
 TITLE EXPERIMENTAL BUCKLINGS AND VOID EFFECTS IN HEAVY WATER LATTICES OF NATURAL
 URANIUM OXIDE ROD CLUSTERS
 REPORT NUMBER.... NSENAO, 16, 186-195
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 63-06-00
 SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES
 IN HEAVY WATER

ABSTRACT

THE MATERIAL BUCKLINGS OF TWENTY-FIVE HEAVY WATER MODERATED LATTICES OF NATURAL URANIUM DIOXIDE ROD CLUSTERS WERE MEASURED IN THE PROCESS DEVELOPMENT PILE (POP). THE MEASUREMENTS WERE MADE IN ONE-REGION LOADINGS, AND SHOULD THEREFORE BE SUBJECT TO LITTLE SYSTEMATIC ERROR. A NUMBER OF THE LATTICES EMPLOYED VOIDED HOUSING TUBES AROUND THE FUEL ASSEMBLIES. VALUES OF MIGRATION AREAS INFERRED FROM MEASUREMENTS OF POSITIVE PERIODS ARE ALSO PRESENTED.

AN EVALUATION OF THE ERRORS IN THE BUCKLING MEASUREMENTS INDICATED THAT THE BUCKLINGS SHOULD BE ACCURATE TO ABOUT 1 PERCENT. THE MIGRATION AREAS ARE COMPARED WITH THEORETICAL VALUES OBTAINED FROM THE BENOIST THEORY, AND THE AGREEMENT IS SHOWN TO BE GOOD. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1038 ID-NUMBER ID-NUMBER 1038

AUTHOR GAST, P. F.
 TITLE NORMAL URANIUM, GRAPHITE-MODERATED REACTORS: A COMPARISON OF THEORY AND
 EXPERIMENT--WATER COOLED LATTICES
 REPORT NUMBER..... GENEVA-1, 05, 288-294
 CONFERENCE FIRST UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
 ATOMIC ENERGY, GENEVA, SWITZERLAND, 8-20 AUGUST 1955
 DATE PUBLISHED ... 55-08-00
 SITE/PROGRAM HANFORD - URANIUM(1%) - GRAPHITE LATTICES

ABSTRACT

A LARGE AMOUNT OF DATA IS NOW AVAILABLE GIVING THE BUCKLINGS MEASURED IN EXPONENTIAL EXPERIMENTS ON A VARIETY OF WATER COOLED, GRAPHITE MODERATED LATTICES. ANALYSIS OF THIS DATA IN TERMS OF THEORY HAS JUST BEGUN AND THE SUBJECT IS PRESENTLY IN A RATHER CHAOTIC STATE. INITIAL ATTEMPTS TO FIT THE DATA BY THE CLASSICAL FOUR-FACTOR FORMULA FOR THE MULTIPLICATION CONSTANT HAVE NOT BEEN COMPLETELY SUCCESSFUL EVEN FOR A RESTRICTED SELECTION OF MEASUREMENTS FROM ALL THE AVAILABLE DATA. SHORTCOMINGS IN THE CLASSICAL FORMULA ARE READILY APPARENT AND WAYS TO IMPROVE THE TREATMENT ARE PRESENTLY KNOWN BUT HAVE NOT YET BEEN APPLIED BECAUSE OF CALCULATIONAL COMPLEXITY. THE METHODS ARE ADAPTED FOR HIGH SPEED COMPUTER USE AND SOME COMPUTATIONS ARE NOW IN PROGRESS.

SUCCESS IN DEVELOPING A SATISFACTORY LATTICE THEORY WILL BE DEPENDENT UPON REDUCING THE NUMBER OF ADJUSTABLE PARAMETERS THROUGH INDEPENDENT MEASUREMENT OF SUCH QUANTITIES AS THE THERMAL UTILIZATION AND THE RESONANCE ESCAPE PROBABILITY. A TEST REACTOR WHICH WILL PROVIDE SUFFICIENT NEUTRON FLUX TO FACILITATE SUCH MEASUREMENTS IS NOW UNDER CONSTRUCTION AND WILL SOON BE IN OPERATION.

WITH THE APPLICATION OF METHODS NOW KNOWN, AND THE ACCUMULATION OF ADDITIONAL EXPERIMENTAL DATA IT CAN BE EXPECTED A SATISFACTORY THEORY OF GRAPHITE URANIUM LATTICES WILL BE DEVELOPED.

1042 ID-NUMBER ID-NUMBER 1042

AUTHOR MILLS, C. B.
 TITLE MINIMUM CRITICAL DIMENSIONS FOR WATER SOLUTIONS
 REPORT NUMBER..... NSENAO, 09, 377-390
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 61-03-00
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER - CALCULATIONS ; OAK RIDGE - URANIUM-
 233 SYSTEMS - CALCULATIONS ; HANFORD - PLUTONIUM NITRATE IN WATER -
 CALCULATIONS

ABSTRACT

BY USE OF THE LOS ALAMOS TRANSPORT CODE, A PARAMETRIC SET OF CRITICALITY CONDITIONS FOR ONE DIMENSIONAL GEOMETRIES OF LIGHT WATER SOLUTIONS OF THE FISSIONABLE MATERIALS URANIUM-233, URANIUM- 235, AND PLUTONIUM-239 HAS BEEN DETERMINED. MINIMUM CRITICAL DIMENSIONS FOR SLABS AND CYLINDERS AND CRITICAL RADIUS, MASS, AND VOLUME FOR SPHERES AS A FUNCTION OF SOLUTION CONCENTRATIONS(KG/LITER) AND H/X ATOMIC RATIO ARE SHOWN FOR BARE AND LIGHT WATER REFLECTED SOLUTIONS. RESULTS OF EXPERIMENTAL STUDIES FOR CRITICAL DIMENSIONS ARE GIVEN TO SUPPORT THE STUDY. (AUTH).

1043 ID-NUMBER ID-NUMBER 1043

AUTHOR PUECHL, K. H.
 TITLE AN APPROACH TO REACTOR PHYSICS USING RESULTS OF INTEGRAL EXPERIMENTS
 REPORT NUMBER..... NSENAO, 09, 241-259
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 61-02-00
 SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - YANKEE REACTOR - URANIUM DIOXIDE -
 WATER - CALCULATIONS

ABSTRACT

AN APPROACH TO REACTOR PHYSICS IS DEVELOPED BY ANALYSIS OF EXPERIMENTAL DATA ON ORDINARY WATER, SLIGHTLY ENRICHED URANIUM LATTICES. THE DEVELOPED PROCEDURE IS EXTREMELY SIMPLE, AND FOR THESE PARTICULAR LATTICES, IT IS DEMONSTRATED THAT THE THERMAL UTILIZATION FACTOR AND RESONANCE ESCAPE PROBABILITY CAN BE CALCULATED TO SATISFACTORY ACCURACY.

GENERALIZATION OF THE PROCEDURE TO ALL TYPES OF LATTICES IS DISCUSSED, AND A NUMBER OF GRAPHITE MODERATED LATTICES ARE ANALYZED. HOWEVER, DETAILED ANALYSIS OF FURTHER EXPERIMENTAL DATA IS REQUIRED BEFORE THE GENERALIZATION CAN BE USED WITH COMPLETE CONFIDENCE.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

TO ILLUSTRATE THE REASONABLENESS OF THE PROPOSED GENERAL APPROACH AND HENCE THE DESIRABILITY FOR CONTINUED INVESTIGATION ALONG THESE LINES, RESULTS OF CRITICALITY AND CORE-LIFE CALCULATIONS ARE PRESENTED FOR THE CALDER HALL REACTOR AND FOR THE YANKEE REACTOR WITH VARIOUS ENRICHMENTS. (AUTH).

1047 ID-NUMBER ID-NUMBER 1047

AUTHOR MC COOL, W. J./ ROBINSON, R. A./ SCHRADER, E. W./ WEISS, S. H.

TITLE SM-2 FLEXIBLE CRITICAL EXPERIMENTS

REPORT NUMBER..... NSENAO, 09, 047-054

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 61-01-00

SITE/PROGRAM ALCO PRODUCTS, INC. - ARMY PACKAGE POWER REACTOR

ABSTRACT

THE GOLD, CLEAN, STEEL-REFLECTED, FINAL, SM-2 MOCK-UP CONTAINING 36.4 KILOGRAMS URANIUM-235 AND 61 GRAMS BERYLLIUM-10 MAINTAINED CRITICALITY AFTER A SEVEN ROD BANK WITHDRAWAL OF 6.974 INCH AND HAS AN "EXCESS K" (DELTA K E) OF 1520 CENTS. AN INFINITE STEEL-WATER LAMINATED REFLECTOR IS WORTH APPROXIMATELY +85 CENTS OVER THE INFINITE WATER REFLECTED CORE. THE MEASURED REACTIVITY COEFFICIENT, AT 2000 PSI, RANGES FROM -1.15 CENTS/ DEGREE FAHRENHEIT TO -5.20 CENTS/ DEGREE FAHRENHEIT AT 510 DEGREE FAHRENHEIT. THE INTEGRAL REACTIVITY EFFECT OF RAISING THE SM-2 CORE WATER TEMPERATURE FROM 103 TO 510 DEGREE FAHRENHEIT AT 2000 PSI AND THE WATER IN THE REFLECTOR COOLANT GRAPH FROM 103 TO 477 DEGREE FAHRENHEIT AT 2000 PSI IS -889.7 CENTS. THE AVERAGE MEASURED MATERIAL COEFFICIENTS FOR URANIUM-235 AND BERYLLIUM-10 ARE 0.157 CENTS/GRAM AND 42.54 CENTS/GRAM, RESPECTIVELY. WITHOUT THE BENEFIT OF FLUX SUPPRESSORS THE MAXIMUM TO AVERAGE POWER RATIO OF 7.28 OCCURS AT THE TOP OF THE FUEL SECTION OF CONTROL ROD C (WITHDRAWN TO 7.14 INCH, AND A RATIO OF 5.28 OCCURS AT THE BOTTOM OF STATIONARY ELEMENT 43 AND SYMMETRIC ELEMENTS. (AUTH.).

1053 ID-NUMBER ID-NUMBER 1053

AUTHOR HURLEY, T. J./ FIKE, H. R./ O'NEILL, G. F.

TITLE EXPERIMENTAL BUCKLINGS OF HEAVY WATER MODERATED LATTICES OF NATURAL URANIUM METAL ROD CLUSTERS

REPORT NUMBER..... NSENAO, 12, 341-347

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 62-03-00

SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES IN HEAVY WATER

ABSTRACT

STUDIES PERFORMED IN THE PROCESS DEVELOPMENT PILE OF THE SAVANNAH RIVER LABORATORY HAVE PROVIDED PRECISE MEASUREMENTS OF THE MATERIAL BUCKLINGS OF A NUMBER OF HEAVY WATER-MODERATED LATTICES OF NATURAL URANIUM METAL RODS OVER AN EXTENDED RANGE OF FUEL ASSEMBLY SIZES AND LATTICE PITCHES. THE 1-INCH URANIUM RODS WERE CLAD WITH 0.032 INCH OF ALUMINUM. FUEL ASSEMBLY SIZES VARIED FROM SINGLE RODS TO CLUSTERS OF 3, 7, AND 19 RODS (0.09 TO 1.81 KG URANIUM/CENTIMETER) AND LATTICE SPACINGS FROM 7.00 TO 21.00 INCH, COVERING A RANGE OF MODERATOR-TO-FUEL VOLUME RATIOS FROM 10.23 TO 161.53. A FEW LATTICES WERE STUDIED AT DIFFERENT HEAVY WATER PURITIES, IN LOADINGS OF DIFFERENT SIZES, AND IN REFLECTED LOADINGS. (AUTH).

1054 ID-NUMBER ID-NUMBER 1054

AUTHOR WINGFIELD, E. C./ HENNELLY, E. J.

TITLE EXPONENTIAL MEASUREMENTS OF NATURAL URANIUM RODS IN HEAVY WATER AND COMPARISONS WITH CRITICAL EXPERIMENTS

REPORT NUMBER..... NSENAO, 12, 348-358

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 62-03-00

SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES IN HEAVY WATER

ABSTRACT

BUCKLING MEASUREMENTS OF 42 LATTICES OF NATURAL URANIUM 1-INCH RODS IN HEAVY WATER HAVE BEEN MADE IN AN EXPONENTIAL FACILITY AT TWO MODERATOR PURITIES. THE FUEL ASSEMBLIES WERE SINGLE RODS AND CLUSTERS OF 3, 7, AND 19 RODS. LATTICE PITCHES VARIED FROM 3.00 TO 21.59 INCH. A COMPARISON WAS MADE BETWEEN THE BUCKLINGS THAT WERE MEASURED IN THE EXPONENTIAL FACILITY AND THOSE THAT WERE OBTAINED FROM CRITICAL MEASUREMENTS. ON THE BASIS OF A CONSTANT RADIAL BUCKLING FOR THE EXPONENTIAL, SYSTEMATIC DIFFERENCES BETWEEN THE EXPONENTIAL AND CRITICAL MEASUREMENTS WERE NOTED. POSSIBLE CAUSES OF THESE DIFFERENCES ARE DISCUSSED. EXPERIMENTAL CURVES FOR CHANGES IN BUCKLING PRODUCED BY CHANGES IN MODERATOR PURITY ARE ALSO GIVEN. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1063 ID-NUMBER ID-NUMBER 1063

AUTHOR FISCHER, G. J.
 TITLE NEUTRON ENERGY SPECTRUM MEASUREMENTS IN UNMODERATED ASSEMBLIES
 REPORT NUMBER..... NSENAO, 07, 355-362
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 60-04-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-5 ; LOS ALAMOS - LOW ENRICHED URANIUM METAL EXPONENTIAL EXPERIMENTS

ABSTRACT

THE NEUTRON ENERGY SPECTRUM AT THE CENTER OF THE DILUTE FAST CORE OF THE COUPLED FAST-THERMAL REACTOR, ZPR-5 HAS BEEN STUDIED BY USE OF FISSION CHAMBERS HAVING ELECTRODES QUANTITATIVELY ELECTRODEPOSITED WITH URANIUM-234, URANIUM-235, URANIUM-236, AND URANIUM-238. ATOMIC FISSION RATIOS FOUND WITH THESE FOUR URANIUM ISOTOPES DETERMINE A FOUR-GROUP NEUTRON ENERGY SPECTRUM WHICH CAN READILY BE MEASURED AS A FUNCTION OF POSITION IN THE CORE BY USE OF SUITABLE DRIVE UNITS.

THE SAME FISSION CHAMBER PROCEDURE HAS BEEN USED TO STUDY THE EQUILIBRIUM NEUTRON ENERGY SPECTRUM IN A NATURAL URANIUM EXPONENTIAL COLUMN AT LOS ALAMOS. THE RESULTS OF MEASUREMENTS IN THESE TWO SPECTRA ARE SHOWN AND COMPARED WITH THEORETICAL PREDICTIONS. THE ZPR-5 RESULTS ARE ALSO COMPARED TO AN ANALYSIS OF THIS SPECTRUM MADE BY USE OF NUCLEAR EMULSIONS FOR THE RANGE 0.2 TO 2.2 MEV. (AUTH).

1077 ID-NUMBER ID-NUMBER 1077

AUTHOR KRUESI, F. E./ ERKMAN, J. O./ LANNING, D. D.
 TITLE CRITICAL MASS STUDIES OF PLUTONIUM SOLUTIONS
 REPORT NUMBER..... HW-24512
 DATE PUBLISHED ... 60-02-15
 NSA-NUMBER 14:16167
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

THE CHAIN REACTING CONDITIONS FOR PLUTONIUM NITRATE IN WATER SOLUTION WERE EXAMINED EXPERIMENTALLY FOR A VARIETY OF SIZES OF SPHERES AND CYLINDERS. THE EFFECTS ON THE CRITICAL MASS OF THE DISPLACEMENT OF HYDROGEN AND THE ADDITION OF POISONS TO THE FUEL WERE MEASURED IN WATER TAMPED AND BARE REACTORS.

1086 ID-NUMBER ID-NUMBER 1086

AUTHOR KOUTS, H. / SHER, R. / BROWN, J. R. / KLEIN, D. / STEIN, S. / HELLENS, R. L. / ARNOLD, H.
 TITLE PHYSICS OF SLIGHTLY ENRICHED, NORMAL WATER LATTICES (THEORY AND EXPERIMENT)
 REPORT NUMBER..... GENEVA-2, 12, 446-482
 CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958
 DATE PUBLISHED ... 58-09-00
 SITE/PROGRAM BABCOCK AND WILCOX CO. - MERCHANT SHIP CONTRACT (URANIUM(4%)DIOXIDE - WATER) ; WESTINGHOUSE, ATOMIC POWER DIVISION - YANKEE REACTOR - URANIUM DIOXIDE - WATER

ABSTRACT

THE THREE YEARS SINCE THE LAST GENEVA CONFERENCE HAVE SEEN A NOTABLE IMPROVEMENT IN THE KNOWLEDGE AND UNDERSTANDING OF THE NEUTRON BEHAVIOR OF REACTOR CORES OF SLIGHTLY ENRICHED URANIUM IN LIGHT WATER. DURING THIS INTERVAL, THE MEASUREMENTS OF THE PARAMETERS HAVE BEEN IMPROVED AND EXTENDED, SO THAT THE BODY OF DATA AGAINST WHICH METHODS OF ANALYSIS CAN BE TRIED IS NOW QUITE LARGE. NOT ALL INTERESTING SITUATIONS AND CONDITIONS ARE COVERED BY THE RANGE OF COMPLETED EXPERIMENTS, AND SO THERE IS LIKELY TO BE ACTIVITY IN THIS FIELD FOR STILL A FEW MORE YEARS.

THE METHODS OF CALCULATION USED FOR FINDING THE CRITICAL PARAMETERS AND THE RELATIVE REACTION RATES HAVE UNDERGONE A GREAT DEAL OF CHANGE. IT HAS BECOME APPARENT THAT THE CLASSICAL WAYS BY WHICH THESE QUANTITIES WERE CALCULATED WOULD NOT SUFFICE, FOR THEY DO NOT PERMIT ANALYSIS OF MULTI- REGION SYSTEMS OR OF REACTOR CORES IN WHICH A SUBSTANTIAL AMOUNT OF BURNUP HAS TAKEN PLACE. THE THEORETICAL METHODS HAVE THUS BEEN FORCED TO MULTIGROUP AND RELATED FEW-GROUP FORMS, IN WHICH THE PROPERTIES OF THE ASSEMBLIES ARE HOMOGENIZED.

SINCE BOTH THE MEASUREMENTS AND THE THEORY ARE STILL NOT COMPLETELY DEVELOPED, IT WOULD BE TOO MUCH TO HOPE THAT A PROGRESS REPORT OF THIS NATURE COULD DEMONSTRATE EXCELLENT AGREEMENT IN ALL RESPECTS. BROADLY SPEAKING, HOWEVER, THE

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

MEASURED PARAMETERS ARE QUITE WELL REPRODUCED BY THE CALCULATIONS. IT MAY BE EXPECTED THAT THIS SITUATION WILL IMPROVE EVEN MORE AS METHODS ARE MADE INCREASINGLY BETTER.

ONE DEFINITE FEATURE OF THE INCOMPLETENESS OF THIS REPORT IS A CHANGING ATTITUDE TOWARD NEUTRON LEAKAGE AND THE MIGRATION AREA. THIS IS REFLECTED IN A SITUATION WHERE THE EXPERIMENTS ARE STILL BEING ANALYZED BY OLD METHODS, WHILE AT THE SAME TIME THE THEORY IS POINTING TOWARD A NEED FOR CHANGING TO NEW METHODS. IT IS TO BE EXPECTED THAT THE NEXT STAGE IN THE IMPROVEMENT OF THE PHYSICAL UNDERSTANDING OF THESE SYSTEMS WILL BE RECONCILING OF THESE TWO POINTS OF VIEW. (AUTH).

1087 ID-NUMBER ID-NUMBER 1087

AUTHOR CLAYTON, E. D./ BLOCK, E. Z.
 TITLE BUCKLING MEASUREMENTS WITH ENRICHED HOLLOW FUEL ELEMENTS IN LIGHT WATER
 PHYSICS RESEARCH QUARTERLY REPORT
 REPORT NUMBER HW-51983
 DATE PUBLISHED ... 57-08-00
 SITE/PROGRAM HANFORD - ENRICHED URANIUM - WATER LATTICES

ABSTRACT

A SERIES OF EXPONENTIAL EXPERIMENTS HAS BEEN COMPLETED IN THE WATER MODERATED LATTICES USING HOLLOW FUEL ELEMENTS ENRICHED TO 1.466 PER CENT BY WEIGHT URANIUM-235. THESE FUEL ELEMENTS ARE 1.394-INCH O.D., 0.464-INCH I.D., AND 8 INCHES LONG. A MAJOR PURPOSE OF THE MEASUREMENTS WAS TO DETERMINE HOW THE EXPERIMENTAL VALUE OF THE BUCKLING DEPENDED ON THE NUMBER OF TUBES IN THE ASSEMBLY AT VARIOUS ROD SEPARATIONS.

THE EXPERIMENTS WERE ALSO INTENDED TO GIVE SOME INFORMATION CONCERNING THE REFLECTOR SAVINGS (FOR EFFECTIVELY INFINITE REFLECTOR) APPROPRIATE TO LARGE FUEL ELEMENTS. HERETOFORE, VALUES OF REFLECTOR SAVINGS HAVE BEEN ESTIMATED ON THE BASES OF WATER-TO-URANIUM VOLUME RATIO FROM MEASUREMENTS PERFORMED AT BROOKHAVEN NATIONAL LABORATORY.

1088 ID-NUMBER ID-NUMBER 1088

AUTHOR LLOYD, R. C.
 TITLE BUCKLING MEASUREMENTS OF FUEL ELEMENTS IN A RANDOM ARRAY, WATER MODERATED
 NUCLEAR PHYSICS RESEARCH QUARTERLY REPORT
 REPORT NUMBER HW-54591
 DATE PUBLISHED ... 58-03-05
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

BUCKLING MEASUREMENTS OF RANDOM ARRAYS OF LOW ENRICHMENT URANIUM-235 FUEL ELEMENTS HAVE BEEN MADE TO SEE IF SUCH CONFIGURATIONS WOULD HAVE BUCKLINGS SIGNIFICANTLY LESS THAN THOSE RESULTING FROM UNIFORM DISTRIBUTION OF FUEL ELEMENTS.

1091 ID-NUMBER ID-NUMBER 1091

AUTHOR PRESKITT, C. A./ D'OULTREMONT, P./ NEILL, J. M./ YOUNG, J. C.
 TITLE (FAST REACTOR SPECTRUM MEASUREMENTS QUARTERLY PROGRESS REPORT FOR THE
 PERIOD ENDING OCTOBER 31, 1968)
 REPORT NUMBER GA-9140
 DATE PUBLISHED ... 68-11-01
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6

ABSTRACT

THIS QUARTERLY PROGRESS REPORT DESCRIBES THE WORK PERFORMED DURING THE PERIOD FROM AUGUST 1, 1968 TO OCTOBER 31, 1968 ON THE PROGRAM OF FAST REACTOR SPECTRUM MEASUREMENTS CONDUCTED BY GULF GENERAL ATOMIC FOR THE U. S. ATOMIC ENERGY COMMISSION. THIS PROGRAM, AUTHORIZED UNDER CONTRACT AT(04-3)-167, P. A. NO. 35, IS DESIGNED TO DEVELOP EXPERIMENTAL TECHNIQUES AND TO PROVIDE DATA ON FAST NEUTRON SPECTRA FOR THE VERIFICATION OF CALCULATIONAL TECHNIQUES AND BASIC DATA EMPLOYED IN THE DESIGN OF FAST-BREEDER REACTORS.

THE PRINCIPAL FACILITY USED IN THIS PROGRAM IS THE SUBCRITICAL TIME-OF-FLIGHT SPECTRUM FACILITY (STSF) CONSTRUCTED AT THE INITIATION OF THE PROGRAM. THE STSF IS A SPLIT-BED, FAST REACTOR ASSEMBLY MACHINE WITH A GEOMETRY ESSENTIALLY IDENTICAL TO THE ZPR REACTORS OPERATED BY THE ARGONNE NATIONAL LABORATORY. IT IS LICENSED FOR LOADINGS WITHIN 10 DOLLARS OF CRITICAL AND CONTAINING UP TO 600 KILOGRAMS OF URANIUM-235.

FOR TIME-OF-FLIGHT MEASUREMENTS THE STSF IS PULSED BY THE GULF GENERAL ATOMIC ELECTRON LINEAR ACCELERATOR (LINAC) AND IS VIEWED BY AN EVACUATED FLIGHT PATH WITH DETECTOR STATIONS AT DISTANCES OF APPROXIMATELY 215, 113, AND 45 METERS.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

TO DATE, FOUR ASSEMBLIES HAVE BEEN STUDIED IN THE STSF. THESE CONSISTED OF LOADINGS FROM ABOUT 60 KILOGRAMS, FOR THE FIRST TWO ASSEMBLIES, UP TO ABOUT 400 KILOGRAMS FOR THE OTHER TWO. THE LARGER ASSEMBLIES WERE ZONED SYSTEMS WITH THE CENTRAL REGION HAVING A COMPOSITION TYPICAL OF A DILUTE URANIUM-DIOXIDE-FUELLED LMFBR. THE FIRST LARGE ASSEMBLY CONTAINED SODIUM, WHILE THE SECOND WAS IDENTICAL IN COMPOSITION EXCEPT THAT THE SODIUM WAS REMOVED. (AUTH.).

1092 ID-NUMBER ID-NUMBER 1092

AUTHOR THOMAS, J. T./ FOX, J. K./ CALLIHAN, A. D.
 TITLE A DIRECT COMPARISON OF SOME NUCLEAR PROPERTIES OF URANIUM-233 AND URANIUM-235
 REPORT NUMBER.... NSEAO, 01, 020-032
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 56-03-00
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER ; OAK RIDGE - URANIUM-233 SYSTEMS

ABSTRACT

NUCLEAR PROPERTIES OF URANIUM-233 AND URANIUM-235 ARE COMPARED USING DATA OBTAINED IN A SERIES OF CRITICAL EXPERIMENTS. AQUEOUS SOLUTIONS OF URANYL OXYFLUORIDE CONTAINING URANIUM ENRICHED TO ABOUT 90 PERCENT IN EACH OF THE TWO ISOTOPES HAVE BEEN MADE CRITICAL IN WATER-REFLECTED SPHERICAL REACTORS HAVING DIAMETERS OF 26.4 AND 32.0 CM. ASSUMING THE REPORTED NUCLEAR CONSTANTS FOR URANIUM-235 ARE RELIABLY KNOWN AND ASSUMING EQUALITY OF THE NEUTRON LEAKAGE SPECTRA OF URANIUM-233 AND URANIUM-235 FOR THE SAME WATER-REFLECTED CRITICAL SPHERE, THE VALUE OF η (URANIUM-233) AT 0.026 EV WAS DETERMINED TO BE 2.31 ± 0.03 . THE CRITICAL MASSES FOR THE TWO ISOTOPES IN THESE SYSTEMS HAVE BEEN MEASURED OVER THE TEMPERATURE RANGE FROM 20 DEGREES CENTIGRADE TO 100 DEGREES CENTIGRADE; CORRESPONDING VALUES OF THE REACTIVITY TEMPERATURE COEFFICIENT ARE REPORTED. DELAYED NEUTRON YIELDS FOR THE TWO ISOTOPES WERE COMPARED BY NOTING THE PERIODS RESULTING FROM THE WITHDRAWAL OF A BORON POISON FROM THE CRITICAL SPHERES. IT IS SHOWN THAT THE YIELD FROM URANIUM-233 IS ABOUT ONE-THIRD THAT FROM URANIUM-235, IN AGREEMENT WITH OTHER DETERMINATIONS. (AUTH.).

1096 ID-NUMBER ID-NUMBER 1096

AUTHOR BUTLER, D. K./ DOERNER, R. C./ KNAPP, W. G./ LOEWENSTEIN, W. B.
 TITLE PHYSICS OF FAST REACTORS WITH TUNGSTEN-URANIUM-235 FUEL SUMMARY AND DISCUSSION
 REPORT NUMBER.... ANL-7285
 DATE PUBLISHED ... 66-00-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-9 (FAST ROCKET)

ABSTRACT

A COPY OF THIS REPORT IS NOT YET AVAILABLE IN THE SYSTEM

1097 ID-NUMBER ID-NUMBER 1097

AUTHOR MENEGHETTI, D./ LOOMIS, M. F.
 TITLE CALCULATION OF HETEROGENEITY EFFECTS IN ZPR-3 FAST ASSEMBLIES USING THE DSN PROGRAMS
 REPORT NUMBER.... ANL-6218
 DATE PUBLISHED ... 60-11-00
 NSA-NUMBER 15:10368
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

REACTIVITY CHANGES, FLUX VARIATIONS, AND DETECTOR-RESPONSE VARIATIONS FOR ZPR-3 FAST CRITICAL ASSEMBLIES DUE TO VARIATIONS IN HETEROGENEITIES CAUSED BY VARIOUS INTRADRAWER CONFIGURATIONS OF FUEL AND DILUENT PLATES AND DEVIATIONS OF REACTIVITIES FROM IDEAL HOMOGENEOUS CORES ARE CALCULATED AS REFLECTIVE BOUNDARY SLAB CELLS USING THE DSN CODE. FOR THESE CELLS THE CALCULATED MULTIPLICATION CONSTANTS, FOR A GIVEN ASSEMBLY PLATE CONFIGURATION, BY $N = 4, 8$, AND 16 APPROXIMATIONS SUCCESSIVELY INCREASE SUCH THAT THE EIGENVALUES OBTAINABLE AT $N = 16$ ARE STILL GENERALLY FAR FROM THE LIMITING VALUES AT LARGE N . THIS ASPECT MAKES FOR UNCERTAINTY ESPECIALLY IF DIFFERENCES IN $k(\text{EFF})$ VALUES FROM HOMOGENEOUS ARE DESIRED. (AUTH.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1098 ID-NUMBER ID-NUMBER 1098

AUTHOR DOERNER, R. C./ KNAPP, W. G./ ALMENAS, K. K./ COHN, C. E./ KARAM, R. A./
KATO, W. Y./ LOEWENSTEIN, W. B.
TITLE EXPERIMENTAL PHYSICS STUDIES IN TUNGSTEN-BASED FAST REACTORS REACTOR
PHYSICS DIVISION ANNUAL REPORT
REPORT NUMBER..... ANL-7110, 215-221
DATE PUBLISHED ... 65-12-00
NSA-NUMBER 20:20176
SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-9 (FAST ROCKET)

ABSTRACT

STUDIES OF THE FAST TUNGSTEN REACTOR PREVIOUSLY REPORTED HAVE BEEN EXTENDED DURING THE PAST YEAR TO INCLUDE MEASUREMENTS OF THE CONTROL MARGIN AVAILABLE IN REFLECTOR ORIENTED CONTROL ELEMENTS AND THE EFFECTS OF COOLANT VOIDING IN THE REFLECTOR. THE PRESENT REPORT SUMMARIZES THE STUDIES MADE ON TUNGSTEN-BASED FAST CORES DILUTED WITH RHENIUM (ASSEMBLY NO. 4B), GRAPHITE (ASSEMBLY NO. 5), AND VOID IN THE FORM OF 45% DENSITY ALUMINUM (ASSEMBLY NO. 6). ALSO INCLUDED ARE A NUMBER OF IDEALIZED MEASUREMENTS OF THE PROPELLANT VOID COEFFICIENT AND THE BORON CONTROL MARGIN IN THE REFLECTOR.

IN ORDER TO BEST ILLUSTRATE THE GENERAL TRENDS IN THE DATA WITH RESPECT TO THE DILUENT MATERIAL, TWO OF THE ASSEMBLIES ALREADY REPORTED ARE INCLUDED IN THE PRESENT REPORT. THESE INCLUDE THE ALL TUNGSTEN-DILUTED ASSEMBLY (NO. 4) AND THE PART TUNGSTEN-PART DEPLETED URANIUM DILUTED ASSEMBLY (NO. 3).

1113 ID-NUMBER ID-NUMBER 1113

AUTHOR SCHUSKE, C. L./ ARTHUR, M. G./ GOODWIN, A./ NICKEL, A. N./ SMITH, D. F.
TITLE SUBCRITICAL MEASUREMENTS ON PARALLELEPIPEDS CONTAINING URANIUM-235 AND
SALT EUTECTIC
REPORT NUMBER..... RFP-0089
DATE PUBLISHED ... 57-11-27
SITE/PROGRAM ROCKY FLATS - URANIUM METAL - SALT SYSTEMS

ABSTRACT

NEUTRON MULTIPLICATION MEASUREMENTS WERE MADE ON SQUARE CYLINDRICAL ASSEMBLIES CONTAINING SALT EUTECTIC (30% LITHIUM CARBONATE + 5% SODIUM CARBONATE + 65% POTASSIUM CARBONATE) AS THE MODERATOR AND TAMPER AND URANIUM SHEET (APPROXIMATELY 90% URANIUM-235) AS THE FUEL.

1118 ID-NUMBER ID-NUMBER 1118

AUTHOR HELLENS, R. L. / ANDERSEN, E.
TITLE SOME PROBLEMS IN THE INTERPRETATION OF EXPONENTIAL EXPERIMENTS
REPORT NUMBER..... BNL-07293
DATE PUBLISHED ... 66-10-15
SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - GENERAL DESCRIPTIONS, INFORMATION, AND
SUMMARIES

ABSTRACT

BUCKLING MEASUREMENTS AT BNL HAVE EMPLOYED TWO EXPERIMENTAL METHODS WHICH IN PRINCIPLE SHOULD YIELD IDENTICAL RESULTS BUT IN PRACTICE SHOW A SYSTEMATIC AND SIGNIFICANT DISCREPENCY. IN THIS PAPER THE EXPERIMENTAL EVIDENCE OF THESE ERRORS IS REVIEWED AND THEIR SOURCE IS TRACED BY MEANS OF THEORY TO THE RADIAL FLUX TRANSIENTS WHICH PERTURB THE ASYMPTOTIC NEUTRON SPECTRUM IN THE EXPONENTIAL ASSEMBLIES. SOME ALTERNATE AND APPARENTLY MORE PRECISE METHODS OF ANALYZING THE DATA ARE EXAMINED THEORETICALLY, INCLUDING THE POSSIBILITY OF ANISOTROPY IN THE LEAKAGE PROBABILITY. (AUTH).

1119 ID-NUMBER ID-NUMBER 1119

AUTHOR WINDSOR, H.
TITLE BUCKLING MEASUREMENTS IN WATER-MODERATED AND -REFLECTED EXPONENTIAL
EXPERIMENTS
REPORT NUMBER..... NSENAO, 29, 296-298
JOURNAL NUCLEAR SCIENCE AND ENGINEERING
DATE PUBLISHED ... 67-08-00

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

AT THE BROOKHAVEN NATIONAL LABORATORY, MATERIAL BUCKLINGS IN LIGHT-WATER LATTICES HAVE BEEN MEASURED IN TWO WAYS. THE FIRST WAS THE NORMAL "FLUX-SHAPE" TECHNIQUE IN WHICH THE FLUX WAS MAPPED (WITH BARE INDIUM FOILS) IN THE FULLY LOADED ASSEMBLY. THE SECOND WAS THE "VARIABLE LOADING" TECHNIQUE, IN WHICH ONLY FLUX DISTRIBUTIONS PERPENDICULAR TO THE PLANE OF THE NEUTRON SOURCE WERE MEASURED FOR SEVERAL RADIAL SIZES OF LATTICES.

1122 ID-NUMBER ID-NUMBER 1122

AUTHOR LLOYD, R. C.

TITLE BUCKLING MEASUREMENTS OF FUEL ELEMENTS IN RANDOM ARRAYS

REPORT NUMBER.... HW-57853

DATE PUBLISHED ... 58-10-00

SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

PROCESSING ENRICHED URANIUM IN PLANTS DESIGNED TO HANDLE NATURAL URANIUM CAN RESULT IN CRITICALITY HAZARDS UNLESS ADEQUATE PROCEDURES ARE ADOPTED TO INSURE SAFETY IN THE OPERATIONS. DISSOLVER VESSELS WHICH ARE SAFE FOR FULL CONTAINMENT WITH NATURAL URANIUM MAY NOT BE SUBCRITICAL WHEN FILLED WITH SLIGHTLY ENRICHED URANIUM UNDER THE SAME CONDITIONS. BUCKLING MEASUREMENTS HAVE BEEN MADE WITH ENRICHED URANIUM FUEL ELEMENTS IN A UNIFORM DISTRIBUTION FOR WHICH CRITICAL MASS LIMITS COULD THEN BE GIVEN. IN THE DISSOLUTION PROCESS THE FUEL ELEMENTS ARE DUMPED AT RANDOM INTO THE DISSOLVERS. (AUTH).

1126 ID-NUMBER ID-NUMBER 1126

AUTHOR LLOYD, R. C./ CLAYTON, E. D./ SMITH, R. B.

TITLE CRITICALITY MEASUREMENTS OF HETEROGENEOUS 3.1 PERCENT ENRICHED URANIUM-WATER SYSTEMS

REPORT NUMBER.... HW-61181, 52-58

DATE PUBLISHED ... 59-07-00

NSA-NUMBER 23:47334

SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

THE PROGRAM OF MEASURING THE CRITICAL MASS OF 3.063 PER CENT ENRICHED URANIUM RODS IN LIGHT WATER BY CRITICAL APPROACH TECHNIQUES HAS CONTINUED. DESCRIPTIONS OF THESE MEASUREMENTS AND THE RESULTS FOR THREE ROD DIAMETERS (0.300, 0.600, AND 0.925 INCHES) HAVE APPEARED IN PREVIOUS REPORTS. THE USEFULNESS OF THESE DATA IN CALCULATING THE CRITICAL MASS OF THIS MATERIAL IN OTHER CORE GEOMETRIES DEPENDS ON THE CHOICE OF AN APPROPRIATE EXTRAPOLATION DISTANCE (REFLECTOR SAVINGS) FOR THESE SYSTEMS. AN EFFORT HAS BEEN MADE TO OBTAIN THE EXTRAPOLATION DISTANCE FOR SOME OF THE SYSTEMS WHICH HAVE BEEN MEASURED. IN CONNECTION WITH THESE EFFORTS SOME ADDITIONAL CRITICAL APPROACH MEASUREMENTS WERE MADE AND THE RESULTS ARE REPORTED. ONE EXPERIMENT WAS PERFORMED TO DETERMINE THE EFFECT ON THE MEASURED CRITICAL MASS OF THE PLASTIC TUBES USED TO ENCASE THE URANIUM SLUGS.

1133 ID-NUMBER ID-NUMBER 1133

AUTHOR HOFMANN, P. L./ STORM, M. L.

TITLE TWO-DIMENSIONAL (R,Z) MULTIGROUP CALCULATION FOR AN INTERMEDIATE SPECTRUM CRITICAL ASSEMBLY

REPORT NUMBER.... NSENAO, 03, 313-338

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 58-03-00

SITE/PROGRAM GENERAL ELECTRIC CO., KNOLLS ATOMIC POWER LABORATORY - PRELIMINARY PILE ASSEMBLY (PPA)

ABSTRACT

THE RESULTS OF TWO-DIMENSIONAL (R,Z) MULTIGROUP CALCULATIONS OF AN EXPERIMENTAL LOW-POWER REACTOR (PPA-19) ARE DESCRIBED. COMPARISON IS MADE BETWEEN CALCULATED RESULTS AND EXPERIMENTAL MEASUREMENTS OF REACTIVITY, POWER DISTRIBUTION, AND SODIUM ACTIVATION. GENERALLY GOOD AGREEMENT IS OBSERVED BETWEEN CALCULATION AND EXPERIMENT. THIS CALCULATION WAS PERFORMED IN 1954 AND REPRESENTS THE FIRST APPLICATION OF ROE'S TWO-DIMENSIONAL MULTIGROUP FORMULATION TO THE ANALYSIS OF AN OPERATING CRITICAL ASSEMBLY. THE OVER-ALL OBJECTIVE OF SUCH CALCULATIONS IS TO ASCERTAIN THE ACCURACY OF TWO-DIMENSIONAL MULTIGROUP METHODS IN ORDER TO FACILITATE THEIR APPLICATION TO FUTURE PROBLEMS IN REACTOR DESIGN. (AUTH.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1134 ID-NUMBER ID-NUMBER 1134

AUTHOR NONE
 TITLE CAVITY REACTOR CRITICAL EXPERIMENT PROGRESS REPORT FOR THE PERIOD
 INCEPTION THROUGH JULY 31, 1968
 REPORT NUMBER..... GEMP-629
 DATE PUBLISHED ... 68-08-08
 SITE/PROGRAM GENERAL ELECTRIC CO., IDAHO - CAVITY REACTOR

ABSTRACT

INTRODUCTION: THIS REPORT CONTAINS THE PROGRESS REPORT FROM THE BEGINNING OF THE CONTRACT PERIOD TO JULY 31, 1968, ON THE CAVITY REACTOR CRITICAL EXPERIMENT BEING PERFORMED BY THE GENERAL ELECTRIC COMPANY AT THE IDAHO TEST STATION FOR THE SPACE NUCLEAR PROPULSION OFFICE OF NASA AND THE AEC. THE REPORT COVERS THE TECHNICAL ACCOMPLISHMENTS AND EXPERIMENTAL RESULTS RELATING TO THE SCOPE OF WORK FOR CONTRACT C-67747-A, MODIFICATION NO. 7, RELATED SERVICES SUPPLEMENT NO. 8. (AUTH.).

1141 ID-NUMBER ID-NUMBER 1141

AUTHOR EGGLE, C./ HUDDLESTON, C. M./ KROHN, V. E./ RINGO, G. R.
 TITLE MEASUREMENT OF NEUTRON SPECTRA OF THE EXPERIMENTAL BREEDER REACTOR
 REPORT NUMBER..... NSENAO, 01, 391-408
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 56-10-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - EBR-I

ABSTRACT

THE NEUTRON SPECTRA AT TWO POSITIONS IN THE CORE AND TWO POSITIONS IN THE INNER BLANKET OF THE EXPERIMENTAL BREEDER REACTOR IN IDAHO HAVE BEEN MEASURED BY MEANS OF BEAMS EXTRACTED FROM THESE POSITIONS. THE ENERGY RANGE COVERED WAS FROM 75 KEV TO 4 MEV. A CLOUD CHAMBER WAS USED FOR THE MEASUREMENT FROM 75 KEV TO 1 MEV AND RECOIL-PROTON TRACKS IN NUCLEAR PLATES FOR THAT FROM 0.8 TO 4 MEV. REACTION RATE RATIOS MEASURED INSIDE THE REACTOR AGREE WELL WITH THOSE CALCULATED FROM KNOWN CROSS SECTIONS AND THE SPECTRA FOUND IN THE BEAMS. (AUTH.).

1142 ID-NUMBER ID-NUMBER 1142

AUTHOR HIROTA, J./ NOMOTO, S./ HIRAKAWA, N./ NAKANO, M.
 TITLE STUDIES OF THE CRITICALITY OF 20 PERCENT ENRICHED URANIUM FAST CRITICAL
 ASSEMBLIES (FCA-I)
 REPORT NUMBER..... J. NUC. SCI. TECH., 06, 035-042
 JOURNAL JOURNAL OF NUCLEAR SCIENCE AND TECHNOLOGY
 DATE PUBLISHED ... 69-01-00
 SITE/PROGRAM JAPAN - FAST CRITICAL ASSEMBLY (FCA)

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS AND ANALYSES HAVE BEEN MADE ON CYLINDRICAL ASSEMBLIES FUELED WITH 20 PERCENT ENRICHED URANIUM METAL IN THE JAERI FAST CRITICAL FACILITY.

THE FIRST ASSEMBLY CONTAINS IN THE CORE 10.8 PERCENT OF STAINLESS STEEL AND 6.5 PERCENT OF VOID BY VOLUME, AND IS PROVIDED WITH A NATURAL URANIUM BLANKET 30 CM THICK. BASED ON A NUMBER OF CORRECTION EXPERIMENTS, THE CRITICAL MASS OF THE ASSEMBLY WAS DETERMINED TO BE 94.9 +/- 0.3 KG OF URANIUM-235. WITH A REDUCED BLANKET THICKNESS OF 10 CM, THE CRITICAL MASS WAS FOUND TO INCREASE BY 16.4 PERCENT. WHEN ONE QUARTER OF THE ENRICHED-URANIUM METAL WAS SUBSTITUTED BY GRAPHITE, THE CRITICAL MASS INCREASED BY 36.6 PERCENT.

COMPARISON OF THESE RESULTS WITH THEORETICAL CALCULATIONS INDICATED THAT THE CRITICALITY OF THE ASSEMBLIES CAN BE WELL ESTIMATED BY MEANS OF THE S-N APPROXIMATION WITH ANL-635 SCT. (AUTH.).

1143 ID-NUMBER ID-NUMBER 1143

AUTHOR BROWN, C. L./ HANSEN, L. E.
 TITLE MATERIAL BUCKLING MEASUREMENTS WITH 2.1 WEIGHT PERCENT URANIUM-235
 ENRICHED URANIUM TUBES IN LIGHT WATER
 REPORT NUMBER..... NSENAO, 35, 358-363
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

DATE PUBLISHED ... 89-03-00
SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

EXPONENTIAL AND CRITICAL APPROACH EXPERIMENTS HAVE BEEN PERFORMED TO DETERMINE MATERIAL BUCKLINGS AND EXTRAPOLATION DISTANCES FOR SEVERAL HEXAGONAL LATTICE ARRAYS OF 2.1 WEIGHT PERCENT URANIUM-235 ENRICHED URANIUM TUBES IN LIGHT WATER. TUBES OF TWO SIZES WERE MEASURED-2.33-INCH O.D., 1.77-INCH I.D.; AND 1.38-INCH O.D., 0.63-INCH, I.D. THE ARRAYS INCLUDED CLEAN LATTICES OF URANIUM TUBES; URANIUM TUBES CONTAINING LITHIUM ALUMINATE TARGET RODS; URANIUM TUBES WITH ADJACENT NEUTRON ABSORBING COLUMNS; AND TWO MIXED LATTICES OF 0.95 AND 2.1 WEIGHT PERCENT ENRICHED TUBES-ONE WITH THE 0.95 AND 2.1 WEIGHT PERCENT TUBES EVENLY DISTRIBUTED IN THE LATTICE, AND THE OTHER WITH THE 0.95 AND 2.1 WEIGHT PERCENT TUBES ARRANGED IN ALTERNATE RINGS. THESE EXPERIMENTS SUPPLEMENT DATA OBTAINED IN 1965 FOR 1.002, 1.25, AND 1.95 WEIGHT PERCENT ENRICHED URANIUM TUBES. CRITICAL PARAMETERS FOR THESE LATTICES, CALCULATED WITH THE HAMMER CODE, AGREE REASONABLY WELL WITH THE MEASURED RESULTS. (AUTH.).

1145 ID-NUMBER ID-NUMBER 1145

AUTHOR BANNERMAN, R. C.
TITLE ANALYSIS OF REACTIVITY MEASUREMENTS IN HECTOR ON SINGLE PLUTONIUM-URANIUM
OXIDE CLUSTERS
REPORT NUMBER.... AEEW-R499
DATE PUBLISHED ... 68-08-00
SITE/PROGRAM UNITED KINGDOM, WINFRITH - HECTOR (GRAPHITE)

ABSTRACT

A SERIES OF REACTIVITY PERTURBATION MEASUREMENTS HAS BEEN CARRIED OUT IN THE REACTOR ON SINGLE PLUTONIUM-URANIUM OXIDE CLUSTERS. THESE CLUSTERS ARE 14 INCH LONG, WITH A GEOMETRY SIMILAR TO THAT USED IN THE WINDSCALE A.G.R., AND CONTAIN UP TO 2 PERCENT PLUTONIUM WITH A PLUTONIUM-240 CONTENT FROM 3 PERCENT TO 26 PERCENT. THESE PLUTONIUM CONTENTS COVER THE RANGE ENCOUNTERED BOTH IN BURN-UP AND IN POSSIBLE PLUTONIUM ENRICHMENT OF AN A.G.R.

A METHOD OF ANALYSING THESE MEASUREMENTS HAS BEEN DEVELOPED, WHICH USES AS A STARTING POINT REACTION RATES PRODUCED BY ANY SUITABLE SINGLE-CELL LATTICE CODE. A COMPARISON BETWEEN THE MEASURED AND CALCULATED REACTIVITY PERTURBATIONS FOR A GIVEN SINGLE PLUTONIUM-BEARING CLUSTER THEN PROVIDES A MEASURE OF THE ACCURACY OF $K(\text{INF.})$ CALCULATED BY THAT CODE FOR A COMPLETE LATTICE CONTAINING THAT PARTICULAR FUEL.

THE EXPERIMENTAL RESULTS HAVE BEEN ANALYSED IN THIS REPORT USING REACTION RATES OBTAINED FROM THE ARGOSY 4 CODE. GOOD AGREEMENT IS FOUND WITHIN THE ERRORS BETWEEN CALCULATED AND MEASURED REACTIVITY PERTURBATIONS FOR ALL SAMPLES. THESE ERRORS, IN TERMS OF $K(\text{INF.})$ FOR EACH SAMPLE LATTICE, ARE TYPICALLY ± 0.5 PERCENT FOR SAMPLES CONTAINING 0.2K PERCENT AND 0.4 PERCENT PLUTONIUM, AND ± 0.9 PERCENT FOR SAMPLES CONTAINING 2 PERCENT PLUTONIUM. THE EFFECT OF CHANGING THE PLUTONIUM-240 CONTENT OF A SAMPLE IS PREDICTED TO WITHIN 5 PERCENT OF THE CHANGE. TEMPERATURE COEFFICIENTS OVER THE RANGE 22 DEGREES CENTIGRADE TO 427 DEGREES CENTIGRADE ARE CORRECTLY PREDICTED WITHIN 1-2 MN/DEGREES CENTIGRADE;

THESE RESULTS ARE FOUND TO BE INDEPENDENT, WITHIN WIDE LIMITS, OF THE REACTOR ENVIRONMENT LATTICE IN WHICH THE REACTIVITY PERTURBATION MEASUREMENTS ARE MADE. IT IS POSSIBLE, THEREFORE, TO CARRY OUT USEFUL MEASUREMENTS ON PLUTONIUM-BEARING FUEL IN A LATTICE LOADED WITH URANIUM FUEL, WITH A CONSIDERABLE SAVING IN THE AMOUNT OF THE PLUTONIUM-BEARING FUEL REQUIRED. (AUTH.).

1147 ID-NUMBER ID-NUMBER 1147

AUTHOR MIHALCZO, J. T./ LYNN, J. J.
TITLE HOMOGENEOUS CRITICAL ASSEMBLIES OF 3 PERCENT URANIUM-235 ENRICHED URANIUM
TETRAFLUORIDE IN PARAFFIN
REPORT NUMBER.... ORNL-4193, 131
DATE PUBLISHED ... 61-10-00
SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

THE PROGRAM OF CRITICAL EXPERIMENTS WITH HOMOGENEOUS HYDROGEN-MODERATED ASSEMBLIES OF 2 WT% URANIUM-235 ENRICHED URANIUM-TETRAFLUORIDE IN PARAFFIN REPORTED PREVIOUSLY HAS BEEN EXTENDED TO INCLUDE A MIXTURE OF HYDROGEN/URANIUM-235 RATIO OF 133. THIS MIXTURE CONTAINS 92 WT% URANIUM- TETRAFLUORIDE AND HAS A URANIUM DENSITY OF 4.5 G/CC. THE CRITICAL HEIGHT OF A RECTANGULAR PARALLELEPIPED WITH A SQUARE BASE, AS A FUNCTION OF BASE DIMENSIONS, IS DETERMINED. FROM THESE DATA, THE MINIMUM CRITICAL VOLUMES FOR BARE AND REFLECTED SPHERES ARE 200 AND 121 LITERS, RESPECTIVELY. (AUTH.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1148 ID-NUMBER ID-NUMBER 1148

AUTHOR MIHALCZO, J. T.
 TITLE PRELIMINARY STATIC EXPERIMENTS WITH THE REPETITIVELY PULSED CRITICAL ASSEMBLY
 REPORT NUMBER..... ORNL-4280, 37
 DATE PUBLISHED ... 68-00-00
 SITE/PROGRAM OAK RIDGE - SORA REACTOR (FAST, PULSED, NAK)

ABSTRACT

IN PREPARATION FOR A SERIES OF MEASUREMENTS IN WHICH PULSES OF NEUTRONS WILL BE PRODUCED BY PERIODICALLY VARYING THE REACTIVITY OF A CRITICAL ASSEMBLY TO ABOVE PROMPT CRITICALITY, THE SORA MOCKUP HAS BEEN MODIFIED BY INCORPORATION OF A MECHANISM FOR ROTATING A BERYLLIUM REFLECTOR ACROSS THE UNREFLECTED FACE OF THE ASSEMBLY (SECT. 2.3, THIS REPORT). THIS MODIFICATION HAS CHANGED SOME OF THE NUCLEAR CHARACTERISTICS OF THE ASSEMBLY, PARTICULARLY THOSE ASSOCIATED WITH THE BERYLLIUM REFLECTOR. THE ASSEMBLY NOW DIFFERS FROM THE SORA MOCKUP IN THAT THE PLANE OF ROTATION OF THE REFLECTOR IS TANGENT TO THE CORE SURFACE RATHER THAN PERPENDICULAR TO IT. THE BERYLLIUM ITSELF IS 20.3 CM HIGH 12.7 CM WIDE, AND 3.16 CM THICK RATHER THAN 24, 11, AND 7 CM, RESPECTIVELY, AS IN THE SORA REFERENCE ASSEMBLY. THE BERYLLIUM IS MOUNTED IN A TITANIUM ALLOY ROTOR WHICH PASSES THE CORE SURFACE 60 TIMES PER SECOND AT A SPEED OF ABOUT $2.7 \times 10^{+4}$ CM/SEC. THE THICKNESS OF THE FIXED IRON REFLECTOR HAS BEEN REDUCED FROM 29 CM TO 17 CM. (AUTH.).

1149 ID-NUMBER ID-NUMBER 1149

AUTHOR REYNOLDS, A. B./ THOMPSON, T. J./ HENRY, K. M./ JOHNSON, E. B.
 TITLE REACTIVITY EFFECTS OF LARGE VOIDS IN THE REFLECTOR OF A LIGHT-WATER-MODERATED AND -REFLECTED REACTOR
 REPORT NUMBER..... NSENAO, 07, 001-013
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 60-01-00
 SITE/PROGRAM OAK RIDGE - POOL CRITICAL ASSEMBLY (PCA)

ABSTRACT

REACTIVITY EFFECTS OF LARGE VOIDS IN THE REFLECTOR OF THE POOL CRITICAL ASSEMBLY, AN ENRICHED- URANIUM, LIGHT-WATER-MODERATED AND -REFLECTED REACTOR, WERE INVESTIGATED. THE FOUR REACTIVITY EFFECTS STUDIED WERE (1) VARIATION OF REACTIVITY WITH VOID SIZE, (2) VARIATION OF REACTIVITY WITH VOID POSITION ON THE CORE-REFLECTOR INTERFACE, (3) VARIATION OF REACTIVITY WITH THE DISTANCE BETWEEN THE VOID AND THE CORE, AND (4) SUPERPOSITION OF VOID REACTIVITY EFFECTS. THE VARIATION OF REACTIVITY WITH VOID SIZE AND POSITION ON THE CORE-REFLECTOR INTERFACE WAS CORRELATED BY A STATISTICAL WEIGHT CORRELATION. AN APPROXIMATE THEORETICAL METHOD BASED ON TWO-GROUP DIFFUSION THEORY WAS DEVELOPED FOR CALCULATING BOTH THE EFFECT ON REACTIVITY AND THE EFFECT ON THE NEUTRON FLUX FOR A VOID COVERING ONE ENTIRE FACE OF A REACTOR HAVING A RECTANGULAR PARALLELEPIPED CORE. THE CALCULATED EFFECTS ON REACTIVITY AND ON THE THERMAL-NEUTRON FLUXES WERE IN REASONABLE AGREEMENT WITH EXPERIMENTAL RESULTS. (AUTH.).

1151 ID-NUMBER ID-NUMBER 1151

AUTHOR JOHNSON, E. B.
 TITLE CRITICAL LATTICES OF HIGH FLUX ISOTOPE REACTOR FUEL ELEMENTS
 REPORT NUMBER..... ORNL-TM-1808
 DATE PUBLISHED ... 67-03-20
 SITE/PROGRAM OAK RIDGE - HIGH FLUX ISOTOPE REACTOR (LATTICE)

ABSTRACT

LATTICES OF HIGH FLUX ISOTOPE REACTOR (HFIR) FUEL ELEMENTS WERE ASSEMBLED IN ORDER TO DETERMINE THE CRITICAL SPACING BETWEEN ELEMENTS WHEN MODERATED AND REFLECTED BY WATER. IT WAS FOUND THAT SEVEN ELEMENTS SPACED 6.37 INCH IN A TRIANGULAR PATTERN WERE CRITICAL WHEN SUBMERGED. SEVEN OUTER ANNULI IN THE SAME PATTERN WERE CRITICAL WHEN SEPARATED 1.50 INCH., AND SEVEN INNER ANNULI WERE SUBCRITICAL EVEN WHEN IN CONTACT. (AUTH.).

1153 ID-NUMBER ID-NUMBER 1153

AUTHOR JOHNSON, E. B./ REEDY, R. K.
 TITLE CRITICALITY OF LATTICES OF HEAT TRANSFER REACTOR EXPERIMENT FUEL ELEMENTS
 REPORT NUMBER..... ORNL-TM-1566
 DATE PUBLISHED ... 66-07-20
 SITE/PROGRAM OAK RIDGE - HEAT TRANSFER REACTOR EXPERIMENT (HTRE) (LATTICE)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

A SERIES OF EXPERIMENTS HAS BEEN COMPLETED TO DETERMINE THE CRITICAL PARAMETERS OF LATTICES OF HEAT TRANSFER REACTOR EXPERIMENT (HTRE) FUEL ELEMENTS, PRIMARILY IN GEOMETRIES AND ENVIRONMENTS OF INTEREST FOR TRANSPORT, STORAGE, AND CHEMICAL DISSOLUTION. ARRAYS OF THESE ELEMENTS WERE MADE CRITICAL WITH WATER AND WITH DILUTE AQUEOUS URANIUM(92.6) NITRATE OF TWO CONCENTRATIONS (TO SIMULATE DISSOLVER ENVIRONMENTS) AS MODERATOR AND REFLECTOR; ONE SOLUTION CONCENTRATION WAS 3.97 G OF URANIUM-235 PER LITER AND THE OTHER WAS 8.02 G PER LITER. IN SOME OF THE SLAB LATTICES IN WATER, SHEETS OF CADMIUM WERE PLACED BETWEEN ROWS TO SERVE AS A NEUTRON ABSORBER AS THEY MIGHT IN A SHIPPING CONTAINER. (AUTH.).

1159 ID-NUMBER ID-NUMBER 1159

AUTHOR MIHALCZO, J. T.
 TITLE MULTIPLICATION FACTOR OF URANIUM METAL BY ONE-VELOCITY MONTE CARLO CALCULATIONS
 REPORT NUMBER..... ORNL-TM-1220
 DATE PUBLISHED ... 65-08-19
 SITE/PROGRAM OAK RIDGE - GEOMETRICALLY COMPLICATED URANIUM METAL PIECES - CALCULATIONS;
 OAK RIDGE - URANIUM(93%) METAL CYLINDERS - CALCULATIONS

ABSTRACT

A METHOD IS DESCRIBED FOR PREDICTING THE NEUTRON MULTIPLICATION FACTORS OF GEOMETRICALLY COMPLICATED CONFIGURATIONS OF UNREFLECTED UNMODERATED ENRICHED-URANIUM METAL FROM THE RESULTS OF TWO DELAYED-CRITICAL EXPERIMENTS IN SIMPLE GEOMETRY, ONE WITH A NEARLY MINIMUM SURFACE-TO-VOLUME RATIO AND THE OTHER WITH A LARGE SURFACE-TO-VOLUME RATIO AND THE OTHER WITH A LARGE SURFACE-TO- VOLUME RATIO. THE METHOD REQUIRES TWO CONSTANTS CHARACTERISTIC OF THE METAL. THESE ARE THE TOTAL COLLISION CROSS SECTION ($\Sigma(T)$) AND THE NUMBER OF NEUTRONS PRODUCED PER COLLISION ($\nu \cdot \Sigma(F) / \Sigma(T)$), WHICH ARE OBTAINED FROM THE TWO EXPERIMENTS BY USING S(12) TRANSPORT THEORY CALCULATIONS WITH ISOTROPIC SCATTERING. THESE FACTORS, TOGETHER WITH THE ASSUMPTION OF ISOTROPIC SCATTERING, ARE THEN USED IN OSR MONTE CARLO NEUTRON TRANSPORT CALCULATIONS TO PREDICT THE MULTIPLICATION FACTORS. THE METHOD HAS BEEN TESTED BY PREDICTING THE MULTIPLICATION FACTORS OF 21 DIFFERENT DELAYED-CRITICAL CONFIGURATIONS TO WITHIN A STANDARD DEVIATION OF 1.5 PERCENT. (AUTH.).

1164 ID-NUMBER ID-NUMBER 1164

AUTHOR ERNST, B. B./ TUCK, G.
 TITLE CRITICAL MASSES OF SPHERICAL AND HEMISPHERICAL STEEL-MODERATED, OIL-REFLECTED ENRICHED URANIUM ASSEMBLIES
 REPORT NUMBER..... RFP-1025
 DATE PUBLISHED ... 67-11-06
 SITE/PROGRAM ROCKY FLATS - URANIUM(93%) METAL - SPHERES

ABSTRACT

INTRODUCTION: THE CRITICAL MASS WAS DETERMINED, OF STEEL-MODERATED, OIL-REFLECTED, ENRICHED URANIUM SPHERICAL AND HEMISPHERICAL ASSEMBLIES AS A FUNCTION OF THE INNER URANIUM RADIUS. MEASUREMENTS WERE MADE ON SPHERICAL ASSEMBLIES HAVING AN INNER URANIUM RADIUS OF 0, 4.016, 8.010, 12.011 CENTIMETERS (CM); AND ON HEMISPHERICAL ASSEMBLIES WITH INNER URANIUM RADIUS OF 0, 4.106, 6.012, 8.007, AND 11.011 CM.

THE EXPERIMENTAL DATA WERE FOUND TO FIT AN EMPIRICAL EQUATION OF THE FORM $M(\text{SUB } C) = C/[(V/S) - B] + A$ AS PREVIOUSLY REPORTED IN RFP-939 FOR SIMILAR GEOMETRICAL CONFIGURATIONS. REFER ALSO TO APPENDIX B, PAGE 7. IN THE EQUATION, $M(\text{SUB } C)$ IS THE CRITICAL MASS; A, B, AND C ARE EMPIRICAL CONSTANTS; AND V/S RELATES TO THE VOLUME TO SURFACE RATIO.(AUTH.).

1170 ID-NUMBER ID-NUMBER 1170

AUTHOR KOONTZ, P. G./ ORNDORFF, J. D./ PAXTON, H. C.
 TITLE OPERATING PROCEDURES FOR THE PAJARITO SITE CRITICAL ASSEMBLY FACILITY
 REPORT NUMBER..... LA-4037-SOP
 DATE PUBLISHED ... 69-04-04
 SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THESE OPERATING PROCEDURES APPLY TO ANY CRITICALITY EXPERIMENT PERFORMED AT PAJARITO SITE, IN THE FACILITY DESCRIBED BY LAMS-2698, REVISED, "HAZARDS EVALUATION FOR THE LOS ALAMOS CRITICAL ASSEMBLY FACILITY," NOVEMBER 1962. THE EXPERIMENTS ARE CONDUCTED IN REMOTE-CONTROL LABORATORIES, KNOWN AS KIVAS, WHICH ARE LOCATED AT SOME DISTANCE FROM THE MAIN LABORATORY BUILDING THAT HOUSES INDIVIDUAL CONTROL ROOMS FOR EACH KIVA. ALL REMOTE CONTROLS AND INDICATORS, INCLUDING CLOSED- CIRCUIT TELEVISION RECEIVERS, ARE MOUNTED IN THE CONTROL ROOMS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

EACH KIVA IS SURROUNDED BY A SECURITY FENCE BEYOND WHICH IS AN ADDITIONAL POSTED AREA TO KEEP PERSONNEL AT A SAFE DISTANCE DURING REMOTE OPERATION. AT OTHER TIMES, ACCESS WITHIN THE FENCE IS THROUGH A KEY-ACTUATED GATE. THE SAME KEY ACTUATES A THREE-POSITION SELECTOR SWITCH IN THE CONTROL ROOM, WHICH ESTABLISHES SAFETY PLANS APPROPRIATE TO ACTIVITIES IN THE KIVA, AND CONTROLS POWER TO ASSEMBLIES. (AUTH.).

1171 ID-NUMBER ID-NUMBER 1171

AUTHOR NONE
 TITLE NEUTRON SPECTRA
 REPORT NUMBER..... EACRP-L-62, VOLS. 1 AND 2
 DATE PUBLISHED ... 65-10-00
 SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - VERA FAST REACTOR

ABSTRACT

THIS PUBLICATION IS A COMPILATION OF VARIOUS NEUTRON SPECTRA MEASUREMENTS USING BOTH SIMPLE AND COMPLEX GEOMETRIES. THE EXPERIMENTS INCLUDE PULSED, BULK, HOMOGENEOUS, AND HETEROGENEOUS ASSEMBLIES COMPOSED OF VARIOUS MATERIALS. IN SOME EXPERIMENTS, COMPARISONS ARE MADE WITH CALCULATIONS. ALSO, SOME CORRECTIONS TO THE EXPERIMENTAL SYSTEM ARE LISTED. (H.W.).

1176 ID-NUMBER ID-NUMBER 1176

AUTHOR BUSSELMAN, G. J.
 TITLE PRELIMINARY ANALYSIS OF SOME PLUTONIUM-ALUMINUM POLYETHYLENE EXPERIMENTS
 IN THE PCTR
 REPORT NUMBER..... BNWL-0149, 33-35
 DATE PUBLISHED ... 65-07-15
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM-ALUMINUM DISKS - BORATED POLYETHYLENE

ABSTRACT

A SERIES OF EXPERIMENTS WERE SCHEDULED FOR THE PCTR WHICH WOULD YIELD CRITICAL COMPOSITION AND PLATE THICKNESSES FOR SOME PLUTONIUM-ALUMINUM BORATED POLYETHYLENE SYSTEMS. ONE REQUIREMENT OF THE EXPERIMENTS IS THAT THE TEST CELL BE BUFFERED WITH LIKE MATERIAL TO ACHIEVE SPECTRAL AND FLUX FLATTENING ACROSS THE TEST CELL. THESE PLUTONIUM SYSTEMS CONSIST OF UNCLAD PLUTONIUM-ALUMINUM DISCS WHICH ARE SANDWICHED BETWEEN POLYETHYLENE DISCS AND THEN PLACED IN ALUMINUM TUBES. THIS OPERATION MUST TAKE PLACE IN A GLOVE BOX AND IS A RATHER LENGTHY JOB AS THE WHOLE SYSTEM CONTAINS SOME 34,000 DISCS. OBVIOUSLY ONE WOULD LIKE TO MINIMIZE THE NUMBER OF TIMES THAT THE DISCS BE REARRANGED. (AUTH)

1177 ID-NUMBER ID-NUMBER 1177

AUTHOR STRATTON, W. R.
 TITLE CORRELATIONS OF EXPERIMENTS AND CALCULATIONS
 REPORT NUMBER..... LA-DC-8386
 DATE PUBLISHED ... 66-00-00
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

SINCE THE BEGINNING OF THE ATOMIC ENERGY INDUSTRY, IT HAS BEEN NECESSARY TO EXTEND AND INTERPRET EXPERIMENTAL CRITICAL DATA BY MEANS OF CALCULATIONS. THESE CALCULATIONS, OF VARYING DEGREES OF RIGOR, HAVE PERMITTED SOME UNDERSTANDING OF NEW CONFIGURATIONS, MATERIALS, DENSITIES, REFLECTORS, ETC. AN ELEMENT OF UNCERTAINTY HAS ALWAYS BEEN PRESENT AND, IN TIMES PAST, THIS UNCERTAINTY HAS LED TO LARGE FACTORS OF CONSERVATISM AND/OR IGNORANCE. IT IS THE THESIS OF THIS PAPER THAT FOR SOME CONFIGURATIONS OF FISSILE MATERIAL, THESE FACTORS MAY BE REDUCED AND IN SOME CASES CALCULATIONS MAY BE SUBSTITUTED FOR EXPERIMENT.

A SITUATION NOW EXISTS WHICH IS DISTINCTLY DIFFERENT FROM THE SITUATION, SAY, TEN OR MORE YEARS AGO. THIS IS THE FAIRLY READY ACCESSIBILITY OF FAST DIGITAL COMPUTERS AND THE GENERAL AVAILABILITY OF CODES AND CROSS SECTION SETS WHICH ALLOW A MATHEMATICALLY RIGOROUS AND PHYSICALLY CORRECT CALCULATION OF A CRITICAL SYSTEM.

THIS PAPER WILL DISCUSS THE STATE OF THIS ART FOR ONE SUCH COMPUTATION. THE THEORETICAL TECHNIQUE USED IS THE LAST NEUTRON TRANSPORT CODE MAKING USE OF THE HANSEN-ROACH 16 GROUP CROSS SECTION SET. TO SPECIALIZE EVEN MORE, WE RESTRICT OURSELVES TO THE ONE-DIMENSIONAL CODES --THOSE FOR THE SPHERE, THE SLAB OR THE INFINITE CYLINDER. OUR PHILOSOPHY WILL BE TO REGARD THE CALCULATIONAL SCHEME AS A BLOCK BOX, AND TO COMPARE ITS RESULTS WITH THOSE OF EXPERIMENT. TO DO THIS, SOME OF THE EXISTING EXPERIMENTAL DATA WILL BE REVIEWED AND TYPICAL EXPERIMENTS WHICH SHOW THE WIDE DIVERSITY OF TECHNIQUES USED WILL BE MENTIONED. IT IS HOPED THAT A NEAR-COMPLETE LISTING OF APPROPRIATE EXPERIMENTS IS GIVEN IN THE REFERENCES. NEXT, THE TRANSFORMATION SCHEME EMPLOYED TO CHANGE THE CRITICAL DIMENSIONS OF ONE GEOMETRICAL SHAPE TO ANOTHER WILL BE INTRODUCED AND, FINALLY, GIVEN THESE DATA, A COMPARISON BETWEEN CALCULATED VALUES AND EXPERIMENTAL

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

RESULTS WILL BE GIVEN. SOME ADDITIONAL ADJUSTMENTS TO EXPERIMENTAL DATA TO ALLOW INTERCOMPARISONS OF EXPERIMENTS WILL BE NOTED. (AUTH).

1179 ID-NUMBER ID-NUMBER 1179

AUTHOR: KUSTERS, H./ SCHMIDT, J. J./ BROEDERS, C. H. M./ EISEMANN, E./ METZENROTH, M./ SCHROETER, K. E./ THIEM, D.

TITLE: ANALYSIS OF FAST CRITICAL ASSEMBLIES AND LARGE FAST POWER REACTORS WITH GROUP-CONSTANT SETS RECENTLY EVALUATED AT KARLSRUHE

REPORT NUMBER....: KFK-793

DATE PUBLISHED ...: 68-11-00

SITE/PROGRAM: GERMANY - SNEAK (FAST BREEDER) - CALCULATIONS

ABSTRACT

A SATISFACTORY AGREEMENT BETWEEN CALCULATED AND MEASURED RESULTS OF THE MOST INTERESTING INTEGRAL QUANTITIES FOR THE SNEAK-3A-1 CORE WAS REPORTED BY KUSTERS ET AL AND STEGEMANN ET AL. AT THE IAEA CONFERENCE ON FAST REACTOR PHYSICS IN KARLSRUHE 1967. THIS IMPROVEMENT WAS MAINLY DUE TO THE FACT THAT IN THE NEW GROUP CONSTANT SET KFK-SNEAK LOW FISSION AND CAPTURE DATA OF URANIUM-235 IN THE RANGE FROM 1 KEV UP TO 200 KEV WERE INCLUDED COMPARED TO THE PREVIOUSLY USED DATA IN KFK 26- 10 AND THE RUSSIAN ABN CROSS SECTION SET.

IN THIS PAPER WE ARE FOLLOWING THIS LINE: IN A FIRST CHAPTER THE BASIC DATA OF THE HEAVY ISOTOPES, UNDERLYING THE GROUP SETS MENTIONED ABOVE ARE INDICATED BRIEFLY. A DETAILED DISCUSSION OF THE PRESENTLY KNOWN UNCERTAINTIES OF THESE DATA IS GIVEN IN CHAPTER 2. IN CHAPTER 4 WE PRESENT THE ANALYSIS OF A SERIES OF CRITICAL AND SUBCRITICAL ASSEMBLIES WITH THE AIM TO GAIN MORE DEFINITE INFORMATION ABOUT THE QUALITY OF OUR GROUP CONSTANT SETS, PARTICULARLY IN VIEW OF NEW IMPORTANT MICROSCOPIC DATA MEASUREMENTS.

IN A LAST CHAPTER WE DISCUSS THE INFLUENCE OF THE VARIOUS DATA SETS ON THE PREDICTION OF THE NEUTRONIC BEHAVIOUR OF LARGE FAST POWER BREEDERS WITH SODIUM, STEAM, AND HELIUM AS COOLANTS, FOR A STEAM-COOLED FAST REACTOR SOME RESULTS OF THE SENSITIVITY OF THE SAFETY COEFFICIENTS TO DATA UNCERTAINTIES ARE GIVEN. FINALLY, WE SUMMARIZE THE CONCLUSIONS OF OUR PRESENT INVESTIGATIONS. (AUTH)

1180 ID-NUMBER ID-NUMBER 1180

AUTHOR: BORGWALDT, H./ EDELMANN, M./ HABERMANN, F. W. A./ KUBMAUL, G./ MEISTER, H. / SEIFRITZ, W./ STEGEMANN, D.

TITLE: EXPERIENCE OBTAINED AT KARLSRUHE WITH DIFFERENT KINETIC METHODS OF REACTIVITY DETERMINATION

REPORT NUMBER....: KFK-899

DATE PUBLISHED ...: 68-12-00

SITE/PROGRAM: GERMANY - STARK (COUPLED FAST-THERMAL ZERO POWER REACTOR) ; GERMANY - SNEAK (FAST BREEDER)

ABSTRACT

IN THIS SURVEY PAPER WE INTEND TO SUMMARIZE EXPERIENCE OBTAINED AT THE KARLSRUHE NUCLEAR RESEARCH CENTER WITH DIFFERENT METHODS OF REACTIVITY MEASUREMENT. A COMMON FEATURE OF ALL METHODS TREATED HERE IS THAT THEY RELY ON AN ANALYSIS OF THE KINETIC BEHAVIOR OF THE REACTOR, UTILIZING EITHER SOME EXTERNAL PERTURBATION OR THE INHERENT NEUTRON FLUCTUATIONS.

WHEREAS IN THE SECTIONS 2 TO 4 METHODS ARE LISTED THAT USE THE COMPLETE SET OF REACTOR KINETIC EQUATIONS AND INVOLVE, PRIMARILY, THE DELAYED NEUTRON PARAMETERS, THE SECTIONS 5 TO 8 DEAL WITH METHODS UTILIZING ONLY THE PROMPT-NEUTRON KINETICS. IN SECTION 9 AN ASPECT COMMON TO ALL KINETIC METHODS IS BRIEFLY EXPLAINED, VIZ. THE PROBLEM OF ERROR ESTIMATES AND ERROR MINIMIZATION IN EXPERIMENTS ON NEAR-CRITICAL SYSTEMS.

ALTHOUGH, GENERALLY, THE MEANING OF REACTIVITY IS SOMEWHAT UNCERTAIN, WE BELIEVE THAT THIS IS NOT AN IMPORTANT POINT IN SIMPLE SYSTEMS WHICH ARE NOT TOO FAR FROM CRITICAL. ONLY SUCH SYSTEMS ARE CONSIDERED IN THIS PAPER.

ANOTHER ASPECT, WHICH MAY COMPLICATE THE INTERPRETATION OF KINETIC EXPERIMENTS IN TERMS OF REACTIVITY, IS THE POSSIBLE NON-SEPARABILITY OF THE SPACE-ENERGY AND THE TIME DEPENDENCE. IN GENERAL, WE WILL ASSUME THE SIMPLEST SITUATION, IN WHICH THE POINT-REACTOR MODEL IS VALID, BUT WILL POINT OUT ALSO SOME CASES WHERE CONTAMINATION BY HIGHER MODES HAS BEEN OBSERVED. IN THE SECTIONS 3 AND 7.2 TWO EXPERIMENTS ON A SPECIAL REACTOR CONFIGURATION ARE TREATED, WHICH COULD BE INTERPRETED IN TERMS OF A TWO-NODE APPROXIMATION AND YIELDED A COUPLING REACTIVITY.

ALL EXPERIMENTS HAVE ACTUALLY BEEN PERFORMED ON ZERO POWER REACTORS, I.E. ON THE FAST-THERMAL ARGONAUT REACTOR KARLSRUHE (STARK), ON A THERMAL ARGONAUT CONFIGURATION (ARK), AND ON THE FAST CRITICAL SNEAK. (AUTH.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1186 ID-NUMBER ID-NUMBER 1186

AUTHOR COHEN, S. C./ MOORE, R. A./ RUSSELL, J. L.
 TITLE THE NEUTRON SPECTRUM FOR A SUBCRITICAL SECTION OF THE THERMIONIC CRITICAL
 EXPERIMENT ASSEMBLY NO. 1
 REPORT NUMBER..... GA-9100
 DATE PUBLISHED ... 68-12-13
 SITE/PROGRAM GENERAL ATOMICS - THERMIONIC CRITICAL EXPERIMENT

ABSTRACT

THE NEUTRON SPECTRUM FOR A SUBCRITICAL SECTION OF THE THERMIONIC CRITICAL EXPERIMENT, ASSEMBLY NO. 1, WAS MEASURED BY THE PULSED SOURCE, TIME-OF-FLIGHT METHOD. THE MEASUREMENT WAS PERFORMED IN A CALCULABLE SLAB CONFIGURATION SO THAT THE RESULTS WOULD BE DIRECTLY APPLICABLE TO THE CRITICAL ASSEMBLY. THE MEASURED SPECTRUM WAS COMPARED WITH MULTIGROUP TRANSPORT CALCULATIONS BASED UPON VARIOUS CROSS SECTION DATA SETS AND CROSS SECTION TREATMENTS. THE RESULTS DEMONSTRATE THE NEED FOR CONSIDERATION OF UNRESOLVED RESONANCE SELF-SHIELDING IN URANIUM-235, AND SUGGEST THAT THE URANIUM-235 ABSORPTION CROSS SECTION DATA MAY BE SLIGHTLY HIGH AT LOW ENERGIES (100 EV (LESS THAN) E (LESS THAN) 2 KEV). (AUTH.).

1189 ID-NUMBER ID-NUMBER 1189

AUTHOR NONE
 TITLE STUDIES IN URANIUM-235
 REPORT NUMBER..... GA-8280,135-145
 DATE PUBLISHED ... 67-10-30
 SITE/PROGRAM LIVERMORE - URANIUM(93%) METAL ; GENERAL ATOMICS - APFA-II (ENRICHED
 URANIUM METAL)

ABSTRACT

SPECTRUM MEASUREMENTS HAVE BEEN MADE THIS YEAR IN A BARE NEAR-CRITICAL, ENRICHED URANIUM-235 SPHERICAL REACTOR (APFA-III). THE GEOMETRY FOR THESE STUDIES IS ILLUSTRATED IN FIG. 10.1. THE MEASUREMENTS WERE MADE AT THE VARIOUS POSITIONS SHOWN IN THE FIGURE BY INSERTING SLUGS OF URANIUM-235 INTO THE THROUGH HOLE. THE REACTOR WAS BROUGHT TO NEAR CRITICAL BY INSERTION OF THE SAFETY BLOCK AND REMOVAL OF THE CONTROL AND REACTIVITY RODS. THIS CONFIGURATION WAS MAINTAINED THROUGHOUT THE STUDIES SO THAT THE REACTIVITY LEVEL CHANGED AS THE SLUGS WERE INSERTED AS INDICATED BY THE K(EFF) TABLE IN FIG. 10.1. (AUTH.).

1191 ID-NUMBER ID-NUMBER 1191

AUTHOR CROSBIE, K. L./ RUSSELL, J. L.
 TITLE HAZARDS SUMMARY REPORT FOR APFA-III
 REPORT NUMBER..... GA-7102
 DATE PUBLISHED ... 66-04-07
 SITE/PROGRAM LIVERMORE - URANIUM(93%) METAL ; GENERAL ATOMICS - APFA-II (ENRICHED
 URANIUM METAL)

ABSTRACT

GENERAL ATOMIC, DIVISION OF GENERAL DYNAMICS CORPORATION, HAS TESTED A COMPLETE PROTOTYPE ACCELERATOR PULSED FAST ASSEMBLY (APFA-I) TO VERIFY THE METHODS AND THEORY TO BE USED IN DESIGNING AN APFA FACILITY. THE ASSEMBLY UNIT AND THE FUEL WERE PROVIDED BY OAK RIDGE NATIONAL LABORATORY AND THE SYSTEM WAS TESTED IN THE CRITICAL CELL OF THE HIGH TEMPERATURE GAS-COOLED REACTOR. THE GENERAL ATOMIC LINEAR ACCELERATOR FACILITY (LINAC) AND THE CRITICAL FACILITY ARE DESCRIBED IN THE HAZARDS SUMMARY REPORT FOR THE METAL ASSEMBLY (GA-4488).

APFA-III IS THE KUKLA PROMPT CRITICAL ASSEMBLY FROM LAWRENCE RADIATION LABORATORIES AT LIVERMORE, CALIFORNIA MODIFIED TO OPERATE AS AN ACCELERATOR PULSED FAST ASSEMBLY. THE MODIFICATION IS IN THE METHOD AND AMOUNT OF EXCESS REACTIVITY ADDED TO THE SYSTEM. IN KUKLA OPERATIONS REACTIVITY WAS ADDED RAPIDLY BY MEANS OF AN AIR RAM TO BRING THE SYSTEM ABOVE PROMPT CRITICAL. FOR APFA-III THE REACTIVITY IS ADDED SLOWLY BY MEANS OF A MECHANICAL DRIVE MECHANISM TO BRING THE SYSTEM LESS THAN PROMPT CRITICAL.

THE PURPOSE OF THIS DOCUMENT IS TO PROVIDE THE INFORMATION NECESSARY TO OBTAIN AUTHORIZATION TO INSTALL AND OPERATE APFA-III IN THE AREAS REFERRED TO BELOW AND TO SHOW THAT SUCH OPERATION WILL NOT CREATE UNDUE RISK TO THE HEALTH AND SAFETY OF PERSONNEL OR DAMAGE TO THE FACILITY.

MUCH OF THE DESCRIPTIVE MATERIAL PROVIDED IN THIS DOCUMENT CONCERNING THE REACTOR WAS EXTRACTED FROM LAWRENCE RADIATION LABORATORY REPORT UCRL 6105. (AUTH.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1194 ID-NUMBER ID-NUMBER 1194

AUTHOR MIHALCZO, J. T.
 TITLE PROMPT-NEUTRON DECAY CONSTANTS FOR UNMODERATED URANIUM METAL CRITICAL ASSEMBLIES WITH LARGE GAPS
 REPORT NUMBER..... ORNL-3360, 39-40
 DATE PUBLISHED ... 62-09-00
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL SLABS

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS WITH ENRICHED-URANIUM METAL ASSEMBLIES HAVING LARGE GAPS AT THEIR MIDPLANES HAS BEEN INITIATED TO PROVIDE DATA ON SIMPLE CRITICAL SYSTEMS OF TWO INTERACTING COMPONENTS FOR USE IN EVALUATING VARIOUS METHODS OF CALCULATION. THE METAL HAS A DENSITY OF 18.72 GRAMS/C.C. AND A URANIUM-235 CONTENT OF 93.2 WEIGHT PERCENT.

THE PRESENCE OF LARGE GAPS IN THESE FAST UNMODERATED AND UNREFLECTED ASSEMBLIES RESULTS IN A DECREASE IN THE PROMPT-NEUTRON DECAY CONSTANT AND AN INCREASE IN THE AMOUNT OF URANIUM METAL REQUIRED FOR CRITICALITY. FOR A DELAYED-CRITICAL ASSEMBLY, THE PROMPT-NEUTRON DECAY CONSTANT IS INVERSELY PROPORTIONAL TO THE MEAN NEUTRON LIFETIME OF THE PROMPT NEUTRONS. THE LIFETIME DEPENDS ON THE GAP WIDTH SINCE, FOR THESE SYSTEMS, THE TIME REQUIRED FOR A NEUTRON TO CROSS THE GAP IS A SIGNIFICANT PART OF ITS LIFETIME. IT ALSO DEPENDS ON THE PROBABILITY THAT A NEUTRON WILL LEAK FROM ONE-HALF THE ASSEMBLY AND ENTER THE OTHER HALF. IN THESE EXPERIMENTS CRITICAL THICKNESSES OF THE SLABS AS A FUNCTION OF THEIR SPACING HAVE BEEN MEASURED, AND CORRESPONDING PROMPT-NEUTRON DECAY CONSTANTS HAVE BEEN DETERMINED. (AUTH.).

1195 ID-NUMBER ID-NUMBER 1195

AUTHOR MAGNUSON, D. W.
 TITLE MEASUREMENT AND CALCULATION OF THE PROMPT-NEUTRON DECAY CONSTANT AND EFFECTIVE BUCKLING AS A FUNCTION OF SIZE FOR HOMOGENEOUS URANIUM SOLUTIONS
 REPORT NUMBER..... ORNL-3499, 57-58
 DATE PUBLISHED ... 63-08-01
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

IT HAS BEEN SUGGESTED THAT PULSED-NEUTRON MEASUREMENTS OF THE PROMPT-NEUTRON DECAY CONSTANT, ALPHA COULD BE USEFUL IN CHARACTERIZING SUBCRITICAL ASSEMBLIES OF FISSILE MATERIALS. WITHIN THE LIMITS OF DIFFUSION THEORY, THE BUCKLING, B_{*2} , IS A QUANTITY THAT IS DEFINED BY THE DIMENSIONS AND THE EXTRAPOLATION DISTANCE. THEREFORE, IT WAS DESIRED TO MEASURE ALPHA AS A FUNCTION OF B_{*2} FOR A WIDE RANGE OF URANIUM CONCENTRATIONS IN AQUEOUS SOLUTIONS AND TO COMPARE THE RESULTS WITH CALCULATED VALUES.

THE MEASUREMENTS MADE THUS FAR HAVE BEEN FOR A URANYL NITRATE SOLUTION HAVING A CONCENTRATION OF APPROXIMATELY 65 GRAMS OF URANIUM PER LITER AND A URANIUM-235 ENRICHMENT OF 93.2 PERCENT. THEY HAVE INCLUDED MEASUREMENTS OF FLUX DISTRIBUTIONS AND PROMPT-NEUTRON DECAY CONSTANTS FOR BOTH CRITICAL AND SUBCRITICAL CONDITIONS IN BOTH SPHERICAL AND CYLINDRICAL GEOMETRIES. (AUTH.).

1196 ID-NUMBER ID-NUMBER 1196

AUTHOR THOMAS, J. T.
 TITLE CRITICAL ARRAYS OF URANIUM(93.2) METAL CYLINDERS
 REPORT NUMBER..... ORNL-3499, 58-62
 DATE PUBLISHED ... 63-08-01
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

IN ORDER TO FURTHER ESTABLISH BASES FOR REGULATIONS GOVERNING THE TRANSPORT AND STORAGE OF INDIVIDUALLY SUBCRITICAL UNITS OF FISSILE MATERIALS, A SERIES OF CRITICAL EXPERIMENTS HAS BEEN PERFORMED WITH THREE-DIMENSIONAL ARRAYS OF URANIUM(93.2) METAL CYLINDERS. THE ELEMENTARY PIECES USED TO FORM THE UNITS CONSIST OF 11.519-CM-DIAMETER METAL CYLINDERS CONTAINING APPROXIMATELY 5.2 KILOGRAMS AND APPROXIMATELY 10.5 KILOGRAMS OF URANIUM(93.2) AS SHOWN IN FIG. 2.5.1. THE DENSITY OF THE URANIUM IS 18.76 GRAMS/CC IN ONE SERIES OF ARRAYS TWO OF THE LARGER CYLINDERS WERE COMBINED TO FORM CYLINDRICAL UNITS CONTAINING APPROXIMATELY 21 KILOGRAMS OF URANIUM(93.2) AND IN ANOTHER SERIES ONE OF THE SMALLER CYLINDERS WAS ADDED TO FORM UNITS CONTAINING APPROXIMATELY 26 KILOGRAMS OF URANIUM(93.2) (AUTH.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1197 ID-NUMBER ID-NUMBER 1197

AUTHOR MIHALCZO, J. T.
 TITLE CRITICAL EXPERIMENTS AND CALCULATIONS WITH ANNULAR CYLINDERS OF URANIUM(93.2) METAL
 REPORT NUMBER..... ORNL-3499, 62-63
 DATE PUBLISHED ... 63-08-01
 NSA-NUMBER 18:5970
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS WITH ANNULAR CYLINDERS OF URANIUM METAL WAS PERFORMED TO VERIFY THE ADEQUACY OF THE SN METHOD OF SOLVING THE TRANSPORT EQUATION FOR THIS GEOMETRY. THE URANIUM HAS A DENSITY OF 18.76 GRAMS/C.C. AND IS ENRICHED TO 93.2 PERCENT IN THE URANIUM-235 ISOTOPE. UNREFLECTED ANNULI WITH OUTSIDE DIAMETERS AS LARGE AS 15 INCHES AND INSIDE DIAMETERS AS SMALL AS 7 INCHES WERE ASSEMBLED TO DELAYED CRITICAL, AND THE PROMPT NEUTRON DECAY CONSTANT WAS MEASURED BY THE ROSSI-ALPHA TECHNIQUE. IN THE ROSSI-ALPHA MEASUREMENTS TWO DETECTORS WERE USED WITH A TECHNICAL MEASUREMENT CORPORATION 256-CHANNEL ANALYZER HAVING A TIME-OF-FLIGHT LOGIC UNIT. A SIGNAL FROM A PLASTIC SCINTILLATOR SENSITIVE TO NEUTRONS AND GAMMA RAYS TRIGGERED THE TIME ANALYZER, AND THE TIME DISTRIBUTION OF NEUTRONS DETECTED BY A SMALL URANIUM-235 SPIRAL FISSION COUNTER WAS MEASURED. THE RESULTING VALUES OF THE DECAY CONSTANT, TOGETHER WITH THE MEASURED REACTIVITIES OF THE VARIOUS ASSEMBLIES, ARE SHOWN IN TABLE 2.6.1. (AUTH.).

1198 ID-NUMBER ID-NUMBER 1198

AUTHOR MIHALCZO, J. T.
 TITLE PROMPT-NEUTRON DECAY PROPERTIES AND CRITICAL DIMENSIONS OF UNMODERATED CYLINDRICAL URANIUM(93.2) METAL ASSEMBLIES WITH LARGE GAPS
 REPORT NUMBER..... ORNL-3499, 64-67
 DATE PUBLISHED ... 63-08-01
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

THE SERIES OF CRITICAL EXPERIMENTS WHICH BEGAN WITH PARALLELEPIPEDAL URANIUM(93.2) METAL ASSEMBLIES HAVING LARGE GAPS AT THEIR MIDPLANES HAS BEEN EXTENDED TO INCLUDE CYLINDRICAL ASSEMBLIES IN WHICH THE FLAT SURFACES OF 7-, 11-, AND 15 INCH DIAMETER DISKS ARE SEPARATED BY AS MUCH AS 9 INCHES. THE CRITICAL SEPARATION DISTANCES OF TWO DISKS VS THE THICKNESS OF ONE DISK (ONE-HALF THE TOTAL METAL THICKNESS OF THE ASSEMBLY) IS SHOWN IN FIG. 2.7.1 FOR ASSEMBLIES OF ALL THREE DIAMETERS.

CORRESPONDING PROMPT-NEUTRON DECAY CONSTANTS WERE OBTAINED BY THE ROSSI ALPHA TECHNIQUE, IN WHICH THE TIME DISTRIBUTION OF PROMPT NEUTRONS ASSOCIATED WITH A COMMON ANCESTOR IS MEASURED. A TYPICAL SET OF DATA COLLECTED IN A ROSSI ALPHA MEASUREMENT USING A TECHNICAL MEASUREMENT CORPORATION 256-CHANNEL ANALYZER WITH A NEUTRON TIME-OF-FLIGHT LOGIC UNIT IS SHOWN IN FIG. 2.7.2. FOR THIS MEASUREMENT A PROTON-RECOIL DETECTOR WAS USED TO TRIGGER THE TIME ANALYZER, AND THE SIGNAL, AFTER A DELAY OF 6.1 MICROSECONDS, WAS FROM TWO SPIRAL FISSION COUNTERS. THE DATA PRIOR TO THE PEAK REPRESENT THE BUILDUP OF THE NEUTRON POPULATION BEFORE THE DECAY. THE DECAY CONSTANTS MEASURED BY THIS TECHNIQUE FOR THE THREE SETS OF DISKS ARE GIVEN IN FIG. 2.7.3.

VALUES OF THE EFFECTIVE DELAYED-NEUTRON FRACTION, BETA(EFF), WHICH ARE REQUIRED TO OBTAIN THE PROMPT-NEUTRON LIFETIMES FROM THE MEASURED DECAY CONSTANTS HAVE BEEN COMPUTED FOR THE 11-INCH DIAMETER ASSEMBLIES FROM TRANSPORT-THEORY CALCULATIONS USING THE SN METHOD OF SOLUTION OF THE TRANSPORT EQUATION AND THE CROSS SECTIONS REFERRED TO IN SEC. 2.6. THE ADEQUACY OF THE SN METHOD IN THE S-B APPROXIMATION AND OF THE SIX-GROUP CROSS-SECTION SETS USED FOR THE CALCULATIONS OF THESE ASSEMBLIES WAS DEMONSTRATED, SINCE THE CALCULATED MULTIPLICATION FACTORS FOR 11 DIFFERENT EXPERIMENTAL CONFIGURATIONS ARE BETWEEN 0.99 AND 1.002. (AUTH.).

1199 ID-NUMBER ID-NUMBER 1199

AUTHOR MAGNUSON, D. W.
 TITLE DSN TRANSPORT CALCULATIONS OF CRITICAL SPHERES OF URANIUM SOLUTIONS
 REPORT NUMBER..... ORNL-3499, 68
 DATE PUBLISHED ... 63-08-01
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER - CALCULATIONS

ABSTRACT

CALCULATIONS HAVE BEEN MADE OF THE MULTIPLICATION FACTORS OF SEVERAL WATER-REFLECTED AND UNREFLECTED CRITICAL SPHERES OF URANYL NITRATE OR URANYL FLUORIDE AQUEOUS SOLUTIONS. CARLSON'S SN TRANSPORT CODE, DSN, WAS USED IN THE S(4) APPROXIMATION WITH THE 16-GROUP CROSS-SECTION VALUES OF HANSEN AND ROACH. THE CRITICAL CONDITIONS AND THE CALCULATED MULTIPLICATION CONSTANTS ARE GIVEN IN TABLE 2.8.1. IT IS CONCLUDED THAT THIS CODE AND CROSS-SECTION SET CAN BE USED WITH CONFIDENCE FOR THESE SOLUTIONS OVER THE COMPLETE RANGE OF CONCENTRATIONS. IT IS BELIEVED THAT THE DIFFERENCE

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

BETWEEN THE CALCULATED AND EXPERIMENTAL MULTIPLICATION FACTORS IS DUE PRIMARILY TO ERRORS IN THE EXPERIMENTAL DETERMINATION OF ATOMIC DENSITIES AND TO ERRORS IN THE CROSS SECTIONS. (AUTH.).

1200 ID-NUMBER ID-NUMBER 1200

AUTHOR MIHALCZO, J. T.
 TITLE SMALL GRAPHITE-OR BERYLLIUM-REFLECTED URANIUM-DIOXIDE CRITICAL ASSEMBLIES
 REPORT NUMBER..... ORNL-3499, 69
 DATE PUBLISHED ... 63-08-01
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) - POLYETHYLENE SLABS ; OAK RIDGE - URANIUM(93%) - BERYLLIUM

ABSTRACT

THREE SMALL CRITICAL ASSEMBLIES OF URANIUM-235 ENRICHED URANIUM-DIOXIDE, REFLECTED IN TWO CASES BY GRAPHITE AND IN THE THIRD BY BERYLLIUM, HAVE PROVIDED DATA TO VERIFY CALCULATIONAL METHODS FOR THESE TYPES OF ASSEMBLIES. THIS WORK IS DESCRIBED IN PREVIOUS PUBLICATIONS. (AUTH.).

1201 ID-NUMBER ID-NUMBER 1201

AUTHOR KINNEY, W. E./ MIHALCZO, J. T./ HAPPER, I.
 TITLE APPLICATION OF MONTE CARLO CALCULATIONAL TECHNIQUES TO THE STUDY OF FAST CRITICAL ASSEMBLIES
 REPORT NUMBER..... ORNL-3499, 77-81
 DATE PUBLISHED ... 63-08-01
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS

ABSTRACT

THE MONTE CARLO CALCULATIONAL METHOD HAS BEEN WIDELY APPLIED TO MANY NEUTRON PHYSICS PROBLEMS, BUT, BECAUSE OF HIGH COMPUTING COSTS AND THE LACK OF ADEQUATE CROSS-SECTION DATA, SELDOM TO CRITICALITY STUDIES. STILL, IT REPRESENTS THE ONLY MEANS FOR CALCULATING COMPLEX ASSEMBLIES SUCH AS THOSE DESCRIBED IN SEC. 2.5, AND, WITH MORE DETAILED MICROSCOPIC DATA BECOMING AVAILABLE AND WITH THE COST PER COMPUTING OPERATION DECREASING, IT SEEMS REASONABLE THAT THE METHOD SHOULD BE DEVELOPED AS A ROUTINE CALCULATIONAL TOOL TO PREDICT THE PROPERTIES OF CRITICAL ASSEMBLIES. AS A FIRST STEP IN THIS DIRECTION, MONTE CARLO CALCULATIONS HAVE BEEN PERFORMED FOR SEVERAL SIMPLE UNMODERATED, UNREFLECTED URANIUM METAL ASSEMBLIES WHICH HAD BEEN MADE CRITICAL EXPERIMENTALLY.

THE COMPUTER CODE USED FOR THE CALCULATIONS WAS THE O5R CODE, A GENERAL-PURPOSE MONTE CARLO NEUTRON TRANSPORT CODE. ONLY HIGHLY URANIUM-235 ENRICHED URANIUM SYSTEMS WERE CONSIDERED, AND THEY WERE ASSUMED TO CONTAIN URANIUM-235 AND URANIUM-238 ONLY. CROSS-SECTION VALUES FROM BNL-325 WERE USED WHERE POSSIBLE, WITH HOWERTON'S COMPILATION SERVING AS A BASIS FOR SEPARATING THE SCATTERING AND INELASTIC CROSS SECTIONS. THE RESULTING CROSS SECTIONS ARE SHOWN IN FIGS. 2.12.1 AND 2.12.2. THE ANGULAR DISTRIBUTIONS FROM BNL-400 WERE USED TO OBTAIN THE LEGENDRE EXPANSION COEFFICIENTS $F(1)$ THROUGH $F(8)$ SHOWN IN TABLE 2.12.1. THE ANGULAR DISTRIBUTIONS FOR URANIUM-238 AND URANIUM-235 WERE TAKEN TO BE IDENTICAL. INELASTIC SCATTERING WAS TREATED WITH EVAPORATION THEORY, (REF. 6) AND THE VARIATION OF η WITH ENERGY WAS TAKEN TO BE $\eta(E) = 2.43 + 0.115 \cdot E$ (MEV).

THE SYSTEMS CONSIDERED WERE A 17.42-CM-DIAMETER SPHERE CORRESPONDING TO THE GODIVA I REACTOR, (REF. 7) A 12.7 BY 12.7 BY 23.15 CM PARALLELEPIPED, AND 17.77-, 27.93-, AND 38.08-CM-OUTSIDE DIAMETER CYLINDERS WHOSE HEIGHTS WERE APPROXIMATELY 12.6, 8.7, AND 7.6 CM, RESPECTIVELY (SEE TABLE 2.12.2). IN EACH CASE THE ISOTOPIC COMPOSITION OF THE SYSTEM WAS ASSUMED TO BE 4.508×10^{-22} URANIUM-235 NUCLEI PER CUBIC CENTIMETER AND 2.942×10^{-21} URANIUM-238 NUCLEI PER CUBIC CENTIMETER. (AUTH.).

1202 ID-NUMBER ID-NUMBER 1202

AUTHOR ROHRER, E. R./ TUNNELL, W. C./ MAGNUSON, D. W.
 TITLE NEW CRITICAL EXPERIMENT MACHINES
 REPORT NUMBER..... ORNL-4193, 168-173
 DATE PUBLISHED ... 61-10-00
 SITE/PROGRAM OAK RIDGE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

TWO NEW CRITICAL-EXPERIMENT MACHINES WERE RECENTLY INSTALLED AND OPERATED IN THE OAK RIDGE CRITICAL EXPERIMENT FACILITY. BOTH DEVICES UTILIZE THE SPLIT-TABLE TECHNIQUE FOR COMBINING SUBCRITICAL AMOUNTS OF SOLID FISSIONABLE MATERIAL INTO CRITICAL ASSEMBLIES BY CONTROLS OPERATED IN A SHIELDED AREA. ONE OF THE MACHINES, IDENTIFIED AS THE CRITICALITY TESTING UNIT (CTU), WAS DESIGNED FOR CRITICAL EXPERIMENTS ON UNMODERATED METAL SYSTEMS WITH MINIMAL REFLECTION FROM THE SUPPORT STRUCTURE AND THE ROOM. EXISTING EQUIPMENT WAS NOT SUITED TO THIS TYPE OF PROGRAM BECAUSE

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

OF THE LARGE MASS OF THE SUPPORTING MEMBERS AND THE SLOW SPEED OF SEPARATION, ESPECIALLY SINCE THE SEPARATION OF COMPONENTS IS THE ONLY SAFETY MECHANISM PROPOSED FOR THE SYSTEMS TO BE STUDIED. (AUTH.).

1205 ID-NUMBER ID-NUMBER 1205

AUTHOR MIHALCZO, J. T.

TITLE MONTE CARLO CALCULATIONS OF THICK-GRAPHITE-REFLECTED URANIUM-METAL CRITICAL ASSEMBLIES

REPORT NUMBER..... ORNL-4280, 41-43

DATE PUBLISHED ... 68-00-00

SITE/PROGRAM OAK RIDGE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

THE NEUTRON MULTIPLICATION FACTOR FOR A VARIETY OF URANIUM-METAL ANNULI AND CYLINDERS SURROUNDED WITH THICK CARBON REFLECTORS HAS BEEN MEASURED AND CALCULATED BY A MONTE CARLO METHOD. THE MATERIAL WITHIN THE ANNULI WAS CARBON OR AIR. THE THICKNESSES OF THE SIDE, TOP, AND BOTTOM REFLECTORS WERE EQUAL IN ANY ONE ASSEMBLY. THE DENSITY OF THE INDIVIDUAL PIECES OF TYPE HLM GRAPHITE VARIED BETWEEN 1.688 AND 1.783 GRAM/C.C. THE URANIUM METAL WAS ENRICHED TO 93.2 PERCENT IN URANIUM-235 AND HAS PREVIOUSLY BEEN DESCRIBED.

THE MULTIPLICATION FACTORS WERE CALCULATED USING THE 16-GROUP CROSS SECTIONS OF HANSEN AND ROACH (REF. 3) FOR URANIUM AND CARBON AND THE KENO CODE, (REF. 4) WHICH IS A MULTIGROUP MONTE CARLO METHOD WITH ISOTROPIC SCATTERING AND WITH NEUTRON SLOWING DOWN TREATED BY A TRANSFER MATRIX. TWENTY-ONE THOUSAND NEUTRON HISTORIES (105 BATCHES OF 200 SOURCE NEUTRONS EACH) WERE CALCULATED, REQUIRING APPROXIMATELY 20 MINUTES ON THE IBM 360-75 FOR EACH PROBLEM. THE SOURCE NEUTRONS WERE PUT IN THE URANIUM UNIFORMLY, AND THE FIRST FIVE BATCHES WERE DISCARDED. (AUTH.).

1206 ID-NUMBER ID-NUMBER 1206

AUTHOR MIHALCZO, J. T.

TITLE CRITICAL PARAMETERS OF ENRICHED URANIUM METAL PARTLY REFLECTED BY POLYETHYLENE

REPORT NUMBER..... ORNL-4280, 43

DATE PUBLISHED ... 68-00-00

SITE/PROGRAM OAK RIDGE - URANIUM(93%) - POLYETHYLENE SLABS

ABSTRACT

URANIUM METAL CYLINDERS WITH DIAMETERS RANGING FROM 17.71 TO 38.09 CM HAVE BEEN ASSEMBLED TO DELAYED CRITICALITY WITH A POLYETHYLENE REFLECTOR ON ONE FLAT SURFACE. THE URANIUM WAS ENRICHED TO 93.15 WEIGHT PERCENT IN URANIUM-235 AND HAD AN AVERAGE DENSITY IN THESE ASSEMBLIES OF 18.70 GRAM/C. C. THE DIMENSIONS OF THE REFLECTOR WERE 112 X 112 X 15.2 CM AND THE DENSITY WAS 0.916 GRAM/C.C. IT WAS OF EFFECTIVE INFINITE THICKNESS AND, AS SHOWN BELOW, ALSO EFFECTIVELY INFINITE IN AREA. A PLOT OF THE CRITICAL MASS AS A FUNCTION OF DIAMETER IS GIVEN IN FIG. 2.6.1. (AUTH.).

1208 ID-NUMBER ID-NUMBER 1208

AUTHOR RAFFETY, S. J.

TITLE HOMOGENEOUS ASSEMBLIES OF URANIUM(2)-TETRAFLUORIDE IN PARAFFIN AT AN HYDROGEN/URANIUM-235 ATOMIC RATIO OF 972

REPORT NUMBER..... ORNL-4280, 50-51

DATE PUBLISHED ... 68-00-00

SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN

ABSTRACT

A CONTINUING PROGRAM OF CRITICAL EXPERIMENTS WITH HOMOGENEOUS HYDROGEN-MODERATED ASSEMBLIES OF LOW-ENRICHMENT URANIUM-TETRAFLUORIDE IN PARAFFIN HAS BEEN EXTENDED TO INCLUDE A MIXTURE CONTAINING 70.2 WEIGHT PERCENT URANIUM(2)-TETRAFLUORIDE WITH A RESULTING HYDROGEN/URANIUM-235 ATOMIC RATIO OF 972. THE DENSITY OF THIS MIXTURE WITHIN A SINGLE UNIT WAS 2.302 GRAM/C.C., BUT THE AVERAGE DENSITY IN THE EXPERIMENTAL ASSEMBLIES WAS 2.286 GRAM/C.C. DUE TO IRREGULARITIES IN ASSEMBLY.

THE DIMENSIONS OF SEVERAL CRITICAL RECTANGULAR PARALLELEPIPEDS OF THIS MATERIAL (CORRECTED FOR NEUTRON REFLECTION FROM SUPPORT STRUCTURES) WERE DETERMINED BY THE USUAL PROCEDURES. THE BUCKLING, B^2 FOR EACH ASSEMBLY WAS CALCULATED FROM THESE MEASURED DIMENSIONS AND THE EXTRAPOLATION DISTANCE, 2.59 ± 0.11 CM, OBTAINED FROM FLUX MEASUREMENTS IN A CRITICAL ASSEMBLY. THE AVERAGE MATERIAL BUCKLING THUS OBTAINED WAS $(3.616 \pm 0.030) \times 10^{-3}$ (CM⁻²). MINIMUM CRITICAL MASSES IN UNREFLECTED RECTANGULAR, CYLINDRICAL, AND SPHERICAL GEOMETRIES WERE CALCULATED FROM THESE DATA BY STANDARD BUCKLING CONVERSION TECHNIQUES, AND THE RESULTS ARE SHOWN, ALONG WITH THE RESULTS OF PREVIOUS EXPERIMENTS, IN FIG. 2.13.1. A VALUE OF 3.45 ± 0.08 CM WAS FOUND FOR THE REFLECTOR SAVINGS IN ASSEMBLIES COMPLETELY REFLECTED BY AN EFFECTIVELY INFINITE THICKNESS OF POLYETHYLENE ON THE SIDES AND TOP AND OF A METHACRYLATE PLASTIC ON THE BOTTOM. THIS

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REFLECTOR SAVINGS WAS USED TO CALCULATE THE MINIMUM CRITICAL MASSES FOR REFLECTED GEOMETRIES SHOWN IN FIG. 2.13.1 (AUTH.).

1209 ID-NUMBER ID-NUMBER 1209

AUTHOR RAFFETY, S. J./ MIHALCZO, J. T.
 TITLE NEUTRON AGE AND INFINITE-MEDIUM NEUTRON MULTIPLICATION FACTOR FOR URANIUM-TETRAFLUORIDE PARAFFIN MIXTURES WITH LOW URANIUM-235 ENRICHMENT
 REPORT NUMBER..... ORNL-4280, 51-53
 DATE PUBLISHED ... 68-00-00
 SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN

ABSTRACT

THE INFINITE-MEDIUM NEUTRON MULTIPLICATION FACTOR, $K(\text{INF})$ AND THE NEUTRON AGE TO THERMAL ENERGY FOR URANIUM-TETRAFLUORIDE PARAFFIN MIXTURES HAVE BEEN INFERRED FROM CRITICAL EXPERIMENTS WITH 2 AND 3 PERCENT URANIUM-235 ENRICHED URANIUM. THE VOLUME FRACTION OF PARAFFIN WAS VARIED SO THAT THE HYDROGEN/URANIUM-235 ATOMIC RATIO WAS BETWEEN 195 AND 972 FOR THE 2 PERCENT ENRICHMENT AND WAS 133 AND 277 FOR THE 3 PERCENT ENRICHMENT. (AUTH.).

1210 ID-NUMBER ID-NUMBER 1210

AUTHOR SEHGAL, B. R.
 TITLE ANALYSES OF BROOKHAVEN URANIUM-233-THORIUM-232 OXIDE, LIGHT- AND HEAVY-WATER-MODERATED LATTICE EXPERIMENTS
 REPORT NUMBER..... TANSO, 10, 596-597
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 69-11-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - URANIUM-233 - THORIUM DIOXIDE LATTICE - CALCULATIONS

ABSTRACT

A SERIES OF EXPONENTIAL LATTICE EXPERIMENTS WITH 3 PERCENT URANIUM-233 ENRICHED THORIUM-232 OXIDE FUEL IN LIGHT AND HEAVY WATER HAVE BEEN COMPLETED RECENTLY AT BROOKHAVEN. THE DETAILS OF THE EXPERIMENTS AND THE PARAMETER DATA HAVE BEEN REPORTED. (AND 2) IN ADDITION, RESULTS OF THE PRELIMINARY CALCULATIONS FOR THE LIGHT-WATER LATTICES WERE REPORTED.

THESE EXPERIMENTS CONSTITUTE A COMPREHENSIVE SET OF INTEGRAL DATA TO CHECK THE CALCULATIONAL METHODS AND THE CROSS-SECTION LIBRARIES FOR URANIUM-233 AND THORIUM-232. A GOOD RANGE OF REACTOR SPECTRA HAS BEEN PROVIDED BY VARYING THE PITCH SUCH THAT THE FRACTION OF FISSIONS OF URANIUM-233 ABOVE 0.625 EV VARIES FROM 0.04 TO 0.6. THE CORE LEAKAGE HAS BEEN VARIED FROM 4 TO 36 PERCENT OF THE NEUTRONS BY BORON POISONING THE LIGHT-WATER MODERATOR.

THE MAIN TOOL OF ANALYSES OF THESE LATTICES IS THE HAMMER MULTIGROUP CODE. THE INADEQUACIES OF THE RESONANCE TREATMENT IN THE HAMMER CODE ARE CORRECTED BY INSERTING THE MONTE CARLO CALCULATIONS OF RESONANCE CAPTURE WITH THE REPETITIOUS CODE IN THE ENERGY BAND OF 17.6 TO 1234 EV. (AUTH.).

1211 ID-NUMBER ID-NUMBER 1211

AUTHOR THOMAS, J. T.
 TITLE CRITICAL EXPERIMENTS WITH AQUEOUS SOLUTIONS OF URANIUM-233(1), OXYGEN(2), (NITROGEN(1)-OXYGEN(3))(2)
 REPORT NUMBER..... ORNL-4280, 53-55
 DATE PUBLISHED ... 68-00-00
 SITE/PROGRAM OAK RIDGE - URANYL(92%) SALTS - WATER

ABSTRACT

THE CRITICALITY OF URANIUM-233 UNDER CONDITIONS OF INTEREST TO NUCLEAR CRITICALITY SAFETY AS WELL AS IN BASIC GEOMETRIES SUITABLE FOR THEORETICAL ANALYSIS HAS BEEN STUDIED IN A SERIES OF EXPERIMENTS CONDUCTED OVER THE PAST 18 MONTHS. IN ONE SERIES AQUEOUS URANYL NITRATE SOLUTIONS OF URANIUM-233 WERE EXAMINED IN A LARGE CAPACITY VESSEL CONTAINING BOROSILICATE GLASS IN ORDER TO DEFINE SYSTEMS HAVING $K(\text{INF})$ OF UNITY OR LESS. IN A SECOND SERIES AS MANY AS 27 NEARLY IDENTICAL SUBCRITICAL CYLINDRICAL VOLUMES OF THE SOLUTION WERE ASSEMBLED IN AIR-SPACED ARRAYS BOTH UNREFLECTED AND REFLECTED BY POLYETHYLENE TO ESTABLISH PARAMETERS USEFUL IN STORAGE AND TRANSPORT SPECIFICATIONS. A FINAL SERIES OF EXPERIMENTS DETERMINED THE CRITICALITY OF WATER-REFLECTED AND UNREFLECTED SPHERICAL AND CYLINDRICAL VOLUMES.

THE URANIUM-233 ISOTOPIC CONTENT OF THE URANIUM OF THE URANYL NITRATE SOLUTION WAS 97.59 PERCENT. THERE WERE NO IMPURITIES PRESENT IN SIGNIFICANT QUANTITIES. (AUTH.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1214 ID-NUMBER ID-NUMBER 1214

AUTHOR MIHALCZO, J. T.
 TITLE SENSITIVITY OF NEUTRON-SPECTRUM-DEPENDENT QUANTITIES IN URANIUM (93.2 PERCENT URANIUM-235) METAL ASSEMBLIES TO INELASTIC SCATTERING MODELS FOR URANIUM-235
 REPORT NUMBER..... TANSO, 09, 489-490
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 66-10-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS

ABSTRACT

THE EXISTING DISCREPANCY BETWEEN THE MEASURED AND CALCULATED NEUTRON LIFETIME IN FAST CRITICAL ASSEMBLIES HAS MOTIVATED A STUDY OF THE SENSITIVITY OF THIS AND OTHER QUANTITIES DEPENDENT ON THE NEUTRON ENERGY SPECTRUM TO THE INELASTIC SCATTERING PROPERTIES OF URANIUM-235. THE ENERGY DISTRIBUTIONS OF NEUTRONS AFTER ONE, TWO, AND THREE SUCCESSIVE INELASTIC COLLISIONS WITH THE URANIUM-235 NUCLEUS HAVE BEEN DETERMINED BY USING THE EVAPORATION MODEL AT ALL ENERGIES AND BY USING A COMBINATION OF THE EVAPORATION MODEL AND THE LEVEL EXCITATION MODEL. IN ONE VARIATION OF THE LATTER, THE CALCULATED CROSS SECTIONS OF YIFIAH, OKRENT, AND MOLDAUER (YOM) WERE USED IN THE EXCITATION LEVEL MODEL UP TO 2.3 MEV; IN ANOTHER VARIATION THE CROSS SECTIONS OF PARKER WERE USED IN LEVEL EXCITATION UP TO 2.0 MEV. THE EVAPORATION MODEL WAS USED FOR HIGHER ENERGIES IN BOTH CASES. THE SOURCE NEUTRONS FOR THESE SCATTERING STUDIES WERE ASSUMED TO HAVE A MAXWELLIAN SPECTRUM WITH A MEAN TEMPERATURE CORRESPONDING TO THAT RESULTING FROM FISSIONS PRODUCED BY NEUTRONS HAVING AN ENERGY OF 1 MEV. THE RESULTS OF THESE THREE CALCULATIONS ARE SUMMARIZED IN TABLE I.

THE EFFECT OF THESE VARIATIONS ON A NUMBER OF CHARACTERISTICS OF THE GODIVA I CRITICAL ASSEMBLY HAVE BEEN CALCULATED BY A MONTE CARLO CODE AND ARE SUMMARIZED IN TABLE II. (AUTH.).

1215 ID-NUMBER ID-NUMBER 1215

AUTHOR SIMS, F. L./ KUNZE, J. F./ WALSH, W. P./ HENDERSON, W. B.
 TITLE FAST-SPECTRUM REFRACTORY-METAL CRITICAL-EXPERIMENT MEASUREMENTS
 REPORT NUMBER..... TANSO, 09, 488-489
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 66-10-00
 SITE/PROGRAM GENERAL ELECTRIC CO., IDAHO - FAST SPECTRUM REFRACTORY METALS

ABSTRACT

A FAST-SPECTRUM REFRACTORY-METAL CRITICAL EXPERIMENT WITH A MODERATING REFLECTOR HAS BEEN OPERATED IN IDAHO TO DETERMINE THE BASIC NUCLEAR CHARACTERISTICS OF THIS TYPE OF REACTOR. THIS PAPER DESCRIBES THE MEASUREMENTS THAT HAVE BEEN PERFORMED WITH THIS CRITICAL EXPERIMENT.

THE CONFIGURATION ON WHICH THE EXPERIMENTS WERE PERFORMED IS SHOWN IN FIG. 1. THE CORE WAS COMPOSED OF 0.156-INCH- AND 0.170-INCH-DIAMETER RODS IN AN HEXAGONAL ALUMINUM STRUCTURE GIVING A COMPOSITION OF 26.8 PERCENT METALLIC URANIUM (93.2 PERCENT URANIUM-235), 26.2 PERCENT TUNGSTEN, 10.2 PERCENT TANTALUM, AND 6.9 PERCENT ALUMINUM. THE RADIAL REFLECTOR WAS 88 PERCENT BERYLLIUM AND 6.9 PERCENT ALUMINUM. THE FRONT REFLECTOR WAS A MIXTURE OF ALUMINUM, TANTALUM, AND BERYLLIUM, WITH A TOTAL VOLUME FRACTION OF MATERIALS OF NOMINALLY 83 PERCENT. THE MEDIAN FISSION ENERGY IN THE CORE WAS CALCULATED TO BE 0.4 MEV. (AUTH.).

1219 ID-NUMBER ID-NUMBER 1219

AUTHOR COLE, A. G.
 TITLE EXPERIMENTS INVOLVING GAPS IN CRITICAL ASSEMBLIES
 REPORT NUMBER..... TANSO, 05, 079-080
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 62-00-00
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

ABSTRACT

THE SERIES OF EXPERIMENTS INVOLVING GAPS OR VOIDS IN CRITICAL ASSEMBLIES WITH SIMPLE CONFIGURATIONS HAS BEEN EXTENDED TO INCLUDE TWO-DIMENSIONAL GEOMETRIES. THREE METHODS OF TREATING THE GAPS IN NEUTRON DIFFUSION CODE CALCULATIONS ARE PRESENTED, TOGETHER WITH THE RESULTS OBTAINED. THE NEW EXPERIMENTS (FIG. 1) INCLUDE AN ASSEMBLY STACKED ON A 30-INCH-SQUARE BASE WITH A 6-INCH SQUARE VOID CENTERED ON THE VERTICAL AXIS OF SYMMETRY AND EXTENDING THE FULL 20.6 +/- 0.2 INCH CRITICAL HEIGHT OF THE STACK. THIS ASSEMBLY HAS 8-MIL ORALLOY (93.2 PERCENT URANIUM-235) FOILS ARRANGED IN PLANES SEPARATED BY .1-INCH BLOCKS OF BERYLLIUM OXIDE TO GIVE AN EFFECTIVE BERYLLIUM OXIDE DENSITY OF 2.86 GMS/CM³(3) AND A MODERATOR-TO-FUEL RATIO BERYLLIUM OXIDE: URANIUM-235 = 247. (AUTH.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1220 ID-NUMBER ID-NUMBER 1220

AUTHOR HANSEN, G. E./ PAXTON, H. C.
 TITLE RE-EVALUATED CRITICAL SPECIFICATIONS OF SOME LOS ALAMOS FAST-NEUTRON SYSTEMS
 REPORT NUMBER..... LA-4208
 DATE PUBLISHED ... 69-09-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES ; LOS ALAMOS - PLUTONIUM METAL SPHERES ; LOS ALAMOS - URANIUM-233 METAL SPHERES

ABSTRACT

THE DESIRE FOR MORE DETAILED CRITICAL SPECIFICATIONS OF LOS ALAMOS FAST-NEUTRON ASSEMBLIES THAN WAS REQUIRED ORIGINALLY HAS LED TO THE RE-EVALUATION OF A NUMBER OF PUBLISHED CRITICAL MASSES. IN EACH CASE, THERE IS IDEALIZATION TO THE APPROPRIATE ONE-DIMENSIONAL OR TWO-DIMENSIONAL REPRESENTATION. MINOR CHANGES OF SOME PUBLISHED CRITICAL SPECIFICATIONS RESULT EITHER FROM IMPROVEMENT OF DATA UPON WHICH CORRECTIONS ARE BASED OR FROM MORE DETAILED ACCOUNTING OF COMPONENT DIMENSIONS THAN WAS ORIGINALLY BELIEVED TO BE JUSTIFIED. (AUTH).

1227 ID-NUMBER ID-NUMBER 1227

AUTHOR NEWMAN, D. F. / DAVENPORT, L. C.
 TITLE NEUTRON FLUX SPECTRUM STUDIES IN THE PCTR FAST NEUTRON CAVITY
 REPORT NUMBER..... BNWL-1240
 DATE PUBLISHED ... 69-11-30
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

SUMMARY: NEUTRON SPECTRUM RESULTS FROM MULTIPLE FOIL ACTIVATION MEASUREMENTS WERE OBTAINED OVER THE ENTIRE ENERGY SPECTRUM, 10--10 TO 18 MEV. DETAILED NEUTRON SPECTRUM STRUCTURE WAS MEASURED BY PROTON-RECOIL SPECTROMETER METHODS IN THE ENERGY INTERVAL, 9.6 KEV TO 1.4 MEV, COMPRISING 80 PERCENT OF THE INTEGRATED NEUTRON FLUX. THUS, EACH OF THESE TWO EXPERIMENTAL METHODS SUPPLEMENTED AND CONFIRMED THE INFORMATION OBTAINED FROM THE OTHER. USING BOTH METHODS PERMITTED THE ABSOLUTE VALUE OF THE NEUTRON FLUX SPECTRUM TO BE OBTAINED IN THE CENTER OF THE FNC WITH THE PCTR OPERATING AT A 100 WATT POWER LEVEL. (AUTH).

1232 ID-NUMBER ID-NUMBER 1232

AUTHOR PROFIO, A. E./ ANTUNEZ, H. M./ CROSBIE, K. L./ RUSSELL, J. L.
 TITLE TIME-OF-FLIGHT MEASUREMENT OF THE NEUTRON SPECTRUM FROM A SPHERICAL URANIUM-235 FAST REACTOR
 REPORT NUMBER..... TANSO, 09, 233-234
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 66-06-00
 SITE/PROGRAM GENERAL ATOMICS - APFA-II (ENRICHED URANIUM METAL) ; LIVERMORE - URANIUM(93%) METAL

ABSTRACT

THE TIME-OF-FLIGHT METHOD WAS USED TO MEASURE THE NEUTRON SPECTRUM FROM THE ACCELERATOR-PULSED FAST ASSEMBLY (APFA), WHICH IS A 7-INCH-DIAM SPHERE OF 93 PERCENT ENRICHED URANIUM SIMILAR TO THE GODIVA REACTOR. THE REACTOR WAS SUBCRITICAL WITH A PROMPT MULTIPLICATION OF 18, GIVING A PROMPT- NEUTRON DIEAWAY TIME CONSTANT OF ABOUT 112 NSEC. THE REACTOR IS CONTROLLED BY SEPARATION INTO THREE SEGMENTS; FOR THIS EXPERIMENT, A 0.5-INCH GAP WAS INTRODUCED BETWEEN THE UPPER THIRD AND THE REMAINDER OF THE CORE. NEUTRONS WERE PRODUCED NEAR THE CENTER OF THE SPHERE BY (GAMMA, N) REACTIONS RESULTING FROM 30-MEV ELECTRONS STRIKING THE URANIUM AT THE BOTTOM OF A 1-INCH-DIAM BY 3-INCH-DEEP RE-ENTRANT HOLE. THE ELECTRON BEAM, FROM THE GENERAL ATOMIC LINEAR ACCELERATOR, WAS PULSED AT 20 NS AND 360 PULSES/SEC. THE DETECTORS USED WERE A 2- X 2-INCH LIQUID SCINTILLATOR FOR ENERGIES ABOVE 1 MEV, AND A CARBON TETRABORIDE-PARAFFIN CAPTURE SLAB AND GAMMA-RAY SENSOR. A 1-INCH-DIAM COLLIMATED BEAM FROM THE SURFACE WAS ALLOWED TO DRIFT DOWN A 50-M EVACUATED FLIGHT PATH. THE FLIGHT DISTANCE AND DIEAWAY TIME RESULTS IN A 15 PERCENT ENERGY RESOLUTION AT 10 MEV, AND SOMEWHAT BETTER RESOLUTION AT LOWER ENERGIES. THE SPECTRUM WAS OBTAINED FROM 30 KEV TO 10 MEV WITH AN ESTIMATED ERROR OF +/- 10 PERCENT. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1237 ID-NUMBER ID-NUMBER 1237

AUTHOR PHELPS, J./ COURT, A. J./ DOWNES, K.
 TITLE CEPFR-1A MEASUREMENTS AND ASSEMBLY DESCRIPTION
 REPORT NUMBER..... BNL-RP-06 (F)
 DATE PUBLISHED ... 69-09-22
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - PULSED FAST REACTOR EXPERIMENT

ABSTRACT

THE FIRST ASSEMBLY TAKEN CRITICAL IN THE EXPERIMENT FOR THE PULSED FAST REACTOR HAD A CORE COMPOSED OF 26 VOL% URANIUM (93 PERCENT ENRICHED), 41 VOL% STAINLESS STEEL, 14 VOL% ALUMINUM, AND 19 VOL% VOID, REFLECTED BY AT LEAST 12 INCHES OF STAINLESS STEEL.

THE MEASUREMENTS MADE ON THIS ASSEMBLY INCLUDE CORE LOADING, CORE VOLUME, K-EXCESS, REACTIVITY WORTH OF VARIOUS MATERIALS IN THE REFLECTOR, NEUTRON LIFETIME, AND VARIOUS OPERATING CHARACTERISTICS.

A DETAILED DESCRIPTION OF THE ASSEMBLY IS GIVEN. (AUTH).

1238 ID-NUMBER ID-NUMBER 1238

AUTHOR PRICE, G. A./ WINDSOR, H.
 TITLE PLUTONIUM-ALUMINUM-WATER BUCKLING MEASUREMENTS
 REPORT NUMBER..... BNL-RP-08 (F)
 DATE PUBLISHED ... 69-10-01
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - PLUTONIUM-ALUMINUM RODS IN WATER

ABSTRACT

MEASUREMENTS OF MATERIAL BUCKLING HAVE BEEN MADE IN A SERIES OF SUB-CRITICAL LATTICES OF PLUTONIUM-ALUMINUM RODS IN ORDINARY WATER. COMPARISONS ARE MADE WITH CALCULATIONS, USING THE HAMMER REACTOR CODE, AND LIMITATIONS ARE ESTABLISHED FOR SAFE STORAGE AND HANDLING OF THE PLUTONIUM-ALUMINUM FUEL RODS. (AUTH).

1239 ID-NUMBER ID-NUMBER 1239

AUTHOR PHELPS, J. / CONANT, J. / COURT, A. J. / DOWNES, K. / WINDSOR, H.
 TITLE CEPFR-1B MEASUREMENTS AND ASSEMBLY DESCRIPTION
 REPORT NUMBER..... BNL-RP-07 (F)
 DATE PUBLISHED ... 69-09-22
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - PULSED FAST REACTOR EXPERIMENT

ABSTRACT

THE SECOND SET OF ASSEMBLIES TAKEN CRITICAL IN THE EXPERIMENTS FOR THE PULSED FAST REACTOR HAD CORES COMPOSED OF 26 VOL% URANIUM (93 PERCENT ENRICHED), 41 VOL% STAINLESS STEEL, 14 VOL% ALUMINUM, AND 19 VOL% VOID. THEY WERE REFLECTED BY AT LEAST 12 INCHES OF STAINLESS STEEL EXCEPT FOR ONE OPEN CORE FACE IN FRONT OF WHICH WERE PLACED VARIOUS REFLECTOR BLOCKS. MEASUREMENTS ON THESE ASSEMBLIES INCLUDED, 1) THE REACTIVITY EFFECTS OF VARIOUS REFLECTOR BLOCKS AS A FUNCTION OF POSITION, 2) NEUTRON LIFETIME, 3) CORE LOADING, 4) CORE VOLUME, 5) AND VARIOUS OPERATING CHARACTERISTICS. A DESCRIPTION OF THE ASSEMBLIES IS GIVEN IN THE APPENDIX. (AUTH).

1249 ID-NUMBER ID-NUMBER 1249

AUTHOR HESS, A. L./ KEENEY, W. P./ CAUMETTE, P./ BOYER, J. P.
 TITLE CRITICAL STUDIES FOR THE FRENCH FAST REACTOR <RAPSODIE> (ZPR-3 ASSEMBLY 44)
 REPORT NUMBER..... ANL-7044
 DATE PUBLISHED ... 66-03-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

A PROGRAM OF CRITICAL STUDIES WAS CARRIED OUT ON ZPR-3 WITH A MOCKUP OF THE FRENCH FAST REACTOR, RAPSODIE. OBJECTIVES OF THE PROGRAM INCLUDED THE ACQUISITION OF CRITICAL DATA PERTINENT TO THE FUEL SPECIFICATION FOR RAPSODIE, THE EVALUATION OF THE RAPSODIE DESIGN CONTROL SYSTEMS, AND THE COLLECTION OF OTHER DATA USEFUL IN VERIFYING CALCULATIONAL TECHNIQUES. THE RAPSODIE CORE SIMULATED IN THE MOCKUP WAS APPROXIMATELY A 40-LITER CYLINDER CONTAINING 40

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

VOL% FUEL (A PLUTONIUM DIOXIDE - URANIUM DIOXIDE MIXTURE), 34 VOL% SODIUM, AND 20 VOL% STEEL. THE EXPERIMENTS WERE DONE IN TWO PHASES: A PHYSICS-CORE STUDY, AND AN ENGINEERING-CORE STUDY.

FOR THE PHYSICS-CORE STUDY, A SIMPLE CORE-BLANKET ARRANGEMENT WAS CONSTRUCTED FOR EASE OF CALCULATION, AND SPECTRAL INDICES AND LOCAL REACTIVITY COEFFICIENTS WERE MEASURED. IN THE FUEL FOR THE PHYSICS-CORE MOCKUP, THE RATIO OF URANIUM TO PLUTONIUM WAS ABOUT 5:1, WITH THE URANIUM ENRICHED TO 60 A/O. BOTH RADIAL AND AXIAL BLANKETS HAD A COMPOSITION EQUIVALENT TO ABOUT 45 VOL% URANIUM, 30 VOL% SODIUM, AND 15 VOL% STEEL.

IN THE FUEL FOR THE ENGINEERING CORE, THE URANIUM-TO-PLUTONIUM RATIO WAS REDUCED TO 3.2:1, WITH THE URANIUM 62 A/O ENRICHED. MOCKUPS OF THE RAPSODIE AXIAL REGIONS, STEEL-SODIUM END GAPS, AND DIFFERENT AXIAL BLANKETS WERE CONSTRUCTED WITH THE ENGINEERING CORE, ALONG WITH MOCKUPS OF THE RAPSODIE CONTROL AND SAFETY RODS. EXPERIMENTS IN THE FULL ENGINEERING MOCKUP INCLUDED ROD-WORTH STUDIES, MATERIAL-REACTIVITY-COEFFICIENT MEASUREMENTS, AND TRAVERSES OF NEUTRON DETECTORS AND FUEL- REACTIVITY SAMPLES.

THIS WAS THE FIRST ZPR-3 CRITICAL ASSEMBLY TO CONTAIN A SIGNIFICANT LOADING OF PLUTONIUM, AND THE PROBLEMS INTRODUCED THEREBY WERE INVESTIGATED. HEAT GENERATION FROM ALPHA DECAY OF THE PLUTONIUM AFFECTED THE ACCURACY OF REACTIVITY MEASUREMENTS, AND THE NEUTRON SOURCE FROM SPONTANEOUS FISSION REQUIRED DIFFERENT TECHNIQUES FOR MEASURING REACTOR PERIODS. (AUTH).

1250 ID-NUMBER ID-NUMBER 1250

AUTHOR LLOYD, R. C./ CLAYTON, E. D./ CHALMERS, J. H.

TITLE CRITICALITY OF ARRAYS OF URANIUM-233 SOLUTION

REPORT NUMBER..... NUAPA, 04, 136-141

JOURNAL NUCLEAR APPLICATIONS AND TECHNOLOGY

DATE PUBLISHED ... 68-03-00

SITE/PROGRAM HANFORD - URANIUM-233 SOLUTIONS

ABSTRACT

THE RESULTS OF NEUTRON MULTIPLICATION MEASUREMENTS PERFORMED WITH ARRAYS OF URANIUM-233 SOLUTION APPLY TO CRITICALITY SAFETY CONSIDERATIONS IN HANDLING SOLUTIONS AT A CONCENTRATION OF APPROX. 330 G URANIUM-233/LITER AND ARE USEFUL IN CHECKING COMPUTATIONAL METHODS. THE MEASUREMENTS WERE MADE WITH 17.3 KG. URANIUM-233 IN BOTH REFLECTED AND UNREFLECTED ARRAYS. CRITICAL NUMBERS OF BOTTLES WERE DETERMINED AS A FUNCTION OF SPACING, AND THE EFFECT OF ADDING MODERATING MATERIAL BETWEEN THE BOTTLES COMPRISING AN ARRAY WAS ALSO EXAMINED. MONTE CARLO CALCULATIONS WERE FOUND TO REPRODUCE THE EXPERIMENTAL DATA REASONABLY WELL, WITH K(EFF) BEING COMPUTED TO WITHIN ABOUT 0.03 OF UNITY FOR THOSE CASES COMPARED. (AUTH).

1256 ID-NUMBER ID-NUMBER 1256

AUTHOR RALSTON, H. R.

TITLE THE LIVERMORE COLD-CRITICAL EXPERIMENTS ON TORY II-A AND II-C

REPORT NUMBER..... UCRL-6837, SUMMARY

DATE PUBLISHED ... 62-03-20

SITE/PROGRAM LIVERMORE - TORY REACTOR

ABSTRACT

THE BASIC PHILOSOPHY OF CRITICAL ASSEMBLIES AND REACTOR OPERATIONS CAN BE STATED AS FOLLOWS: THE ASSEMBLY AND OPERATIONS MUST BE PLANNED IN SUCH A WAY THAT ALL APPROACHES TO CRITICAL ARE ALWAYS UNDER THE DIRECT AND DELIBERATE CONTROL OF THE OPERATOR.

THE APPLICATION OF THIS PHILOSOPHY CAN INVOLVE ONE IN COMPLEX AND SUBTLE PATHWAYS OF ANALYSIS OF BOTH THE REACTOR AND THE PEOPLE OPERATING IT. WHEN THE PROBLEMS ARE VIEWED AS A COMBINATION OF MECHANICAL AND HUMAN ELEMENTS AND IT IS RECOGNIZED THAT ANY MECHANICAL-ELECTRICAL SYSTEM CAN BE SUBVERTED BY OPERATING PERSONNEL, THE NECESSITY OF IMPOSING ADMINISTRATIVE CONTROL BECOMES APPARENT. SUCH CONTROL, IN ESSENCE, FORCES THE OPERATING AND PLANNING PERSONNEL TO PREPARE WELL-THOUGHT-OUT PROCEDURES WHICH ARE RIGIDLY FOLLOWED.

ONCE ADMINISTRATIVE CONTROL HAS BEEN ASSURED, THE PROBLEM OF SAFETY BECOMES ONE OF MINIMIZING THE CHANCE OF OPERATOR ERROR WITH ELECTRO-MECHANICAL SYSTEMS AND AT THE SAME TIME LEAVING THE ULTIMATE CONTROL ALWAYS IN THE HANDS OF THE OPERATOR. THE OBVIOUS FIRST STEP IS TO SET UP A SYSTEM OF INTERLOCKS WHICH MAKE OPERATION IMPOSSIBLE UNLESS A SERIES OF BASIC CONDITIONS HAS BEEN MET. ONCE THESE CONDITIONS HAVE BEEN SATISFIED, THE APPROACH TO CRITICAL CAN TAKE PLACE AND IT IS AT THIS POINT WE MUST TURN OUR ATTENTION TO THE BASIC DESIGN OF THE REACTOR. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1258 ID-NUMBER ID-NUMBER 1258

AUTHOR HESS, G. M. / BIERMAN, S. R.
 TITLE PULSED NEUTRON SOURCE MEASUREMENTS - PLUTONIUM NITRATE SOLUTIONS
 REPORT NUMBER.... BNWL-0340, 49-50
 DATE PUBLISHED ... 66-10-15
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

PULSED NEUTRON SOURCE EXPERIMENTS WERE PERFORMED CONCURRENTLY WITH THE CRITICALITY EXPERIMENTS ON PLUTONIUM NITRATE SOLUTION IN THE EXPANDABLE SLAB TANK. ANALYSIS OF THE DATA TAKEN ON THE FULLY REFLECTED TANK AT A WIDTH OF 4.6 INCH HAVE BEEN COMPLETED AND THE RESULTS ARE SHOWN IN TABLE I. THE PLUTONIUM CONCENTRATION WAS APPROXIMATELY 58 GRAMS/LITER AND THE LENGTH OF THE TANK WAS 42 INCH. THE ERRORS SHOWN ARE THE LEAST-SQUARES FITTING ERRORS ONLY. THAT IS, THE EXPERIMENTAL VALUES OF THE DECAY CONSTANT, ALPHA, USED TO DETERMINE THE DELAYED CRITICAL ALPHA WERE LEAST-SQUARES FIT WITHOUT REGARD FOR THE ERROR IN THESE NUMBERS. BY RECOGNIZING THESE ERRORS, AN EXPERIMENTAL ERROR OF +/- 3 IS FOUND FOR THE DELAYED CRITICAL DECAY CONSTANT. THIS RANGE ENCOMPASSES THE EXPERIMENTAL VALUES.

THE SAME REASONING APPLIES TO THE DELAYED CRITICAL HEIGHT AS DETERMINED BY INVERSE MULTIPLICATION; AND, INDEED, RECOGNITION OF THE ERRORS IN THE FITTED POINTS MAY ACCOUNT FOR THE DIFFERENCE IN THIS HEIGHT SHOWN BY EXPERIMENTS 3-4.6-2-356 AND 3-4.6-2-359.

CHEMICAL ANALYSES OF THE SOLUTIONS USED IN THESE EXPERIMENTS ARE LISTED IN THE SECTION CONTAINING THE CRITICALITY EXPERIMENTS. (AUTH).

1259 ID-NUMBER ID-NUMBER 1259

AUTHOR CLARK, H. K.
 TITLE EFFECT OF DISTRIBUTION OF FISSILE MATERIAL ON CRITICAL MASS
 REPORT NUMBER.... TANSO, 08, 200-201
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 65-06-00
 SITE/PROGRAM SAVANNAH RIVER - URANIUM-235, URANIUM-233, PLUTONIUM MINIMUM CRITICAL MASS

ABSTRACT

EXPERIMENTS HAVE ESTABLISHED THE MINIMUM CRITICAL MASSES OF FISSILE NUCLIDES IN HOMOGENEOUS AQUEOUS SOLUTIONS. GOERTZEL HAS SHOWN, HOWEVER, THAT WITH AN OPTIMUM DISTRIBUTION OF FISSILE MATERIAL, LOWER MASSES ARE CRITICAL. THE PRESENT WORK CALCULATES MINIMUM CRITICAL MASSES OF URANIUM-235, PLUTONIUM-239, AND URANIUM-233 AS A FUNCTION OF DISTRIBUTION. (AUTH).

1260 ID-NUMBER ID-NUMBER 1260

AUTHOR HANSEN, L. E. / CLAYTON, E. D. / LLOYD, R. C. / BIERMAN, S. R. / JOHNSON, R. D.
 TITLE CRITICAL PARAMETERS OF PLUTONIUM SYSTEMS. PART 1: ANALYSIS OF EXPERIMENTS
 REPORT NUMBER.... NUAPA, 06, 371-380
 JOURNAL NUCLEAR APPLICATIONS AND TECHNOLOGY
 DATE PUBLISHED ... 69-04-00
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

TO PREDICT THE CRITICAL PARAMETERS OF PLUTONIUM FUELED SYSTEMS ONE MUST ESTABLISH THE ACCURACY OF THE COMPUTATIONAL METHODS TO BE EMPLOYED AND THE ACCURACY AND APPLICABILITY OF THE AVAILABLE CRITICAL EXPERIMENT DATA WITH WHICH THE CALCULATIONS ARE TO BE COMPARED. THE ACCURACY OF A MULTIGROUP DIFFUSION THEORY CODE, HFN, AND A MULTIGROUP TRANSPORT THEORY CODE, DTF-IV, WAS EXAMINED BY ANALYZING RECENT PLUTONIUM CRITICAL EXPERIMENTS. THE EXPERIMENTS COVER THE ENTIRE RANGE OF POSSIBLE MODERATION RATIOS, AND THE PLUTONIUM FUELS CONTAIN AS MUCH AS 23.2 ISOTOPIC PERCENT PLUTONIUM-240. ALL THREE BASIC GEOMETRIES ARE REPRESENTED BY THE EXPERIMENTAL DATA EXAMINED. WHERE NECESSARY, THE CRITICALITY DATA WERE CORRECTED, BY MEANS OF ADDITIONAL EXPERIMENTS AND/OR CALCULATIONS, TO CONFORM TO ONE-DIMENSIONAL, CLEAN, HOMOGENEOUS CRITICAL ASSEMBLIES WHICH COULD BE ADEQUATELY DEFINED AND USED AS A BASIS FOR ESTABLISHING NUCLEAR CRITICALITY SAFETY GUIDELINES. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1264 ID-NUMBER ID-NUMBER 1264

AUTHOR CLAYTON, E. D.
 TITLE PLUTONIUM CRITICALITY EXPERIMENTS
 REPORT NUMBER..... PHYSICS TODAY, SEPT. (1965), 46-52
 DATE PUBLISHED ... 65-09-00
 SITE/PROGRAM HANFORD - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

PLUTONIUM, THE MAN-MADE ELEMENT OF ATOMIC NUMBER 94, HAS ESTABLISHED ITSELF MAINLY AS THE FISSIONABLE COMPONENT OF NUCLEAR WEAPONS. IT IS ALWAYS MADE IN THE OPERATION OF A URANIUM-FUELED REACTOR AND HAS BEEN MANUFACTURED IN LARGE QUANTITIES SINCE ITS INTRODUCTION IN WORLD WAR II. IT HAS LONG BEEN CONSIDERED INEVITABLE THAT PLUTONIUM WILL BECOME AN IMPORTANT REACTOR FUEL. IT OFFERS HAZARDS AND PUZZLES TO REACTOR PHYSICISTS, AND FOR TWO REASONS IN PARTICULAR THEY MUST KNOW THE CONDITIONS UNDER WHICH ASSEMBLIES CONTAINING IT BECOME CRITICAL. FIRST, THEY MUST DESIGN PROCESSING SYSTEMS THAT WILL NOT HAVE ACCIDENTAL AND DANGEROUS CHAIN REACTIONS. SECOND, THEY NEED DATA FOR REACTOR DESIGN.

TO DETERMINE THESE DATA (AND EXTEND SOME THAT WERE DETERMINED MORE THAN A DECADE AGO), CALCULATIONS TO DETERMINE CRITICALITY PARAMETERS AND EXPERIMENTS LIKE THAT SHOWN IN FIG. 1 ARE BEING CARRIED OUT IN THE CRITICAL MASS LABORATORY AT THE BATTELLE INSTITUTE'S PACIFIC NORTHWEST LABORATORY AT HANFORD, WASH. (AUTH).

1267 ID-NUMBER ID-NUMBER 1267

AUTHOR PALMEDO, P. F./ WEINSTOCK, E. V.
 TITLE FS-1 CORES 2 AND 2A
 REPORT NUMBER..... BNL-RP-01 (F)
 DATE PUBLISHED ... 69-08-12
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - FAST SOURCE ASSEMBLY

ABSTRACT

A BRIEF DESCRIPTION IS PRESENTED OF THE EXPERIMENTS PERFORMED ON CORES 2 AND 2A OF THE BROOKHAVEN FAST SOURCE ASSEMBLY, FS-1. THESE CORES WERE DESIGNED TO INCORPORATE TEST CELLS IN WHICH FINE-STRUCTURE MEASUREMENTS WERE PERFORMED. (AUTH).

1269 ID-NUMBER ID-NUMBER 1269

AUTHOR GOODJOHN, A. J./ JOANOU, G. D./ WIKNER, N. F.
 TITLE ON THE PHYSICS OF SEMI-HOMOGENEOUS GRAPHITE URANIUM-235 REACTORS
 REPORT NUMBER..... TANSO, 05, 367-368
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 62-11-00
 SITE/PROGRAM LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS - CALCULATIONS ; LOS ALAMOS -
 URANIUM(92%) METAL - GRAPHITE - CALCULATIONS

ABSTRACT

THE BARE AND REFLECTED GRAPHITE/URANIUM-235 ASSEMBLIES DESCRIBED BY H. L. REYNOLDS HAVE BEEN ANALYZED. CAREFUL ATTENTION HAS BEEN GIVEN TO BOTH THE SELECTION OF INPUT CROSS SECTION DATA AND TO THE ADEQUACY OF VARIOUS APPROXIMATIONS TO BOLTZMANN'S EQUATION IN SOLVING FOR THE BASIC REACTIVITY.

FOR GRAPHITE, EXISTING EXPERIMENTAL INFORMATION ON THE HIGH-ENERGY SCATTERING CROSS SECTIONS HAS BEEN ANALYZED AND COMPILED IN SUITABLE CALCULATIONAL FORM. THE DATA HAVE BEEN CHECKED AGAINST FERMI AGE MEASUREMENTS IN GRAPHITE AND IN HYDROCARBONS; EXCELLENT CORRELATIONS HAVE BEEN OBTAINED. IN ADDITION, THERMAL-NEUTRON INTERACTIONS WITH BOUND CARBON ATOMS HAVE BEEN THE SUBJECT OF AN INTENSIVE INVESTIGATION LEADING TO EXCELLENT CORRELATIONS WITH THERMAL-NEUTRON-SPECTRA MEASUREMENTS IN POISONED GRAPHITE. THERE ARE NOT SUFFICIENT EXPERIMENTAL DATA ON ALL OF THE PARTIAL CROSS SECTIONS OF URANIUM-235. EXPERIMENTAL MEASUREMENTS HAVE BEEN MADE OF THE TOTAL AND FISSION CROSS SECTIONS FOR MOST OF THE PERTINENT ENERGY RANGE. (AUTH).

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1273 ID-NUMBER ID-NUMBER 1273

AUTHOR BENZI, V./ CUPINI, E./ DE MATTEIS, A.
 TITLE A MONTE CARLO ANALYSIS OF SOME ENRICHED URANIUM-235 FAST CRITICAL ASSEMBLIES
 REPORT NUMBER..... JAABA, 20, 017-024
 JOURNAL JOURNAL OF NUCLEAR ENERGY
 DATE PUBLISHED ... 65-06-10
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

A MONTE CARLO STRATEGY ADOPTED FOR AN ANALYSIS OF SOME HIGHLY ENRICHED URANIUM-235 FAST CRITICAL ASSEMBLIES IS BRIEFLY DESCRIBED. MOREOVER A TWENTY-GROUP CROSS SECTION SET FOR URANIUM-235 AND URANIUM-238 GIVING A SATISFACTORY AGREEMENT BETWEEN THE RESULTS OF CALCULATION AND EXPERIMENT IS REPORTED. (AUTH).

1276 ID-NUMBER ID-NUMBER 1276

AUTHOR BIERMAN, S. R./ HANSEN, L. E./ LLOYD, R. C./ CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS WITH HOMOGENEOUS PLUTONIUM DIOXIDE-POLYSTYRENE AT 5 HYDROGEN/PLUTONIUM
 REPORT NUMBER..... NUAPA, 06, 023-026
 JOURNAL NUCLEAR APPLICATIONS AND TECHNOLOGY
 DATE PUBLISHED ... 69-01-00
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

THE RESULTS AND ANALYSES ARE PRESENTED FROM THE LATEST SERIES OF EXPERIMENTS IN A CONTINUING PROGRAM FOR DETERMINING THE CRITICAL PARAMETERS OF PLUTONIUM MIXTURES HAVING CONCENTRATIONS THAT ARE TYPICAL OF WET POWDERS, PRECIPITATES, SLURRIES, AND POLYMERS. THE INITIAL SERIES OF MEASUREMENTS IN THIS PROGRAM WERE MADE ON 15 HYDROGEN/PLUTONIUM FUEL HAVING PLUTONIUM-240 ISOTOPIC CONCENTRATIONS OF 2.2 AND 8.08 WT PERCENT. THE LATEST EXPERIMENTS WERE CONDUCTED WITH FUEL HAVING A PLUTONIUM-240 ISOTOPIC CONCENTRATION OF 11.46 WT PERCENT AND A HYDROGEN/PLUTONIUM ATOM RATIO OF 5. GENERALLY, THESE RESULTS INDICATE THAT THE PUBLISHED VALUES FOR THE CRITICAL SIZES AND MASSES OF PLUTONIUM SHOULD BE INCREASED FOR THE HIGHLY CONCENTRATED SYSTEMS. ADDITIONAL DATA ARE NEEDED, HOWEVER, TO BETTER ESTABLISH THE CRITICALITY CURVES IN THIS REGION. THE 11.46 WT PERCENT PLUTONIUM- 240 ISOTOPIC CONCENTRATION CAUSED AN INCREASE OF 30 PERCENT IN THE SPHERICAL CRITICAL MASS OF A BARE PLUTONIUM-239-WATER SYSTEM AT 5 HYDROGEN/PLUTONIUM. IN THE REFLECTED SYSTEM THE INCREASE WAS 43 PERCENT. (AUTH).

1280 ID-NUMBER ID-NUMBER 1280

AUTHOR HANSEN, L. E./ CLAYTON, E. D.
 TITLE CRITICAL PARAMETERS OF PLUTONIUM SYSTEMS. PART-2: INTERPRETATION
 REPORT NUMBER..... NUAPA, 06, 381-390
 JOURNAL NUCLEAR APPLICATIONS AND TECHNOLOGY
 DATE PUBLISHED ... 69-04-00
 SITE/PROGRAM ROCKY FLATS - PLUTONIUM SOLUTIONS ; HANFORD - PLUTONIUM NITRATE IN WATER - CALCULATIONS

ABSTRACT

LACK OF EXPERIMENTAL DATA FOR NUCLEAR CRITICALITY CONTROL OVER OPERATIONS WITH PLUTONIUM NECESSITATES THE USE OF COMPUTED CRITICAL PARAMETERS FOR GUIDANCE. TO PROVIDE GUIDELINES FOR CRITICALITY SAFETY USE, SURVEY CALCULATIONS FOR UNREFLECTED AND WATER-REFLECTED SPHERES, SEMI- INFINITE CYLINDERS, AND SEMI-INFINITE SLABS HAVE BEEN MADE, USING CALCULATIONAL TECHNIQUES CONFIRMED BY AVAILABLE EXPERIMENTAL DATA. THE PLUTONIUM(METAL)-WATER MIXTURES EXAMINED COVER THE ENTIRE RANGE OF POSSIBLE MODERATION RATIOS AND HAVE ISOTOPIC PLUTONIUM-240 CONTENTS OF LESS THAN OR EQUAL TO 20 PERCENT. CRITICAL EXPERIMENT DATA FOR WATER-REFLECTED SPHERICAL SYSTEMS CONTAINING PLUTONIUM NITRATE SOLUTIONS WITH LESS THAN OR EQUAL TO 435 G PLUTONIUM/LITER AT 4.6 WT% PLUTONIUM- 240 WERE EXTRAPOLATED BY MEANS OF CALCULATIONS TO PLUTONIUM (METAL)-WATER MIXTURES FOR A DIRECT COMPARISON BETWEEN CALCULATIONS AND EXPERIMENTALLY DERIVED CRITICAL PARAMETERS. THE EFFECT OF PLUTONIUM-240 ON CRITICALITY WAS EXAMINED AS A FUNCTION OF BOTH CONCENTRATION AND GEOMETRY. THE MANNER IN WHICH PLUTONIUM-240 AFFECTED THE MINIMUM CRITICAL MASS OF PLUTONIUM(METAL)-WATER SYSTEMS WAS ALSO DETERMINED. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1281 ID-NUMBER ID-NUMBER 1281

AUTHOR BIERMAN, S. R. / HANSEN, L. E. / WOODRUFF, G. L. / LLOYD, R. C. / HESS, G. M.

TITLE NEUTRON SPECTRA EXPERIMENTS

REPORT NUMBER..... BNWL-0340, 46-49

DATE PUBLISHED ... 66-10-15

SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

MEASUREMENTS WERE COMPLETED ON THREE EXPERIMENTS DESIGNED TO PERMIT STUDYING FUNDAMENTAL BEHAVIOR OF NEUTRONS IN PLUTONIUM FUELED CRITICAL ASSEMBLIES. EACH OF THE ASSEMBLIES HAD DIFFERENT HYDROGEN/PLUTONIUM ATOMIC RATIOS, BUT ALL WERE PARALLELEPIPEDS HAVING UNIFORM CELLS OF PLUTONIUM DIOXIDE-POLYSTYRENE AND LUCITE.

IN ADDITION TO THE CRITICAL APPROACH AND PULSED NEUTRON SOURCE MEASUREMENTS, FOIL ACTIVATION MEASUREMENTS WERE MADE TO DETERMINE THE INTRACELLULAR DISTRIBUTION OF THE PLUTONIUM-239 FISSION RATE, THE INDIUM-115 (N, GAMMA) REACTION, THE INDIUM-115 (N,N') INDIUM-115(METASTABLE) REACTION, AND THE COPPER-63 (N, GAMMA) REACTION. THE CRITICAL APPROACH AND PULSED NEUTRON DATA AT CRITICAL ARE SUMMARIZED.

1287 ID-NUMBER ID-NUMBER 1287

AUTHOR MENEGHETTI, D. / WHITE, J. R.

TITLE CALCULATIONS OF ZPR-3 FAST ASSEMBLIES USING A TWENTY-SIX-GROUP CROSS-SECTION SET.

REPORT NUMBER..... ANL-7133

DATE PUBLISHED ... 64-11-00

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

IMPROVED KNOWLEDGE OF MICROSCOPIC CROSS SECTIONS TOGETHER WITH MORE INVOLVED PROCEDURES FOR DETERMINATION OF MULTIGROUP CONSTANTS HAVE RECENTLY LED TO THE DEVELOPMENT OF AN UP-DATED MULTIGROUP CROSS-SECTION SET. A COMPARISON HAS THEREFORE BEEN MADE BETWEEN REPORTED EXPERIMENTAL RESULTS AND CALCULATED QUANTITIES, USING THIS CROSS-SECTION SET, FOR A REPRESENTATIVE SERIES OF URANIUM-235-FUELED ZPR-3 FAST CRITICAL ASSEMBLIES. CRITICAL MASSES, CENTRAL-DETECTOR RESPONSE RATIOS, AND PROMPT-NEUTRON LIFETIMES HAVE BEEN CALCULATED. ONLY THE FIRST 22 GROUPS OF THE 26-GROUP SET WERE EMPLOYED; HOWEVER, FOR THE RELATIVELY HIGH NEUTRON-FLUX SPECTRA OF THESE ASSEMBLIES THE 30 EV LOWER ENERGY LIMIT OF GROUP 22 MORE THAN SUFFICES.

FOR ANY GIVEN CORE COMPOSITION THE EFFECTIVE-GROUP CROSS SECTIONS FOR TRANSPORT AND ELASTIC TRANSFER ATTRIBUTED TO NONFISSILE AND NONFERTILE MATERIALS, HOWEVER, WERE OBTAINED BY USING THE ELMOE PROGRAM IN THE CONSISTENT B-1 OPTION. ELMOE SOLVES A FUNDAMENTAL MODE PROBLEM USING HUNDREDS OF FINE GROUPS AND OUTPUTS COARSE-GROUP CROSS SECTIONS FOR USE IN THE SUBSEQUENT MULTIREGION- MULTIGROUP REACTOR ANALYSIS. THE DETAILS OF THE ELASTIC-SCATTERING RESONANCES PRESENT IN THE LIGHT- ELEMENT STRUCTURAL AND THE COOLANT ATOMS ARE THUS TAKEN INTO ACCOUNT. THE DATA ON THE LIGHT-ELEMENT ANGULAR SCATTERING ARE PROVIDED BY A LIBRARY OF LEGENDRE POLYNOMIAL COEFFICIENTS.

THE SUBSEQUENT REFLECTED-SYSTEMS CRITICALITY ANALYSES WERE CARRIED OUT USING THE DSN NEUTRON TRANSPORT CODE IN THE S-4 APPROXIMATION WITH SPHERICAL GEOMETRY. THE LATTER CALCULATIONS ASSUMED HOMOGENEOUS, SPHERICAL CORES. THE DSN RESULTS WERE CORRECTED TO ACCOUNT FOR THE INCREASED REACTIVITY EFFECT OF THE THIN FUEL-PLATE HETEROGENEITIES AND FOR THE CYLINDRICAL-CORE GEOMETRIES WHEN NECESSARY.

THE DEVIATIONS OF THE ADJUSTED CALCULATED MASSES RELATIVE TO THE REPORTED EXPERIMENTAL VALUES RANGE FROM ABOUT ZERO TO LESS THAN ABOUT +3 PERCENT K IN TERMS OF REACTIVITY. THE CALCULATED CRITICAL MASSES OF ASSEMBLIES HAVING CORE COMPOSITIONS CONTAINING LARGE AMOUNTS OF LIGHT MATERIALS, SUCH AS ALUMINUM, SODIUM, STEEL, OXYGEN AND CARBON, DEVIATE MOST FROM THE EXPERIMENTAL VALUES. BECAUSE OF UNCERTAINTIES IN THE SHAPE FACTORS AND HETEROGENEITY CORRECTIONS, IT IS ESTIMATED THAT THE PERCENT ERRORS IN REACTIVITIES SHOULD BE ASSESSED ON THE ESTIMATE THAT THE ORDER OF MAGNITUDE OF ERROR BECAUSE OF THESE UNCERTAINTIES MAY IN ITSELF REPRESENT VARIATIONS OF +/- 0.5 PERCENT TO +/- 1.0 PERCENT IN REACTIVITY.

THE CORE NEUTRON-FLUX SPECTRA CALCULATED USING THIS CROSS-SECTION SET ARE MORE DEGRADED THAN CORRESPONDING SPECTRA CALCULATED USING THE 16-GROUP SET OF YIFAH, OKRENT, AND MOLDAUER. THIS IS DUE, IN PART, TO MODIFIED INELASTIC SCATTERING CROSS SECTIONS AND TO LARGE INELASTIC TRANSFER MATRICES.

THE RANGE OF DEVIATIONS OF THE CENTRAL FISSION DETECTOR RESPONSE RATIOS: URANIUM-238/URANIUM-235, URANIUM-233/URANIUM-235, URANIUM-234/URANIUM-235, PLUTONIUM-239/URANIUM-235 AND PLUTONIUM-240/URANIUM-235 RESPECTIVELY, RELATIVE TO THE EXPERIMENTAL VALUES (CORRECTED FOR COUNTER WALL THICKNESS) FOR THE SERIES OF ASSEMBLIES STUDIED ARE ABOUT - 7 PERCENT + 5 PERCENT, +3 PERCENT TO +9 PERCENT -14 PERCENT TO +8 PERCENT, -6 PERCENT TO +5 PERCENT, AND -14 PERCENT TO +4 PERCENT RESPECTIVELY. THE CALCULATED SIGMA-C URANIUM-238/SIGMA-F URANIUM-235 RATIOS DEVIATE BY ABOUT +1 PERCENT TO +24 PERCENT FROM EXPERIMENT WITH THE AVERAGE DEVIATION BEING ABOUT +13 PERCENT.

THE RELATIVELY MORE DEGRADED NEUTRON-FLUX SPECTRA RESULTS IN AN IMPROVEMENT IN THE CORRELATIONS OF CALCULATED PROMPT-NEUTRON LIFETIMES WITH REPORTED VALUES BASED UPON ROSSI-ALPHA MEASUREMENTS IN ZPR-3 FAST CRITICAL ASSEMBLIES. THE DETAILED CALCULATIONAL STUDY OF A LARGE SERIES OF ZPR-3 ASSEMBLIES BY DAVEY, FOR EXAMPLE, SHOWED THAT THE

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

EXPERIMENTAL LIFETIMES ARE ON THE AVERAGE 34 PERCENT LARGER THAN CALCULATED USING A MODIFIED FORM OF THE YIFTAH, OKRENT, AND MOLDAUER 16-GROUP CROSS-SECTION SET. THE PRESENT CROSS-SECTION SET REDUCES THE DISCREPANCY BY ABOUT A HALF. THE PROMPT-NEUTRON LIFETIMES WERE CALCULATED USING THE METHOD OF $1/V$ CAPTURE INSERTION IN AUXILIARY CRITICALITY PROBLEMS. (AUTH).

1298 ID-NUMBER ID-NUMBER 1298

AUTHOR MOORE, R. A./ SARGIS, D. A./ COHEN, S. C.
 TITLE INTEGRAL TEST OF ENDF/B AND GAM NEUTRON CROSS-SECTION DATA IN A CLEAN FAST ASSEMBLY
 REPORT NUMBER..... NSENAO, 39, 263-272
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 70-02-00
 SITE/PROGRAM GENERAL ATOMICS - THERMIONIC CRITICAL EXPERIMENT - CALCULATIONS

ABSTRACT

INTRODUCTION: THIS NOTE DESCRIBES AN EXTENSIVE SERIES OF REACTIVITY-WORTH MEASUREMENTS DESIGNED TO CHECK THE VALIDITY OF BASIC CROSS-SECTION DATA ON AN INTEGRAL BASIS. IN PARTICULAR, THE RECENT DATA, RELEASED AS THE EVALUATED NUCLEAR DATA FILE (ENDF/B), AND THE DATA EVALUATED OVER THE LAST SEVERAL YEARS BY GULF GENERAL ATOMIC FOR UTILIZATION WITH THE GAM SERIES OF CODES, WERE INVESTIGATED.

THE CRITICAL ASSEMBLY, WHICH IS DESCRIBED IN CONSIDERABLE DETAIL ELSEWHERE, IS COMPOSED OF BLOCKS OF SLIGHTLY DILUTED FUEL (93.2 PERCENT ENRICHED URANIUM AND POLYETHYLENE WITH AN ATOMIC RATIO, NUM. H/NUM. URANIUM-235 APPROX. STACKED INTO A CUBOIDAL CONFIGURATION. THE COMPOSITION WAS CHOSEN TO PROVIDE A CLEAN, SINGLE-REGION SIMULATION OF THE NEUTRON SPECTRUM OF A THERMIONIC REACTOR CORE REFLECTED WITH BERYLLIUM OXIDE. THE SIMPLE COMPOSITION AND CONFIGURATION (MECHANICALLY HOMOGENEOUS AND BARE) OF THIS ASSEMBLY WERE MENDED TO FACILITATE THE ANALYSIS OF THE REACTIVITY MEASUREMENTS. INDEED, AUXILIARY MEASUREMENTS INDICATED THAT THE CONFIGURATION AND NEUTRON SPECTRUM WERE REASONABLY WELL UNDERSTOOD

REACTIVITY-WORTH MEASUREMENTS WERE PERFORMED AT THREE LOCATIONS WITHIN THE ASSEMBLY. THE WORTH OF SMALL SAMPLES, CONSISTING OF THIN DISKS NOMINALLY $3/4$ INCH IN DIAMETER BY 0.020 INCH THICK, WAS DETERMINED AT THE CORE CENTER, AND AT AN OFF-CENTER POSITION FOR SOME OF THE SAMPLES. ADDITIONALLY, THE WORTH OF SEVERAL THIN SLABS WHICH WERE NOMINALLY $1/8$ INCH THICK, WAS DETERMINED AT A LOCATION ADJACENT TO AN EXTERIOR FACE OF THE ASSEMBLY.

THE COMPARISON BETWEEN EXPERIMENT AND ANALYSIS IS AUGMENTED BY A DETAILED EXAMINATION OF THE REACTIVITY-WORTH COMPONENTS AND THE ENERGY DEPENDENCE OF THE REACTIVITY EFFECT FOR SEVERAL OF THE SAMPLES. ADDITIONAL INSIGHT IS PROVIDED BY THE COMPARISON OF RESULTS AT THE CENTRAL AND OFF-CENTER LOCATIONS.

THE RESULTS HIGHLIGHT THE SENSITIVITY OF THE NET REACTIVITY EFFECT TO THE BASIC CROSS-SECTION DATA. THE SIGNIFICANT CONTRIBUTION OF SELF-SHIELDING, EVEN FOR NEUTRONICALLY THIN SAMPLES, IS DISCUSSED. THE SURPRISINGLY GOOD AGREEMENT BETWEEN PREDICTIONS BASED UPON ENDF/B AND GAM DATA FOR MOST MATERIALS IS BROUGHT OUT. FINALLY, THE SUBSTANTIAL DEVIATIONS BETWEEN EXPERIMENT AND ANALYSIS FOR SEVERAL MATERIALS INDICATES THAT THEIR CROSS-SECTION DATA MAY WARRANT REEVALUATION. (AUTH).

1303 ID-NUMBER ID-NUMBER 1303

AUTHOR BROEDERS, C. H. M.
 TITLE THE INFLUENCE OF NUCLEAR DATA UNCERTAINTIES ON PROPERTIES OF CRITICAL ASSEMBLIES
 REPORT NUMBER..... KFK-939
 DATE PUBLISHED ... 69-01-00
 SITE/PROGRAM GERMANY - SNEAK (FAST BREEDER) - CALCULATIONS ; ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

INTRODUCTION: IN THE INFLUENCE OF THE NUCLEAR DATA UNCERTAINTIES ON THE PARAMETERS OF A LARGE STEAM-COOLED FAST REACTOR (D-1 DESIGN) WAS INVESTIGATED. AS A CONTINUATION OF THIS STUDY THE INFLUENCE OF DATA UNCERTAINTIES ON THE PROPERTIES OF SMALL CRITICAL ASSEMBLIES IS EXAMINED. FOR THE D-1 DESIGN THE MAIN SAFETY AND STABILITY PARAMETERS (DOPPLER COEFFICIENT AND STEAM DENSITY COEFFICIENT) HAD MOST ATTENTION WHILE FOR THE CRITICAL ASSEMBLIES THE QUANTITIES DETERMINED BY EXPERIMENTS ARE THE MOST INTERESTING ONES BECAUSE COMPARISON OF EXPERIMENTAL AND CALCULATED VALUES WITH SEVERAL CROSS SECTION VARIATIONS MAY BE INDICATIVE FOR THE QUALITY OF THE GROUP CONSTANT SETS AND FOR THE MOST PROBABLE TREND OF THE DATA VARIATIONS. FUNDAMENTAL MODE CALCULATIONS FOR 2 CRITICAL ASSEMBLIES ARE PERFORMED: THE SNEAK 3A-2 URANIUM FUELED ASSEMBLY WITH A SOFT NEUTRON SPECTRUM (SIMULATED STEAM COOLANT) AND THE ZPR-3-48 PLUTONIUM FUELED ASSEMBLY WITH A HARDER NEUTRON SPECTRUM (SODIUM COOLANT WITH RATHER MUCH CARBON).

IN THIS STUDY THE INFLUENCE OF THE UNCERTAINTY OF THE CAPTURE CROSS SECTION OF URANIUM-238 AND OF THE FISSION CROSS SECTION OF URANIUM-235 HAVE BEEN INVESTIGATED. THE RESULTS OF THE STUDY MAY BE USED AS HELPFUL INDICATIONS FOR FUTURE IMPROVEMENTS OF GROUP CROSS SECTION SETS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1304 ID-NUMBER ID-NUMBER 1304.

AUTHOR TRAYLOR, R. C.
 TITLE AN EVALUATION OF URANIUM-233 CROSS SECTIONS WITH NUMERICAL ANALYSIS OF INTEGRAL EXPERIMENTS
 REPORT NUMBER..... GAMD-8067
 DATE PUBLISHED ... 68-09-26
 SITE/PROGRAM OAK RIDGE - URANIUM-233 SYSTEMS - CALCULATIONS

ABSTRACT

INTRODUCTION: EVALUATIONS AND MEASUREMENTS OF URANIUM-233 NEUTRON CROSS SECTIONS HAVE PROVIDED DETAILED DIFFERENTIAL INFORMATION OVER A WIDE ENERGY RANGE. AS AN INTEGRAL NUMERICAL EVALUATION OF THESE CROSS SECTIONS, AN ANALYSIS OF THREE HOMOGENEOUS WATER MODERATED CRITICAL ASSEMBLIES WAS UNDERTAKEN. THE ANALYSIS OF THESE SOFT SPECTRUM CRITICAL ASSEMBLIES SUPPLEMENTS THE REACTIVITY COEFFICIENT EXPERIMENTS WITH URANIUM-233 IN THE HARDER SPECTRUM HTGR CRITICAL ASSEMBLY

THE THREE SPHERICAL ASSEMBLIES ARE CHARACTERIZED BY HYDROGEN-TO-FISSILE ATOM RATIOS OF 1521, 405, AND 381; THE FIRST AND LAST WERE BARE WHILE THE HYDROGEN/URANIUM-233 = 405 ASSEMBLY WAS REFLECTED. TO HELP UNDERSTAND THE RESULTS OF URANIUM-233 ASSEMBLY ANALYSIS, A URANIUM-235 ASSEMBLY WITH SPECTRUM SIMILAR TO THE HARDER URANIUM-233 ASSEMBLIES WAS ALSO ANALYZED (HYDROGEN/URANIUM-235 = 525) USING THE LATEST EVALUATION OF THE BETTER KNOWN CROSS SECTIONS FOR URANIUM-235.

MULTI-GROUP ONE-DIMENSIONAL DIFFUSION THEORY AND TRANSPORT THEORY CODES, GAZE AND IDF, A UNIVAC 1108 VERSION OF DTF-IV, WERE USED TO CALCULATE THE EFFECTIVE MULTIPLICATION CONSTANT (K-EFF) OF EACH ASSEMBLY. BROAD GROUP CROSS SECTIONS WERE PREPARED WITH THE GGC-II CODE. HYDROGEN SCATTERING KERNELS IN THE THERMAL REGION WERE BASED ON THE NELKIN MODEL AS EMPLOYED IN THE GAKER CODE. (AUTH).

1306 ID-NUMBER ID-NUMBER 1306

AUTHOR PHELPS, J./ WINDSOR, H./ CHANDRAMOLESHWAR, K.
 TITLE CEPFR-1-2 MEASUREMENTS AND ASSEMBLY DESCRIPTION
 REPORT NUMBER..... BNL-RP-14 (F)
 DATE PUBLISHED ... 70-05-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - PULSED FAST REACTOR EXPERIMENT

ABSTRACT

THE SEVENTH OF A SET OF ASSEMBLIES TAKEN CRITICAL IN THE EXPERIMENT FOR THE PULSED FAST REACTOR HAD CORES COMPOSED OF 18 VOID PERCENT URANIUM (93 PERCENT ENRICHED) 49 VOID PERCENT STEEL, 14 VOID PERCENT ALUMINUM AND 19 VOID PERCENT VOID. THEY WERE REFLECTED BY AT LEAST 7 1/2 INCHES OF STAINLESS STEEL EXCEPT FOR AN OPEN CORE FACE AND A MODERATOR BOX INSERTED IN THE REFLECTOR.

THIS SERIES OF EXPERIMENTS WAS PRIMARILY DESIGNED TO NEARLY APPROXIMATE, IN SIZE, THE RELATIVELY LARGE CORES PRESENTLY OF INTEREST IN THE PULSED REACTOR PROJECT. THE PRINCIPAL MEASUREMENTS WERE CRITICALITY, SLIDING BLOCK WORTHS, ROSSI ALPHA, ABSOLUTE NEUTRON YIELD, MODERATOR BLOCK DECAYS AND YIELDS, AND REFLECTOR BAR REACTIVITY WORTHS IN POSITIONS APPLICABLE FOR REACTOR CONTROL. (AUTH).

1307 ID-NUMBER ID-NUMBER 1307

AUTHOR WINDSOR, H./ PHELPS, J./ CHANDRAMOLESHWAR, K.
 TITLE CEPFR-1F MEASUREMENTS AND ASSEMBLY DESCRIPTION
 REPORT NUMBER..... BNL-RP-13 (F)
 DATE PUBLISHED ... 70-05-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - PULSED FAST REACTOR EXPERIMENT

ABSTRACT

THE SIXTH OF A SET OF ASSEMBLIES TAKEN CRITICAL IN THE EXPERIMENT FOR THE PULSED FAST REACTOR HAD CORES COMPOSED OF 26 VOID PERCENT URANIUM (93 PERCENT ENRICHED) 41 VOID PERCENT STAINLESS STEEL, 14 VOID PERCENT ALUMINUM, AND 19 VOID PERCENT VOID. THEY ARE REFLECTED BY AT LEAST 7 1/2 INCHES OF STAINLESS STEEL EXCEPT FOR AN OPEN CORE FACE AND A MODERATOR BOX INSERTED IN THE REFLECTOR.

THIS SERIES OF EXPERIMENTS WAS PRIMARILY DESIGNED TO MEASURE THE YIELD, DECAY AND SPECTRUM OF LEAKAGE NEUTRONS ESCAPING FROM VARIOUS MODERATING BLOCKS. MEASUREMENTS WERE ALSO MADE OF REACTOR LIFETIME, GAMMA YIELD, REACTIVITY WORTH OF REFLECTOR BARS IN LOCATIONS THAT COULD BE USEFUL FOR REACTOR CONTROL, AND VARIOUS NEUTRON NOISE CORRELATION EXPERIMENTS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1308 ID-NUMBER ID-NUMBER 1308

AUTHOR PHELPS, J./ WINDSOR, H.
 TITLE CEPFR-1E MEASUREMENTS AND ASSEMBLY DESCRIPTION
 REPORT NUMBER.... BNL-RP-12 (F)
 DATE PUBLISHED ... 70-05-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - PULSED FAST REACTOR EXPERIMENT

ABSTRACT

THE FIFTH OF A SET OF ASSEMBLIES TAKEN CRITICAL IN THE EXPERIMENT FOR THE PULSED FAST REACTOR HAD CORES COMPOSED OF 26 VOID PERCENT URANIUM (93 PERCENT ENRICHED), 41 VOID PERCENT STAINLESS STEEL, 14 VOID PERCENT ALUMINUM, AND 19 VOID PERCENT VOID. THEY WERE REFLECTED BY AT LEAST 9 INCHES OF STAINLESS STEEL EXCEPT FOR AN OPEN CORE FACE.

THE EXPERIMENTAL EMPHASIS INVOLVED THE EFFECT OF A 1 1/2 INCH THICK VERTICAL BARON CARBIDE LINER ISOLATING THE STATIONARY REFLECTOR FROM THE CORE. REFLECTOR BLOCK WORTHS, NEUTRON LIFETIMES, CORE LOADINGS, CORE VOLUMES, AND VARIOUS OPERATING CHARACTERISTICS WERE MEASURED. A DESCRIPTION OF THE ASSEMBLIES IS GIVEN IN THE APPENDIX. (AUTH).

1309 ID-NUMBER ID-NUMBER 1309

AUTHOR WINDSOR, H./ PHELPS, J.
 TITLE CEPFR-1 D MEASUREMENTS AND ASSEMBLY DESCRIPTION
 REPORT NUMBER.... BNL-RP-11 (F)
 DATE PUBLISHED ... 70-05-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - PULSED FAST REACTOR EXPERIMENT

ABSTRACT

THE FOURTH SET OF ASSEMBLIES TAKEN CRITICAL IN THE EXPERIMENT FOR THE PULSED FAST REACTOR HAD CORES COMPOSED OF 26 VOID PERCENT URANIUM (93 PERCENT ENRICHED), 41 VOID PERCENT STAINLESS STEEL, 14 VOID PERCENT ALUMINUM, AND 19 VOID PERCENT VOID. THEY WERE REFLECTED BY AT LEAST 12 INCHES OF STAINLESS STEEL EXCEPT FOR AN OPEN CORE FACE.

THE EXPERIMENTAL EMPHASIS INVOLVED THE EFFECT OF CORE CAVITIES ON REFLECTOR BLOCK MEASUREMENTS FOR VARIOUS SIZES AND COMPOSITIONS OF A BLOCK WHICH COVERED AN OPEN CORE FACE. NEUTRON LIFETIMES, CORE LOADINGS, CORE VOLUMES, AND VARIOUS OPERATING CHARACTERISTICS WERE ALSO MEASURED. A DESCRIPTION OF THE ASSEMBLIES IS GIVEN IN THE APPENDIX. (AUTH).

1314 ID-NUMBER ID-NUMBER 1314

AUTHOR PINCOCK, G. D./ KUNZE, J. F.
 TITLE CAVITY REACTOR CRITICAL EXPERIMENT VOLUME-III
 REPORT NUMBER.... GESP-129
 DATE PUBLISHED ... 68-11-15
 SITE/PROGRAM GENERAL ELECTRIC CO., IDAHO - CAVITY REACTOR

ABSTRACT

THIS REPORT IS VOLUME THREE OF A SET COVERING CRITICAL EXPERIMENTS PERFORMED ON A LARGE CAVITY REACTOR SYSTEM AT THE NATIONAL REACTOR TESTING STATION. THIS VOLUME DESCRIBES EXPERIMENTS DESIGNED TO INVESTIGATE THE EFFECTS OF SPECIFIC ENGINEERING DESIGN FACTORS NEEDED FOR AN OPERATING POWER REACTOR, AND HOW THESE FACTORS INFLUENCE THE ULTIMATE CRITICAL MASS OF THE SYSTEM. INCLUDED ARE EFFECTS OF A LINER MATERIAL TO PROTECT THE CAVITY WALL FROM THERMAL AND PRESSURE EFFECTS, THE HYDROGEN PROPELLANT GAS THAT WILL OCCUPY THE SPACE BETWEEN THIS LINER AND THE CORE, AND THE APPROPRIATE PLACEMENT OF FUEL IN THE REFLECTOR IN ORDER TO REDUCE CRITICAL MASS IN THE CORE. (NSIC).

1317 ID-NUMBER ID-NUMBER 1317

AUTHOR EICH, W. J.
 TITLE A STATUS REPORT FOR THE CURRENT EVALUATION OF MODIFIED ENDF/B REPRESENTATIONS FOR THE ISOTOPES OF PLUTONIUM - 239, 240, 241, AND 242
 REPORT NUMBER.... WCAP-7365
 DATE PUBLISHED ... 69-10-00
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

CROSS SECTIONAL REPRESENTATIONS FOR THE FOUR MAJOR PLUTONIUM ISOTOPES HAVE BEEN EVALUATED AND MODIFIED ON THE BASIS OF ANALYSIS BOTH OF CRITICAL EXPERIMENTS AND EXPENDED FUEL ISOTOPIC DATA. ISOTOPIC DATA WAS DERIVED FROM YANKEE EXPENDED FUEL. COMPARISONS WERE MADE BETWEEN ANALYTIC AND EXPERIMENTAL ISOTOPIC RATIOS, WHICH CORROBORATED TWO MODIFICATIONS AND PROVIDED RATIONALE FOR MODIFICATION OF THE PLUTONIUM-239 REPRESENTATION. A SIMPLE APPROACH FOR FACTORING THE RESULTS INTO DESIGN CALCULATIONS WAS DEVELOPED AND VERIFIED. (NSIC).

1319 ID-NUMBER ID-NUMBER 1319

AUTHOR YOUNG, W. R./ BENNETT, R. A.
 TITLE FTR CRITICAL EXPERIMENTS ANALYSIS
 REPORT NUMBER.... TANSO, 12, 183-184
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 69-06-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

ZPR-3 ASSEMBLIES-51 AND -52A THROUGH -52F WERE CONSTRUCTED BY BNL AS A PART OF THE EARLY EFFORT IN SUPPORT OF THE DESIGN OF THE MATERIAL COMPOSITIONS APPROXIMATED THOSE OF THE PLUTONIUM DIOXIDE-URANIUM DIOXIDE DRIVER ZONE AND NICKEL-SODIUM REFLECTORS OF THE REFERENCE DESIGN OF THE FTR. EXPERIMENTS WERE DEvised TO CHECK COMPUTATIONAL MODELS AND TO MEASURE PARAMETERS RELATED TO THE DESIGN AND SAFE OPERATION OF THE FTR. ANALYSES WERE DONE WITH THE DIFFUSION, TRANSPORT, AND PERTURBATION COMPUTER CODES. CRITICAL MASS CALCULATIONS WERE IN AGREEMENT WITH EXPERIMENTS WITHIN + /- 6 PERCENT. FUEL COMPACTION EXPERIMENTS AND LARGE-SAMPLE PERTURBATION EXPERIMENTS WERE PERFORMED TO SUPPORT SAFETY AND FUEL MANAGEMENT STUDIES AND DESIGN ACTIVITIES. (NSIC).

1345 ID-NUMBER ID-NUMBER 1345

AUTHOR COHEN, S. C./ MOORE, R. A./ YOUNG, J. C./ RUSSELL, J. L.
 TITLE FAST NEUTRON SPECTRUM FOR A SUBCRITICAL SECTION OF A HOMOGENEOUS URANIUM-235 POLYETHYLENE CRITICAL ASSEMBLY
 REPORT NUMBER.... NSEAO, 37, 111-126
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 69-07-00
 NSA-NUMBER 23:33112
 SITE/PROGRAM GENERAL ATOMICS - THERMIONIC CRITICAL EXPERIMENT

ABSTRACT

THE NEUTRON SPECTRUM FOR A SUBCRITICAL SECTION OF THE THERMIONIC CRITICAL EXPERIMENT, ASSEMBLY NO. 1, WAS MEASURED BY THE PULSED SOURCE, TIME-OF-FLIGHT METHOD. THE MEASUREMENT WAS PERFORMED IN A CALCULABLE SLAB CONFIGURATION SO THAT THE RESULTS WOULD BE DIRECTLY APPLICABLE TO THE CRITICAL ASSEMBLY. THE MEASURED SPECTRUM WAS COMPARED WITH MULTIGROUP TRANSPORT CALCULATIONS BASED UPON VARIOUS CROSS-SECTION DATA SETS AND CROSS-SECTION TREATMENTS. THE RESULTS DEMONSTRATE THE NEED FOR CONSIDERATION OF UNRESOLVED RESONANCE SELF-SHIELDING IN URANIUM-235, AND SUGGEST THAT THE URANIUM-235 ABSORPTION CROSS-SECTION DATA MAY BE SLIGHTLY HIGH AT LOW ENERGIES (100 EV LESS THAN E LESS THAN 2 KEV). (AUTH).

1354 ID-NUMBER ID-NUMBER 1354

AUTHOR COONFIELD, D. C./ TUCK, G./ CLARK, H. E./ ERNST, B. B.
 TITLE CRITICAL MASS IRREGULARITY OF STEEL-MODERATED ENRICHED URANIUM METAL ASSEMBLIES WITH COMPOSITE STEEL-OIL REFLECTORS
 REPORT NUMBER.... NSEAO, 39, 320-328
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 70-03-00
 NSA-NUMBER 24:18728
 SITE/PROGRAM ROCKY FLATS - URANIUM(93%) METAL - SPHERES

ABSTRACT

CRITICAL MASSES HAVE BEEN DETERMINED BY EXPERIMENT AND BY CALCULATION FOR ENRICHED-URANIUM- METAL SPHERICAL SHELLS MODERATED INTERNALLY WITH A SPHERE OF MILD STEEL OF RADIUS 8.01 CM. THE SHELLS WERE REFLECTED WITH VARIOUS THICKNESSES OF MILD STEEL FOLLOWED BY AN EFFECTIVELY INFINITE AMOUNT OF OIL. THE POINTS REPRESENTING CRITICAL MASS AS A FUNCTION OF THE THICKNESS OF THE STEEL REFLECTOR ARE NOT RELATED BY A SMOOTH CURVE. THE IRREGULARITY APPEARS TO BE MOST SEVERE FOR A 3-CM- THICK STEEL REFLECTOR AND IS DUE TO THE RESONANCE IN THE NEUTRON ELASTIC-SCATTERING CROSS SECTION OF IRON. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1358 ID-NUMBER ID-NUMBER 1358

AUTHOR TUCK, G./ CLARK, H. E.
 TITLE CRITICAL PARAMETERS OF A URANIUM SOLUTION SLAB CYLINDER SYSTEM
 REPORT NUMBER.... NSENAO, 40, 407-413
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 70-06-00
 SITE/PROGRAM ROCKY FLATS - PARALLEL CYLINDERS ON FISSION SLAB

ABSTRACT

CRITICAL PARAMETERS ARE REPORTED FOR URANIUM-SOLUTION SYSTEMS CONSISTING OF EQUALLY SPACED VERTICAL CYLINDERS ARRANGED IN A SQUARE ARRAY RESTING ON THE BOTTOM OF A 20.3-CM-HIGH SQUARE SLAB TANK. SOME OF THESE SYSTEMS WERE REFLECTED EXTERNALLY. BOTH THE CYLINDERS AND THE SLAB CONTAINED URANYL-NITRATE SOLUTION HAVING 490 G OF URANIUM (93.2 WT PERCENT URANIUM-235)/LITER.

A SYSTEM OF AN 87-CM-HIGH ARRAY OF SIXTEEN 11.0-CM-DIAM CYLINDERS ON AN 11.4-CM-THICK SOLUTION SLAB WAS CRITICAL. THE SLAB ALONE WAS CRITICAL AT 12.8 CM. ANOTHER CRITICAL SYSTEM WAS A SINGLE 22.4-CM-DIAM CYLINDER OF EFFECTIVELY INFINITE HEIGHT ON A SOLUTION SLAB 10.8-CM THICK. THE 22.4-CM DIAMETER IS 93.7 PERCENT OF THE CRITICAL DIAMETER FOR AN INFINITE CYLINDER.

MONTE CARLO CALCULATIONS, SIMULATING SEVERAL TYPICAL EXPERIMENTAL CRITICAL SYSTEMS, YIELDED VALUES FOR K-EFF BETWEEN 0.958 +/- 0.012 AND 0.986 +/- 0.009. (AUTH).

1363 ID-NUMBER ID-NUMBER 1363

AUTHOR ARCHIBALD, R./ BAXTER, A./ SARGIS, D. A.
 TITLE A BENCHMARK STUDY OF ZPR-3 ASSEMBLY-48 USING ENDF/B CROSS SECTIONS
 REPORT NUMBER.... TANSO, 12, 182-183
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 69-06-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

A BENCHMARK ANALYSIS OF ZPR-3 ASSEMBLY-48 HAS BEEN PERFORMED USING ENDF/B DATA AND THE GAF/GAR/GAND SERIES OF FAST REACTOR CODES. ONLY MINOR ALTERATIONS OF THE ENDF/B DATA WERE MADE TO CONFORM WITH THE FORMATS REQUIRED IN THE CROSS-SECTION GENERATING PROGRAMS. THE CALCULATED REACTIVITY WORTHS AND OTHER INTEGRAL QUANTITIES SHOULD THEREFORE BE USEFUL, IN CONJUNCTION WITH EXPERIMENTAL RESULTS, IN IDENTIFYING POSSIBLE CROSS-SECTION DISCREPANCIES IN THE PRESENT MICROSCOPIC ENDF/B DATA. (AUTH).

1364 ID-NUMBER ID-NUMBER 1364

AUTHOR SMITH, J. C./ ATKINSON, H./ MC TAGGART, M. H.
 TITLE VERA CORE 18: AN ASSEMBLY BUILT TO TEST CALCULATION METHODS AND DATA FOR D. F.R.
 REPORT NUMBER.... TRG REPORT 1539
 DATE PUBLISHED ... 69-06-13
 NSA-NUMBER 23:43148
 SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - VERA FAST REACTOR

ABSTRACT

SUMMARY: VERA CORE 18 WAS BUILT TO SIMULATE DFR. THE CORE COMPOSITION WAS CHOSEN TO GIVE A SIMILAR CENTRAL SPECTRUM, CRITICAL SIZE AND ENRICHMENT. AT ONE SIDE OF THE CORE A NICKEL REFLECTOR SIMILAR TO THAT OF DFR WAS BUILT. TWO VERSIONS, CORES 18A AND 18B, HAD 14.1 AND 23.4 CM THICK NICKEL ZONES RESPECTIVELY. IN BOTH VERSIONS RADIAL AND VERTICAL REACTION RATE DISTRIBUTIONS WERE MEASURED IN THE CORE AND IN THE NICKEL REGION. URANIUM-235 AND URANIUM-238 FISSION DETECTORS, MANGANESE FOILS, A BORON TRIFLUORIDE COUNTER AND FOILS FOR THE URANIUM-238 (N,GAMMA) REACTION WERE USED. A CONFIGURATION SIMILAR TO A PARTIALLY INSERTED CONTROL ROD IN DFR WAS DEVISED AND SELECTED REACTION RATE MEASUREMENTS MADE IN ITS VICINITY. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1365 ID-NUMBER ID-NUMBER 1365

AUTHOR: CERBONE, R. J./ CROSBIE, K. L./ GOZANI, T./ MIRR, C. H./ NEILL, J. M./
D'OUTREMONT, P./ PRESKITT, C. A./ SPERLING, M./ TRIMBLE, G. D./ YOUNG, H.
P./ YOUNG, J. C.

TITLE: FAST REACTOR SPECTRUM MEASUREMENTS, QUARTERLY PROGRESS REPORT FOR THE
PERIOD ENDING APRIL 30, 1969

REPORT NUMBER.....: GA-9386
DATE PUBLISHED ...: 69-05-15
NSA-NUMBER: 23:37462
SITE/PROGRAM: ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

1. INTRODUCTION: THIS QUARTERLY PROGRESS REPORT DESCRIBES THE WORK PERFORMED ON THE PROGRAM OF FAST REACTOR SPECTRUM MEASUREMENTS DURING THE PERIOD FEBRUARY 1 THROUGH APRIL 30, 1969, UNDER CONTRACT AT(04-3)-167, PROJECT AGREEMENT NO. 35 WITH THE U. S. ATOMIC ENERGY COMMISSION. PREVIOUS WORK UNDER THIS PROGRAM IS DESCRIBED IN REFS. 1 AND 2.

DURING THIS REPORTING PERIOD, WE HAVE STARTED WORK ON THE NEXT REACTOR ASSEMBLY, STSF-2, WHICH IS SIMILAR TO ASSEMBLY 17 OF ZPR-3. (3) THE ASSEMBLY HAS BEEN LOADED AND A DETAILED EXPERIMENTAL PROGRAM HAS BEEN PLANNED. PART OF THIS PROGRAM WILL INCLUDE STUDIES TO EXPLAIN SMALL ANOMALIES IN EXPERIMENTAL DATA FROM PREVIOUS ASSEMBLIES, AND TO UNDERSTAND, IN PARTICULAR, POSSIBLE EFFECTS DUE TO SOURCE ANISOTROPY AND RE-ENTRANT HOLE PERTURBATION. EXPERIMENTS ARE ALSO PLANNED IN STSF-2 FOR TWO-PARAMETER DATA TAKING WITH A PROTON RECOIL LIQUID SCINTILLATOR TO UNFOLD THE SPECTRUM AT HIGH NEUTRON ENERGIES WHERE THE EMISSION TIMES HAVE COMPARABLE MAGNITUDE TO THE FLIGHT TIMES. TO PREPARE FOR THESE EXPERIMENTS, CALCULATIONS HAVE BEEN PERFORMED TO DETERMINE THE NUMBER OF COUNTS NECESSARY TO OBTAIN SATISFACTORY RESULTS AFTER UNFOLDING AND TO DETERMINE THE ENERGY RANGE OVER WHICH THIS SCINTILLATOR CAN BE USED EFFECTIVELY.

WE HAVE LOOKED IN MORE DETAIL AT THE DIFFERENCES BETWEEN THEORY AND EXPERIMENT IN STSF-3, AN ASSEMBLY MOCKING UP A DILUTE OXIDE LMFBR. ENDF/B CROSS SECTIONS FOR SODIUM HAVE BEEN PLACED ON A GAM TAPE TO REPLACE THE SET USED ORIGINALLY. IN ADDITION, WE HAVE COMPUTED BROAD GROUP CROSS SECTIONS WITH THE GAF-GAR CODE THAT CAN USE ENDF/B CROSS SECTIONS DIRECTLY AND HAS AN IMPROVED RESONANCE TREATMENT, THOUGH IT IS RESTRICTED TO P-1 SCATTERING. THESE NEW BROAD GROUP CROSS SECTIONS HAVE SUBSTANTIALLY REDUCED THE SPECTRAL DISCREPANCIES IN SODIUM OBSERVED PREVIOUSLY AROUND THE 2.92 KEV RESONANCE. WE PLAN TO STUDY THE EFFECT OF THE RESTRICTION OF THE SCATTERING MOMENTS ON THE CALCULATIONS OF THE CELL AND ON THE OVER-ALL SYSTEM SPECTRA. WE HAVE ALSO INVESTIGATED THE DISCREPANCIES IN THE LOW KEV REGION BETWEEN OUR TIME-OF-FLIGHT DATA IN STSF-3 AND 4 AND BENNETT'S PROTON RECOIL MEASUREMENTS IN COMPARABLE ASSEMBLIES. THIS INVESTIGATION, WHICH IS DESCRIBED IN DETAIL IN SECTION 4.1, HAS NOT RESOLVED THE DISCREPANCIES THAT WE ENCOUNTERED. (AUTH).

1366 ID-NUMBER ID-NUMBER 1366

AUTHOR: FRISCH, O.

TITLE: THE DRAGON EXPERIMENT

REPORT NUMBER.....: NUCL. NEWS 12, 30-32
JOURNAL: NUCLEAR NEWS
DATE PUBLISHED ...: 69-04-00
NSA-NUMBER: 23:28571
SITE/PROGRAM: LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

SOME MONTHS AGO MY WIFE BROUGHT ME A LETTER. I HAD OVERSLEPT AND WAS STILL RATHER SLEEPY, AND I STARED AT THAT LETTER THAT REFERRED TO AMERICAN NUCLEAR SOCIETY NATIONAL TOPICAL MEETING, FAST BURST REACTORS.; AND I SAID, GOOD GOD, DO THE AMERICANS RUN A MEETING ON A NATIONWIDE SCALE BECAUSE THEIR REACTORS BURST SO FAST?; WELL, AFTER THAT I WOKE UP AND REALIZED THAT I WAS BEING HONORED AS THE FATHER (I FEEL MORE LIKE THE GRANDFATHER) OF THE REACTORS I HAD ALWAYS CALLED PULSED REACTORS, HAVING ARRANGED THE EXPERIMENT THAT, FOR THE FIRST TIME, ESTABLISHED A SHORT-LASTING HARMLESS FAST FISSION REACTION, WHICH DID NOT DEPEND ON DELAYED NEUTRONS. THIS EXPERIMENT, WHICH INVOLVED A GROUP OF NO LESS THAN 17 PEOPLE, BECAME KNOWN AS THE DRAGON EXPERIMENT. (AUTH).

1368 ID-NUMBER ID-NUMBER 1368

AUTHOR: PETTUS, W. G./ BALDWIN, M. N./ FAIRBURN, G. T./ STERN, M. E.

TITLE: PHYSICS VERIFICATION PROGRAM PART-3 QUARTERLY TECHNICAL REPORT APRIL -
JUNE 1969

REPORT NUMBER.....: BAW-3647-14
DATE PUBLISHED ...: 69-09-00
NSA-NUMBER: 23:52400
SITE/PROGRAM: BABCOCK AND WILCOX CO. - PHYSICS VERIFICATION PROGRAM - SMALL LATTICE
EXPERIMENT

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

INTRODUCTION: PART III OF THE PHYSICS VERIFICATION PROGRAM WAS INITIATED BY THE BABCOCK & WILCOX COMPANY (B&W) IN JANUARY OF 1968. THE PROGRAM IS SUPPORTED JOINTLY BY B&W AND THE U. S. ATOMIC ENERGY COMMISSION (AEC). TASK 1 OF THE PROGRAM HAS CONSISTED OF A SERIES OF EXPERIMENTS TO INVESTIGATE THE RESPONSE OF AN ALL-SOLID INCORE DETECTOR, AT TEMPERATURES APPROACHING THOSE OF AN OPERATING POWER REACTOR. THESE EXPERIMENTS ARE COMPLETE AND ARE REPORTED IN REFERENCE 1. TASKS 2 AND 3 OF THE PROGRAM ARE PRESENTLY IN PROGRESS.

TASK 2 WAS INITIATED IN OCTOBER OF 1968 AND CONSISTS OF A SERIES OF EXPERIMENTS TO MEASURE THE STEADY STATE POWER DISTRIBUTION THROUGH CRITICAL ASSEMBLY MOCK-UPS OF TYPICAL PWR DESIGNS. RESULTS OBTAINED DURING THE PREVIOUS QUARTERS ARE COVERED IN REFERENCE 4.

TASK 3 WAS BEGUN IN JANUARY OF 1969 AND CONSISTS OF A SERIES OF SMALL LATTICE EXPERIMENTS AND ZONED OR MIXED LATTICE EXPERIMENTS WITH URANIUM DIOXIDE AND URANIUM DIOXIDE-PLUTONIUM DIOXIDE FUEL. THE SMALL LATTICE EXPERIMENTS ARE INTENDED PRIMARILY TO YIELD ACCURATE K-INFINITY VALUES FOR POISONED UNIFORM LATTICES OF VARIOUS METAL-TO-WATER RATIOS. IN THE ZONED AND MIXED LATTICES THE FLUX AND POWER DISTRIBUTION WILL BE MEASURED FOR VARIOUS ROD CONFIGURATIONS. THE WORK OF THE SECOND QUARTERS CONSISTED PRIMARILY OF PERFORMING THE INITIAL CRITICAL LOADING FOR THE FIRST SMALL LATTICE EXPERIMENT AND DETERMINING THE OPERATING CHARACTERISTICS OF THIS ASSEMBLY. (AUTH).

1369 ID-NUMBER ID-NUMBER 1369

AUTHOR PETTUS, W. G./ BALDWIN, M. N./ FAIRBURN, G. T./ STERN, M. E.
TITLE PHYSICS VERIFICATION PROGRAM PART-3 QUARTERLY TECHNICAL REPORT JANUARY -
MARCH 1969
REPORT NUMBER.... BAW-3647-12
DATE PUBLISHED .. 69-06-00
NSA-NUMBER 23:52399
SITE/PROGRAM BABCOCK AND WILCOX CO. - PHYSICS VERIFICATION PROGRAM - SMALL LATTICE
EXPERIMENT

ABSTRACT

INTRODUCTION: PART III OF THE PHYSICS VERIFICATION PROGRAM WAS INITIATED BY THE BABCOCK + WILCOX COMPANY (B&W) IN JANUARY OF 1968. THE PROGRAM IS SUPPORTED JOINTLY BY B&W AND THE U. S. ATOMIC ENERGY COMMISSION (AEC). TASK 1 OF THE PROGRAM HAS CONSISTED OF A SERIES OF EXPERIMENTS TO INVESTIGATE THE RESPONSE OF AN ALL-SOLID INCORE DETECTOR, AT TEMPERATURES APPROACHING THOSE OF AN OPERATING POWER REACTOR. THESE EXPERIMENTS ARE COMPLETE AND ARE REPORTED IN REFERENCES 1, 2, AND 3. TASKS 2 AND 3 OF THE PROGRAM ARE PRESENTLY IN PROGRESS.

TASK 2 WAS INITIATED IN OCTOBER OF 1968 AND CONSISTS OF A SERIES OF EXPERIMENTS TO MEASURE THE STEADY STATE POWER DISTRIBUTION THROUGH CRITICAL ASSEMBLY MOCK-UPS OF TYPICAL PWR DESIGNS. RESULTS OBTAINED DURING THE PREVIOUS QUARTER ARE COVERED IN REFERENCE 4.

TASK 3 WAS BEGUN IN JANUARY OF 1969 AND WILL CONSIST OF A SERIES OF SMALL LATTICE EXPERIMENTS AND ZONED OR MIXED LATTICE EXPERIMENTS WITH URANIUM DIOXIDE AND URANIUM DIOXIDE-PLUTONIUM DIOXIDE FUEL. THE SMALL LATTICE EXPERIMENTS ARE INTENDED PRIMARILY TO YIELD ACCURATE K-INFINITY VALUES FOR POISONED UNIFORM LATTICES OF VARIOUS METAL-TO-WATER RATIOS. IN THE ZONED AND MIXED LATTICES THE FLUX AND POWER DISTRIBUTION WILL BE MEASURED FOR VARIOUS ROD CONFIGURATIONS. THE WORK OF THE FIRST QUARTER CONSISTED OF PREPARATIONS FOR THE EXPERIMENTS INCLUDING LICENSE APPLICATIONS, FUEL PROCUREMENT, AND FACILITY PREPARATION. (AUTH).

1370 ID-NUMBER ID-NUMBER 1370

AUTHOR SARGIS, D. A./ BAXTER, A./ ARCHIBALD, R.
TITLE A BENCHMARK STUDY OF ZPR-3 ASSEMBLY 48 USING ENDF/B CROSS SECTIONS
REPORT NUMBER.... GA-8847
DATE PUBLISHED .. 68-09-22
NSA-NUMBER 23:31198
SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

A STUDY OF THE FAST CRITICAL REACTOR ZPR-3 ASSEMBLY 48 HAS BEEN PERFORMED USING ENDF/B CROSS SECTIONS. MINOR ALTERATIONS OF THE ENDF/B DATA WERE MADE TO CONFORM WITH THE FORMAT REQUIREMENTS OF THE CROSS SECTION PREPARATION PROGRAMS. A COMPARISON WAS MADE OF EXPERIMENTAL AND CALCULATED RESULTS FOR VARIOUS INTEGRAL QUANTITIES, INCLUDING CENTRAL REACTIVITY WORTHS, FISSION AND CAPTURE RATIOS, AND DOPPLER AND SODIUM-VOID COEFFICIENTS. THE COMPARISON INDICATED SOME POSSIBLE AREAS OF UNCERTAINTY IN THE BASIC CROSS SECTION DATA. REAL AND ADJOINT NEUTRON SPECTRA WERE ALSO COMPUTED FOR COMPARISON WITH CALCULATED AND MEASURED RESULTS.

THE STUDY WAS PERFORMED PRIMARILY TO TEST THE UNMODIFIED ENDF/B DATA FILE IN COOPERATION WITH THE CROSS SECTION EVALUATION WORKING GROUP'S EVALUATION PROGRAM. FOR THIS REASON MODIFICATIONS TO THE ENDF/B DATA WERE LIMITED TO MINOR ALTERATIONS AND ENERGY RANGE CORRECTIONS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1371 ID-NUMBER ID-NUMBER 1371

AUTHOR NONE

TITLE QUARTERLY STATUS REPORT ON: ULTRA HIGH TEMPERATURE REACTOR EXPERIMENT (UHTREX), FOR PERIOD ENDING APRIL 30, 1969

REPORT NUMBER..... LA-4207-MS

DATE PUBLISHED ... 69-07-10

SITE/PROGRAM LOS ALAMOS - UHTREX (ULTRA HIGH TEMPERATURE - GRAPHITE)

ABSTRACT

THE UHTREX REACTOR HAS BEEN OPERATED AT A CORE AVERAGE TEMPERATURE OF 1020 DEGREES FAHRENHEIT. THIS REPRESENTS THE FIRST OPERATION AT AN ELEVATED TEMPERATURE. THE FUEL LOAD WAS 7.728 KG URANIUM (93 PERCENT URANIUM-235) GIVING 8.81 DOLLARS EXCESS REACTIVITY WHICH WAS HELD DOWN BY THREE CONTROL RODS. THE TEMPERATURE WAS INCREASED AT CONSTANT COOLANT FLOW BY WITHDRAWING RODS UNTIL THE TEMPERATURE OF 1020 DEGREES FAHRENHEIT WAS REACHED WITH 14 CENT OF REACTIVITY REMAINING. THIS INTERMEDIATE TEMPERATURE LEVEL WAS ESSENTIALLY AS PREDICTED, CONFIRMING THE VALUE OF THE CORE MODERATOR TEMPERATURE COEFFICIENT. SEVERAL HOT RESTARTS WERE MADE TO TEST HOT RESTART PROCEDURES.

THE BUFFER SYSTEM WAS SUCCESSFUL AT LIMITING THE VESSEL TEMPERATURE TO REASONABLE VALUES. THE COOLANT IMPURITIES WERE REDUCED TO LOW VALUES AND NO EVIDENCE OF CORROSION WAS FOUND ON ELEMENTS REMOVED FOR INSPECTION. CALCULATED TEMPERATURES IN THE CORE AND MODERATOR WERE COMPARED WITH THERMOCOUPLE READINGS AND THE RESULTS FROM MELT WIRES.

THE AGREEMENT BETWEEN OBSERVED AND CALCULATED CRITICAL MASS FOR THREE UNRODDED COLD CRITICAL CONFIGURATIONS HAS BEEN IMPROVED BY RECENT CALCULATIONS. THE CRITICAL MASS FOR THE INTERMEDIATE TEMPERATURE AND DESIGN TEMPERATURE HAS BEEN RECALCULATED.

THE FUEL LOAD HAS BEEN INCREASED TO 11.5 KG URANIUM IN PREPARATION FOR THE ASCENSION IN TEMPERATURE AND POWER TOWARD THE DESIGN MAXIMUM OF 2400 DEGREES FAHRENHEIT COOLANT OUTLET AT 3 MW POWER. (AUTH).

1373 ID-NUMBER ID-NUMBER 1373

AUTHOR NEUHOLD, R. J.

TITLE FAST BREEDER REACTOR STATIC PHYSICS METHODS DEVELOPMENT AND ANALYSIS PROJECT VOLUME 4 - PRODUCTION TESTS AND SENSITIVITY STUDIES USING THE FARED CODE

REPORT NUMBER..... BAW-3867-09, VOL 4

DATE PUBLISHED ... 69-11-00

NSA-NUMBER 24:13590

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

THE FARED COMPUTER PROGRAM AND ASSOCIATED LIBRARY HAVE BEEN USED TO CALCULATE ZPR-3 ASSEMBLY 48 AND ZPR-3 ASSEMBLY 11. THE CALCULATED RESULTS FOR K-EFF, SPECTRAL INDICES, CENTRAL REACTIVITY WORTHS, DOPPLER COEFFICIENTS AND FLUXES ARE COMPARED WITH REPORTED EXPERIMENTAL DATA. ADDITIONAL CALCULATED DATA ON THE TWO ASSEMBLIES ARE PROVIDED AS B&W'S CONTRIBUTION TO THE CSEWG PHASE II, ENDF/B DATA EVALUATION.

IN ADDITION, SENSITIVITY STUDIES USING THE B&W-1000 MW(E) FOLLOW-ON REFERENCE DESIGN ARE PRESENTED. THESE STUDIES INCLUDE:

- 1) THE EFFECT OF CROSS SECTION RE-AVERAGING DURING DEPLETION.
- 2) THE EFFECT OF HOMOGENEOUS VERSUS HETEROGENEOUS RESONANCE TREATMENT.
- 3) THE EFFECT OF THE NUMBER OF GROUPS AND DOWNSCATTER GROUPS ON CRITICALITY AND DEPLETION.
- 4) THE EFFECT OF BUCKLING VALUES IN SPECTRUM GENERATION. (AUTH).

1374 ID-NUMBER ID-NUMBER 1374

AUTHOR MAHALINGAM, L. M./ SHANKAR SINGH, R.

TITLE ANALYSIS OF ZERO POWER REACTOR III ASSEMBLY 48 WITH RECENT CROSS-SECTION DATA

REPORT NUMBER..... BARC-421

DATE PUBLISHED ... 69-00-00

NSA-NUMBER 24:16230

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

AN ANALYSIS OF THE EXPERIMENTAL RESULTS OF THE FAST CRITICAL ASSEMBLY 48 OF ZERO POWER REACTOR III WHICH IS A PLUTONIUM FUELLED, SOFT SPECTRUM AND SIMPLE GEOMETRY SYSTEM HAS BEEN CARRIED OUT USING A 22 - GROUP CROSS-SECTION SET. COMPUTED PARAMETERS SUCH AS CRITICAL MASS, SPECTRAL INDICES, REACTIVITY WORTHS OF VARIOUS SAMPLES AND DOPPLER COEFFICIENTS HAVE BEEN COMPARED WITH THE EXPERIMENTAL VALUES. THE EFFECTS OF USING RECENTLY EVALUATED FISSION CROSS-SECTIONS BY DAVEY AND HIGHER ALPHA VALUES OF PLUTONIUM 239 MEASURED IN U.K. ON THE CALCULATED VALUES OF THESE PARAMETERS HAVE ALSO BEEN STUDIED. (AUTH).

1375 ID-NUMBER ID-NUMBER 1375

AUTHOR SPRINGER, T. H. / TUTTLE, R. J. / MOUNTFORD, L. A.
 TITLE QUARTERLY TECHNICAL PROGRESS REPORT LMFBR PHYSICS PROGRAMS JULY-SEPTEMBER 1969
 REPORT NUMBER.... A1-AEC-12884
 DATE PUBLISHED ... 69-11-15
 NSA-NUMBER 24:13519
 SITE/PROGRAM ATOMICS INTERNATIONAL - LMFBR - EPITHERMAL CRITICAL EXPERIMENT LABORATORY

ABSTRACT

PROJECT OBJECTIVES: THE OBJECTIVES OF THIS PROJECT ARE TO (1) DETERMINE REACTIVITY, TEMPERATURE, AND DOPPLER COEFFICIENTS OF VARIOUS MATERIALS IN A VARIETY OF FAST REACTOR SPECTRA; (2) INVESTIGATE EFFECTS DUE TO DIFFERENT GEOMETRIC ARRANGEMENTS OF SUCH MATERIALS, INCLUDING THE VARIATION OF THE SURFACE-TO-MASS RATIO; (3) PROVIDE EXPERIMENTAL RESULTS FOR THE PURPOSE OF CHECKING THEORETICAL PREDICTIONS; AND (4) DEVELOP IMPROVED EXPERIMENTAL AND THEORETICAL METHODS FOR TREATMENT OF PROBLEMS IN THE FIELD OF FAST REACTOR PHYSICS. (AUTH).

1388 ID-NUMBER ID-NUMBER 1388

AUTHOR KALLFELZ, J. M./ ZOLOTAR, B. A./ SEHGAL, B. R.
 TITLE MODIFICATIONS TO FISSION ELEMENT CROSS SECTIONS AND THEIR INFLUENCE ON CALCULATED FAST REACTOR PARAMETERS
 REPORT NUMBER.... EACRP-L-77
 DATE PUBLISHED ... 69-10-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS ; LOS ALAMOS - PLUTONIUM METAL SPHERES - CALCULATIONS ; UNITED KINGDOM, ALDERMASTON - VERA FAST REACTOR - CALCULATIONS ; ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

INTRODUCTION: THE PURPOSE OF THIS STUDY WAS TO TEST THE AGREEMENT OF CALCULATED AND MEASURED INTEGRAL PHYSICS PARAMETER FOR A NUMBER OF FAST CRITICAL ASSEMBLIES WITH SEVERAL DIFFERENTIAL CROSS SECTION SETS. WITH ENDF/B CROSS SECTIONS USED AS THE BASE VALUES, THE INVESTIGATIONS CONCERNED THE INFLUENCE OF CHANGING THE CAPTURE AND FISSION CROSS SECTIONS OF THE IMPORTANT FISSION ELEMENTS ACCORDING TO CONSISTENT EXPERIMENTAL RESULTS. THE EFFECT OF MODIFICATIONS IN THE INELASTIC SCATTERING OF URANIUM-238 AND THE FISSION SPECTRUM OF URANIUM-235 WERE ALSO STUDIED. (AUTH).

1389 ID-NUMBER ID-NUMBER 1389

AUTHOR WIMETT, T. F./ WHITE, R. H./ WAGNER, R. G.
 TITLE GODIVA IV
 REPORT NUMBER.... CONF-690102, 95
 CONFERENCE..... AMERICAN NUCLEAR SOCIETY NATIONAL TOPICAL MEETING ON FAST BURST REACTORS, ALBUQUERQUE, 28-30 JANUARY, 1969
 DATE PUBLISHED ... 69-12-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

PRELIMINARY RESULTS OBTAINED WITH A NEW FAST BURST ASSEMBLY ARE PRESENTED. THE FUEL IS URANIUM -1.5 WEIGHT PERCENT MOLYBDENUM ALLOY. ASSEMBLY FEATURES INCLUDE A NEW SCHEME FOR SECURING FUEL COMPONENTS IN THE CORE. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1391 ID-NUMBER ID-NUMBER 1391

AUTHOR DAVEY, W. G./ HESS, A. L./
 TITLE VALIDITY OF FAST-CRITICAL EXPERIMENTS AS INTEGRAL TESTS OF ENDF/B
 REPORT NUMBER..... TANSO, 12, 717-718
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 69-11-00
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

INTRODUCTION: THE CROSS SECTION EVALUATION WORKING GROUP (CSEWG) WAS ESTABLISHED BY THE AEC TO PROVIDE A BASIC LIBRARY OF NUCLEAR DATA FOR USE IN REACTOR ANALYSIS AND DESIGN. THE CSEWG DUTIES INCLUDE THE ESTABLISHMENT AND TESTING OF "BEST VALUES" FOR MICROSCOPIC CROSS SECTIONS (EITHER FROM MEASUREMENTS OR THEORY). THE DATA COMPRISING THE EVALUATED NUCLEAR DATA FILE B (ENDF/B). TESTING OF ENDF/B IN THE FAST ENERGY RANGE MUST INCLUDE THE ABILITY TO PREDICT THE RESULTS OF INTEGRAL MEASUREMENTS IN THE NUMEROUS ASSEMBLIES ON THE FAST CRITICAL ASSEMBLIES. AS TESTS, THE EXPERIMENTAL RESULTS MUST BE EXAMINED TO ESTABLISH MODELS FOR CALCULATIONS WITH ENDF/B-BASED CROSS SECTIONS. ALSO, THE UNCERTAINTIES OF CORRELATING THE MEASURED VALUES WITH VALUES CALCULATED WITH THE MODELS MUST BE UNDERSTOOD. THE AUTHORS, AS MEMBERS OF THE DATA TESTING SUBCOMMITTEE OF CSEWG, HAVE PROVIDED THE PRESCRIPTIONS FOR THE FAST-CRITICAL MODELS AND HAVE BEEN COORDINATING THE ANALYTICAL EFFORTS BY CSEWG-PARTICIPATING AGENCIES IN BEHALF OF THE ENDF/B TESTING. THIS PAPER REVIEWS THE ESTABLISHMENT OF THE TEST MODELS, AND SOME OF THE RESULTS OBTAINED, AND DISCUSSES THEIR VALIDITY IN REGARD TO THE CSEWG OBJECTIVES. (AUTH).

1394 ID-NUMBER ID-NUMBER 1394

AUTHOR BARRE, J. Y./ RAVIER, J.
 TITLE USE OF INTEGRAL EXPERIMENTS TO IMPROVE THE CADARACHE CROSS SECTION SET - SET VERSION NO. 2 - APPLICATION TO PHENIX
 REPORT NUMBER..... PNR/SETR 69.031
 DATE PUBLISHED ... 69-03-00
 SITE/PROGRAM FRANCE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THE AUTHORS USED A SET OF INTEGRAL PARAMETERS MEASURED IN FAST CRITICAL ASSEMBLIES TO IMPROVE THE ACCURACY OF THE CALCULATED FORECASTS FOR FAST NEUTRON REACTORS.

THE FIRST METHOD, DESCRIBED BY BAKER, SIMPLY PROVIDES AN EMPIRICAL FUNCTION OF THE CORE ATOMIC DENSITIES FOR CORRECTING THE CALCULATED CRITICAL MASS. DIRECTLY APPLIED TO THE FIRST MULTIGROUP CROSS SECTION CADARACHE SET, THE METHOD NOTABLY IMPROVES THE CRITICAL MASSES CALCULATED BY THIS SET.

ON THE OTHER HAND, THE SECOND METHOD (BARRACA) PROVIDES A SET OF CORRECTIONS TO THE CROSS SECTIONS CONSIDERED TO BE OF MAJOR IMPORTANCE. THESE CORRECTIONS ARE OBTAINED BY ADJUSTMENTS BETWEEN THE EXPERIMENTAL VALUES AND THOSE CALCULATED FROM THE CADARACHE SET FOR SEVERAL PARAMETERS MEASURED IN A LARGE NUMBER OF ASSEMBLIES.

THIS METHOD ALLOWS TO IMPROVE THE BASIC NEUTRON DATA AND ITS CONCLUSIONS SERVE AS A STARTING POINT FOR THE DEVELOPMENT OF THE VERSION NO. 2 OF THE CADARACHE SET. THE RESULTS OF THIS NEW SET ARE VERY ENCOURAGING PARTICULARLY FOR CRITICAL MASS ESTIMATES.

THE AUTHORS GIVE THE APPLICATION OF THIS VERSION NO 2 SET TO PHENIX. (AUTH).

1401 ID-NUMBER ID-NUMBER 1401

AUTHOR KALLFELZ, J. M./ POENITZ, W. P./ SEHGAL, B. R./ ZOLOTAR, B. A.
 TITLE STUDIES OF FAST-NEUTRON CROSS SECTIONS THROUGH INTEGRAL EXPERIMENTS
 REPORT NUMBER..... TANSO, 12, 186-187
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 69-06-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS ; LOS ALAMOS - PLUTONIUM METAL SPHERES - CALCULATIONS ; UNITED KINGDOM, ALDERMASTON - VERA FAST REACTOR - CALCULATIONS ; ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

CALCULATIONS OF INTEGRAL PARAMETERS IN TEN FAST CRITICAL ASSEMBLIES HAVE BEEN PERFORMED WITH SEVERAL NEUTRON CROSS-SECTION SETS TO TEST THE AGREEMENT WITH EXPERIMENTAL INTEGRAL VALUES. THESE CRITICAL ASSEMBLIES ARE LISTED IN TABLE I IN APPROXIMATELY DECREASING ORDER OF SPECTRUM HARDNESS. THEY AND THEIR SPECIFICATIONS FOR ONE-DIMENSIONAL HOMOGENEOUS CALCULATIONS HAVE BEEN SELECTED BY DAVEY AND HESS FOR THE NEXT PHASE OF ENDF/B DATA TESTING. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1404 ID-NUMBER ID-NUMBER 1404

AUTHOR COHEN, S. C./ MOORE, R. A./ RUSSELL, J. L.
 TITLE FAST SPECTRUM MEASUREMENTS ON A SUBCRITICAL SECTION OF THE THERMIONIC CRITICAL EXPERIMENT
 REPORT NUMBER..... TANSO, 12, 221-223
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 69-06-00
 SITE/PROGRAM GENERAL ATOMICS - GRAPHITE CRITICAL ASSEMBLY (HTGR)

ABSTRACT

THE EMERGENT NEUTRON SPECTRUM FROM A SUBCRITICAL SECTION OF ASSEMBLY NO. 1, THERMIONIC CRITICAL EXPERIMENT, WAS MEASURED USING THE GULF GENERAL ATOMIC LINEAR ACCELERATOR AND THE TIME-OF- FLIGHT METHOD . THE SUB-CRITICAL SPECTRUM DETERMINATION IS INTENDED TO AUGMENT THE THERMIONIC CRITICAL EXPERIMENT PROGRAM, WHOSE OBJECTIVE IS TO COMPARE INTEGRAL NEUTRONIC DATA WITH ANALYSIS IN SUPPORT OF THE CORE DESIGN OF THERMIONIC SPACE POWER REACTORS . ASSEMBLY NO. 1 CONSISTS OF A NEUTRONICALLY HOMOGENEOUS MIXTURE OF FULLY ENRICHED URANIUM AND POLYETHYLENE HYDROGEN/URANIUM-235 = 0.855) AND A SMALL FRACTION OF STAINLESS STEEL FOR STRUCTURAL PURPOSES . (AUTH).

1407 ID-NUMBER ID-NUMBER 1407

AUTHOR COHEN, S. C.
 TITLE ANALYSIS OF REFLECTED ORALLOY CRITICAL EXPERIMENTS
 REPORT NUMBER..... TANSO, 11, 671
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 68-11-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS

ABSTRACT

A SERIES OF CALCULATIONS WAS PERFORMED IN AN ATTEMPT TO PREDICT THE MULTIPLICATION OF ORALLOY CRITICAL ASSEMBLIES $\rho = 18.8 \text{ G/CM}^3$; 93.5 PERCENT ENRICHED IN URANIUM-235 SURROUNDED BY LIGHT REFLECTORS. THE CLEAN CRITICAL EXPERIMENTS, PERFORMED SEVERAL YEARS AGO AT LOS ALAMOS SCIENTIFIC LABORATORY, FEATURED ORALLOY CORES SURROUNDED BY FOUR INCHES OF BERYLLIUM, BERYLLIUM OXIDE, GRAPHITE, AND WATER. IN EVERY CASE, THE RESULTS REVEALED A SIGNIFICANT OVER PREDICTION OF THE MULTIPLICATION FACTOR. (AUTH).

1408 ID-NUMBER ID-NUMBER 1408

AUTHOR KARAM, R. A./ MARSHALL, J. E./ NAKAMURA, T.
 TITLE FLUXES INTRASTRUCTURE IN A LARGE, PLATE-TYPE HETEROGENEOUS URANIUM DIOXIDE FAST CORE (ASSEMBLY-6, ZPR-6)
 REPORT NUMBER..... TANSO, 11, 598-599
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 68-11-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6

ABSTRACT

THE SPATIAL INTRASTRUCTURE OF THE FLUXES IN A UNIT CELL OF THE PLATE-TYPE HETEROGENEOUS CRITICALS IS USED TO AVERAGE THE BROAD-GROUP CROSS SECTIONS (REF 1) OVER SPACE TO ACCOUNT FOR HETEROGENEITY EFFECTS. THE ADEQUACY OF THIS PROCEDURE WAS TESTED BY MEASURING THE FISSION RATES IN URANIUM-235 AND URANIUM-238 AS A FUNCTION OF POSITION IN A UNIT CELL AT THE CENTER OF ASSEMBLY-6 OF ZPR-6 . (AUTH).

1409 ID-NUMBER ID-NUMBER 1409

AUTHOR EISEMANN, E./ KUESTERS, H./ METZENROTH, M./ SCHMIDT, J. J./ SCHROETER, K. E./ THIEM, D.
 TITLE ANALYSIS OF FAST CRITICAL ASSEMBLIES AND LARGE FAST POWER REACTORS WITH GROUP-CONSTANT SETS RECENTLY EVALUATED AT KARLSRUHE
 REPORT NUMBER..... TANSO, 11, 601-602
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 68-11-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS ; UNITED KINGDOM, WINFRITH - ZEBRA - CALCULATIONS ; GERMANY - SNEAK (FAST BREEDER) - CALCULATIONS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THIS REPORT DEALS WITH THREE TOPICS: 1) ARE THE CONCLUSIONS IN CALCULATING URANIUM-235-FUELED FAST CRITICAL ASSEMBLIES CONFIRMED BY FURTHER EXPERIMENTS?; 2) WHAT ARE THE RESULTS OBTAINED FOR PLUTONIUM-FUELED CRITICALS IF ONE INCLUDES THE RECENT HIGHER PLUTONIUM-ALPHA VALUES?; AND 3) WHAT ARE THE CONSEQUENCES FOR LARGE POWER REACTORS? (AUTH).

1411 ID-NUMBER ID-NUMBER 1411

AUTHOR MIHALCZO, J. T.

TITLE MONTE CARLO CALCULATIONS OF TWO-CORE DELAYED CRITICAL ASSEMBLIES

REPORT NUMBER..... TANSO, 11, 603-604

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 68-11-00

SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL SLABS

ABSTRACT

TO DETERMINE THE ADEQUACY OF THE ASSUMPTION OF LOOSE COUPLING, I.E., THE USE OF PROPERTIES MEASURED IN ISOLATED CORES TO DESCRIBE THE BEHAVIOR OF COUPLED ASSEMBLIES, THE RESULTS OF MONTE CARLO CALCULATIONS OF TWO-CORE DELAYED CRITICAL ASSEMBLIES OF ENRICHED URANIUM (93.2 WT PERCENT URANIUM-235) ARE COMPARED WITH EXPERIMENT IN A LOOSELY COUPLED TWO-CORE ASSEMBLY THE MULTIPLICATION FACTOR OF A CORE EQUALS THAT OF A SINGLE ISOLATED CORE AND THUS IMPLIES AN EQUALITY BETWEEN THE SUBCRITICAL REACTIVITY OF AN ISOLATED CORE AND THE COUPLING REACTIVITY IN THE TWO-CORE ASSEMBLY. THIS EQUALITY IS A MEASURE OF THE ADEQUACY OF THE ASSUMPTION OF LOOSE COUPLING. CALCULATIONS WERE PERFORMED FOR 3 DELAYED CRITICAL ASSEMBLIES OF 2 SLABS IN WHICH THE LARGE, ADJACENT, FLAT 20.32- BY 25.40-CM FACES WERE SEPARATED AND PARALLEL AND THE THIN SIDES WERE COPLANAR, AND 14 DELAYED CRITICAL ASSEMBLIES OF 2 COAXIAL CYLINDERS OF 17.77-, 27.93-, OR 38.09-CM DIAM WITH THEIR FLAT FACES SEPARATED. IN ONE ASSEMBLY THE SEPARATION WAS ZERO. THE NEUTRON MULTIPLICATION FACTOR AND SOME OTHER CALCULATED PROPERTIES ARE GIVEN IN TABLE I FOR SOME ASSEMBLIES.

A CORE WAS DIVIDED INTO TEN EQUAL-THICKNESS HORIZONTAL LAYERS AND THE NEUTRON PRODUCTION DENSITY WAS CALCULATED IN EACH LAYER AS SHOWN IN THE FIGURE FOR THE ASSEMBLIES OF 27.93-CM-DIAM CYLINDERS. (AUTH).

1413 ID-NUMBER ID-NUMBER 1413

AUTHOR CRUME, E. C./ THOMAS, J. T.

TITLE CRITICAL AND NEAR-CRITICAL GRAPHITE-MODERATED ARRAYS OF URANIUM(93.2) CYLINDERS

REPORT NUMBER..... TANSO, 12, 336

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 69-06-00

SITE/PROGRAM OAK RIDGE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

A SERIES OF EXPERIMENTS AND COMPLEMENTARY CALCULATIONS USING THE KENO PROGRAM (REF 1), ON BOTH BARE AND THICK-POLYETHYLENE-REFLECTED, GRAPHITE-MODERATED CUBIC ARRAYS OF 8 NOMINALLY 15.7 KG URANIUM(93.2) METAL CYLINDERS, HAS BEEN STARTED. DATA FROM THESE EXPERIMENTS SUPPLEMENT THAT ON UNMODERATED AND HYDROGENOUSLY MODERATED ARRAYS OF THE SAME METAL CYLINDERS, AND SO WILL BE VALUABLE IN THE ANALYSIS OF THE EFFECTS OF ARRAY MODERATION AND REFLECTION. ALSO, THE DATA PROVIDE VALUABLE CHECK POINTS FOR VALIDATION OF CALCULATIONAL TECHNIQUES, SUCH AS THE KENO PROGRAM, THAT ARE USED IN NUCLEAR CRITICALITY SAFETY ANALYSIS. THIS SUMMARY PRESENTS DATA AND CALCULATIONAL RESULTS ON THE FIRST SEVERAL EXPERIMENTS IN THE SERIES. (AUTH).

1421 ID-NUMBER ID-NUMBER 1421

AUTHOR SHER, R.

TITLE INTEGRAL MEASUREMENTS OF FAST-NEUTRON SPECTRA IN SOME URANIUM- AND PLUTONIUM-FUELED FAST REACTOR CORES

REPORT NUMBER..... TANSO, 12, 714

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 69-11-00

SITE/PROGRAM SWEDEN - FRO ZERO ENERGY FAST REACTOR (URANIUM(20%) - GRAPHITE)

ABSTRACT

FAST-NEUTRON SPECTRA IN SEVERAL URANIUM- AND PLUTONIUM-FUELED CORES IN THE SWEDISH FRO CRITICAL ASSEMBLY HAVE BEEN STUDIED USING THE THRESHOLD REACTIONS RHODIUM-103 (N,N PRIME) RHODIUM- 103M, INDIUM-115 (N,N PRIME) INDIUM-115M, ZINC-64 (N,P) COPPER-64 EACH OF THESE DETECTORS IS AVAILABLE AS METAL FOILS OF HIGH PURITY, PERMITTING EASY FABRICATION, IRRADIATION, AND COUNTING. A SODIUM IODIDE SCINTILLATION COUNTER WAS USED TO DETECT THE 20-KEV CONVERSION X RAY IN

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

RHODIUM-103 (57 MIN), 335-KEV GAMMA RAY IN INDIUM-115 (4.5 H), AND ANNIHILATION RADIATION IN COPPER-64 (12.8 H). (AUTH).

1425 ID-NUMBER ID-NUMBER 1425

AUTHOR PETERSEN, G. T. / KUNZE, J. F. / WALL, I. B. / HALLAM, J. W. / HENDERSON, W. B. / WARZEK, F. G.
 TITLE RECENT FAST CRITICAL EXPERIMENTS IN THE MSCA AND 710-CE
 REPORT NUMBER ANL-7320, 195-204
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS, 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM GENERAL ELECTRIC CO., SAN JOSE - MIXED SPECTRUM CRITICAL ASSEMBLY ; GENERAL ELECTRIC CO., IDAHO - 710-CE

ABSTRACT

EXPERIMENTAL FAST REACTOR PHYSICS ACTIVITIES AT GENERAL ELECTRIC HAVE EMBRACED BOTH SPACE AND CENTRAL-STATION POWER APPLICATIONS. AT THE VALLECITOS ATOMIC LABORATORY, STUDIES UTILIZING THE FAST CORE OF THE MIXED SPECTRUM CRITICAL ASSEMBLY (MSCA) HAVE CONCENTRATED ON SOFT-SPECTRA PARAMETERS. CONCURRENTLY, AT THE IDAHO TEST STATION, SMALL HARD-SPECTRUM REFRACTORY METAL SYSTEMS HAVE BEEN STUDIED IN THE 710-CE.

1426 ID-NUMBER ID-NUMBER 1426

AUTHOR CAIZERGUES, R. / DEILGAT, E. / LECORCHE, P. / MAUBERT, L. / REVOL, H.
 TITLE CRITICALITY OF LIQUID MIXTURES OF HIGHLY URANIUM-235 ENRICHED HEXAFLUORIDE AND HYDROFLUORIC ACID
 REPORT NUMBER Y-CDC-9
 DATE PUBLISHED ... 71-05-00
 SITE/PROGRAM FRANCE - HIGHLY ENRICHED URANIUM HEXAFLUORIDE

ABSTRACT

THE CRITICALITY OF SPHERICAL AND NEAR-SPHERICAL VOLUMES OF LIQUEFIED URANIUM HEXAFLUORIDE- HYDROFLUORIC ACID MIXTURES, IN WHICH THE URANIUM WAS ENRICHED TO 93% IN URANIUM-235, IN MONEL CONTAINERS HAVING 4-MM-THICK WALLS AND SURROUNDED BY AN EFFECTIVELY INFINITELY THICK WATER REFLECTOR, HAS BEEN INVESTIGATED. THE HYDROGEN-TO-URANIUM ATOMIC RATIO OF THE MIXTURE RANGED BETWEEN ZERO AND EIGHTY, THE LATTER CORRESPONDING TO A COMPOSITION OF ABOUT 1.23 MOL % URANIUM HEXAFLUORIDE. THE TEMPERATURE OF THE MIXTURE DURING THE EXPERIMENT WAS BETWEEN 70 AND 95 DEGREES C.

SHORT EXTRAPOLATIONS UTILIZING MEASURED AND CALCULATED REFLECTOR, TEMPERATURE, DIMENSIONAL, AND STRUCTURAL-MATERIAL COEFFICIENTS OF REACTIVITY AND NEUTRON MULTIPLICATION DATA ESTABLISHED THE CRITICAL DIMENSIONS OF SPHERES OF THE SEVERAL COMPOSITIONS.

1427 ID-NUMBER ID-NUMBER 1427

AUTHOR BOST, WILLIAM E.
 TITLE FAST NEUTRON PULSE REACTORS AND FAST NEUTRON CRITICAL ASSEMBLIES (A LITERATURE SEARCH)
 REPORT NUMBER TID-03571
 DATE PUBLISHED ... 62-04-00
 SITE/PROGRAM BIBLIOGRAPHIC INFORMATION

ABSTRACT

REFERENCES ARE GIVEN TO 122 REPORTS, JOURNAL ARTICLES, AND OTHER LITERATURE.

THE REFERENCES ARE ARRANGED BY SUBJECT AS SHOWN IN THE TABLE OF CONTENTS. WITHIN THE SUBJECT GROUPS, REPORTS ARE LISTED FIRST AND ARE ARRANGED ALPHA-NUMERICALLY BY REPORT NUMBER; JOURNAL ARTICLES ARE NEXT AND ARE ARRANGED ALPHABETICALLY BY JOURNAL NAME AND CHRONOLOGICALLY; LAST, ANY OTHER PUBLISHED LITERATURE IS ARRANGED ALPHABETICALLY BY TITLE.

SUMMARIES OF MOST OF THE REFERENCES MAY BE SEEN IN THE AEC ABSTRACT JOURNAL, NUCLEAR SCIENCE ABSTRACTS, BY USE OF THE NSA REFERENCE NUMBERS PROVIDED.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1429 ID-NUMBER ID-NUMBER 1429

AUTHOR CLAYTON, E. D.
 TITLE PROGRESS REPORT ON PLUTONIUM CRITICALITY STUDIES
 REPORT NUMBER..... BNWL-B-468
 DATE PUBLISHED ... 76-02-00
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES IN FISSIONABLE SOLUTIONS

ABSTRACT

CRITICALITY EXPERIMENTS WERE COMPLETED FOR DETERMINING THE CRITICAL MASS AND VOLUME OF FULLY REFLECTED RECTANGULAR PARALLELEPIPEDS OF UNDERMODERATED HOMOGENEOUS ASSEMBLIES OF MIXED OXIDES OF PLUTONIUM AND URANIUM (8.1 WT% PLUTONIUM IN THE OXIDE). THE H/X ATOMIC RATIO WAS 7.33(H/FISSIONABLE OF 100.6). THE URANIUM WAS DEPLETED TO 0.2 WT% URANIUM-235 AND THE PLUTONIUM-240 ISOTOPIC CONTENT OF THE PLUTONIUM WAS 11.5 WT% A SUMMARY HAS BEEN PREPARED ON NEUTRON POISONS WHICH INCLUDES RECENT EXPERIMENTAL DATA THAT HAVE BEEN GENERATED ON URANIUM PLUS PLUTONIUM SOLUTIONS CONTAINING MIXTURES OF SOLUBLE POISONS (BORON AND GADOLINIUM).

1430 ID-NUMBER ID-NUMBER 1430

AUTHOR MAGNUSON, D. W.
 TITLE CALCULATED LIMITING CRITICAL CONCENTRATIONS OF PLUTONIUM IN NATURAL URANIUM AND WATER
 REPORT NUMBER..... ORNL/TM-5443
 DATE PUBLISHED ... 76-05-00
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF) - CALCULATIONS

ABSTRACT

CALCULATIONS HAVE BEEN PERFORMED TO DETERMINE THE LIMITING CONCENTRATION OF PLUTONIUM REQUIRED FOR CRITICALITY WHEN ADDED TO NORMAL URANIUM. THE BIAS OF THE METHOD HAS BEEN EVALUATED BY COMPARING THE CALCULATED AND EXPERIMENTAL LIMITING URANIUM-235 ENRICHMENTS FOR CRITICALITY OF OXIDE- WATER MIXTURES AND OF NITRATE-WATER MIXTURES.

1431 ID-NUMBER ID-NUMBER 1431

AUTHOR SCOTT, RAYMOND L.
 TITLE CRITICALITY STUDIES (A LITERATURE SEARCH)
 REPORT NUMBER..... TID-03533
 DATE PUBLISHED ... 59-08-00
 SITE/PROGRAM BIBLIOGRAPHIC INFORMATION

ABSTRACT

THIS LITERATURE SEARCH HAS BEEN PREPARED TO SERVE AS A REFERENCE TOOL UNTIL THE COMPLETION OF A FORMAL BIBLIOGRAPHY ON THIS SUBJECT. THE SEARCH IS COMPREHENSIVE, INCLUDING EXPERIMENTAL AND THEORETICAL STUDIES OF CONDITIONS FOR CRITICALITY WITH VARIOUS MATERIALS AND CONFIGURATIONS, AS WELL AS REFERENCES ON THE SAFE HANDLING OF FISSIONABLE MATERIALS, BOTH DURING CRITICAL EXPERIMENTS AND IN PLANTS FOR THE CHEMICAL AND METALLURGICAL PROCESSING OF FISSIONABLE MATERIALS.

1432 ID-NUMBER ID-NUMBER 1432

AUTHOR PAXTON, H. C.
 TITLE SAFETY ANALYSIS OF THE LOS ALAMOS CRITICAL EXPERIMENTS FACILITY
 REPORT NUMBER..... LA-6206, VOL I
 DATE PUBLISHED ... 76-02-00
 SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THE SAFETY OF PAJARITO SITE CRITICAL ASSEMBLY OPERATIONS DEPENDS UPON PROTECTION BUILT INTO THE FACILITY, UPON KNOWLEDGEABLE PERSONNEL, AND UPON GOOD PRACTICE AS DEFINED BY OPERATING PROCEDURES AND EXPERIMENTAL PLANS. DISTANCE, SUPPLEMENTED BY SHIELDING IN SOME CASES, WOULD PROTECT PERSONNEL AGAINST AN EXTREME ACCIDENT GENERATING 10¹⁹ FISSIONS.

DURING THE FACILITY'S 28-YEAR HISTORY, THE DIRECT COST OF CRITICALITY ACCIDENTS HAS TRANSLATED TO A RISK OF LESS THAN \$200 PER YEAR.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1433 ID-NUMBER ID-NUMBER 1433

AUTHOR SCHUSKE, C. L. / DICKINSON, D. / HUNT, D. C. / ROTHE, R. E. / TUCK, G.
 TITLE REFERENCE CRITICAL EXPERIMENTS (PROGRESS REPORT FOR PERIOD JULY 1, 1975
 THROUGH DECEMBER 31, 1975)
 REPORT NUMBER..... RFP-NUREG-2481
 DATE PUBLISHED ... 76-01-00
 SITE/PROGRAM ROCKY FLATS - URANYL NITRATE - PLEXIGLASS

ABSTRACT

THE INCENTIVE FOR OBTAINING EXPERIMENTAL CRITICALITY DATA IS TO PROVIDE REFERENCE DATA FOR THE VALIDATION OF CALCULATIONAL METHODS, WHICH INCLUDE COMPUTER CODES AND NUCLEAR CROSS SECTION DATA. THE VALIDATED METHODS THEN CAN BE USED WITH CONFIDENCE TO PROVIDE SAFE AND ECONOMIC LIMITS FOR HANDLING FISSILE MATERIALS IN PROCESSING AND FABRICATION PLANTS AND FOR THE STORAGE AND SHIPMENT OF FISSILE PRODUCT. A RECENT LITERATURE SEARCH REVEALED THAT MORE THAN 90% OF ALL CRITICALITY SAFETY DATA TO DATE INVOLVED HIGHLY ENRICHED URANIUM AND PLUTONIUM SYSTEMS, PRINCIPALLY FOR THE MANUFACTURE AND HANDLING OF WEAPONS MATERIALS.

TODAY'S EXPERIMENTAL DATA PRIORITIES INCLUDE THOSE THAT SUPPORT VARIOUS REACTOR FUEL CYCLES WITH CONSIDERABLE INTEREST IN ENRICHMENTS OF LESS THAN 5% URANIUM-235.

IN JULY, 1975, WE SET ABOUT TO REVIEW THE FUEL CYCLE AREAS AND COMPILER A LIST OF NEEDED CRITICALITY MEASUREMENTS. SPECIALISTS IN INDUSTRY AND GOVERNMENT WERE CONTACTED AND A TENTATIVE LIST OF PROBLEM AREAS WAS COMPILED. A MEETING OF CRITICALITY SPECIALISTS WAS HELD AT ROCKY FLATS ON AUGUST 8, 1975, TO FIRM UP THIS LIST AND ESTABLISH PRIORITIES FOR THOSE AREAS OF INTEREST. THIS INFORMATION IS COVERED UNDER TASK 1 OF THIS REPORT.

1434 ID-NUMBER ID-NUMBER 1434

AUTHOR SCHUSKE, C. L. / DICKINSON, D. / GAYLORD, N. D. / OH, I. / ROTHE, R. E. /
 TUCK, G.
 TITLE REFERENCE CRITICAL EXPERIMENTS (PROGRESS REPORT FOR PERIOD JANUARY 1,
 1977, THROUGH MARCH 31, 1977)
 REPORT NUMBER..... RFP-NUREG-2660
 DATE PUBLISHED ... 77-05-00
 SITE/PROGRAM ROCKY FLATS - URANYL NITRATE - PLEXIGLASS

ABSTRACT

THIRTY-EIGHT BENCHMARK CRITICAL MEASUREMENTS FOR A SINGLE TANK REFLECTED BY PLEXIGLAS HAVE BEEN COMPLETED DURING THE QUARTER. THESE MEASUREMENTS INVOLVED CRITICAL SOLUTION HEIGHT DETERMINATIONS FOR THREE DIFFERENT VESSELS (TWO ALUMINUM AND ONE STEEL), WITH THREE URANYL NITRATE SOLUTION CONCENTRATIONS, AND TWO LOCATIONS WITHIN A 20.3-CM-THICK PLEXIGLAS ENCLOSURE.

MEASUREMENTS ON ARRAYS OF CYLINDERS WITHIN THE PLEXIGLAS ENCLOSURE HAVE BEGUN AND WILL BE COMPLETED DURING THE NEXT QUARTER.

KENO-IV (USED WITH HANSEN-ROACH CROSS SECTIONS) CALCULATIONS ON THE MINIMALLY-REFLECTED SINGLE TANK MEASUREMENTS AND CONCRETE-REFLECTED 16-CYLINDER ARRAY MEASUREMENTS ARE DISCUSSED.

WORK PROGRESSES ON THE FABRICATION OF FIXTURES FOR THE 4.5%-ENRICHED URANIUM OXIDE EXPERIMENTS TO BE PERFORMED LATER THIS YEAR. PROBLEMS ASSOCIATED WITH THE PRESSING OF FUEL PIECES ARE NEAR SOLUTION.

THE MEASUREMENT CONTROL PROGRAM ON SOLUTION CONCENTRATION DETERMINATION CONTINUES. RESULTS FOR THE SERIES OF BENCHMARKS WHICH ARE UNDER WAY SHOULD BE COMPLETED BY THE END OF THE NEXT QUARTER.

1435 ID-NUMBER ID-NUMBER 1435

AUTHOR DICKINSON, D. / GAYLORD, N. D. / ROTHE, R. E. / TUCK, G.
 TITLE REFERENCE CRITICAL EXPERIMENTS (PROGRESS REPORT FOR PERIOD APRIL 1, 1977,
 THROUGH JUNE 30, 1977)
 REPORT NUMBER..... RFP-NUREG-2690
 DATE PUBLISHED ... 77-09-00
 SITE/PROGRAM ROCKY FLATS - URANYL NITRATE - PLEXIGLASS

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

CRITICALITY MEASUREMENTS ON PLASTIC-REFLECTED ARRAYS OF URANYL NITRATE SOLUTION CYLINDERS AND SIMILAR MEASUREMENTS IN A SINGLE MINIMALLY-REFLECTED 50-CM-DIAMETER TANK WERE PERFORMED, COMPLETING THE EXPERIMENTAL PHASE OF TASK 4. ALL OF THE TASK 4 DATA ARE SUMMARIZED, AND THE BEST-CORRECTED VALUES FOR SOLUTION PROPERTIES, CYLINDER DIMENSIONS, AND CRITICAL HEIGHT ARE GIVEN.

ADDITIONAL CALCULATIONS TO DETERMINE DRIVER SIZES FOR LOW-ENRICHED OXIDE CRITICAL ARRAYS WITH HYDROGEN/URANIUM = 1.5 HAVE BEEN PERFORMED, AS WELL AS CALCULATIONS TO DETERMINE HYDROGEN/URANIUM VALUES REQUIRED FOR UNDRIVEN CRITICAL ARRAYS. THE METHOD TO BE USED FOR MEASURING HYDROGEN/URANIUM DURING THE COURSE OF THE EXPERIMENTAL PROGRAM IS DESCRIBED, AND PRELIMINARY RESULTS ON ACHIEVING HOMOGENEOUS OXIDE-WATER MIXTURES ARE DISCUSSED. THE FABRICATION OF EQUIPMENT FOR THE EXPERIMENTS IS NEARLY COMPLETE, AND PRELIMINARY TESTING IS UNDERWAY. ABOUT 40% OF THE OXIDE HAS BEEN PRESSED INTO BRIQUETTES.

1436 ID-NUMBER ID-NUMBER 1436

AUTHOR THOMAS, J. T.

TITLE URANIUM METAL CRITICALITY, MONTE CARLO CALCULATIONS AND NUCLEAR CRITICALITY SAFETY

REPORT NUMBER.... Y-CDC-7

DATE PUBLISHED ... 70-08-05

SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

THE CRITICALITY OF CUBOIDAL ARRAYS OF SUBCRITICAL URANIUM-METAL COMPONENTS IS EXPLORED WITH THE KENO MONTE CARLO CODE. A SUFFICIENT NUMBER OF CRITICAL EXPERIMENTS IS DESCRIBED AND CALCULATED WITH THE CODE USING THE HANSEN-ROACH CROSS-SECTION SETS TO ADEQUATELY VERIFY THE USE OF THIS COMBINATION TO EXAMINE ARRAY CONDITIONS OF INTEREST TO NUCLEAR CRITICALITY SAFETY. THE MAGNITUDES OF CHANGES IN ARRAY REACTIVITY ASSOCIATED WITH A NUMBER OF SAFETY CONSIDERATIONS, USUALLY COMPENSATED BY ARBITRARY SAFETY FACTORS, ARE PRESENTED.

1437 ID-NUMBER ID-NUMBER 1437

AUTHOR RAY, J. W. / MATTHEWS, R. G. / HOGAN, W. S. / DINGEE, D. A. / CHASTAIN, J. W.

TITLE ML-1-1B CRITICAL-ASSEMBLY STUDIES

REPORT NUMBER.... BMI-1501

DATE PUBLISHED ... 61-02-21

SITE/PROGRAM BATTELLE MEMORIAL INSTITUTE - GAS COOLED REACTOR STUDIES

ABSTRACT

CRITICAL-ASSEMBLY STUDIES WERE CONDUCTED TO PROVIDE PHYSICS AND ENGINEERING DATA TO AID AEROJET-GENERAL NUCLEONICS IN THE DEVELOPMENT OF THE MOBILE LOW-POWER REACTOR (ML-1-1B). THE ML-1- 1B CRITICAL ASSEMBLY IS A MULTITUBE ASSEMBLY CONSISTING OF PIN-TYPE FUEL ELEMENTS WITHIN A RADIAL LEAD REFLECTOR. THE ELEMENTS ARE 19-PIN ASSEMBLIES CONTAINED IN AN INSULATION LINER AND A PRESSURE TUBE, WITH STEEL-SHIM POISON AND CADMIUM-COPPER BURNABLE-POISON BANDS PRESENT ON THE INSULATION LINER.

THE ML-1-1B CORE WITHOUT STEEL-SHIM POISON WAS CRITICAL WITH 48 ELEMENTS CONTAINING 31,088.36 GRAMS OF URANIUM-235. THE CORE WITH THE STEEL-SHIM POISON WAS CRITICAL WITH 51 ELEMENTS CONTAINING 32,999.97 GRAMS OF URANIUM-235.

THE FUEL TUBES WERE FILLED WITH WATER TO SIMULATE FLOODING THE CORE. IN THIS CONDITION THE CORE WAS CRITICAL WITH 42 ELEMENTS CONTAINING 27,221.00 GRAMS OF URANIUM-235.

1438 ID-NUMBER ID-NUMBER 1438

AUTHOR DINGEE, D. A. / BALLOWE, W. C. / KLINGENSMITH, R. W. / EGEN, R. A. / JANKOWSKI, F. J. / CHASTAIN, J. W.

TITLE GCRE CRITICAL-ASSEMBLY STUDIES

REPORT NUMBER.... BMI-1288

DATE PUBLISHED ... 58-09-10

SITE/PROGRAM BATTELLE MEMORIAL INSTITUTE - GAS COOLED REACTOR STUDIES

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

CRITICAL-ASSEMBLY STUDIES WERE MADE TO PROVIDE ENGINEERING AND PHYSICS DATA TO AID IN DEVELOPING THE GAS COOLED REACTOR EXPERIMENT-1 (GCRE-1). MEASUREMENTS OF CRITICAL MASS, FLUX AND POWER DISTRIBUTIONS, AND SHUTDOWN WORTH OF THE GCRE-1 MOCK-UP SAFETY AND CONTROL BLADES WERE OBTAINED.

THE CRITICAL ASSEMBLY CONSISTS OF ALUMINUM TUBES CONTAINING FOUR CONCENTRIC STAINLESS STEEL CYLINDERS WRAPPED WITH HIGHLY ENRICHED URANIUM FOIL. THESE TUBES ARE SUPPORTED AT EACH END BY GRID PLATES AND ARRANGED TO APPROXIMATE A RIGHT CIRCULAR CYLINDER. THE ENTIRE CORE STRUCTURE IS SUPPORTED WITHIN A TANK WHICH CAN BE FILLED REMOTELY WITH MODERATOR WATER. A VOID BENEATH THE CORE STRUCTURE AND THE AIR ABOVE IT REPRESENT THE GAS PLENUMS OF THE GCRE-1 REACTOR.

CRITICAL MASS AND FLUX POWER DISTRIBUTIONS WERE DETERMINED FOR SEVERAL CASES OF FOUR BASIC CORES. THE THERMAL UTILIZATION, MEASURED IN TWO CORE CONFIGURATIONS, WAS 0.780 FOR THE REACTOR WITHOUT BURNABLE POISON OR A LEAD REFLECTOR. THE TEMPERATURE COEFFICIENT OF REACTIVITY, MEASURED IN TWO CORES, WAS POSITIVE AT ROOM TEMPERATURE BUT NEGATIVE IN THE PROPOSED OPERATING-TEMPERATURE RANGE. THE TOTAL REACTIVITY EFFECT IN GOING FROM 20 TO 80 C WAS A POSITIVE 0.22 PER CENT DELTA-K/K.

THE WORTH OF CONTROL AND SAFETY-SHUTDOWN BLADES OF SEVERAL COMPOSITIONS AND SIZES IN VARIOUS LOCATIONS WAS DETERMINED FOR A NUMBER OF CORE CONFIGURATIONS; BLADES HAVING A SANDWICH CONSTRUCTION OF CADMIUM, TUNGSTEN, AND INDIUM HAD THE GREATEST SHUTDOWN WORTH.

TO DATE THESE STUDIES HAVE RESULTED IN A 61-ELEMENT CORE (CRITICAL WITH 54 ELEMENTS) WITH A 4- INCH LEAD REFLECTOR WHICH HAS 2.5 PER CENT DELTA-K/K EXCESS REACTIVITY FOR STARTUP AND FOR OVERRIDE OF POISON AND BURNUP. A MOCK-UP BLADE CONFIGURATION HAS BEEN DETERMINED WHICH WILL CONTROL THE EXCESS REACTIVITY INTRODUCED BY FLOODING THE ELEMENTS WITH MINERAL OIL (TO SIMULATE WATER FLOODING WHEN FUEL ELEMENTS ARE CHANGED IN GCRE-1).

1439 ID-NUMBER ID-NUMBER 1439

AUTHOR JOHNSON, E. B.

TITLE THE CRITICALITY OF HETEROGENEOUS LATTICES OF EXPERIMENTAL BERYLLIUM OXIDE REACTOR FUEL PINS IN WATER AND IN AQUEOUS SOLUTIONS CONTAINING BORON AND URANYL NITRATE

REPORT NUMBER.... ORNL/ENG-2

DATE PUBLISHED ... 76-07-00

SITE/PROGRAM OAK RIDGE - URANIUM(64.4%)OXIDE - BERYLLIUM OXIDE PINS IN WATER AND URANYL NITRATE

ABSTRACT

THE FUEL INTENDED FOR THE EXPERIMENTAL BERYLLIUM OXIDE REACTOR WAS MADE AVAILABLE FOR A SERIES OF CRITICAL EXPERIMENTS AT THE OAK RIDGE CRITICAL EXPERIMENTS FACILITY. THE FUEL PINS CONSISTED OF COMPRESSED CERAMIC PELLETS CONTAINED IN HASTELLOY X-280 TUBES. THE PELLETS WERE A HOMOGENEOUS MIXTURE OF 62.4% ENRICHED URANIUM-DIOXIDE AND BERYLLIUM OXIDE. THE DATA GENERATED ARE APPLICABLE TO SUPPORT THE ESTABLISHMENT OF SPECIFICATIONS FOR THE CHEMICAL RECOVERY OF URANIUM IN A PROCESS IN WHICH BORON AS A SOLUBLE NEUTRON ABSORBER IS A PART OF THE DISSOLVER SOLUTION. IT WAS FOUND THAT A BORON CONCENTRATION OF ABOUT 0.3 GRAMS/LITER IN A DILUTE SOLUTION OF URANYL NITRATE (3.7 G OF URANIUM-235/LITER) INCREASED THE CRITICAL MASS 60% OVER THAT WITHOUT BORON.

1440 ID-NUMBER ID-NUMBER 1440

AUTHOR CLAYTON, E. D.

TITLE NUCLEAR SAFETY IN CHEMICAL AND METALLURGICAL PROCESSING OF PLUTONIUM

REPORT NUMBER.... ENEA-KARLS.-1981, 367-392

CONFERENCE CRITICALITY CONTROL IN CHEMICAL AND METALLURGICAL PLANT, KARLSRUHE SYMPOSIUM, ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT EUROPEAN NUCLEAR ENERGY AGENCY, 1981

DATE PUBLISHED ... 81-11-00

SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

WHEN FISSILE MATERIALS ARE HANDLED IN SIGNIFICANT QUANTITIES, SUCH AS IN CHEMICAL SEPARATION PLANTS FOR REPROCESSING SPENT REACTOR FUELS AND CONCOMITANT METALLURGICAL PROCESSES, A POTENTIAL CRITICALITY HAZARD EXISTS. THE PREVENTION OF A CRITICALITY INCIDENT, OR INADVERTENT UNCONTROLLED CRITICAL NUCLEAR REACTION, IS OF PRIMORDIAL IMPORTANCE BECAUSE OF THE POTENTIALLY SERIOUS CONSEQUENCES WHICH CAN RESULT.

THE NUCLEAR SAFETY PROBLEMS WHICH ARE ENCOUNTERED IN THE HANDLING AND PROCESSING OF FISSILE MATERIALS OUTSIDE OF REACTORS ARE ESPECIALLY COMPLEX: NOT ONLY MUST CRITICALITY BE CONSIDERED FOR THE STANDARD OPERATING CONDITIONS OF THE PLANT, BUT ALSO FOR THOSE OFF-STANDARD CONDITIONS WHICH ARE PHYSICALLY POSSIBLE AND, AT THE SAME TIME, PERHAPS MOST FAVOURABLE FOR THE CHAIN REACTION. IN DETERMINING THE NUCLEAR SAFETY OF A CHEMICAL AND METALLURGICAL PROCESSING PLANT, ALL ASPECTS OF REACTOR THEORY MAY BE INVOLVED, INCLUDING BOTH MODERATED AND UNMODERATED SYSTEMS. THE PROBLEMS ARE FURTHER ENHANCED BECAUSE OF THE LACK OF CERTAIN EXPERIMENTAL DATA AND THE UNCERTAINTY WHICH EXISTS IN THE THEORETIC VALUES.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THIS PAPER IS CONCERNED PRIMARILY WITH NUCLEAR SAFETY CONSIDERATIONS IN THE HANDLING AND PROCESSING OF PLUTONIUM. AMONG THE QUESTIONS DISCUSSED ARE: WHAT TYPES OF CRITICALITY PROBLEMS ARE ENCOUNTERED IN A TYPICAL PLUTONIUM PROCESSING AND METAL FABRICATION PLANT? WHAT CRITICALITY DATA ARE NEEDED, AND WHAT ARE SOME OF THE METHODS AND PROCEDURES USED TO ACHIEVE NUCLEAR SAFETY IN OPERATION?

1441 ID-NUMBER ID-NUMBER 1441

AUTHOR DENIZ, V.
 TITLE STUDY OF THE USE OF PULSED-NEUTRON EXPERIMENTS ON MULTIPLYING LATTICES FOR THE ADJUSTMENT OF CRITICALITY CODES
 REPORT NUMBER..... NSEAO, 40, 246-253
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 70-05-00
 SITE/PROGRAM FRANCE - GRAPHITE LATTICES - CALCULATIONS

ABSTRACT

CRITICALITY CODES ARE IN GENERAL ADJUSTED TO REPRODUCE MEASURED VALUES OF CRITICAL BUCKLINGS WHICH FURNISH $(K(INF) - 1)/M \approx 2$. THE PARAMETER ADJUSTED IS $K(INF)$, THE CALCULATION OF LEAKAGE BEING ASSUMED TO BE WELL MADE. HOWEVER, IN THE CASE OF HETEROGENEOUS SYSTEMS IN PARTICULAR, THE SLOWING DOWN REGION IS NOT EASY TO STUDY, AND ONE HAS PERFORCE TO MAKE CERTAIN SIMPLIFYING ASSUMPTIONS WHICH REFLECT ON THE CALCULATED VALUE OF THE AGE. SINCE A PROPER ESTIMATION OF LEAKAGE IS NECESSARY FOR A CODE ADJUSTED ON CLEAN CRITICAL SYSTEMS TO BE VALID WHEN EXTRAPOLATED TO LARGE POWER REACTORS WHERE LEAKAGES ARE DIFFERENT, IT IS OF PRACTICAL INTEREST TO BE ABLE TO USE SOME EXPERIMENTAL DATA FOR CHECKING AGE CALCULATIONS AND SEARCHING FOR IMPROVEMENTS IF NECESSARY. PULSED EXPERIMENTS FURNISH THE NECESSARY EXPERIMENTAL DATA, SINCE MEASUREMENTS MADE ON A GIVEN LATTICE FOR DIFFERENT BLOCK SIZES PERMIT THE SEPARATION OF MULTIPLICATION FROM LEAKAGE.

A METHOD OF ANALYSIS IS PRESENTED AND APPLIED TO EXPERIMENTS ON NATURAL URANIUM/GRAPHITE LATTICES. AN EFFECTIVE AGE-DIFFUSION EXPRESSION IN WHICH $K(INF)/P$, $L \approx 2$ AND THE MEAN LIFETIME ARE EVALUATED IN TERMS OF BUCKLING-DEPENDENT SPECTRA, IS TRANSFORMED INTO LINEAR EQUATION WHICH PERMITS SIMULTANEOUS ADJUSTMENT OF P AND OF THE AGE.

OUR ANALYSIS SHOWS THAT PULSED EXPERIMENTS CAN BE SUFFICIENTLY PRECISE FOR AGE ADJUSTMENTS. HOWEVER, SINCE THESE EXPERIMENTS ARE PERFORMED AT FAR-FROM-CRITICAL BUCKLINGS, THE PRECISION IS NOT SUFFICIENT FOR ADJUSTING P , AND HENCE $K(INF)$. WE CONCLUDE THAT THESE EXPERIMENTS ARE VERY USEFUL FOR ADJUSTING LEAKAGE, BUT THIS ADJUSTMENT BEING MADE, CRITICAL EXPERIMENTS REMAIN NECESSARY FOR THE SUBSEQUENT ADJUSTMENT OF $K(INF)$ WITH PRECISION. (AUTH).

1442 ID-NUMBER ID-NUMBER 1442

AUTHOR CHOW, R. H. / BIERMAN, S. R.
 TITLE PULSED NEUTRON DETERMINATION OF THE EFFECTIVE MULTIPLYING CONSTANT AND NEUTRON AGE TO THERMAL ENERGY FOR A BARE HOMOGENEOUS SUBCRITICAL ASSEMBLY OF ENRICHED URANYL NITRATE SALT
 REPORT NUMBER..... NSEAO, 41, 132-138
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 70-07-00
 SITE/PROGRAM HANFORD - URANYL(2.3%) NITRATE CUBES

ABSTRACT

THE LAST DECADE HAS SEEN WIDESPREAD INTEREST AND ACTIVITY IN THE FIELD OF PULSED-NEUTRON STUDIES. OUT OF THESE STUDIES HAVE CULMINATED METHODS AND TECHNIQUES FOR DETERMINING THE DEGREE OF SUBCRITICALITY OF A MULTIPLYING SYSTEM, FOR MEASURING DIFFUSION AND REACTION PARAMETERS, FOR NEUTRON SPECTRAL ANALYSIS, AND FOR MANY OTHER APPLICATIONS THAT INGENUITY CAN CONCEIVE AND DEVISE. DESCRIBED IN THIS PAPER IS AN EXPERIMENT IN WHICH THE EFFECTIVE MULTIPLICATION FACTOR, $K(EFF)$, IS DETERMINED FOR A BARE, HOMOGENEOUS SUBCRITICAL ASSEMBLY, AND THE AGE TO THERMAL IS DEDUCED FOR THE MULTIPLYING MEDIUM USING THE PULSED-NEUTRON TECHNIQUE. (AUTH).

1443 ID-NUMBER ID-NUMBER 1443

AUTHOR THOMAS, A. F.
 TITLE INTERIM NOTE ON CRITICAL THICKNESS MEASUREMENTS WITH 45% ENRICHMENT URANIUM SLABS
 REPORT NUMBER..... SNA/NM/A/14/61
 DATE PUBLISHED ... 61-10-03
 SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - URANIUM(30.37.5.46%) METAL

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

MEASUREMENTS HAVE BEEN MADE OF THE CRITICAL THICKNESS OF SLABS OF URANIUM METAL, FORMED FROM HEXAGONAL PIECES SO AS TO FORM PSEUDO CYLINDERS, BOTH UNREFLECTED AND REFLECTED BY NATURAL URANIUM, ALUMINUM, STEEL, GRAPHITE, AND BORATED GRAPHITE.

1444 ID-NUMBER ID-NUMBER 1444

AUTHOR MIHALCZO, J. T.
 TITLE SUPERPROMPT-CRITICAL BEHAVIOR OF AN UNMODERATED, UNREFLECTED URANIUM-MOLYBDENUM ALLOY REACTOR
 REPORT NUMBER.... NSENAO, 16, 291-298
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 63-07-00
 SITE/PROGRAM OAK RIDGE - ORNL FAST BURST REACTOR (FBR) - HEALTH PHYSICS RESEARCH REACTOR (HPRR)

ABSTRACT

THE TIME-DEPENDENT BEHAVIOR OF THE NEUTRON POPULATION IN AN UNREFLECTED, UNMODERATED CYLINDRICAL ASSEMBLY OF 90 WT% URANIUM (93.2 WT% URANIUM-235), 10 WT% MOLYBDENUM ALLOY FOLLOWING A RAPID ESTABLISHMENT OF SUPERPROMPT CRITICAL CONDITIONS WITH NEGLIGIBLE INITIAL NEUTRON POPULATION HAS BEEN STUDIED. REACTIVITY INCREASES UP TO 11 CENTS ABOVE PROMPT CRITICAL RESULTED IN BURSTS YIELDING AS MANY AS $1.8E+17$ FISSIONS AND PEAK POWER UP TO 100,000 MW WITH PERIODS AS SHORT AS 16 MICROSEC AND TEMPERATURE INCREASES AS LARGE AS 400 DEGREES C. FOR BURSTS GREATER THAN ABOUT $6.0E+16$ FISSIONS THE SAFETY BLOCK--A PIECE OF THE CORE HELD IN PLACE BY AN ELECTROMAGNET--IS DRIVEN OUT BY PRESSURE WAVES ABOUT 225 MICROSEC AFTER THE PEAK OF THE BURST.

1445 ID-NUMBER ID-NUMBER 1445

AUTHOR THOMAS, A. F.
 TITLE INTERIM NOTE ON CRITICAL MASS MEASUREMENTS WITH 30% ENRICHED URANIUM/HYDROGEN MIXTURES AT LOW HYDROGEN/URANIUM RATIOS
 REPORT NUMBER.... SNA/NM/A/13/61
 DATE PUBLISHED ... 61-10-03
 SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - URANIUM(30.37.5.46%) METAL

ABSTRACT

CRITICAL MASS MEASUREMENTS HAVE BEEN MADE WITH SQUARE PRISMS CONSTRUCTED FROM 1 INCH CUBES OF A MIXTURE OF URANIUM OXIDE (30.2% ENRICHMENT) AND PARAFFIN WAX. THE CUBES WERE PRESSED TO 95% OF THE THEORETICAL DENSITY FOR THE CUBES AT HYDROGEN TO URANIUM-235 = 8.3 AND TO BETTER THAN 98% FOR THE LATER BATCHES. THE LOWER DENSITY BATCHES AT HYDROGEN TO URANIUM-235 = 8.3 AND 16.5 WERE OBTAINED BY PRESSING THE CUBES WITH 5 HOLES 0.2 INCH DIAMETER THROUGH THE CUBES IN ONE DIRECTION. NO EFFECTS OF STREAMING ON THE CRITICAL MASS COULD BE DETECTED IN THE REFLECTED SYSTEMS.

MEASUREMENTS WERE MADE OF THE CRITICAL HEIGHT OF AN 8 INCH SQUARE PRISM OF THE COMPACTS AT HYDROGEN TO URANIUM-235 = 40, REFLECTED ON SIDES AND BOTTOM BY 8 INCH POLYTHENE, AND ON THE TOP BY THINNER LAYERS OF POLYTHENE AND BY 8 INCH REFLECTORS OF OTHER MATERIALS.

1446 ID-NUMBER ID-NUMBER 1446

AUTHOR LANE, R. C./ THOMAS, A. F.
 TITLE MEASUREMENT OF THE CRITICAL MASS OF 37.5% ENRICHED URANIUM REFLECTED BY WOOD, CONCRETE, OR POLYTHENE
 REPORT NUMBER.... CRIT/OP/3
 DATE PUBLISHED ... 63-10-09
 SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - URANIUM(30.37.5.46%) METAL

ABSTRACT

A SERIES OF CRITICALITY EXPERIMENTS WERE CARRIED OUT USING THE 37.5% ENRICHED URANIUM FUEL TABLETS DESTINED FOR THE ZEBRA REACTOR AT A.E.E. WINFRITH. THE TABLETS WERE IN THE FORM OF THIN SLABS, NOMINALLY 2 INCH X 2 INCH X 1/8 INCH, EACH CONTAINING 56.5 GMS OF THE URANIUM-235 ISOTOPE. NEAR CRITICAL RECTANGULAR PARALLELEPIPEDS WERE CONSTRUCTED WITH THIS MATERIAL WHEN REFLECTED BY POLYTHENE, CONCRETE AND WOOD, FROM WHICH THE CRITICAL SIZE COULD BE ESTIMATED BY EXTRAPOLATION OF THE RECIPROCAL COUNT RATE RATIO.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1447 ID-NUMBER ID-NUMBER 1447

AUTHOR RICHEY, C. R.
 TITLE REEXAMINATION OF THE VALUE FOR THE MINIMUM CRITICAL CONCENTRATION OF
 PLUTONIUM-239 IN WATER
 REPORT NUMBER..... NSEAO, 55, 244-248
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 74-10-00
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

THE LIMITING CRITICAL CONCENTRATION OF PLUTONIUM-239 IN AQUEOUS SOLUTION HAS BEEN REEVALUATED FROM EXPERIMENTS WITH DATA OBTAINED IN THE PHYSICAL CONSTANTS TEST REACTOR AND DETERMINED TO BE 7.19 ± 0.15 GRAMS PLUTONIUM-239 LITER. THE VALUE IS SUPPORTED BY THE RESULTS OF 18-GROUP DIFFUSION THEORY CALCULATIONS.

1448 ID-NUMBER ID-NUMBER 1448

AUTHOR MIHALCZO, J. T.
 TITLE PROMPT-NEUTRON DECAY CONSTANT VERSUS BUCKLING FOR HYDROGEN-MODERATED 3%
 URANIUM-235-ENRICHED URANIUM
 REPORT NUMBER..... ORNL-3499, 49-50
 DATE PUBLISHED ... 63-08-01
 SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN

ABSTRACT

PROMPT-NEUTRON DECAY CONSTANTS FOR UNREFLECTED PARALLELEPIPEDS OF A HOMOGENEOUS MIXTURE OF URANIUM-TETRAFLUORIDE AND PARAFFIN WERE DETERMINED AS A FUNCTION OF BUCKLING BY THE PULSED-NEUTRON TECHNIQUE. THE FUEL MIXTURE HAD A DENSITY OF 4.5 GRAM/CC AND CONTAINED 92 WEIGHT PERCENT URANIUM- TETRAFLUORIDE IN WHICH THE URANIUM-235 ENRICHMENT OF THE URANIUM WAS 3.00% THE HYDROGEN/URANIUM-235 RATIO WAS 133.

1449 ID-NUMBER ID-NUMBER 1449

AUTHOR FERMI, E.
 TITLE EXPERIMENTAL PRODUCTION OF A DIVERGENT CHAIN REACTION
 REPORT NUMBER..... AECD-3269
 DATE PUBLISHED ... 52-01-04
 SITE/PROGRAM UNIVERSITY OF CHICAGO - FERMI PILE (CP-1) ; ARGONNE NATIONAL LABORATORY -
 FERMI PILE (CP-1)

ABSTRACT

THIS REPORT GIVES A DESCRIPTION OF THE CONSTRUCTION AND OPERATION OF A CHAIN REACTING PILE. THE PILE WAS CONSTRUCTED IN THE WEST STANDS LABORATORY DURING THE MONTHS OF OCTOBER AND NOVEMBER 1942 AND WAS OPERATED FOR THE FIRST TIME ON DECEMBER 2, 1942.

THE PILE CONSISTS ESSENTIALLY OF A LATTICE OF LUMPS, PARTLY OF URANIUM METAL AND PARTLY OF URANIUM OXIDE IMBEDDED IN GRAPHITE. EXCEPT FOR A SMALL FRACTION NEAR THE SURFACE OF THE PILE THE LATTICE CELL IS A CUBE OF 8.25 INCHES SIDE.

SINCE ONLY A RELATIVELY SMALL AMOUNT OF METAL (ABOUT SIX TONS) WAS AVAILABLE AND SINCE OUR GRAPHITE WAS OF VARIOUS BRANDS OF DIFFERENT PURITY IT HAD BEEN PLANNED ORIGINALLY TO CONSTRUCT THE PILE IN AN APPROXIMATELY SPHERICAL SHAPE, PUTTING THE BEST MATERIALS AS NEAR AS POSSIBLE TO THE CENTER. IT HAPPENED ACTUALLY THAT THE CRITICAL CONDITIONS WERE REACHED BEFORE THE SPHERE WAS COMPLETED AND CONSTRUCTION WAS INTERRUPTED ABOUT ONE LAYER ABOVE THE CRITICAL DIMENSIONS. FOR THE SAME REASON THE TOP LAYERS OF THE PILE WERE MADE APPRECIABLY SMALLER THAN WOULD CORRESPOND TO THE SPHERICAL SHAPE ORIGINALLY PLANNED. THE PRESENT STRUCTURE MAY BE ROUGHLY DESCRIBED AS A FLATTENED ROTATIONAL ELLIPSOID HAVING THE POLAR RADIUS 309 CM AND THE EQUATORIAL RADIUS 388 CM THE GRAPHITE IS SUPPORTED ON A WOODEN STRUCTURE AND RESTS ON THE FLOOR ON ITS LOWEST POINT.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1450 ID-NUMBER ID-NUMBER 1450

AUTHOR SNELL, A. H. / BROLLEY, J. E. / LEVINGER, J. S. / WILKINSON, R.
 TITLE STUDIES IN A FIVE TON METAL PILE
 REPORT NUMBER..... CF-0589
 DATE PUBLISHED ... 43-04-17
 SITE/PROGRAM UNIVERSITY OF CHICAGO - FERMI PILE (CP-1) ; ARGONNE NATIONAL LABORATORY -
 FERMI PILE (CP-1)

ABSTRACT

A PILE OF PURE METAL, 22 INCHES HIGH, 22 INCHES WIDE, AND 28 INCHES LONG WAS ERECTED NEAR THE BERYLLIUM TARGET OF THE CHICAGO CYCLOTRON. FISSION/CAPTURE MEASUREMENTS WERE MADE IN IT, LEADING TO THE RESULT THAT FOR THE EQUILIBRIUM SPECTRUM OF NEUTRONS WHICH PREVAILS WHEN FISSION NEUTRONS ARE BEING GENERATED, PARTLY SLOWED DOWN, AND ABSORBED IN METAL, THE MACROSCOPIC ABSORPTION CROSS SECTION FOR FISSION IS ONE-TENTH OF THAT FOR RESONANCE CAPTURE. USE WAS MADE OF SEPARATED ISOTOPES IN A DOUBLE FISSION CHAMBER TO MEASURE THE RELATIVE ATOMIC CROSS SECTIONS OF URANIUM-235 AND URANIUM-238 AT VARIOUS POINTS IN THE PILE, WITH THE RESULT THAT FOR THE EQUILIBRIUM PILE NEUTRONS SIGMA (FISS., URANIUM-235)=200 SIGMA(FISS., URANIUM-238). TAKEN TOGETHER, THESE RESULTS LEAD TO THE CONCLUSION THAT A VERY LARGE BODY OF METAL WOULD HAVE TO HAVE ITS URANIUM-235 CONCENTRATION INCREASED BY A FACTOR OF 12 IN ORDER TO START CHAIN-REACTING.

1451 ID-NUMBER ID-NUMBER 1451

AUTHOR BROLLEY, J. E. / BYERLEY, F. J. / FELD, B. T. / OLDS, A. E. / SCHALETTAR, R. / SLOTIN, S. L. / STEWART, R. B.
 TITLE NEUTRON MULTIPLICATION IN A MASS OF URANIUM METAL
 REPORT NUMBER..... CF-1627
 DATE PUBLISHED ... 44-04-01
 NSA-NUMBER 10:4470
 SITE/PROGRAM UNIVERSITY OF CHICAGO - FERMI PILE (CP-1) ; ARGONNE NATIONAL LABORATORY -
 FERMI PILE (CP-1)

ABSTRACT

MEASUREMENTS WERE MADE OF NEUTRON MULTIPLICATION IN 35 TONS OF URANIUM METAL, USING THE CLINTON PILE AS A NEUTRON SOURCE, A THREE-GROUP APPROXIMATION WAS USED TO DERIVE THE NEUTRON DISTRIBUTION IN THE METAL. DETAILED DESCRIPTIONS OF THE EXPERIMENTAL SET-UP AND MEASUREMENTS ARE ALSO GIVEN.

1452 ID-NUMBER ID-NUMBER 1452

AUTHOR MARTENS, F. H.
 TITLE THE FAST EXPONENTIAL EXPERIMENT
 REPORT NUMBER..... ANL-5379
 DATE PUBLISHED ... 55-11-00
 NSA-NUMBER 10:3384
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - GENERAL DESCRIPTIONS, INFORMATION, AND
 SUMMARIES

ABSTRACT

THE FAST EXPONENTIAL EXPERIMENT WAS SET UP IN ORDER TO STUDY THE PROPERTIES OF A REACTIVE SYSTEM UTILIZING FAST NEUTRONS. THE EXPERIMENT CONSISTED OF A SOURCE PILE OF URANIUM-235 MODERATED WITH WATER TO PROVIDE NEUTRONS TO THE EXPONENTIAL ASSEMBLY, AND THE ASSEMBLY ITSELF: A URANIUM SLAB WAS LOCATED BETWEEN THESE TWO SYSTEMS TO ABSORB THERMAL AND RESONANCE NEUTRONS FROM THE SOURCE PILE. COMPLETE DESCRIPTIONS OF THESE SYSTEMS ARE INCLUDED. DATA ARE GIVEN FROM PRELIMINARY STUDIES USING THIS SYSTEM. THESE INCLUDE FLUX DISTRIBUTION MEASUREMENTS, REFLECTOR STUDIES, AND SHIELDING STUDIES. DESCRIPTIONS ARE ALSO GIVEN OF FISSION CHAMBERS, FLUX MONITORS, AND CATCHER FOILS TO BE USED WITH THE ASSEMBLY. THE THEORY OF BUCKLING IS BRIEFLY DISCUSSED, AND RESULTS OF BUCKLING CALCULATIONS FOR AN ENRICHED EXPONENTIAL CORE ARE GIVEN. EXPONENTIAL MEASUREMENTS OF BUCKLING ARE ALSO DESCRIBED. MEASUREMENTS OF REFLECTOR SAVINGS AND FISSION RATIOS ARE ALSO DESCRIBED. DATA ON EQUILIBRIUM NEUTRONS IN NATURAL URANIUM ARE INCLUDED IN APPENDICES. (B.J.H.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1453 ID-NUMBER ID-NUMBER 1453

AUTHOR BIERMAN, S. R. / CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS WITH LOW-MODERATED HOMOGENEOUS MIXTURES OF PLUTONIUM
 AND URANIUM OXIDES CONTAINING 8, 15, AND 30 WT% PLUTONIUM
 REPORT NUMBER.... NSENAO, 61, 370-376
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED .. 76-11-00
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

ABSTRACT

THE RESULTS FROM A SERIES OF CRITICALITY EXPERIMENTS WITH THREE DIFFERENT MIXTURES OF OXIDES OF PLUTONIUM AND URANIUM ARE PRESENTED. THE FUEL MIXTURES CONSISTED OF URANIUM-235-DEPLETED URANIUM HOMOGENIZED WITH 8.15, AND 30 WT% PLUTONIUM AND BLENDED, HOMOGENEOUSLY, WITH POLYSTYRENE TO ACHIEVE HYDROGEN TO PLUTONIUM PLUS URANIUM ATOMIC RATIOS OF 7, 3, AND 3, RESPECTIVELY. CRITICAL SIZES ARE GIVEN FOR RECTANGULAR PARALLELEPIPEDS OF EACH OF THE FUELS FULLY REFLECTED WITH A METHACRYLATE PLASTIC (PLEXIGLAS). CRITICAL SIZES ARE ALSO GIVEN FOR UNREFLECTED PARALLELEPIPEDS OF THE 30-WT% PLUTONIUM-ENRICHED FUEL MIXTURE. FOR THE 30-WT% PLUTONIUM-ENRICHED MIXTURE, SUFFICIENT FUEL WAS AVAILABLE TO PERMIT DETERMINING THAT THE CRITICAL THICKNESS OF A FULLY REFLECTED SLAB OF THIS MATERIAL, INFINITE IN TWO DIMENSIONS, WAS 12.93 ± 0.14 CM.

COMPARISONS WERE MADE BETWEEN THE CRITICAL ASSEMBLIES AND CALCULATIONAL RESULTS USING ENDF/B- III CROSS SECTIONS AND THE KENO AND DTF-IV COMPUTE CODES. WHEREVER COMPARISONS COULD BE MADE, THE DTF-IV AND KENO RESULTS WERE WITHIN 1% OF EACH OTHER; HOWEVER, SOME OF THE COMPARISONS BETWEEN CALCULATIONS AND EXPERIMENTS DIFFERED BY 2 TO 3% IN K(EFF).

1454 ID-NUMBER ID-NUMBER 1454

AUTHOR PELLARIN, D. J. / JARRIEL, J. L.
 TITLE PULSED REACTIVITY MEASUREMENTS OF LARGE URANIUM-235-ALUMINUM CASTINGS IN
 WATER
 REPORT NUMBER.... TANSO, 27, 413-415
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED .. 77-11-00
 SITE/PROGRAM SAVANNAH RIVER - LARGE URANIUM-ALUMINUM FUEL FORMS IN WATER

ABSTRACT

THE MARGIN OF ERROR IN REACTIVITY CALCULATIONS WITH KENO-IV WAS INVESTIGATED OVER A WIDE RANGE OF SUBCRITICAL REACTIVITIES FOR WATER-MODERATED LATTICES OF MASSIVE, HIGHLY ENRICHED URANIUM-235- ALUMINUM ALLOY FUEL FORMS. A PREVIOUS PAPER DESCRIBES PULSED REACTIVITY MEASUREMENTS AND CALCULATIONS FOR REGULARLY SPACED, RECTANGULAR, SUBCRITICAL ARRAYS OF LARGE ALLOY (1.94 KG URANIUM- 235 PER FOOT) FUEL CASTINGS IN WATER. IN THIS PAPER, THE MEASUREMENTS ARE EXTENDED TO CASTINGS WITH 5.30 KG URANIUM-235 PER FOOT. THE PULSED EXPERIMENTS ARE MORE ACCURATELY ANALYZED, AND THE MEASUREMENTS FOR BOTH 7-ASSEMBLY HEXAGONAL AND 2 X 3 SQUARE PITCH ARE COMPARED WITH KENO-IV CALCULATIONS.

1455 ID-NUMBER ID-NUMBER 1455

AUTHOR PELLARIN, D. J. / JARRIEL, J. L.
 TITLE PULSED REACTIVITY MEASUREMENTS OF LARGE URANIUM-235-ALUMINUM CASTINGS IN
 WATER
 REPORT NUMBER.... DP-MS-77-49
 DATE PUBLISHED .. 77-11-27
 SITE/PROGRAM SAVANNAH RIVER - LARGE URANIUM-ALUMINUM FUEL FORMS IN WATER

ABSTRACT

THE MARGIN OF ERROR IN REACTIVITY CALCULATIONS WITH KENO-IV WAS INVESTIGATED OVER A WIDE RANGE OF SUBCRITICAL REACTIVITIES FOR WATER-MODERATED LATTICES OF MASSIVE, HIGHLY ENRICHED URANIUM-235- ALUMINUM ALLOY FUEL FORMS. A PREVIOUS PAPER DESCRIBES PULSED REACTIVITY MEASUREMENTS AND CALCULATIONS FOR REGULARLY SPACED, RECTANGULAR, SUBCRITICAL ARRAYS OF LARGE ALLOY (1.94 KG URANIUM- 235 PER FOOT) FUEL CASTINGS IN WATER. IN THIS PAPER, THE MEASUREMENTS ARE EXTENDED TO CASTINGS WITH 5.30 KG URANIUM-235 PER FOOT. THE PULSED EXPERIMENTS ARE MORE ACCURATELY ANALYZED, AND THE MEASUREMENTS FOR BOTH 7-ASSEMBLY HEXAGONAL AND 2 X 3 SQUARE PITCH ARE COMPARED WITH KENO-IV CALCULATIONS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1456 ID-NUMBER ID-NUMBER 1456

AUTHOR BIERMAN, S. R. / CLAYTON, E. D.
 TITLE CRITICAL SEPARATION BETWEEN SUBCRITICAL CLUSTERS OF 2.35 WT% URANIUM-235
 ENRICHED URANIUM DIOXIDE RODS IN WATER WITH FIXED NEUTRON POISONS
 REPORT NUMBER..... TANSO, 27, 422-424
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 77-11-00
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

AN EXPERIMENTAL PROGRAM WAS INITIATED DURING THE PAST YEAR AT THE BATTELLE-OPERATED CRITICAL MASS LABORATORY TO OBTAIN CONFIRMATORY, BENCHMARK-TYPE CRITICALITY DATA ON CONDITIONS TYPICALLY PRESENT IN FUEL ELEMENT STORAGE FACILITIES AND SHIPPING CASKS. THE RESULTS OF THE INITIAL SERIES OF MEASUREMENTS WITH 2.35 WT% URANIUM-235 ENRICHED URANIUM DIOXIDE RODS IN WATER ARE COVERED IN THIS PAPER.

1457 ID-NUMBER ID-NUMBER 1457

AUTHOR DURST, B. M. / BIERMAN, S. R. / CLAYTON, E. D.
 TITLE BENCHMARK CALCULATIONS FOR SUBCRITICAL CLUSTERS OF 2.35 WT% URANIUM-235
 ENRICHED URANIUM DIOXIDE RODS IN WATER WITH FIXED NEUTRON POISONS
 REPORT NUMBER..... TANSO, 27, 424-425
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 77-11-00
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

A SERIES OF EXPERIMENTS WAS PERFORMED RECENTLY AT THE BATTELLE-OPERATED CRITICAL MASS LABORATORY TO PROVIDE BENCHMARK-TYPE CRITICALITY DATA FOR SHIPPING CASKS USED IN TRANSPORTING LWR- TYPE FUELS. IN CONJUNCTION WITH THE EXPERIMENTS, A SERIES OF CALCULATIONS WAS ALSO PERFORMED FOR THE PURPOSE OF CORRELATING THE EXPERIMENTS WITH THEORY AND FOR CODE AND CROSS-SECTION VALIDATION. THIS PAPER SUMMARIZES THE RESULTS OF THESE BENCHMARK CALCULATIONS.

1460 ID-NUMBER ID-NUMBER 1460

AUTHOR PAXTON, H. C.
 TITLE EXPERIMENTAL CRITICALITY SPECIFICATIONS, AN ANNOTATED BIBLIOGRAPHY THROUGH
 1976
 REPORT NUMBER..... LA-UR-77-684
 DATE PUBLISHED ... 77-00-00
 SITE/PROGRAM BIBLIOGRAPHIC INFORMATION

ABSTRACT

THIS COMPILATION GIVES SOURCES OF EXPERIMENTAL CRITICAL PARAMETERS OF SYSTEMS CONTAINING URANIUM-235, URANIUM-233, AND PLUTONIUM-239. THE INTENT IS TO COVER BASIC DATA FOR CRITICALITY SAFETY APPLICATIONS. THE FOLLOWING ARE NOT INCLUDED: DESCRIPTIONS OF COMPUTATIONALLY COMPLEX REACTOR SYSTEMS, SUBCRITICAL DATA THAT DO NOT EXTRAPOLATE WELL TO CRITICALITY, AND INFORMATION FROM PERIODIC PROGRESS REPORTS OR ANS TRANSACTIONS. RESULTS OF SOME EARLY EXPERIMENTS THAT HAVE BEEN SUPPLANTED ARE INCLUDED FOR HISTORICAL INTEREST.

1461 ID-NUMBER ID-NUMBER 1461

AUTHOR BOULY, J. C. / CAIZERGUES, R. / DEILGAT, E. / HOUELLE, M. / MAUBERT, L.
 TITLE NEUTRON INTERACTION IN AIR BETWEEN CYLINDRICAL CONTAINERS HOLDING EITHER
 URANIUM OR PLUTONIUM SOLUTIONS
 REPORT NUMBER..... CEA-R-3946
 DATE PUBLISHED ... 70-03-00
 NSA-NUMBER 24:22924
 SITE/PROGRAM FRANCE - PLUTONIUM AND URANIUM SOLUTIONS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE MAIN EXPERIMENTAL RESULTS OBTAINED ON THE NEUTRON INTERACTION, IN AIR, BETWEEN CYLINDRICAL CONTAINERS FILLED WITH URANIUM AND PLUTONIUM SOLUTIONS ARE GIVEN. COMPARISONS HAVE BEEN MADE BETWEEN THE URANIUM AND THE PLUTONIUM. THE RESULTS OBTAINED FROM VARIOUS CALCULATION METHODS WERE COMPARED WITH EXPERIMENTAL DATA. INTERACTION CRITERIA WERE DRAWN UP FOR SYSTEMS OF TUBES, IN AIR, FILLED WITH URANIUM AND PLUTONIUM-CONTAINING SOLUTIONS. (AUTH).

1462 ID-NUMBER ID-NUMBER 1462

AUTHOR MIHALCZO, J. T.

TITLE GRAPHITE AND POLYETHYLENE REFLECTED URANIUM-METAL CYLINDERS AND ANNULI

REPORT NUMBER..... Y-DR-081

DATE PUBLISHED ... 72-04-28

SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

CYLINDERS AND CYLINDRICAL ANNULI OF URANIUM METAL (93.15 WT% URANIUM-235), WITH DIAMETERS VARYING FROM 7 TO 15 INCHES, WERE ASSEMBLED TO DELAYED CRITICALITY WITH GRAPHITE REFLECTORS VARYING IN THICKNESS UP TO 18 INCHES OR WITH EFFECTIVELY INFINITE THICKNESS POLYETHYLENE ON ALL OUTER SURFACES. IN ONE SERIES OF MEASUREMENTS AN EFFECTIVELY INFINITE THICKNESS POLYETHYLENE WAS ALSO PLACED ADJACENT TO ONLY ONE FLAT SURFACE OF THE CYLINDERS. THE MULTIPLICATION FACTOR CALCULATED BY BOTH S-N TRANSPORT THEORY AND MONTE CARLO METHODS AGREED VERY WELL WITH THE EXPERIMENTAL VALUES. AS A RESULT OF THE HIGH ORDER OF S-N AND THE LARGE NUMBER OF SPATIAL INTERVALS REQUIRED, THE COMPUTING TIME FOR THE TRANSPORT THEORY CALCULATIONS WAS A FACTOR OF 10 LARGER THAN THAT REQUIRED FOR THE MONTE CARLO CALCULATIONS WITH STANDARD DEVIATIONS OF 1% (AUTH).

1463 ID-NUMBER ID-NUMBER 1463

AUTHOR BRETON, D. / LECORCHE, P. / CLOUET D'ORVAL, C.

TITLE CRITICALITY STUDIES

REPORT NUMBER..... GENEVA-3, 13, 234-243

CONFERENCE THIRD UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 31 AUGUST - 9 SEPTEMBER 1964

DATE PUBLISHED ... 64-09-00

SITE/PROGRAM FRANCE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

CRITICALITY STUDIES CARRIED OUT BY THE FRENCH ATOMIC ENERGY COMMISSION DEAL ON THE ONE HAND WITH EXPERIMENTS ON PLUTONIUM AND ENRICHED URANIUM SOLUTIONS AND ON THE OTHER HAND WITH THEORETICAL WORK ON THE DEVELOPMENT AND USE OF COMPUTATION METHODS FOR THE RESOLUTION OF THE NUCLEAR SAFETY PROBLEMS OF CHEMICAL AND METALLURGICAL PLANTS.

SINCE 1958, THE EXPERIMENTAL STUDIES HAVE BEEN FOCUSED ON HOMOGENEOUS MEDIA COMPOSED OF A FISSILE SALT DISSOLVED IN LIGHT WATER. DEVELOPED ON THE PROSERPINE REACTOR, THE EXPERIMENTS WERE CONTINUED AT SACLAY ON THE ALECTO ASSEMBLIES, WHERE SOLUTIONS OF PLUTONIUM OR OF 90%-ENRICHED URANIUM CAN BE MADE CRITICAL. THE RESULTS ALREADY OBTAINED RELATE TO CRITICAL MASSES OF CYLINDRICAL TANKS OF VARIOUS DIAMETERS BETWEEN 20 AND 50 CM, REFLECTED IN SEVERAL WAYS (BY WATER, CONCRETE, ETC.) AT CONCENTRATIONS OF UP TO 100 GRAMS PER LITER. PHYSICAL MEASUREMENTS (SPECTRA, REACTOR NOISES) AND INTERACTION MEASUREMENTS SUPPLEMENT THE CHEMICAL RESULTS.

OTHER EXPERIMENTS ON PLUTONIUM SOLUTIONS WERE BEGUN IN 1963 AT THE VALDUC CENTRE. THEY DEAL WITH THE STUDY OF CRITICAL MASSES OF SOLUTIONS KEPT IN ANNULAR VESSELS OF 50 CM EXTERNAL DIAMETER AND WITH AN INTERNAL DIAMETER OF FROM 10 TO 30 CM. THESE VESSELS CAN BE REFLECTED WITH WATER, EITHER INTERNALLY, OR EXTERNALLY, OR BOTH INTERNALLY AND EXTERNALLY. THE INTERACTION OF TWO SUCH VESSELS HAS BEEN STUDIED FOR VARIOUS GEOMETRIES.

SLABS OF VARIOUS THICKNESSES WERE ALSO STUDIED.

THE STUDIES CARRIED OUT HAVE ENABLED METHODS OF COMPUTATION TO BE PERFECTED WHICH HAVE BEEN TRIED OUT IN A NUMBER OF PRACTICAL WAYS. PARTICULAR USE WAS MADE OF THE POTENTIALITIES OF CALCULATIONS BASED ON TRANSPORT THEORY AND ON THE MONTE-CARLO METHOD.

ALL THESE THEORETICAL STUDIES FIND APPLICATION IN THE DESIGN AND CONTROL OF INDUSTRIAL PLANTS FROM THE SAFETY ANGLE.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1468 ID-NUMBER ID-NUMBER 1468

AUTHOR CROSS, N. F. / WESTFALL, R. M. / TURNBULL, K. R. / FOX, P. B.
 TITLE VALIDATION OF CRITICALITY SAFETY BROAD-GROUP LIBRARY USING URANIUM SYSTEMS
 REPORT NUMBER..... TANSO, 27, 406-407
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 77-11-00
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

THE PERFORMANCE OF A BROAD-GROUP NEUTRON CROSS-SECTION LIBRARY BEING DEVELOPED AS A STANDARD FOR CRITICALITY SAFETY CALCULATIONS HAS BEEN EVALUATED USING SEVERAL CRITICAL URANIUM SYSTEMS. THE PRIMARY EFFORT WAS DIRECTED TOWARD THE EVALUATION OF CLEAN AND BORATED WATER-MODERATED, LOW- ENRICHED LATTICES OF URANIUM METAL OR URANIUM OXIDE RODS. A SET OF URANIUM SOLUTION EXPERIMENTS OVER A WIDE RANGE OF HYDROGEN TO URANIUM-235 RATIOS WAS ALSO EVALUATED.

1469 ID-NUMBER ID-NUMBER 1469

AUTHOR LOEWENSTEIN, W. B. / MENEGHETTI, D.
 TITLE A DESCRIPTION OF INTEGRAL PHYSICS DATA FOR FAST REACTOR DESIGN
 REPORT NUMBER..... ANL-6382
 DATE PUBLISHED ... 61-07-00
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

THIS SURVEY IS INTENDED AS AN ORIENTATION FOR PERSONS WHO ARE UNFAMILIAR WITH THE DETAILED DATA IN THE FIELD OF FAST REACTOR DESIGN. REQUIRED INTEGRAL PHYSICS DATA ARE DESCRIBED.

THE MAJOR EMPHASIS IN THE DESCRIPTION CENTERS ABOUT EXPERIMENTAL DATA. COMPARISONS BETWEEN THEORY AND EXPERIMENT ARE ALSO DESCRIBED. THE LATTER ARE LIMITED TO "TRENDS" OBSERVED BY MANY ANALYSTS. THE EXPERIMENTAL DATA ARE REFERENCED. IN ADDITION, A SELECTED LIST OF REFERENCES PERTAINING TO CALCULATIONAL AND THEORETICAL INTERPRETATION IS GIVEN. (AUTH).

1473 ID-NUMBER ID-NUMBER 1473

AUTHOR THOMAS, J. T. / FOX, J. K. / JOHNSON, E. B.
 TITLE THE EFFECT OF BOROSILICATE GLASS RASCHIG RINGS ON THE CRITICALITY OF AQUEOUS URANYL NITRATE SOLUTIONS
 REPORT NUMBER..... TANSO, 06, 171-172
 DATE PUBLISHED ... 63-11-00
 SITE/PROGRAM OAK RIDGE - URANYL(93%)NITRATE - WATER - BOROSILICATE GLASS

ABSTRACT

A STUDY HAS BEEN COMPLETED IN WHICH GLASS RASCHIG RINGS, VARYING BOTH IN DIMENSIONS AND IN BORON CONTENT, WERE IMMERSSED IN CYLINDERS OF DIFFERENT DIAMETERS CONTAINING ENRICHED URANYL NITRATE SOLUTIONS OF SEVERAL CONCENTRATIONS. THE URANIUM-235 ENRICHMENT WAS 92.6%

1474 ID-NUMBER ID-NUMBER 1474

AUTHOR PLUMLEE, K. E. / BAIRD, Q. L. / STANFORD, G. S. / AMUNDSON, P. I.
 TITLE CRITICAL EXPERIMENTS WITH BORAX-V SUPERHEATER ELEMENTS
 REPORT NUMBER..... TANSO, 06, 217
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 63-11-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-7

ABSTRACT

A CRITICAL EXPERIMENT WAS PERFORMED AT ROOM TEMPERATURE WITH 12 BORAX-V SUPERHEATER FUEL ELEMENTS SURROUNDED BY A PERIPHERAL REGION CONTAINING 1228-1525 URANIUM DIOXIDE FUEL PINS. MEASUREMENTS WERE NEEDED TO SUPPLEMENT THE AVAILABLE COMPUTATIONAL INFORMATION SINCE THE NEUTRON ENERGY SPECTRUM, EFFECTIVE NEUTRON CROSS SECTIONS, FLUX INTENSITY AND POWER PRODUCTION ARE POORLY DEFINED BY THEORY NEAR INTERFACES SUCH AS THAT BETWEEN THE SUPERHEATER AND THE PERIPHERAL REGION, AND ALSO IN THE PRESENCE OF VOIDS SUCH AS EXIST IN THE SUPERHEATER REGION (26% VOID).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE EXPERIMENT WAS PERFORMED IN THE ZPR-7 EXPERIMENTAL FACILITY AT ARGONNE.

1475 ID-NUMBER ID-NUMBER 1475

AUTHOR MIHALCZO, J. T.
 TITLE CRITICAL EXPERIMENTS AND CALCULATIONS WITH ANNULAR CYLINDERS OF URANIUM(93.2) METAL
 REPORT NUMBER..... TANSO, 06, 217-218
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 63-11-00
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS WITH ANNULAR CYLINDERS OF URANIUM METAL HAS BEEN PERFORMED AT THE ORNL CRITICAL EXPERIMENTS FACILITY TO DETERMINE THE ADEQUACY OF THE S-N METHOD OF SOLVING THE TRANSPORT EQUATION FOR THIS GEOMETRY. THE URANIUM HAS A DENSITY OF 18.76 G/CC AND IS ENRICHED TO 93.2% IN THE URANIUM-235 ISOTOPE. UNREFLECTED ANNULI WITH OUTSIDE DIAMETERS AS LARGE AS 15 INCHES AND INSIDE DIAMETERS AS SMALL AS 7 INCHES HAVE BEEN ASSEMBLED TO DELAYED CRITICAL, AND THE PROMPT-NEUTRON DECAY CONSTANT HAS BEEN MEASURED BY THE ROSSI-ALPHA TECHNIQUE. THE RESULTING VALUES OF THE DECAY CONSTANT, TOGETHER WITH THE MEASURED MULTIPLICATION CONSTANT OF THE VARIOUS ASSEMBLIES, ARE SHOWN.

1476 ID-NUMBER ID-NUMBER 1476

AUTHOR WARZEK, F. G. / JOHNSTON, H. F.
 TITLE CLUMPED LIGHT-WATER-MODERATED URANIUM DIOXIDE SUPERHEAT CRITICALS: PART 1, EXPERIMENTS
 REPORT NUMBER..... TANSO, 06, 219-220
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 63-11-00
 SITE/PROGRAM GENERAL ELECTRIC CO., VALLECITOS - LOW ENRICHED URANIUM OXIDE - WATER

ABSTRACT

A SERIES OF CRITICAL AND SUBCRITICAL MEASUREMENTS WAS CONDUCTED IN GENERAL ELECTRIC'S CRITICAL EXPERIMENT FACILITY AT ITS VALLECITOS ATOMIC LABORATORY WITH SUPERHEAT FUEL IN A LATTICE SIMULATING THE ESADA-VALLECITOS EXPERIMENTAL SUPERHEAT REACTOR (EVESR). THE EVESR, A SEPARATE SUPERHEAT REACTOR, IS BEING BUILT BY GENERAL ELECTRIC UNDER THE JOINT SPONSORSHIP OF GENERAL ELECTRIC AND EMPIRE STATES ATOMIC DEVELOPMENT ASSOCIATES. THE FUEL UTILIZED FOR THE CRITICAL EXPERIMENTS WAS FABRICATED FOR A PRIOR AEC-SPONSORED CRITICAL EXPERIMENT PROGRAM. ALTHOUGH THE EVESR FUEL HAS SLIGHTLY DIFFERENT DIMENSIONS, ENRICHMENTS, AND CLADDING MATERIALS, THE BASIC FUEL GEOMETRY IS IDENTICAL TO THE AEC FUEL.

THE MEASUREMENTS PERFORMED CAN BE GROUPED IN THREE CATEGORIES: 1. REACTIVITY MEASUREMENTS WITH NO CONTROL RODS. 2. FULL CORE REACTIVITY MEASUREMENTS WITH CONTROL RODS PRESENT. 3. POWER-DISTRIBUTION MEASUREMENTS IN THE FULL CORE WITH CONTROL RODS PRESENT.

1477 ID-NUMBER ID-NUMBER 1477

AUTHOR PETERSEN, G. T.
 TITLE CLUMPED LIGHT-WATER-MODERATED URANIUM DIOXIDE SUPERHEAT CRITICALS: PART 2, ANALYSES
 REPORT NUMBER..... TANSO, 06, 220-221
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 63-11-00
 SITE/PROGRAM GENERAL ELECTRIC CO., VALLECITOS - LOW ENRICHED URANIUM OXIDE - WATER

ABSTRACT

CRITICAL AND SUBCRITICAL MEASUREMENTS WERE CONDUCTED AS DESCRIBED IN THE PRECEDING PAPER (IDN 1476). THE RESULTING MEASUREMENTS HAVE BEEN COMPARED TO THE PREDICTIONS OF A PHYSICS DESIGN MODEL WHICH HAS DEMONSTRATED GOOD ACCURACY IN TREATING UNIFORM ARRAYS OF THE SAME FUEL.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1478 ID-NUMBER ID-NUMBER 1478

AUTHOR WEINSTEIN, S. / FEINER, F.
 TITLE REACTIVITY WORTH OF TRANSVERSE GAPS
 REPORT NUMBER.... TANSO, 06, 221
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 63-11-00
 SITE/PROGRAM GENERAL ELECTRIC CO., KNOX ATOMIC POWER LABORATORY - SOLID HOMOGENEOUS ASSEMBLY (SHA)

ABSTRACT

A SERIES OF EXPERIMENTS ON THE REACTIVITY WORTH OF GAPS HAS BEEN PERFORMED IN THE SOLID HOMOGENEOUS ASSEMBLY (SHA). THE OBJECTIVE OF THE PROGRAM IS TO PROVIDE DATA AGAINST WHICH CALCULATIONAL MODELS CAN BE CHECKED. AN IMMEDIATE GOAL IS TO DEVELOP A METHOD BY WHICH LARGE VOID REGIONS CAN BE ADEQUATELY TREATED WITHIN THE FRAMEWORK OF DIFFUSION THEORY. THIS WOULD ENABLE THE NUCLEAR ENGINEER TO PERFORM STANDARD DESIGN CALCULATIONS ON SYSTEMS CONTAINING SUCH VOIDS.

THE EXPERIMENTAL PROCEDURE CONSISTS SIMPLY OF ADDING FUEL BLOCKS AXIALLY TO AN UNREFLECTED SHA CORE AND OF DETERMINING THE HALVES SEPARATION AT WHICH THE ASSEMBLY GOES CRITICAL. THE MAXIMUM CORE LENGTH ATTAINABLE IS LIMITED BY NUCLEAR-SAFETY CONSIDERATIONS SINCE ULTIMATELY THE ASSEMBLY WILL BE INADEQUATELY SHUT DOWN EVEN WITH THE HALVES APART.

1479 ID-NUMBER ID-NUMBER 1479

AUTHOR ADERHOLD, H. C. / BERG, S. S. / CLARK, D. D. / FEHR, E. B. / SHAW, R. A.
 TITLE RESULTS OF INITIAL EXPERIMENTS ON THE CORNELL ZERO-POWER-REACTOR CORES
 REPORT NUMBER.... TANSO, 06, 223-225
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 63-11-00
 SITE/PROGRAM CORNELL - ZERO POWER REACTOR CORES

ABSTRACT

THE CORNELL ZERO POWER REACTOR CORES ARE GENERICALLY RELATED TO NORMAL WATER LATTICES STUDIED EARLIER AT BETTIS AND BROOKHAVEN. THE CORNELL CORES HAVE AN HEXAGONAL PATTERN AND NOMINAL WATER-TO- FUEL RATIOS OF 1:1, 1.5:1, 2:1, 3:1, AND 4:1. THE FUEL IS URANIUM DIOXIDE, DENSITY OF 10.38 G/CC, ENRICHED TO 2.094 ATOM PERCENT. THE ACTIVE COLUMN IN EACH FUEL ROD IS 48 INCHES HIGH AND 0.600 INCHES IN DIAMETER. THE FUEL COLUMNS ARE INSIDE ALUMINUM TUBES OF 0.666-INCH-OD AND 0.028-INCH WALL. EACH CONTROL ROD IS CONSTRUCTED AS A CLUSTER OF 3 FUEL-POISON CONTROL ELEMENTS. THE TOP HALF OF EACH CONTROL ELEMENT IS BORON CARBIDE PACKED INTO A 0.666-INCH-OD ALUMINUM TUBE; THE BOTTOM HALF OF THE CONTROL ELEMENT IS A STANDARD FUEL-COLUMN LOADING. THESE CONTROL ELEMENTS MAY BE SUBSTITUTED FOR FUEL RODS AT ANY DESIRED LOCATIONS IN THE LATTICE; WHEN THEY ARE FULLY WITHDRAWN, THE LATTICE IS COMPLETELY UNIFORM.

THE EXPERIMENTAL PROGRAM INCLUDED FINDING THE CRITICAL BUCKLING FROM FOIL TRAVERSES, THE GOLD/CADMIUM RATIOS IN THE FUEL AND THE MODERATOR, THE MANGANESE/CADMIUM RATIO IN THE MODERATOR, THE PERIPHERAL FUEL-ROD WORTH, THE WORTH OF A WATER GAP LEFT IN THE REACTOR BY REMOVING THE CENTRAL FUEL ROD, AND THE WORTHS OF A SINGLE CONTROL ELEMENT AND OF A CLUSTER OF THREE CONTROL ELEMENTS IN THE CENTER OF THE REACTOR.

1480 ID-NUMBER ID-NUMBER 1480

AUTHOR CAMPBELL, R. W. / GUZZLE, T. L. / PASCHALL, R. K.
 TITLE EXPONENTIAL EXPERIMENTS IN URANIUM-DIPHENYL LATTICES
 REPORT NUMBER.... TANSO, 04, 047-048
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM ATOMICS INTERNATIONAL - ORGANIC MODERATED REACTOR

ABSTRACT

MATERIAL BUCKLING AND THERMAL UTILIZATION MEASUREMENTS HAVE BEEN MADE FOR A SERIES OF DIPHENYL- MODERATED, URANIUM METAL EXPONENTIAL ASSEMBLIES IN ORDER TO PROVIDE EXPERIMENTAL DATA FOR SIMPLE LATTICES WHICH CAN BE TREATED MOST READILY BY ANALYTICAL MEANS. MATERIAL BUCKLINGS HAVE BEEN REPORTED EARLIER, AND THESE MEASUREMENTS INDICATED THAT A POSITIVE BUCKLING IS POSSIBLE FOR A SQUARE ARRAY OF 1 INCH DIAM NATURAL URANIUM FUEL RODS SPACED TO GIVE A MODERATOR TO FUEL RATIO OF APPROXIMATELY 3.5:1. CONSIDERABLE DOUBT IS CAST ON THE VALIDITY OF THESE DATA DUE TO THE PRESENCE OF CONSIDERABLE EPITHERMAL LEAKAGE INTO THE EXPONENTIAL ASSEMBLY. TO ELIMINATE THIS UNCERTAINTY, MEASUREMENTS HAVE NOW BEEN REPEATED FOR ONE LATTICE SPACING OF NATURAL URANIUM FUEL ELEMENTS. THERMAL UTILIZATIONS WERE DETERMINED FOR SEVERAL ADDITIONAL SQUARE LATTICE SPACINGS WITH FUEL ENRICHMENTS OF 0.496 (DEPLETED), 0.721 (NATURAL), AND 0.912 (ENRICHED) A/O URANIUM-235.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1481 ID-NUMBER ID-NUMBER 1481

AUTHOR BAUMANN, N. P. / HENNELLY, E. J.
 TITLE BUCKLING MEASUREMENTS OF HEAVY-WATER MODERATED CLUSTERS OF NATURAL URANIUM
 OXIDE RODS
 REPORT NUMBER..... TANSO, 04, 048-049
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES
 IN HEAVY WATER

ABSTRACT

BUCKLING MEASUREMENTS HAVE BEEN MADE ON LATTICES OF SWEDISH R-3/ADAM FUEL ASSEMBLIES IN THE SAVANNAH RIVER CRITICAL FACILITY, THE PDP, AND THE HIGH TEMPERATURE EXPONENTIAL FACILITY, THE PSE. THE R-3/ADAM FUEL WAS IN THE FORM OF SINTERED PELLETS OF NATURAL URANIUM OXIDE 1.70 CM IN DIAMETER WITH A DENSITY OF 10.32 G/CC AVERAGED OVER THE ACTIVE LENGTH OF THE ROD. THE PELLETS WERE CONTAINED IN ZIRCALOY-2 TUBES 1.72 CM ID, 1.86 CM OD, AND 75 CM LONG. EACH CLUSTER CONSISTED OF 19 SUCH RODS IN A HEXAGONAL ARRAY WITH A CENTER-TO-CENTER SPACING OF 2.11 CM, EXCEPT THAT THE SIX RODS ON THE FLATS OF THE OUTER HEXAGONAL RING WERE DISPLACED RADIALLY OUTWARD AN ADDITIONAL 0.29 CM.

1482 ID-NUMBER ID-NUMBER 1482

AUTHOR WINDSOR, H. / PHELPS, J. / CONANT, J.
 TITLE CEPFR-1C MEASUREMENTS AND ASSEMBLY DESCRIPTION
 REPORT NUMBER..... BNL-RP-09 (F)
 DATE PUBLISHED ... 69-10-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - PULSED FAST REACTOR EXPERIMENT

ABSTRACT

THE THIRD SET OF ASSEMBLIES TAKEN CRITICAL IN THE EXPERIMENT FOR THE PULSED FAST REACTOR HAD CORES COMPOSED OF 26 VOLUME PERCENT URANIUM (93 PERCENT ENRICHED), 41 VOLUME PERCENT STAINLESS STEEL, 14 VOLUME PERCENT ALUMINUM, AND 19 VOLUME PERCENT VOID. THEY WERE REFLECTED BY AT LEAST 12 INCHES OF STAINLESS STEEL EXCEPT FOR AN OPEN CORE FACE.

THE EXPERIMENTAL EMPHASIS INVOLVED REFLECTOR BLOCK MEASUREMENTS FOR VARIOUS SIZES AND COMPOSITIONS OF A BLOCK WHICH COVERED A VARIABLE WIDTH OPEN CORE FACE. NEUTRON LIFETIMES, CORE LOADINGS, CORE VOLUMES, AND VARIOUS OPERATING CHARACTERISTICS WERE ALSO MEASURED. A DESCRIPTION OF THE ASSEMBLIES IS GIVEN IN THE APPENDIX. (AUTH).

1483 ID-NUMBER ID-NUMBER 1483

AUTHOR PALMEDO, P. F. / WEINSTOCK, E. V.
 TITLE PRELIMINARY FAST REACTOR HETEROGENEITY STUDIES IN FS-1
 REPORT NUMBER..... BNL-RP-02 (F)
 DATE PUBLISHED ... 69-08-27
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - FAST SOURCE ASSEMBLY

ABSTRACT

A PRELIMINARY SERIES OF HETEROGENEITY STUDIES HAS BEEN PERFORMED ON TEST CELLS IN THE CORE OF THE BROOKHAVEN FAST SOURCE ASSEMBLY, FS-1. URANIUM-235 AND URANIUM-238 FISSION FOILS WERE USED TO STUDY TRANSIENT EFFECTS IN CELLS OF ENRICHED URANIUM, STEEL, AND GRAPHITE. SPATIAL AND SPECTRAL EQUILIBRIA WERE FOUND TO BE ESTABLISHED WITHIN 1 CM OF THE SURFACE OF THE TEST CELL. (AUTH).

1484 ID-NUMBER ID-NUMBER 1484

AUTHOR MOSS, L. I. / PODEWELTZ, C. M. / RANDALL, R. L. / SHAPIRO, J. L. / WIMMER,
 R. E.
 TITLE ANALYTICAL AND EXPERIMENTAL RESULTS FOR A COMPACT, ZIRCONIUM HYDRIDE
 MODERATED CRITICAL ASSEMBLY
 REPORT NUMBER..... TANSO, 04, 053-054
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM ATOMICS INTERNATIONAL - SNAP CORES (ZIRCONIUM HYDRIDE)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE SNAP CRITICAL ASSEMBLY-2 (SCA-2) IS A SOLID, HOMOGENEOUS REACTOR USED AS A RESEARCH AND DEVELOPMENT TOOL IN THE DESIGN OF COMPACT POWER REACTORS. THE CORE IS BUILT UP OF 7-INCH DIAM, .75 INCH THICK PLATES OF URANIUM-ZIRCONIUM HYDRIDE. VARIOUS REFLECTOR MATERIALS INCLUDING BERYLLIUM, NICKEL, AND PLASTIC HAVE BEEN USED. SINCE THIS REACTOR HAS A CLEAN, HOMOGENEOUS CORE AND SIMPLE CYLINDRICAL GEOMETRY IT IS WELL SUITED FOR COMPARING THEORY AND EXPERIMENT.

1485 ID-NUMBER ID-NUMBER 1485

AUTHOR GILLEY, L. W. / THOMAS, J. T.
 TITLE CRITICAL ARRAYS OF NEUTRON INTERACTING UNITS
 REPORT NUMBER.... TANSO, 04, 054-055
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS USING AS MANY AS 100 SUBCRITICAL VESSELS OF URANIUM-235- ENRICHED URANYL NITRATE SOLUTION HAS BEEN PERFORMED WITH THE UNITS ASSEMBLED IN UNREFLECTED AND UNMODERATED ARRAYS. THE PROBLEM OF NEUTRON INTERACTION BETWEEN UNITS IN STORAGE ARRAYS IS A COMPLEX ONE FOR WHICH AN ADEQUATE THEORY DOES NOT EXIST. IT IS INTENDED THAT THE DATA PRESENTED HERE WILL SUPPORT ANALYSES OF SUCH INTERACTION PROBLEMS IN GENERAL AND WILL PROVIDE BASES FOR SAFE STORAGE AND TRANSPORTATION OF THESE PARTICULAR VESSELS WHICH ARE WIDELY USED IN INDUSTRY.

1486 ID-NUMBER ID-NUMBER 1486

AUTHOR PITTERLE, T. A. / PAGE, E. M. / YAMAMOTO, M.
 TITLE CALCULATIONS OF FAST CRITICAL EXPERIMENTS USING ENDF/B DATA AND A MODIFIED, ENDF/B DATA FILE
 REPORT NUMBER.... CONF-660303
 CONFERENCE SECOND CONFERENCE ON NEUTRON CROSS SECTION TECHNOLOGY, WASHINGTON, D. C., 4-7 MARCH 1968
 DATE PUBLISHED ... 68-03-04
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS ; ARGONNE NATIONAL LABORATORY - ZPR-6 - CALCULATIONS

ABSTRACT

THIS PAPER PRESENTS CALCULATIONS OF THE PLUTONIUM-239 FUELED ZPR-3 ASSEMBLY 48 AND THE URANIUM-235 FUELED ZPR-6 ASSEMBLY 2 USING TWO CROSS SECTION DATA FILES - THE RECENTLY COMPILED ENDF/B DATA FILE AND A MODIFIED ENDF/B DATA FILE. MODIFICATIONS MADE TO THE ENDF/B FILE INCORPORATE SOME OF THE SIGNIFICANT CROSS SECTION UNCERTAINTIES IMPORTANT TO FAST REACTORS. THE MODIFIED DATA FILE INCLUDES THE FOLLOWING DIFFERENCES FROM THE ENDF/B DATA: PRIMARY EMPHASIS FOR FISSION CROSS SECTIONS OTHER THAN FOR URANIUM-235 IS PLACED ON THE EVALUATION OF FISSION CROSS SECTION RATIO MEASUREMENTS ABOVE 15 KEV; ALL FISSION CROSS SECTIONS ABOVE 2.5 MEV INCORPORATE THE RECENT CORRECTIONS FOR INELASTIC SCATTERING BY HANSEN ET AL TO THE URANIUM-235 FISSION CROSS SECTION; HIGHER ALPHA VALUES ARE USED FOR PLUTONIUM-239 BELOW 20 KEV; LOWER CAPTURE AND MODIFIED INELASTIC CROSS SECTIONS ARE USED FOR URANIUM-238; RESONANCE PARAMETERS ARE USED TO CALCULATE THE IRON CAPTURE CROSS SECTION BELOW 50 KEV; CHROMIUM CAPTURE AND INELASTIC CROSS SECTIONS WERE RE-EVALUATED; A J=2 SPIN STATE IS ASSUMED FOR THE 2.85 KEV RESONANCE IN SODIUM RATHER THAN THE J=1 STATE USED IN ENDF/B.

USING THE MC-2 CODE (MULTIGROUP CONSTANTS CODE), MULTIGROUP CROSS SECTIONS ARE CALCULATED WITH EACH DATA FILE FOR THE ABOVE MENTIONED ASSEMBLIES. ONE AND TWO DIMENSIONAL DIFFUSION THEORY CALCULATIONS ARE THEN COMPARED WITH EXPERIMENT FOR CRITICALITY, REACTION RATE RATIOS, MATERIAL WORTHS, AND SODIUM VOID COEFFICIENTS.

1487 ID-NUMBER ID-NUMBER 1487

AUTHOR BROOMFIELD, A. M. / AMUNDSON, P. I. / DAVEY, W. G. / GASIDLO, J. M. / HESS, A. L. / KEENEY, W. P. / LONG, J. K.
 TITLE ZPR-3 ASSEMBLY 48: STUDIES OF A DILUTE PLUTONIUM-FUELED ASSEMBLY
 REPORT NUMBER.... ANL-7320, 205-215
 CONFERENCE INTERNATIONAL CONFERENCE ON FAST CRITICAL EXPERIMENTS AND THEIR ANALYSIS, 10-13 OCTOBER 1966, ARGONNE, ILLINOIS
 DATE PUBLISHED ... 66-10-10
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

A SERIES OF RELATIVELY SIMPLE PLUTONIUM-FUELED ASSEMBLIES WITH WELL-DEGRADED SPECTRA HAS BEEN DESIGNED FOR STUDY IN ZPR-3. ASSEMBLY 48, THE FIRST IN THE SERIES, WAS CHOSEN AS THE SUBJECT OF AN INTERNATIONAL COMPARISON OF FAST REACTOR CALCULATION TECHNIQUES WHICH IS REPORTED ELSE WHERE AT THIS CONFERENCE. EACH ASSEMBLY IN THE PROPOSED PROGRAM WILL CONSIST OF A CYLINDRICAL CORE SURROUNDED BY A DEPLETED URANIUM BLANKET. IN ASSEMBLY 48 THE MATERIAL CONSTITUENTS OF THE CORE ARE LIMITED TO PLUTONIUM, DEPLETED URANIUM, SODIUM (25%), GRAPHITE, AND THE STAINLESS STEEL PRESENT IN THE STRUCTURE AND CANNING OF THE SODIUM AND PLUTONIUM PLATES. GRAPHITE IS INCLUDED TO DEGRADE THE NEUTRON SPECTRUM. THE RATIO OF URANIUM TO PLUTONIUM IN THE CORE IS 4.2.

THE PROGRAM OF MEASUREMENTS WITH ASSEMBLY 48 IS STILL IN PROGRESS. THE RESULTS OF THE CRITICAL- MASS EVALUATION, FISSION CROSS-SECTION RATIO, AND CENTRAL PERTURBATION MEASUREMENTS ARE DESCRIBED. ALSO INCLUDED ARE A BRIEF STATEMENT OF THE RESULTS OF THE NEUTRON SPECTRUM AND DOPPLER COEFFICIENT MEASUREMENTS WHICH ARE REPORTED IN MORE DETAIL ELSEWHERE IN THESE PROCEEDINGS. (AUTH).

1488 ID-NUMBER ID-NUMBER 1488

AUTHOR HOOGTERP, J. C. / ORNDOFF, J. D.
 TITLE CRITICAL MEASUREMENTS FOR THE KIWI-A NUCLEAR PROPULSION TEST REACTOR
 REPORT NUMBER..... TANSO, 04, 055
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ..: 61-06-00
 SITE/PROGRAM: LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE

ABSTRACT

THIS PRESENTATION COVERS MEASUREMENTS IN REACTOR MOCKUPS WHICH CONTRIBUTED TO THE DESIGN OF KIWI-A -- THE FIRST NUCLEAR ROCKET PROPULSION TEST REACTOR. INITIAL SURVEYS OF CRITICAL PARAMETERS AND FISSION POWER DISTRIBUTIONS, WHERE FLEXIBILITY WAS MORE IMPORTANT THAN GEOMETRIC DETAIL, WERE CONDUCTED IN THE "HONEYCOMB" MACHINE. RESULTS OF THESE SURVEYS PERMITTED DESIGN OF A PROPULSION TEST REACTOR SAVE FOR TAILORING OF FUEL-ELEMENT LOADINGS AND CONTROLS. THE "ZEPO" MACHINE, WITH FIXED GEOMETRY AND MORE REALISTIC CONTROLS, WAS USED TO FINALIZE THESE CHARACTERISTICS. A FEW ZERO- POWER MEASUREMENTS ON THE ACTUAL KIWI-A REACTOR CONFIRMED THE DATA FROM ZEPO.

1489 ID-NUMBER ID-NUMBER 1489

AUTHOR COHEN, S. C. / MOORE, R. A. / RUSSELL, J. L. / SARGIS, D. A. / SHARP, R.
 TITLE FAST CRITICAL EXPERIMENTS IN SUPPORT OF THERMIONIC REACTOR PHYSICS
 REPORT NUMBER..... GA-8767
 DATE PUBLISHED ..: 68-08-26
 SITE/PROGRAM: GENERAL ATOMICS - THERMIONIC CRITICAL EXPERIMENT

ABSTRACT

THE OBJECTIVE OF THE THERMIONIC CRITICAL EXPERIMENT IS TO COMPARE INTEGRAL NEUTRONIC DATA FROM A SERIES OF CRITICAL ASSEMBLIES WITH DETAILED NEUTRONIC CALCULATIONS AND TO CHECK ANALYTICAL METHODS AND CROSS SECTION DATA USED IN THE CORE DESIGN OF THERMIONIC SPACE POWER REACTORS. AN ORDERLY PROGRESSION OF ASSEMBLIES RANGING FROM THE VERY SIMPLE IN COMPOSITION AND CONFIGURATION TO ACTUAL ZERO-POWER MOCKUPS OF THERMIONIC REACTORS IS PLANNED. THE EARLY EXPERIMENTS WILL FEATURE BARE, HOMOGENEOUS ASSEMBLIES WHICH WILL PROVIDE CLEAN INTEGRAL DATA CONCERNING THE CROSS SECTIONS OF THERMIONIC MATERIALS. THE INTEGRAL DATA WILL BE AUGMENTED BY DIFFERENTIAL NEUTRON SPECTRUM MEASUREMENTS BY THE PULSED SOURCE, TIME-OF-FLIGHT METHOD.

ASSEMBLY NO. 1, A BARE, NEUTRONICALLY HOMOGENEOUS MIXTURE OF FULLY ENRICHED URANIUM AND POLYETHYLENE, WAS TAKEN CRITICAL ON MAY 10, 1968. THE COMPOSITION WAS CHOSEN TO PROVIDE A REASONABLY CLEAN NEUTRONIC SIMULATION OF THE NEUTRON SPECTRUM FOR A THERMIONIC REACTOR CORE REFLECTED WITH BERYLLIUM OXIDE. MEASUREMENTS COMPLETED TO DATE INCLUDE CRITICAL MASS, SUB-CRITICAL NEUTRON SPECTRUM, AND CENTRAL REACTIVITY WORTHS OF THERMIONIC REACTOR MATERIALS. THE RESULTS OF THESE INITIAL EXPERIMENTS ARE COMPARED WITH ANALYSIS.

1490 ID-NUMBER ID-NUMBER 1490

AUTHOR MOREWITZ, H. A. / CARPENTER, S. G. / EGGEN, D. T. / MYHRE, C.
 TITLE SPECIAL FEATURES OF THE ADVANCED EPITHERMAL THORIUM REACTOR CRITICAL ASSEMBLY
 REPORT NUMBER..... TANSO, 04, 055-056
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ..: 61-06-00
 SITE/PROGRAM: ATOMICS INTERNATIONAL - ADVANCED EPITHERMAL THORIUM REACTOR

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

A SPLIT-TABLE, HONEYCOMB-TYPE, CRITICAL ASSEMBLY MACHINE OF MODERN, LOW-FRICTION DESIGN HAS BEEN BUILT FOR USE WITH URANIUM-233 ASSEMBLIES IN THE INTERMEDIATE AND FAST NEUTRON SPECTRA REGIONS. STABILITY AND REPRODUCIBILITY HAVE BEEN EMPHASIZED IN THE DESIGN SO THAT ACCURATE MEASUREMENTS MAY BE OBTAINED ON SMALL SAMPLES IN THE NUCLEAR ENVIRONMENTS OF INTEREST. SPECIAL FEATURES INCLUDE A MULTIREGION, PSEUDOSPHERICAL ASSEMBLY; PERSONNEL SHIELDING; SAFETY FUSES; AND A HIGH-PRECISION OSCILLATOR SYSTEM.

1491 ID-NUMBER ID-NUMBER 1491

AUTHOR INOUE, K. / KATO, W. Y. / SUMITA, K. / IIZUMI, M. / NISHIMURA, K. / KANEKO, Y. / KOBAYASHI, S. / ET AL
 TITLE THE JAPAN ATOMIC ENERGY RESEARCH INSTITUTE SEMIHOMOGENEOUS CRITICAL ASSEMBLY
 REPORT NUMBER..... TANSO, 04, 056-057
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM JAPAN - SEMIHOMOGENEOUS CRITICAL ASSEMBLY

ABSTRACT

THE JAPAN ATOMIC ENERGY RESEARCH INSTITUTE HAS CONSTRUCTED A CRITICAL FACILITY, THE SEMIHOMOGENEOUS CRITICAL EXPERIMENT (SHE), FOR STUDIES ON GRAPHITE MODERATED ENRICHED URANIUM OXIDE THERMAL REACTORS WHICH HAVE AS MUCH AS 20% TO 30% OF THEIR FISSIONS OCCURRING IN THE RESONANCE REGION. THE SHE FACILITY IS OPERATED AT OR ABOUT ROOM TEMPERATURE AND WILL BE USED TO OBTAIN NUCLEAR PARAMETERS NECESSARY IN THE DESIGN OF A HIGH TEMPERATURE GRAPHITE MODERATED POWER REACTOR AS WELL AS FOR GENERALIZED REACTOR PHYSICS STUDIES.

1492 ID-NUMBER ID-NUMBER 1492

AUTHOR HURLEY, T. J. / FIKE, H. R. / O'NEILL, G. F.
 TITLE NATURAL URANIUM-HEAVY-WATER BUCKLINGS OVER AN EXTENDED RANGE OF PITCH AND FUEL ASSEMBLY SIZE
 REPORT NUMBER..... TANSO, 04, 103-104
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES IN HEAVY WATER

ABSTRACT

BUCKLING MEASUREMENTS ON HEAVY WATER MODERATED NATURAL URANIUM LATTICES HAVE, IN THE PAST, GENERALLY BEEN LIMITED TO HIGH BUCKLING REGIONS AND, CONSEQUENTLY, TO SMALL LATTICE PITCHES. THE FEW BUCKLINGS THAT HAVE BEEN AVAILABLE AT THE LARGER LATTICE PITCHES, AS WELL AS MOST OF THOSE AT SMALLER LATTICE PITCHES, HAVE BEEN OBTAINED USING EXPONENTIAL OR SUBSTITUTION TECHNIQUES RATHER THAN CRITICAL LATTICE STUDIES.

A SERIES OF CRITICAL MEASUREMENTS ON FULL-SCALE LATTICES HAS BEEN MADE OVER AN EXTENDED RANGE OF LATTICE PITCH AND FUEL ASSEMBLY SIZE IN THE 16-FT DIAM PROCESS DEVELOPMENT PILE (PDP) AT THE SAVANNAH RIVER LABORATORY. THE LATTICES MEASURED WERE TRIANGULAR WITH A PITCH THAT RANGED FROM 7.00 TO 21.00 INCH. THE FUEL ASSEMBLIES WERE NATURAL URANIUM METAL RODS, 1 INCH IN DIAMETER AND CLAD WITH 0.032 INCH OF ALUMINUM, WHICH WERE USED SINGLY OR IN CLUSTERS OF 3, 7, AND 19 RODS.

1493 ID-NUMBER ID-NUMBER 1493

AUTHOR GUDERJAHN, C. A.
 TITLE HETEROGENEOUS URANIUM METAL-GRAPHITE CRITICAL EXPERIMENTS
 REPORT NUMBER..... TANSO, 04, 104
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM ATOMICS INTERNATIONAL - URANIUM(2%) METAL - GRAPHITE

ABSTRACT

A SERIES OF CLEAN HETEROGENEOUS CRITICAL EXPERIMENTS WAS CARRIED OUT TO PROVIDE INFORMATION FOR NORMALIZING AND IMPROVING SODIUM GRAPHITE REACTOR CALCULATIONS. THE CRITICAL ASSEMBLY CONSISTED OF A LARGE CYLINDRICAL PILE OF REACTOR GRADE GRAPHITE 8 FT HIGH AND 12 FT IN DIAMETER. FUEL ELEMENTS WERE PLACED VERTICALLY IN A TRIANGULAR ARRAY. THE ELEMENTS CONSISTED OF THIN-WALLED ALUMINUM TUBES CONTAINING 1.97% ENRICHED URANIUM METAL HOLLOW SLUGS, EACH 1.75 OD AND 1 INCH ID. THE ASSEMBLY WAS AXIALLY UNREFLECTED AND HAD EFFECTIVELY AN INFINITE REFLECTOR THICKNESS IN THE RADIAL DIRECTION. EIGHT "Y" SHAPED CADMIUM-SILVER ALLOY CONTROL RODS WERE USED FOR CONTROLLING THE ASSEMBLY.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1494 ID-NUMBER ID-NUMBER 1494

AUTHOR WELSHANS, L. M. / JOHNSON, K. M.
 TITLE CRITICAL EXPERIMENTS ON ENRICHED URANIUM STAINLESS STEEL WATER MODERATED LATTICES
 REPORT NUMBER..... TANSO, 04, 104-106
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM MARTIN CORPORATION - ARMY NUCLEAR POWER PROGRAM

ABSTRACT

A SERIES OF 12 COLD, CLEAN CRITICAL CORES HAS BEEN STUDIED UNDER THE ARMY NUCLEAR POWER PROGRAM IN CONJUNCTION WITH THE PRESSURIZED WATER REACTOR CODE DEVELOPMENT TASK. THE PURPOSE OF THE EXPERIMENTAL PROGRAM IS TO SUPPLY DATA ON HIGHLY ENRICHED URANIUM, WATER MODERATED SYSTEMS USING STAINLESS STEEL AS CLADDING MATERIAL.

THE RESULTS CAN BE USED FOR CHECKING THE VALIDITY OF THE PHYSICAL MODELS AND CODES DEVELOPED FOR THIS TYPE OF REACTOR. IN SOME CASES THE DATA ARE OF VALUE IN DETERMINING THE PHYSICAL MODEL USED IN ANALYTICAL CALCULATIONS.

1495 ID-NUMBER ID-NUMBER 1495

AUTHOR DE VILLIERS, J. W. L. / BAIRD, Q. L. / JULIANO, J. / KELBER, C. N. / KIOSE, R. / PLUMLEE, K. E.
 TITLE CRITICAL EXPERIMENTS FOR THE PRELIMINARY DESIGN OF THE ARGONNE HIGH FLUX REACTOR, PART A
 REPORT NUMBER..... TANSO, 04, 109-110
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ARGONNE HIGH FLUX REACTOR

ABSTRACT

THE MAXIMUM AVAILABLE NEUTRON FLUX, THE FLUX TO POWER RATIOS, AND VARIOUS REACTIVITY EFFECTS FOR THE PRELIMINARY DESIGN OF THE ARGONNE HIGH FLUX REACTOR (AHFR) WERE DETERMINED FOR TWO CORE MOCKUPS IN ORDER TO SUPPLEMENT THE THEORETICAL DATA.

THE CRITICAL ASSEMBLY CONSISTED OF A 100-LITER, 50.8-CM HIGH, ANNULAR FUEL REGION ENCLOSING AN 8.2-LITER, 12.7 X 12.7-CM LIGHT WATER INTERNAL THERMAL COLUMN (I.T.C.). THE EXTERNAL RADIAL REFLECTOR CONSISTED OF BERYLLIUM BLOCKS STACKED ON PLEXIGLAS SPACERS TO YIELD APPROXIMATELY 90% BERYLLIUM, 10% WATER, AND PLEXIGLAS. THE AXIAL REFLECTORS WERE EFFECTIVELY INFINITE LIGHT WATER. THE CRITICAL MASSES FOR THE TWO CORES WERE 3.64 AND 7.25 KG 93.5% ENRICHED URANIUM-235, RESPECTIVELY, CONTAINED IN 40 FUEL CLUSTERS.

1496 ID-NUMBER ID-NUMBER 1496

AUTHOR KUCHLE, M.
 TITLE PULSED NEUTRON MEASUREMENTS ON A HEAVY WATER REACTOR AT ZERO ENERGY
 REPORT NUMBER..... IAEA-AMST.-1963, 2, 575-586
 CONFERENCE SYMPOSIUM ON EXPONENTIAL AND CRITICAL EXPERIMENTS HELD BY THE INTERNATIONAL ATOMIC ENERGY AGENCY IN AMSTERDAM, NETHERLANDS, 2-6 SEPTEMBER 1963
 DATE PUBLISHED ... 63-09-06
 SITE/PROGRAM GERMANY - HEAVY WATER

ABSTRACT

THE PULSED NEUTRON METHOD HAS ALREADY BEEN EXTENSIVELY USED FOR REACTIVITY DETERMINATIONS OF REACTORS. BUT VERY LITTLE HAS BEEN REPORTED ABOUT ITS APPLICATION TO HEAVY WATER SYSTEMS. THEREFORE OUR EXPERIMENTS OF THE FR2 MIGHT BE OF INTEREST.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1497 ID-NUMBER ID-NUMBER 1497

AUTHOR JULIANO, J. / KELBER, C. N. / PLUMLEE, K. E.
 TITLE CRITICAL EXPERIMENTS FOR THE PRELIMINARY DESIGN OF THE ARGONNE HIGH FLUX REACTOR, PART B
 REPORT NUMBER..... TANSO, 04, 110-111
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ARGONNE HIGH FLUX REACTOR

ABSTRACT

THEORETICAL NEUTRON FLUX-DISTRIBUTION OF A HOMOGENIZED IDEALIZATION OF THE ARGONNE HIGH FLUX CRITICAL (AHFCR) CORE C-1 WAS MADE AND COMPARED WITH THE EXPERIMENTAL MEASUREMENTS.

1498 ID-NUMBER ID-NUMBER 1498

AUTHOR ROSENTHAL, H. B.
 TITLE PM-1 ZERO POWER TEST EXPERIMENTAL STUDIES
 REPORT NUMBER..... TANSO, 04, 111
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM MARTIN CORPORATION - ARMY NUCLEAR POWER PROGRAM

ABSTRACT

THE PM-1 ZERO POWER TEST PROGRAM (PMZ-1) WAS CONDUCTED TO PROVIDE EXPERIMENTAL DATA TO CONFIRM AND AID IN THE ANALYTICAL DESIGN OF THE ARMY NUCLEAR POWER PROGRAM PM-1 REACTOR CORE. THE PMZ-1 MOCKUP OF THE PM-1 IS A CYLINDRICAL, HETEROGENEOUS, LIGHT-WATER-MODERATED, UNPRESSURIZED CORE CONTAINING APPROXIMATELY 29 KG OF URANIUM-235 AS HIGHLY ENRICHED URANIUM. THE 0.5-INCH OD TUBULAR FUEL ELEMENT IS A STAINLESS STEEL CLAD, URANIUM-235-STAINLESS STEEL CERMET WITH 30 INCH OF ACTIVE LENGTH AND A 0.042-INCH THICK WALL. IN ADDITION TO THE FUEL TUBES, THE CORE INCLUDES 0.5-INCH DIAM BORATED STAINLESS STEEL RODS FOR LUMPED BURNABLE POISON AND SIX STAINLESS STEEL CLAD EUROPIUM OXIDE, Y-SHAPED CONTROL RODS. CRITICAL EXPERIMENT AND SCRAM RODS ARE CYLINDRICAL STAINLESS STEEL CLAD BORON CARBIDE RODS WHICH TRAVEL INSIDE FUEL TUBES.

1499 ID-NUMBER ID-NUMBER 1499

AUTHOR BALL, R. M. / MACKINNEY, A. L.
 TITLE INITIAL CRITICALITY AND EXPERIMENTS ON N. S. SAVANNAH CORE I
 REPORT NUMBER..... TANSO, 04, 112-113
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM BABCOCK AND WILCOX CO. - MERCHANT SHIP CONTRACT (URANIUM(4%)DIOXIDE - WATER)

ABSTRACT

CORE I, DESIGNED AND MANUFACTURED BY B & W FOR THE N. S. SAVANNAH PASSENGER-CARGO SHIP, WAS INSTALLED AND CHECKED AS A COMPLETE NUCLEAR UNIT AT THE COMPANY CRITICAL EXPERIMENT LABORATORY IN FEBRUARY 1960. THE FUEL CONSISTS OF URANIUM DIOXIDE PELLETS IN STAINLESS STEEL TUBES. THE OUTER 16 CANS ARE FILLED WITH 4.6% URANIUM-235 AND THE INNER 16 CANS ARE FILLED WITH 4.2% URANIUM-235. THE ACTIVE LENGTH OF THE CORE IS 66 INCH. THE FUEL PIN CLADDING IS 35-MIL THICK 304 SS WITH AN OD OF 0.500 INCH. THERE ARE 164 PINS PER ELEMENT, 32 ELEMENTS IN THE ENTIRE CORE, AND A TOTAL LOADING OF 8050 KG OF URANIUM DIOXIDE, 312 KG OF WHICH IS URANIUM-235. THE CAN WALL STRUCTURE IS ALSO 304 SS; THE INNER ZONE (16 CANS) IS 94 MILS THICK, AND THE OUTER ZONE (16 CANS) IS 109 MILS THICK

1502 ID-NUMBER ID-NUMBER 1502

AUTHOR LLOYD, R. C. / CLAYTON, E. D. /
 TITLE CRITICALITY OF PLUTONIUM-URANIUM NITRATE SOLUTIONS
 REPORT NUMBER..... NSEAO, 60, 143-146
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 76-06-00
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM NITRATE SOLUTIONS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

A SERIES OF EXPERIMENTS WAS PERFORMED PROVIDING NEW CRITICALITY DATA ON PLUTONIUM-URANIUM NITRATE SOLUTIONS IN CYLINDRICAL AND SPHERICAL GEOMETRY. FOR THE EXPERIMENTS IN CYLINDRICAL GEOMETRY, THE PLUTONIUM CONTENT OF THE TOTAL URANIUM PLUS PLUTONIUM WAS ABOUT 30 WT%; WHEREAS, IN THE CASE OF THE WATER-REFLECTED SPHERES, MEASUREMENTS WERE PERFORMED WITH BOTH 15 AND 30 WT% PLUTONIUM. THE URANIUM IN THE MIXTURE WAS SLIGHTLY DEPLETED, CONTAINING 0.66 WT% URANIUM-235. THE PLUTONIUM CONCENTRATION COVERED BY THESE EXPERIMENTS RANGE BETWEEN 12.4 TO 97.3 G PLUTONIUM/L(URANIUM PLUS PLUTONIUM CONCENTRATIONS BETWEEN 30 TO 310 G/L). THE PLUTONIUM-240 CONTENT OF THE PLUTONIUM WAS 5.6 WT% IN THE FIRST CASE AND 4.7 WT% IN THE SECOND. THE EXPERIMENTS WERE ANALYZED USING ENDF/B-III, AND GAMTEC CROSS SECTIONS. THE KENO CODE, WITH ENDF/B-III CROSS SECTIONS, AS WELL AS THE HFN CODE, PROVIDE CONSERVATIVE RESULTS ON THE CRITICALITY FACTORS FOR THESE SYSTEMS. THE AVERAGE VALUE OF THE COMPUTED K(EFF) FOR THE CYLINDERS, USING KENO, WAS 1.022, AND FOR THE SPHERES, 1.024 USING HFN. THUS, USING THESE METHODS AND CROSS-SECTION DATA, THE COMPUTED CRITICAL MASSES AND VOLUMES WOULD BE EXPECTED TO BE SMALLER THAN THOSE MEASURED BY ABOUT 2% IN TERMS OF K(EFF).

1503 ID-NUMBER ID-NUMBER 1503

AUTHOR BIERMAN, S. R./ DURST, B. M./ CLAYTON, E. D.

TITLE CRITICAL EXPERIMENTS MEASURING THE REACTIVITY WORTH OF MATERIALS COMMONLY ENCOUNTERED AS FIXED NEUTRON POISONS

REPORT NUMBER..... BNWL-2129

DATE PUBLISHED ... 76-10-00

NSA-NUMBER 7756495

SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

ABSTRACT

THERE IS A CONTINUING INTEREST IN THE USE OF FIXED NEUTRON ABSORBERS (POISONS) FOR CRITICALITY CONTROL, SINCE THEIR USE WOULD PERMIT SAFELY HANDLING LARGER QUANTITIES OF NUCLEAR MATERIALS WITH REDUCED PROBABILITY OF CRITICALITY. THE EFFECTIVENESS OF SUCH ABSORBERS AS NEUTRON POISONS DEPENDS ON SELF-SHIELDING EFFECTS WHICH IN TURN ARE DETERMINED BY THE MAGNITUDE OF THE ABSORPTION CROSS SECTIONS AND THEIR VARIATION WITH ENERGY, THE THICKNESS OF MATERIAL, AND THE NEUTRON ENERGY SPECTRUM. EXPERIMENTS WERE PREVIOUSLY PERFORMED, AND REPORTED ON, WHICH PROVIDED DATA ON THE REACTIVITY WORTHS OF COPPER AND COPPER CONTAINING 1 WT% CADMIUM AT SEVERAL THICKNESSES AND IN TWO DIFFERENT NEUTRON ENERGY SPECTRUMS. RESULTS FROM SIMILAR EXPERIMENTS USING 304-L STEEL, 304-L STEEL CONTAINING 1.1 WT% BORON, 304-L STEEL CONTAINING 1.6 WT% BORON, URANIUM DEPLETED TO 0.2 WT% URANIUM-235, BORAL, CADMIUM, AND LEAD AS FIXED POISONS AND SETS OF CLEAN, WELL DEFINED, POISONED CRITICAL ASSEMBLIES THAT CAN BE USED TO CHECK CALCULATIONAL TECHNIQUES AND CROSS SECTION DATA IN TWO DIFFERENT NEUTRON ENERGY SPECTRUMS ARE PRESENTED. THE MEASUREMENT DATA, CURRENTLY BEING REPORTED, ARE LIMITED TO A SINGLE REGION OF A GIVEN ABSORBER MATERIAL IN EACH CRITICAL ASSEMBLY. COMBINATIONS OF ABSORBER MATERIALS OR MULTI-REGIONS WERE NOT INVESTIGATED; HOWEVER, MATERIAL THICKNESSES WERE VARIED FROM ZERO UP TO ABOUT 60 MM. THE REACTIVITY WORTHS OF SEVERAL MATERIALS, COMMONLY CONSIDERED FOR USE AS EITHER FIXED NEUTRON POISONS OR BIOLOGICAL SHIELDS, HAVE BEEN MEASURED. THE RESULTS OF THESE MEASUREMENTS ARE PRESENTED IN THIS REPORT AND PROVIDE A SET OF CLEAN, WELL DEFINED, POISONED CRITICAL SECTION DATA.

ASSEMBLIES THAT CAN BE USED TO CHECK CALCULATIONAL TECHNIQUES AND CROSS TWO DIFFERENT FUELS WERE UTILIZED IN THESE MEASUREMENTS TO PROVIDE DATA ON THE RELATIVE WORTHS OF THE FOLLOWING MATERIALS IN SYSTEMS OF DIFFERING NEUTRON ENERGY SPECTRUM: 304-L STEEL, 304-L STEEL CONTAINING 1.1 WT% BORON, 304-L STEEL CONTAINING 1.6 WT% BORON, URANIUM DEPLETED TO 0.2 WT% URANIUM-235, BORAL, CADMIUM, AND LEAD. BOTH SETS OF FUEL WERE HOMOGENEOUS MIXTURES OF PLUTONIUM-DIOXIDE, URANIUM-DIOXIDE WITH POLYSTYRENE HAVING PLUTONIUM CONCENTRATIONS TYPICAL OF LMFBR FUEL.

1508 ID-NUMBER ID-NUMBER 1508

AUTHOR FISCHER, E. A.

TITLE INTEGRAL MEASUREMENTS OF THE EFFECTIVE DELAYED NEUTRON FRACTIONS IN THE FAST CRITICAL ASSEMBLY SNEAK

REPORT NUMBER..... NSENAO, 62, 105-116

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 77-01-00

NSA-NUMBER 7743145

SITE/PROGRAM GERMANY - SNEAK (FAST BREEDER)

ABSTRACT

INTEGRAL MEASUREMENTS OF DELAYED NEUTRON FRACTIONS IN FAST REACTOR SPECTRA BY TWO DIFFERENT TECHNIQUES WERE CARRIED OUT. THE WORTH OF A CALIBRATED CALIFORNIUM-252 SPONTANEOUS FISSION SOURCE, TOGETHER WITH ABSOLUTE FISSION RATES AND WITH THE NORMALIZATION INTEGRAL OBTAINED FROM FISSION RATE MAPPING, GIVES EXPERIMENTAL VALUES FOR THE EFFECTIVE DELAYED NEUTRON FRACTION OF A CRITICAL ASSEMBLY. THESE MEASUREMENTS WERE PERFORMED IN THREE PLUTONIUM DIOXIDE/URANIUM DIOXIDE FUELED ASSEMBLIES AND IN ONE URANIUM DIOXIDE FUELED ASSEMBLY. THE PILE OSCILLATOR TECHNIQUE WAS USED TO DETERMINE RELATIVE YIELDS OF DELAYED NEUTRONS FROM URANIUM-235, URANIUM-238, AND PLUTONIUM-239. THE RESULTS CONFIRM THE EVALUATED YIELDS BY TUTTLE, WITH A SLIGHT BIAS TOWARD A HIGHER PLUTONIUM-239 YIELD. WITH THESE DATA, THE CENTRAL WORTH DISCREPANCY DISAPPEARS FOR SNEAK MEASUREMENTS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1511 ID-NUMBER ID-NUMBER 1511

AUTHOR SCHUSKE, C. L. / ROTHE, R. E.
 TITLE REFERENCE CRITICAL EXPERIMENTS. PROGRESS REPORT, JULY 1, 1976--SEPTEMBER 30, 1976
 REPORT NUMBER..... RFP-NUREG-2582
 DATE PUBLISHED ... 76-10-00
 NSA-NUMBER 7726647
 SITE/PROGRAM ROCKY FLATS - URANIUM(93%) ARRAYS - CONCRETE REFLECTED

ABSTRACT

THIRTY-TWO CRITICAL EXPERIMENTS WERE PERFORMED THROUGH SEPTEMBER 30, 1976. TWENTY-NINE OF THESE INVOLVED SINGLE CYLINDERS LOCATED WITHIN A CONCRETE ENCLOSURE HAVING 10-INCH-THICK (25.4-CM) WALLS, TOP, AND FLOOR. THE THREE REMAINING EXPERIMENTS WERE A 4 X 4 SQUARE PITCH ARRAY (16 CYLINDERS) OF 8.3-INCH-DIAM (21.2-CM) CYLINDERS IN THIS SAME CONCRETE ENCLOSURE. A MEASUREMENT CONTROL PROGRAM FOR OUR AQUEOUS URANYL NITRATE SOLUTION IS NEARLY COMPLETE TO MEASURE THE LABORATORY'S BIAS IN CONCENTRATION MEASUREMENTS. THIS BIAS MEASURES THE DIFFERENCE BETWEEN AN ANALYTICAL CHEMISTRY DETERMINATION OF THE CONCENTRATION (DONE IN THE NUCLEAR SAFETY LABORATORY) AND CAREFULLY PREPARED STANDARDS SAMPLES IN THE APPROPRIATE CONCENTRATION RANGES. THESE SAMPLES WERE PREPARED BY THE ROCKY FLATS CHEMISTRY STANDARDS LABORATORY. DURING THIS PERIOD, THE CONCRETE REFLECTOR ENCLOSURE WAS ASSEMBLED, INCLUDING SPECIAL INSTRUMENTATION NEEDED TO MEASURE SOLUTION HEIGHTS WITHIN THE EXPERIMENTAL CYLINDRICAL VESSELS. THIRTY-TWO CRITICAL EXPERIMENTS WERE PERFORMED THROUGH SEPTEMBER 30, 1976. TWENTY-NINE OF THESE INVOLVED SINGLE CYLINDERS LOCATED WITHIN A CONCRETE ENCLOSURE HAVING 10-INCH-THICK WALLS, TOP, AND FLOOR. THE THREE REMAINING EXPERIMENTS WERE A 4 X 4 SQUARE PITCH ARRAY (16 CYLINDERS) OF 8.3-INCH-DIAMETER (21.2-CM) CYLINDERS IN THIS SAME CONCRETE ENCLOSURE.

1517 ID-NUMBER ID-NUMBER 1517

AUTHOR BIERMAN, S. R./ DURST, B. M./ CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS MEASURING THE REACTIVITY WORTHS OF MATERIALS COMMONLY ENCOUNTERED AS FIXED-NEUTRON POISONS
 REPORT NUMBER..... TANSO, 24, 209-210
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 76-11-00
 NSA-NUMBER 7726720
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

ABSTRACT

THE REACTIVITY WORTHS OF SEVERAL MATERIALS, COMMONLY CONSIDERED FOR USE AS FIXED NEUTRON POISONS, HAVE BEEN MEASURED. THE RESULTS OF THESE MEASUREMENTS ARE PRESENTED IN THIS PAPER AND PROVIDE A SET OF CLEAN, WELL-DEFINED, POISONED CRITICAL ASSEMBLIES THAT CAN BE USED TO CHECK CALCULATIONAL TECHNIQUES AND CROSS-SECTION DATA.

1520 ID-NUMBER ID-NUMBER 1520

AUTHOR THOMAS, J. T.
 TITLE CRITICAL THREE-DIMENSIONAL ARRAYS OF URANIUM(93.2)-METAL CYLINDERS
 REPORT NUMBER..... NSEAO, 52, 350-359
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 73-11-00
 NSA-NUMBER 29:01058
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

CRITICALITY STUDIES WERE MADE OF THREE-DIMENSIONAL ARRAYS OF URANIUM-METAL CYLINDERS ENRICHED TO 93.2 WT% IN URANIUM-235. FOUR WEIGHT GROUPS OF UNITS, RANGING FROM 10.4 TO 26.2 KG OF URANIUM, IN FIVE GEOMETRIES, WERE EMPLOYED TO DETERMINE THE CRITICAL SURFACE SEPARATION BETWEEN UNITS AS A FUNCTION OF THE NUMBER IN AN ARRAY. THE INFLUENCE ON CRITICALITY OF HYDROGENOUS NEUTRON REFLECTING AND MODERATING MATERIALS, UNIT SHAPE, ARRAY SHAPE, AND OF OTHER CONTROLLED PERTURBATIONS TO SOME ASSEMBLIES WAS EXAMINED. MONTE CARLO CALCULATIONS WERE PERFORMED OF THE EXPERIMENTAL ASSEMBLIES TO CONFIRM THE NEUTRON MULTIPLICATION FACTORS AND TO INTERPRET THE BEHAVIOR OF SEVERAL SUBCRITICAL ASSEMBLIES. THE HANSEN-ROACH NEUTRON CROSS-SECTION SETS REPRODUCE THE RESULTS OF THE EXPERIMENTS, IN A MAJORITY OF CASES, TO AN ACCURACY OF 1% IN K(EFF). (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1521 ID-NUMBER ID-NUMBER 1521

AUTHOR BIERMAN, S. R./ LLOYD, R. C./ CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS TO MEASURE THE NEUTRON POISONING EFFECTS OF COPPER
 AND COPPER-CADMIUM PLATES
 REPORT NUMBER..... TANSO, 17, 265
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 73-11-00
 NSA-NUMBER 29:05633
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

ABSTRACT

SHIPPING CASKS, STORAGE FACILITIES, AND PROCESS VESSELS INVOLVED IN HANDLING FISSILE MATERIALS CONTAIN NEUTRON-ABSORBING MATERIALS-EITHER FOR THEIR NEUTRON ABSORBING PROPERTIES OR FOR STRUCTURAL REASONS. THESE TYPES OF SYSTEMS CAN BE FULLY UTILIZED, SAFELY, ONLY IF THE NEUTRON ABSORBERS ARE PROPERLY ACCOUNTED FOR IN THE CRITICALITY ANALYSES. THE REACTIVITY WORTH OF TWO SUCH MATERIALS, COPPER AND COPPER CONTAINING 1 WT% CADMIUM, WAS MEASURED RECENTLY AT THE BATTELLE-NORTHWEST- OPERATED CRITICAL MASS LABORATORY. THE RESULTS OF THESE MEASUREMENTS ARE PRESENTED IN THIS PAPER AND PROVIDE A SET OF CLEAN, WELL-DEFINED, POISONED CRITICAL ASSEMBLIES THAT CAN BE USED TO CHECK CALCULATIONAL TECHNIQUES AND CROSS-SECTION DATA.

1522 ID-NUMBER ID-NUMBER 1522

AUTHOR MAGNUSON, D. W.
 TITLE ARRAY CRITICAL EXPERIMENTS WITH MATERIALS USED IN SHIPPING CONTAINERS
 REPORT NUMBER..... TANSO, 17, 265-266
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 73-11-00
 NSA-NUMBER 29:05634
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

THE OAK RIDGE CRITICAL EXPERIMENTS FACILITY HAS HAD A CONTINUING PROGRAM IN SUPPORT OF NUCLEAR SAFETY IN THE HANDLING, STORAGE, AND SHIPPING OF SUBCRITICAL UNITS OF FISSILE MATERIAL. THE PRESENT EXPERIMENTS ARE EXTENSIONS OF EARLIER AIR-SPACED, URANIUM-METAL ARRAY STUDIES AND CONSIST OF 8-UNIT, 2 X 2 X 2 NEAR-CUBIC ARRAYS. THESE DATA PROVIDE REFERENCE CRITICALITY INFORMATION FOR MATERIALS USED IN SHIPPING CONTAINERS.

1523 ID-NUMBER ID-NUMBER 1523

AUTHOR SMOTREL, J. R.
 TITLE LIGHT-WATER-MODERATED REACTIVITY OF TUBULAR SLUG PAIRS CONTAINING 1.1 WT%
 ENRICHED URANIUM
 REPORT NUMBER..... TANSO, 17, 266-267
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 73-11-00
 NSA-NUMBER 29:05635
 SITE/PROGRAM SAVANNAH RIVER - URANIUM(1.1%) SLUGS IN WATER

ABSTRACT

EXPERIMENTS IN THE EXPONENTIAL FACILITY AT THE SAVANNAH RIVER LABORATORY HAVE PROVIDED A BASIS FOR SAFE STORAGE AND HANDLING OF SLIGHTLY ENRICHED TUBULAR URANIUM SLUGS. THE REACTIVITIES OF LIGHT- WATER-MODERATED AND -REFLECTED ARRAYS OF CLUSTERED FUEL SLUGS ENRICHED TO 1.1 WT% URANIUM-235 WERE MEASURED AS A FUNCTION OF PITCH, BOTH SQUARE AND TRIANGULAR. THIS WORK REPRESENTS AN EXPANSION OF NUCLEAR SAFETY DATA PRESENTLY AVAILABLE BY PROVIDING NEW DATA ON LARGER AND CONCENTRIC TUBULAR ASSEMBLIES. THESE DATA CAN BE USED TO EXTEND EXPERIMENTAL CORRELATIONS OF CALCULATIONAL CODES.

1524 ID-NUMBER ID-NUMBER 1524

AUTHOR CROSS, N. F. / WHITESIDES, G. E. / HINTON, R. J.
 TITLE MONTE CARLO ANALYSIS OF EXPERIMENTALLY CRITICAL PIPE INTERSECTIONS
 REPORT NUMBER..... TANSO, 17, 268
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 73-11-00

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

NSA-NUMBER 29:05637
 SITE/PROGRAM OAK RIDGE - URANYL(5%)FLUORIDE INTERSECTING CYLINDERS - CALCULATIONS ;
 ROCKY FLATS - INTERSECTING CYLINDERS - CALCULATIONS

ABSTRACT

NUCLEAR SAFETY ANALYSTS OFTEN ENCOUNTER SITUATIONS IN WHICH CRITICALITY EVALUATIONS MUST BE MADE FOR SYSTEMS INVOLVING LARGE TUBING OR PIPING ARRANGED IN VARIOUS CONFIGURATIONS. THOSE INVOLVING INTERSECTIONS CANNOT BE CALCULATED USING THE POPULAR 1-D CODES AND NO STANDARDS HAVE BEEN DEVELOPED FOR THE CALCULATIONAL RELIABILITY OF OTHER CODES FOR THIS TYPE OF SYSTEM. IN THIS ENDEAVOR, CALCULATIONS WERE MADE TO DETERMINE THE ADEQUACY OF THE KENO AND CHERI CODES TO TREAT CRITICAL SYSTEMS OF PIPE INTERSECTIONS. BOTH THE 16-GROUP HANSEN-ROACH CROSS-SECTION SET AND THE 123-GROUP XSDRN CROSS SECTIONS WERE USED SO CROSS-SECTION EFFECTS COULD BE EVALUATED. TEN OF THE CRITICAL EXPERIMENTS EVALUATED WERE PERFORMED AT ROCKY FLATS AND THE REMAINING 21 WERE DONE AT OAK RIDGE.

1526 ID-NUMBER ID-NUMBER 1526

AUTHOR LLOYD, R. C./ CLAYTON, E. D.
 TITLE CRITICALITY OF PLUTONIUM-URANIUM NITRATE SOLUTIONS CONTAINING 30 WT% PLUTONIUM
 REPORT NUMBER..... TANSO, 17, 269-270
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 73-11-00
 NSA-NUMBER 29:05639
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM NITRATE SOLUTIONS

ABSTRACT

DATA ARE REQUIRED ON THE CRITICALITY OF PLUTONIUM/URANIUM NITRATE SOLUTIONS TO ACCURATELY ESTABLISH NUCLEAR SAFETY LIMITS FOR USE IN PROCESSING AND HANDLING OF LMFBR-TYPE FUELS. LITTLE EXPERIMENTAL DATA ON PLUTONIUM/URANIUM NITRATE SOLUTIONS WITH 30 WT% PLUTONIUM (TYPICAL OF LMFBR FUELS) HAVE HERETOFORE BEEN REPORTED. THE CURRENT RESEARCH EMPHASIS IS ON THE PROCUREMENT OF CRITICALITY DATA FOR PLUTONIUM-URANIUM MIXTURES THAT WILL SERVE AS THE BASIS FOR HANDLING CRITICALITY PROBLEMS SUBSEQUENTLY ENCOUNTERED IN THE DEVELOPMENT OF TECHNOLOGY FOR THE LMFBR COMMUNITY.

1527 ID-NUMBER ID-NUMBER 1527

AUTHOR CLARK, H. K.
 TITLE MINIMUM CRITICAL CONCENTRATION OF PLUTONIUM-239
 REPORT NUMBER..... TANSO, 17, 278-279
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 73-11-00
 NSA-NUMBER 29:05641
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

"THE AMERICAN NATIONAL STANDARD FOR NUCLEAR CRITICALITY SAFETY IN OPERATIONS WITH FISSIONABLE MATERIALS OUTSIDE REACTORS" GIVES A SUBCRITICAL CONCENTRATION LIMIT OF 7.3 GRAMS/LITER FOR PLUTONIUM-239 IN A UNIFORM AQUEOUS SOLUTION. ACCORDING TO THE STANDARD, THIS LIMIT WAS CHOSEN TO BE FAR ENOUGH BELOW THE MINIMUM CRITICAL CONCENTRATION TO COMPENSATE FOR UNCERTAINTIES IN THE LATTER AND HENCE TO ENSURE SUBCRITICALITY REGARDLESS OF THE VOLUME OF SOLUTION. HOWEVER, THERE APPEARS TO BE A STRONG POSSIBILITY THAT THIS LIMIT ACTUALLY EXCEEDS THE MINIMUM CRITICAL CONCENTRATION, AND THAT IT SHOULD BE REPLACED BY A SMALLER VALUE.

1528 ID-NUMBER ID-NUMBER 1528

AUTHOR RICHEY, C. R.
 TITLE REEXAMINATION OF THE VALUE FOR THE MINIMUM CRITICAL CONCENTRATION OF PLUTONIUM-239 IN WATER
 REPORT NUMBER..... TANSO, 17, 279-280
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 73-11-00
 NSA-NUMBER 29:05642
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

MASTERTON REPORTED A VALUE OF 8.0 ± 0.3 GM PLUTONIUM-239 PER LITER FOR THE LIMITING CRITICAL CONCENTRATION OF PLUTONIUM-239 IN WATER. THIS VALUE WAS DETERMINED BY THE WELL-KNOWN NULL REACTIVITY METHOD IN THE PCFR FACILITY AT HANFORD. AS RECENTLY POINTED OUT BY CLARK, LARGE CORRECTIONS WERE NECESSARY IN THIS EXPERIMENT FOR SPECTRAL PERTURBATIONS CAUSED BY THE STAINLESS-STEEL TANKS CONTAINING THE PLUTONIUM SOLUTIONS IN THE REACTOR CORE. TO CHECK THE VALIDITY OF THE CORRECTION FOR STAINLESS STEEL, A THEORETICAL MODEL OF THE ORIGINAL EXPERIMENT WAS DEVELOPED.

1534 ID-NUMBER ID-NUMBER 1534

AUTHOR DABROWSKI, C. / MALEWSKI, S.

TITLE ANALYSIS OF THE PHYSICAL PARAMETERS OF THE ANNA CRITICAL ASSEMBLY

REPORT NUMBER..... NUKLEONIKA, 18, 474-494

JOURNAL NUKLEONIKA

DATE PUBLISHED ... 73-10-00

NSA-NUMBER 29:20119

SITE/PROGRAM POLAND - ANNA CRITICAL ASSEMBLY

ABSTRACT

THE ANALYSIS OF SEVERAL SYSTEMS OF THE ANNA CRITICAL ASSEMBLY IS DESCRIBED WITH THE AIM TO DETERMINE THE PHYSICAL PARAMETERS AND PROPERTIES OF THE ASSEMBLY AT CRITICAL STATES. THE ANALYSIS HAS CONSISTED ESSENTIALLY IN THE DETERMINATION OF FEW-GROUP DIFFUSION PARAMETERS IN THE INDIVIDUAL ZONES OF THE SYSTEMS AND IN CALCULATIONS OF CRITICALITY. THE RESULTS OF CALCULATIONS ARE PRESENTED AND COMPARED WITH THE AVAILABLE EXPERIMENTAL EVIDENCE. THE ROLE OF SOME NEUTRON PROCESSES IN THE SYSTEMS INVESTIGATED AND THEIR INFLUENCE ON INTEGRAL PARAMETERS HAVE BEEN CONSIDERED. ALSO THE GEOMETRICAL AND MATERIAL PARAMETERS OF THE ASSEMBLY ARE INCLUDED. (AUTH).

1538 ID-NUMBER ID-NUMBER 1538

AUTHOR BIERMAN, S. R.

TITLE STATUS OF CRITICALITY DATA AND EXPERIMENTS ON HOMOGENEOUS SYSTEMS OF PLUTONIUM-URANIUM

REPORT NUMBER..... TANSO, 18, 160-161

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 74-06-00

NSA-NUMBER 30:16500

SITE/PROGRAM HANFORD - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THE PRIMARY EMPHASIS TO DATE IN OBTAINING EXPERIMENTAL DATA ON MIXED PLUTONIUM-URANIUM SYSTEMS HAS BEEN TO OBTAIN INFORMATION ON THE CRITICAL SIZES OF HOMOGENEOUS SYSTEMS HAVING WELL-DEFINED SPHERICAL, CYLINDRICAL, OR RECTANGULAR GEOMETRIES AND PLUTONIUM ENRICHMENTS BETWEEN 8 AND 30 WT% EMPHASIS HAS ALSO BEEN PLACED ON OBTAINING THE DATA OVER A WIDE RANGE OF CONCENTRATIONS, SELECTED TO GIVE THE MORE USEFUL INFORMATION IN THE SHORTEST PERIOD OF TIME.

1539 ID-NUMBER ID-NUMBER 1539

AUTHOR BROWN, C. L.

TITLE STATUS OF EXPERIMENTAL CRITICALITY DATA FOR (PLUTONIUM, URANIUM) DIOXIDE FUEL RODS

REPORT NUMBER..... TANSO, 18, 161-164

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 74-06-00

NSA-NUMBER 30:16501

SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

A COMPLETE SUMMARY OF EXPERIMENTAL CRITICALITY DATA FOR PLUTONIUM-DIOXIDE-URANIUM-DIOXIDE FUEL RODS IN WATER IS PRESENTED. THE INFORMATION PRESENTED IS SUFFICIENTLY COMPLETE FOR USE IN COMPUTER CODE VALIDATION.

THE EXPERIMENTAL DATA APPLICABLE TO LWR FUEL CRITICALITY SAFETY ARE REASONABLY COMPLETE. MEASUREMENTS COVER ROD SIZES FROM 0.34 TO 0.50 INCH; PLUTONIUM-240 CONTENT IN THE RANGE OF 8 TO 24 WT%; AND FUEL ENRICHMENTS FROM 1.5 TO 6.6 WT% PLUTONIUM-DIOXIDE. THIS SPAN PROVIDES A GOOD BASIS FOR CALCULATIONS DIRECTED TOWARD THE CRITICALITY SAFETY OF PWR AND BWR PLUTONIUM RECYCLE FUELS.

THE EXPERIMENTAL DATA APPLICABLE TO LMFBR FUELS ARE MUCH LESS EXTENSIVE: ONLY ONE FUEL HAS BEEN MEASURED TO DATE.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

TO PROVIDE AN ADEQUATE DATA BASE FOR CRITICALITY SAFETY IN THE LONG TERM, ADDITIONAL LATTICE CRITICAL EXPERIMENTS WILL UNDOUBTEDLY BE NEEDED.

1540 ID-NUMBER ID-NUMBER 1540

AUTHOR HALL, R. J. / BIERMAN, S. R.
 TITLE CALCULATION-EXPERIMENT CORRELATIONS ON HOMOGENEOUS PLUTONIUM-URANIUM SYSTEMS
 REPORT NUMBER.... TANSO, 18, 164-165
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 74-06-00
 NSA-NUMBER 30:16502
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

BECAUSE OF THE GREAT NUMBER OF PARAMETERS INVOLVED IN A MULTIGROUP NUCLEAR CRITICALITY CALCULATION, EXTENSIVE EXPERIMENTAL BENCHMARKS ARE REQUIRED TO TEST CALCULATIONAL RESULTS.

1541 ID-NUMBER ID-NUMBER 1541

AUTHOR LLOYD, R. C.
 TITLE CRITICALITY OF URANIUM-DIOXIDE/PLUTONIUM-DIOXIDE SOLIDS IN FISSION SOLUTION
 REPORT NUMBER.... TANSO, 18, 165-166
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 74-06-00
 NSA-NUMBER 30:16503
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES IN FISSION SOLUTIONS

ABSTRACT

A SERIES OF CRITICALITY MEASUREMENTS WAS COMPLETED ON A LATTICE OF FFTF PROTOTYPE FUEL PINS [25 WT% PLUTONIUM-DIOXIDE/URANIUM-DIOXIDE], IMMERSSED IN PLUTONIUM/URANIUM NITRATE SOLUTIONS OF SEVERAL DIFFERENT CONCENTRATIONS. THE DATA FROM THESE INTEGRAL CRITICAL EXPERIMENTS WILL BE USEFUL AS A CHECK ON COMPUTATIONAL METHODS, AND FURTHER, WILL PROVIDE THE ONLY DATA OF THIS TYPE DIRECTLY APPLICABLE TO THE DISSOLVER PROCESS.

1544 ID-NUMBER ID-NUMBER 1544

AUTHOR ROTHE, R. E. / HUNT, D. C.
 TITLE EFFECT OF POSITION IN THE CRITICALITY OF URANIUM SPHERES IN URANIUM SOLUTION CYLINDERS
 REPORT NUMBER.... NSEAO, 54, 360-366
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 74-07-00
 NSA-NUMBER 30:19454
 SITE/PROGRAM ROCKY FLATS - SOLID UNITS IN FISSION SOLUTIONS

ABSTRACT

THIRTEEN PREVIOUSLY UNPUBLISHED CRITICAL MEASUREMENTS ON ENRICHED (93.16 WT% URANIUM-235) URANIUM METAL SPHERES, WHICH ARE RADIAL BUT NOT AXIALLY CENTERED IN CYLINDERS OF ENRICHED (93.16 WT% URANIUM-235) URANIUM SOLUTION, ARE PRESENTED AND COMPARED WITH THE RESULTS OF MONTE CARLO CALCULATIONS. THE AVERAGE REPRODUCTION FACTOR CALCULATED FOR EXPERIMENTALLY CRITICAL SYSTEMS WAS $k = 0.989$, AND THIS BIAS SHOWED NO SYSTEMATIC VARIATION WITH THE AMOUNT THE SPHERE WAS DISPLACED FROM CENTER. THE SPHERE SIZE WAS INCREASED, KEEPING OTHER PARAMETERS CONSTANT, UNTIL CRITICALITY WAS CALCULATED, AT WHICH POINT THE AVERAGE SPHERE RADIUS AND MASS WERE 2.8 AND 8.8%, RESPECTIVELY, GREATER THAN THE EXPERIMENTAL CASES.

FOR A GIVEN SOLUTION CYLINDER, THE MINIMUM CRITICAL METAL SPHERE MASS OCCURS WHEN THE SPHERE IS CENTERED IN THE SOLUTION. THE INCREASE IN THIS CRITICAL MASS WITH POSITION ALONG THE CYLINDER AXIS IS ALSO PRESENTED PARAMETRIC IN TWO TANK DIAMETERS AND FIVE SOLUTION CONCENTRATIONS. FOR LIKE ASYMMETRIES AND AT THE SAME CONCENTRATION, A GREATER CHANGE IN THE CRITICAL SPHERE MASS WITH POSITION IS SEEN FOR TANKS OF LARGE DIAMETER THAN FOR SMALLER TANKS. IF THE TANK DIAMETER IS FIXED, THE GREATER CHANGE OCCURS FOR SOLUTION OF HIGH URANIUM CONCENTRATION. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1545 ID-NUMBER ID-NUMBER 1545

AUTHOR LLOYD, R. C.
 TITLE CALCULATIONS ON RASCHIG-RING-POISONED PLUTONIUM SOLUTIONS SYSTEMS USING
 HANSEN--ROACH CROSS SECTIONS
 REPORT NUMBER..... NSENAO, 54, 367-368
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 74-07-00
 NSA-NUMBER 30:19455
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES IN FISSILE SOLUTIONS

ABSTRACT

WE WERE PLEASED TO NOTE THE GOOD RESULTS OBTAINED BY DICKINSON IN CALCULATING CRITICALITY FOR SOME OF OUR PLUTONIUM NITRATE RASCHIG-RING-FILLED VESSELS UTILIZING HANSEN-ROACH CROSS SECTIONS. USE OF THE FORMULA PROVIDED FOR MACROSCOPIC POTENTIAL SCATTERING CROSS SECTIONS, WITH INTERPOLATION WHEN THE CALCULATED RATIO FALLS BETWEEN TWO TABULATED VALUES, PROVIDES VERY GOOD RESULTS AND ATTESTS TO THE QUALITY OF THE EXPERIMENTS.

ONE OF THE PRINCIPAL PURPOSES OF THE PAPER WAS TO PRESENT EXPERIMENTAL DATA FOR USE IN VALIDATION OF CROSS SECTIONS AND CALCULATIONAL METHODS. SINCE THE ORIGINAL PAPER WAS PRESENTED, SOME ADDITIONAL CALCULATIONAL CORRELATIONS, WHICH MAY BE OF FURTHER INTEREST, HAVE BEEN MADE USING EVALUATED NUCLEAR DATA FILE CROSS SECTIONS (ENDF/B-III VERSION) WITH 18 ENERGY GROUPS. COMPARISON IS MADE WITH VALUES PRESENTED IN THE ORIGINAL PAPER.

1547 ID-NUMBER ID-NUMBER 1547

AUTHOR BIERMAN, S. R./ CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS TO MEASURE THE NEUTRON POISONING EFFECTS OF COPPER
 AND COPPER--CADMIUM PLATES
 REPORT NUMBER..... NSENAO, 55, 058-066
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 74-09-00
 NSA-NUMBER 30:24817
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

ABSTRACT

THERE HAS BEEN CONSIDERABLE INTEREST IN THE USE OF FIXED NEUTRON ABSORBERS (POISONS) FOR CRITICALITY CONTROL SINCE THEIR USE WOULD PERMIT SAFELY HANDLING LARGER QUANTITIES OF NUCLEAR MATERIALS WITH REDUCED PROBABILITY OF CRITICALITY. TO OBTAIN EXPERIMENTAL DATA IN THIS AREA, THE REACTIVITY WORTH OF TWO SUCH MATERIALS, COPPER AND COPPER CONTAINING 1 WT% CADMIUM, WAS RECENTLY MEASURED IN TWO DIFFERENT ENERGY SPECTRUMS AND AT DIFFERENT THICKNESSES UP TO 2.5 CM. THE RESULTS OF THESE MEASUREMENTS ARE PRESENTED IN THIS PAPER AND PROVIDE A SET OF CLEAN, WELL-DEFINED, POISONED CRITICAL ASSEMBLIES THAT CAN BE USED TO CHECK CALCULATIONAL TECHNIQUES AND CROSS-SECTION DATA.

1548 ID-NUMBER ID-NUMBER 1548

AUTHOR LLOYD, R. C. / BIERMAN, S. R./ CLAYTON, E. D.
 TITLE CRITICALITY OF PLUTONIUM-URANIUM MIXTURES CONTAINING 5 TO 8 WT% PLUTONIUM
 REPORT NUMBER..... NSENAO, 55, 051-057
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 74-09-00
 NSA-NUMBER 30:24818
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM NITRATE SOLUTIONS

ABSTRACT

RESULTS ARE PRESENTED FROM A SERIES OF CRITICALITY EXPERIMENTS WITH HOMOGENEOUS PLUTONIUM- URANIUM FUEL MIXTURES WITH PLUTONIUM CONTENT IN THE RANGE OF 5 TO 8 WT% THE HYDROGEN TO(PLUTONIUM + URANIUM) ATOMIC RATIOS COVERED A RANGE FROM 19.5 TO A HIGH OF 80.7. THE EXPERIMENTS PROVIDE DATA IN THE REGION OF MODERATION WHERE THE MINIMUM CRITICAL VOLUME OCCURS FOR HOMOGENEOUS PLUTONIUM-URANIUM SYSTEMS WITH A PLUTONIUM CONTENT OF 8 WT% THE MINIMUM CRITICAL SPHERICAL RADIUS FOR MATERIAL CONTAINING 8 WT% PLUTONIUM IN PLUTONIUM-DIOXIDE-URANIUM-DIOXIDE-WATER MIXTURES WAS DETERMINED TO BE 14.98 CM.

THE CRITICALITY FACTORS WERE COMPUTED WITH NEUTRON TRANSPORT THEORY AND MONTE CARLO CALCULATIONS, USING THE DTF-IV AND THE KENO-II CODES WITH BOTH ENDF/B-II AND ENDF/B-III VERSION CROSS SECTIONS. THE CALCULATED VALUES WERE FOUND TO BE WITHIN +/-2% OF UNITY.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1549 ID-NUMBER ID-NUMBER 1549

AUTHOR ADAMSKI, L./ BUKOWSKI, K.
 TITLE FAST-THERMAL CRITICAL ASSEMBLY P-ANNA-1
 REPORT NUMBER..... NUKLEONIKA, 19, 565-574
 JOURNAL NUKLEONIKA
 DATE PUBLISHED ... 74-06-00
 NSA-NUMBER 30:34267
 SITE/PROGRAM POLAND - ANNA CRITICAL ASSEMBLY

ABSTRACT

TWO-ZONE CRITICAL ASSEMBLY IS DESCRIBED, WHICH CONTAINS NATURAL URANIUM METAL IN THE CENTRAL ZONE. THE FOLLOWING PARAMETERS WERE MEASURED: CRITICAL MASSES, REACTION RATE DISTRIBUTION, FAST NEUTRON SPECTRA, AND REACTIVITY OF HYDROGEN-CONTAINING MODERATORS IN THE CENTRAL ZONE. THE RESULTS OF MEASUREMENTS ARE COMPARED WITH THE RESULTS OF CALCULATIONS PERFORMED USING BNAB-26 AND BNAB-70 MULTIGROUP CONSTANTS. (AUTH).

1550 ID-NUMBER ID-NUMBER 1550

AUTHOR BLOSER, M. / KIRCH, N. / KRINGS, F. J. / NASEBAND, F. J. / PAUL, N.
 TITLE MEASUREMENTS AT THE CRITICAL FACILITY FOR THE IN-CORE THERMIONIC REACTOR
 AND COMPARISON WITH CALCULATIONS
 REPORT NUMBER..... NSEAO, 55, 129-146
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 74-10-00
 NSA-NUMBER 30:34269
 SITE/PROGRAM GERMANY - IN-CORE THERMIONIC REACTOR

ABSTRACT

IN-CORE THERMIONIC REACTORS (ITR) CONTAIN IN-CORE MATERIALS WHICH ARE VERY UNUSUAL IN REACTOR PHYSICS (TUNGSTEN, NIOBIUM, MOLYBDENUM, AND YTTRIUM HYDRIDE) FOR THIS REASON AND DUE TO THE COMPACT AND VERY HETEROGENEOUS STRUCTURE OF SUCH REACTORS, CRITICAL EXPERIMENTS FOR AN ITR PROTOTYPE WERE CARRIED OUT. DIFFERENT CORE CONFIGURATIONS WITH MEASUREMENTS OF CRITICAL MASSES, REACTIVITY WORTHS, FLUXES, AND POWER DISTRIBUTIONS, ALSO PROVIDED THE OPPORTUNITY TO TEST METHODS OF COMPUTATION, SPECIAL NUCLEAR DATA, AND MEASURING METHODS ON A MORE GENERAL BASIS.

1551 ID-NUMBER ID-NUMBER 1551

AUTHOR PAXTON, H. C.
 TITLE CRITICALITY EXPERIMENTS AND DATA; NUCLEAR CRITICALITY SAFETY
 REPORT NUMBER..... TID-26286, 34-55
 CONFERENCE NUCLEAR CRITICALITY SAFETY SHORT COURSE, D. H. LAWRENCE RANCH, TAOS, NEW
 MEXICO, 7-11 MAY, 1973
 DATE PUBLISHED ... 74-00-00
 NSA-NUMBER 31:04043
 SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

FACILITIES AND METHODS FOR EXPERIMENTS ON CRITICALITY CONTROL ARE DESCRIBED AND SOME SPECIFIC EXPERIMENTS ARE REVIEWED. THE NEED FOR FURTHER CRITICALITY DATA IN FORMULATING STANDARDS FOR FISSILE MATERIAL HANDLING IS DISCUSSED. SOME APPLICATIONS OF PLUTONIUM-238 AND CURIUM-244 ARE PRESENTED AND THE ASSOCIATED CRITICALITY CONTROL PROBLEMS ARE MENTIONED. CRITICALITY CONTROL PROBLEMS IN THE RECOVERY OF PLUTONIUM FROM LEAN SOLUTIONS ARE ALSO EXAMINED.

1552 ID-NUMBER ID-NUMBER 1552

AUTHOR LLOYD, R. C./ CLAYTON, E. D.
 TITLE CRITICALITY OF HETEROGENEOUS SYSTEMS: URANIUM DIOXIDE/PLUTONIUM DIOXIDE
 SOLIDS IN FISSILE SOLUTION CONTAINING GADOLINIUM NITRATE
 REPORT NUMBER..... TANSO, 19, 183-184
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 74-11-00
 NSA-NUMBER 31:06790
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN URANYL NITRATE

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

A SERIES OF CRITICALITY EXPERIMENTS WAS PERFORMED TO DETERMINE THE EFFECTIVENESS OF SOLUBLE POISON (GADOLINIUM NITRATE) ON CRITICALITY OF A HETEROGENEOUS ASSEMBLY OF FFTF-TYPE FUEL PINS IN PLUTONIUM-URANIUM NITRATE SOLUTION. GADOLINIUM WAS CHOSEN AS A NEUTRON POISON BECAUSE OF ITS HIGH NEUTRON CROSS SECTION, HIGH SOLUBILITY, AND COMPATIBILITY IN THE SEPARATION PROCESS. THE ARRANGEMENT SIMULATES THE SIMPLEST APPROACH TO A POSSIBLE DISSOLVER CONFIGURATION, WHEREIN DURING THE DISSOLUTION PROCESS, A HETEROGENEOUS SYSTEM OF SOLIDS IN FISSILE SOLUTION (THE PARTIALLY DISSOLVED FUEL) WOULD PREVAIL.

1555 ID-NUMBER ID-NUMBER 1555

AUTHOR ROTHE, R. E.
 TITLE CRITICALITY OF PERIODICALLY BORON-POISONED ENRICHED-URANIUM-SOLUTION SYSTEMS
 REPORT NUMBER..... TANSO, 19, 187-188
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 74-11-00
 NSA-NUMBER 31:06793
 SITE/PROGRAM ROCKY FLATS - BORON/STAINLESS STEEL PLATES

ABSTRACT

CRITICALITY MEASUREMENTS WERE MADE ON A LARGE, UNREFLECTED URANIUM-SOLUTION SYSTEM POISONED WITH EVENLY SPACED BORON-LOADED STAINLESS-STEEL PLATES. CRITICAL SOLUTION HEIGHTS WERE MEASURED AS A FUNCTION OF THE AVERAGE SPACING BETWEEN PLATES WITHIN A LARGE TANK. EXPERIMENTAL RESULTS WERE COMPARED WITH KENO-II CALCULATIONS WHOSE MATERIAL AND GEOMETRY DESCRIPTIONS SIMULATED EXPERIMENTAL CONDITIONS ACCURATELY. SIXTEEN-ENERGY-GROUP CROSS-SECTION SETS WERE USED.

1556 ID-NUMBER ID-NUMBER 1556

AUTHOR THOMAS, J. T.
 TITLE EXPERIMENTAL MEASUREMENTS WITH ARRAYS OF URANIUM(97.7)-HEXAFLUORIDE NEUTRON-COUPLED THROUGH CONCRETE
 REPORT NUMBER..... TANSO, 19, 199-200
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 74-11-00
 NSA-NUMBER 31:06802
 SITE/PROGRAM OAK RIDGE - URANYL(98%)FLUORIDE ARRAYS - COUPLED THRU CONCRETE

ABSTRACT

CRITICAL EXPERIMENTS WERE PERFORMED AT THE OAK RIDGE CRITICAL EXPERIMENTS FACILITY AS PART OF A NUCLEAR CRITICALITY SAFETY EVALUATION PROGRAM. THE FISSILE MATERIAL WAS SOLIDIFIED URANIUM HEXAFLUORIDE IN TRANSPORT CYLINDERS. THE ISOTOPIIC COMPOSITION OF THE URANIUM WAS 97.66 WT% URANIUM-235, 0.77 WT% URANIUM-234, 0.26 WT% URANIUM-236, AND 1.34 WT% URANIUM-238. THE HYDROGEN-TO-URANIUM ATOMIC RATIO IN THE FISSILE MATERIAL DID NOT EXCEED 0.088. THE CYLINDERS WERE OF MONEL METAL WITH AN INSIDE DIAMETER OF 20.3 CM, A WALL THICKNESS OF 4.8 MM, A HEIGHT OF 1.25 M, AND HAD AN AVERAGE TARE WEIGHT OF 45.4 KG. THE SIX CYLINDERS USED IN THESE EXPERIMENTS HAD MASS LOADINGS BETWEEN 108.0 AND 111.5 KG URANIUM HEXAFLUORIDE. THE REFLECTOR FOR THE ARRAYS WAS CONSTRUCTED OF CONCRETE BLOCKS.

THE EXPERIMENTAL ASSEMBLY CONSISTED OF TWO PARALLEL LINEAR 1 X 3 X 1 ARRAYS OF CYLINDERS. THE ASSEMBLY, AS DESCRIBED, WAS SUBCRITICAL, BUT EXHIBITED AN APPARENT NEUTRON SOURCE MULTIPLICATION GREATER THAN 5. CRITICALITY WAS ACHIEVED BY INCREASING THE OUTER-SURFACE CONCRETE REFLECTOR THICKNESS.

1558 ID-NUMBER ID-NUMBER 1558

AUTHOR SCHUSKE, C. L. / DICKINSON, D.
 TITLE CRITICALITY DESIGN OF A LARGE-CAPACITY PLUTONIUM MELTING CRUCIBLE
 REPORT NUMBER..... NUTY88, 25, 072-083
 JOURNAL NUCLEAR TECHNOLOGY
 DATE PUBLISHED ... 75-01-00
 NSA-NUMBER 31:17600
 SITE/PROGRAM ROCKY FLATS - PLUTONIUM METAL BLOCKS - PLEXIGLASS

ABSTRACT

EXPERIMENTAL CRITICALITY MEASUREMENTS HAVE BEEN MADE ON ASSEMBLIES OF PLUTONIUM METAL TO DESIGN A CRUCIBLE THAT CAN SAFELY MELT UP TO 12 KG OF PLUTONIUM. IN ADDITION, IN SITU EXPERIMENTS ON TWO PROTOTYPE CRUCIBLES AND FURNACE SETUPS CONFIRMED THE 12-KG CAPACITY. THESE CRUCIBLE DESIGNS WERE RESPONSIBLE FOR A CONSIDERABLE SAVINGS IN INITIAL CAPITAL AND OPERATING EXPENSE FOR A NEW PLANT.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

A COMPARISON OF MONTE CARLO CALCULATIONS AND EXPERIMENTAL MEASUREMENTS INDICATED THAT THE CALCULATIONAL METHOD IS SUFFICIENTLY ACCURATE TO BE USED IN FUTURE CRUCIBLE DESIGNS, RATHER THAN A SERIES OF CRITICAL MASS MEASUREMENTS. THE COST FOR A CALCULATIONAL STUDY IS LESS THAN 2% OF THE COST OF AN EXPERIMENTAL STUDY. (AUTH).

1559 ID-NUMBER ID-NUMBER 1559

AUTHOR ROTHE, R. E. / ALVAREZ, D. L. / CLARK, H. E.
 TITLE THE CRITICALITY OF PERIODICALLY BORON-POISONED URANIUM SOLUTION SYSTEMS
 REPORT NUMBER..... NUTYBB, 25, 502-516
 JOURNAL NUCLEAR TECHNOLOGY
 DATE PUBLISHED ... 75-03-00
 NSA-NUMBER 31:26513
 SITE/PROGRAM ROCKY FLATS - BORON/STAINLESS STEEL PLATES

ABSTRACT

NUCLEAR SAFETY ENGINEERS MUST EVALUATE THE CRITICALITY POTENTIAL OF A VARIETY OF PLANT PROBLEMS. MANY OF THESE INVOLVE AN ESSENTIALLY UNREFLECTED SYSTEM CONTAINING URANIUM SOLUTION AND A FIXED NUCLEAR POISON. MEASURED CRITICAL PARAMETERS FOR SUCH A SYSTEM AT SOLUTION CONCENTRATIONS OF 52.2- AND 141.5-GRAMS URANIUM/LITER, TOGETHER WITH THOSE REPORTED PREVIOUSLY AT 450.8-GRAMS URANIUM/LITER, PROVIDE THE ENGINEER INFORMATION OVER A WIDE RANGE OF CONCENTRATIONS NORMALLY ENCOUNTERED IN INDUSTRIAL APPLICATIONS. THE URANIUM WAS ENRICHED TO 93.24 WT% URANIUM-235. THE FIXED POISON WAS 1.02 WT% NATURAL BORON ALLOYED IN STAINLESS-STEEL PLATES. CRITICAL SOLUTION HEIGHTS WERE MEASURED FOR VARIOUS NUMBERS OF NEARLY UNIFORMLY SPACED VERTICAL PLATES WITHIN THE 106.6-CM- DIAM EXPERIMENTAL TANK.

1564 ID-NUMBER ID-NUMBER 1564

AUTHOR LLOYD, R. C. / CLAYTON, E. D.
 TITLE CRITICALITY OF PLUTONIUM-URANIUM NITRATE SOLUTION CONTAINING GLASS RASCHIG RINGS
 REPORT NUMBER..... TANSO, 21, 236-237
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 75-06-00
 NSA-NUMBER 32:12259
 SITE/PROGRAM HANFORD - PLUTONIUM AND URANIUM NITRATE SOLUTIONS WITH RASHIG RINGS ;
 HANFORD - URANIUM-PLUTONIUM NITRATE SOLUTIONS

ABSTRACT

EXPERIMENTS BEING PERFORMED PROVIDE DATA ON PLUTONIUM-URANIUM SYSTEMS TYPICAL OF THE LMFBR FUELS. THESE EXPERIMENTS MAKE USE OF RASCHIG RINGS IN PLUTONIUM-URANIUM NITRATE SOLUTIONS. THE DATA HELP ESTABLISH THE EFFECTIVENESS OF THE FIXED NEUTRON POISON AS A METHOD OF CRITICALITY CONTROL.

1569 ID-NUMBER ID-NUMBER 1569

AUTHOR BIERMAN, S. R.
 TITLE CRITICAL EXPERIMENTS-BENCHMARKS (PLUTONIUM-URANIUM SYSTEMS)
 REPORT NUMBER..... NUTYBB, 26, 352-381
 JOURNAL NUCLEAR TECHNOLOGY
 DATE PUBLISHED ... 75-07-00
 NSA-NUMBER 32:22974
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

FOURTEEN DIFFERENT CRITICAL SYSTEMS OF PLUTONIUM-URANIUM HOMOGENEOUS MIXTURES ARE ARRANGED IN A FORMAT AMENABLE FOR USE IN VALIDATING CALCULATIONAL TECHNIQUES AND CHECKING NUCLEAR DATA. EACH EXPERIMENTAL SYSTEM IS COMPLETELY DEFINED UNDER A SINGLE BENCHMARK NUMBER. FOR THE DATA THAT PERMIT IT, MULTIPLE CRITICAL DIMENSIONS ARE GIVEN FOR EACH FUEL COMPOSITION AND GEOMETRY. WHEREVER POSSIBLE, EXPERIMENTALLY DETERMINED CORRECTION FACTORS ARE PROVIDED FOR REDUCING THE COMPLEXITY OF THE CRITICAL ASSEMBLIES. (AUTH)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1572 ID-NUMBER ID-NUMBER 1572

AUTHOR DRUEKE, V. / FILGES, S. / KIRCH, N. / NEEF, R. D.
 TITLE EXPERIMENTAL AND THEORETICAL STUDIES OF CRITICALITY SAFETY BY INGRESS OF
 WATER IN SYSTEMS WITH PEBBLE-BED HIGH-TEMPERATURE GAS-COOLED REACTOR FUEL
 REPORT NUMBER.... NSENAO, 57, 328-332
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 75-08-00
 NSA-NUMBER 33:16437
 SITE/PROGRAM GERMANY - WATER FLOODED HTGR

ABSTRACT

EXPERIMENTS IN A SUBCRITICAL ASSEMBLY WITH PEBBLE-BED HIGH-TEMPERATURE GAS-COOLED REACTOR FUEL AND HYDROGEN RANGING BETWEEN 0 AND 14.4 VOL PERCENT WERE CARRIED OUT TO STUDY THE EFFECTS OF WATER INGRESS IN REACTIVITY AND TO TEST THE ACCURACY OF DIFFUSION-CODE CALCULATIONS FOR SMALL SUBCRITICAL SYSTEMS. SPECIAL EMPHASIS IS GIVEN TO AN ADEQUATE DESCRIPTION OF THE INFLUENCE OF THE WATER INGRESS ON THE DIFFUSION PROPERTIES OF THE PEBBLE-BED SYSTEM. THE AGREEMENT BETWEEN EXPERIMENTAL AND THEORETICAL RESULTS IS IN ALL CASES BETTER THAN ± 0.01 IN $K(EFF)$. (AUTH)

1574 ID-NUMBER ID-NUMBER 1574

AUTHOR LLOYD, R. C./ CLAYTON, E. D.
 TITLE CRITICALITY SAFETY DATA APPLICABLE TO PROCESSING LIQUID-METAL FAST BREEDER
 REACTOR FUEL
 REPORT NUMBER.... NSENAO, 59, 021-026
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 76-01-00
 NSA-NUMBER 33:17903
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES IN FISSILE SOLUTIONS

ABSTRACT

CRITICAL-EXPERIMENT DATA ARE PRESENTED ON A HETEROGENEOUS LATTICE OF FUEL RODS COMPRISED OF URANIUM AND PLUTONIUM OXIDES, CLAD WITH STAINLESS STEEL, AND MODERATED WITH (URANIUM + PLUTONIUM) NITRATE SOLUTION, A CONDITION NOT UNLIKE THAT ENCOUNTERED IN A FUEL-ELEMENT DISSOLVER OPERATION. THE EFFECT OF A SOLUBLE NEUTRON ABSORBER (GADOLINIUM NITRATE) ON THE CRITICALITY OF THIS TYPE OF SYSTEM WAS ALSO EXAMINED FOR ITS POSSIBLE USE AS A METHOD OF CRITICALITY PREVENTION AND CONTROL DURING THE DISSOLUTION STEP. THE RESULTS PROVIDE DATA FOR CODE VALIDATION, AN ESSENTIAL REQUIREMENT ON COMPLEX SYSTEMS SUCH AS THIS, IF THE CALCULATIONS ARE TO BE UTILIZED TO PRESCRIBE SUBSEQUENT CONTROL LIMITS UNDER SIMILAR OR RELATED CONDITIONS IN FUEL PROCESSING. EXPERIMENTS INDICATE (FOR THE VERY LIMITED DATA PRESENTED) THAT A HETEROGENEOUS SYSTEM COMPOSED OF THESE FUEL RODS IN WATER CAN HAVE A LARGER BUCKLING THAN THE FUEL IN THE DISSOLVED STATE. THE QUESTION IS, WHETHER A FUEL ROD OF A SIZE DIFFERENT FROM THAT USED IN THESE EXPERIMENTS, IMMERSSED IN FISSILE-BEARING SOLUTIONS, MIGHT HAVE A STILL HIGHER BUCKLING (AND SMALLER CRITICAL SIZE) THAN THE HIGHEST ACHIEVABLE BUCKLING FOR FUEL RODS OF OPTIMUM DIAMETER AND SPACING IN WATER. THIS IMPORTANT CONSIDERATION REGARDING THE CRITICALITY SAFETY ASPECTS OF DISSOLVERS MUST BE EXAMINED IN EACH CASE. THE RESULTS OF CALCULATIONS OF THESE SYSTEMS WITH THE KENO MONTE CARLO CODE UTILIZING ENDF/B-III CROSS SECTIONS ARE PRESENTED. (AUTH)

1577 ID-NUMBER ID-NUMBER 1577

AUTHOR LLOYD, R. C.
 TITLE EFFECT OF GADOLINIUM ON CRITICALITY OF URANIUM + PLUTONIUM SOLUTIONS
 REPORT NUMBER.... TANSO, 22, 292
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 75-11-00
 NSA-NUMBER 33:20931
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES IN FISSILE SOLUTIONS

ABSTRACT

EXPERIMENTS WERE RECENTLY COMPLETED TO PROVIDE DATA ON THE EFFECTIVENESS OF SOLUBLE POISONS ON THE CRITICALITY OF PLUTONIUM-URANIUM SOLUTION MIXTURES. ALTHOUGH SOME DATA HAVE BEEN REPORTED ON PLUTONIUM SOLUTIONS, NONE HAVE BEEN AVAILABLE FOR URANIUM/PLUTONIUM SOLUTIONS. THE CURRENT EXPERIMENTS PROVIDE DATA ON SYSTEMS TYPICAL OF LMFBR FUEL COMPOSITIONS. GADOLINIUM WAS CHOSEN FOR THIS STUDY BECAUSE OF ITS HIGH NEUTRON CROSS SECTION, HIGH SOLUBILITY, AND COMPATIBILITY IN THE SEPARATION PROCESS; I.E., GADOLINIUM IS MORE EASILY SEPARABLE FROM PLUTONIUM THAN CADMIUM OR BORON. THE DATA CAN HAVE APPLICATIONS IN CRITICALITY CONTROL AND PREVENTION AND SERVE ALSO AS EXPERIMENTAL BENCHMARKS FOR VALIDATING CALCULATIONAL TECHNIQUES AND CROSS-SECTION SETS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1583 ID-NUMBER ID-NUMBER 1583

AUTHOR TOFFER, H. / NIELSEN, L. A.
 TITLE SUBCRITICAL MEASUREMENTS WITH IRRADIATED AND UNIRRADIATED URANIUM METAL FUEL ELEMENTS
 REPORT NUMBER..... TANSO, 22, 292-295
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 75-11-00
 NSA-NUMBER 33:22049
 SITE/PROGRAM HANFORD - IRRADIATED AND UNIRRADIATED URANIUM METAL FUEL ELEMENTS

ABSTRACT

WITH THE LACK OF SPENT-FUEL REPROCESSING CAPACITY, AN INCREASED EMPHASIS IS PLACED ON MORE EFFICIENT UTILIZATION OF SPACE IN SPENT-FUEL STORAGE POOLS. ANALYTICAL STUDIES SHOW THAT UNNECESSARILY LARGE MARGINS OF SAFETY MAY BE APPLIED TO IRRADIATED FUEL STORAGE BY ASSIGNING UNIRRADIATED FUEL CRITICAL MASS PARAMETERS. SUBCRITICAL MEASUREMENTS WITH IRRADIATED AND UNIRRADIATED FUEL ELEMENTS WERE UNDERTAKEN BY UNITED NUCLEAR INDUSTRIES, WITH TECHNICAL ASSISTANCE SUPPLIED BY THE BATTELLE PACIFIC NORTHWEST CRITICAL MASS LABORATORY, TO CONFIRM THE ANALYTICAL RESULTS.

1584 ID-NUMBER ID-NUMBER 1584

AUTHOR MC KNIGHT, R.D.
 TITLE BENCHMARK TESTING USING ENDF/B-III AND -IV
 REPORT NUMBER..... TANSO, 22, 723-724
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 75-11-00
 NSA-NUMBER 33:22262
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6 - CALCULATIONS ; ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

A SERIES OF BENCHMARK CALCULATIONS OF CRITICAL EXPERIMENTS HAS BEEN PERFORMED TO ASSESS THE EFFECTS THAT RECENT CHANGES IN THE ENDF/B DATA FILES HAVE HAD ON CALCULATED LMFBR PARAMETERS. THREE WELL-DOCUMENTED CRITICAL ASSEMBLIES WERE STUDIED USING STANDARD METHODS OF FAST REACTOR ANALYSIS (TWO-DIMENSIONAL (2-D) MULTIGROUP DIFFUSION THEORY) WITH BOTH VERSIONS III AND IV OF ENDF/B. A REVIEW OF THE CHANGES IN THE PRINCIPAL CROSS SECTIONS INCORPORATED IN THE LATEST EVALUATION HAS BEEN MADE AND WAS USED TO INTERPRET THE CHANGES IN CALCULATED INTEGRAL PARAMETERS.

THE THREE CRITICAL ASSEMBLIES INCLUDED IN THIS STUDY WERE ZPR-6 ASSEMBLIES 6A AND 7 AND ZPR-3 ASSEMBLY 48. THESE THREE BENCHMARK ASSEMBLIES PROVIDE A RANGE OF REACTOR SIZES, FUEL TYPES, AND NEUTRON SPECTRA (ASSEMBLY 7 BEING SIMILAR IN COMPOSITION TO A LARGE LMFBR).

1587 ID-NUMBER ID-NUMBER 1587

AUTHOR KOLAR, O. C. / FINN, H. F. / PRUVOST, N. L.
 TITLE LIVERMORE PLUTONIUM ARRAY PROGRAM: EXPERIMENTS AND CALCULATIONS
 REPORT NUMBER..... NUTYBB, 29, 057-072
 JOURNAL NUCLEAR TECHNOLOGY
 DATE PUBLISHED ... 76-04-00
 NSA-NUMBER 33:30413
 SITE/PROGRAM LIVERMORE - PLUTONIUM ARRAYS

ABSTRACT

THE FIRST PRECISION ARRAY MEASUREMENTS WITH HIGH-DENSITY PLUTONIUM-METAL CYLINDRICAL PARTS OF 3 AND 6 KG TOOK PLACE AT THE LIVERMORE CRITICAL ASSEMBLY FACILITY FROM 1965 TO 1969. CUBIC ARRAYS OF UP TO SIXTY-FOUR 6-KG PARTS WERE MEASURED. MOCK HIGH-EXPLOSIVE EPOXY MODERATORS WERE USED IN SEVERAL MEASUREMENTS. EXPERIMENTS OBSERVING THE EFFECTS OF SIMULATED BODY REFLECTORS PROVIDED PERSONNEL SAFETY GUIDANCE FOR THE CONSTRUCTION OF THESE ARRAYS. A COMPARISON OF MONTE CARLO CALCULATIONS AND THE EXPERIMENTAL MEASUREMENTS INDICATED THAT THE CALCULATIONAL METHOD IS SUFFICIENTLY ACCURATE TO BE USED IN NUCLEAR SAFETY GUIDANCE FOR ARRAYS OF THESE ELEMENTS. INCLUDED FOR COMPARISON ARE CALCULATIONS FOR ARRAYS COMPRISED SOLELY OF THE PLUTONIUM PARTS. ALSO INCLUDED ARE CALCULATIONS FOR 6-KG-PART ARRAYS IN WHICH A 0.479-CM-WIDE GAP AT THE MIDPLANE HAS BEEN ELIMINATED AND WHERE THE SPACING WAS VARIED FOR EACH IDEALIZED ARRAY.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1588 ID-NUMBER ID-NUMBER 1588

AUTHOR LLOYD, R. C./ CLAYTON, E. D.
 TITLE SUMMARY OF CRITICALITY DATA OBTAINED AT BATTELLE PACIFIC NORTHWEST
 LABORATORIES ON FIXED AND SOLUBLE POISONS IN URANIUM + PLUTONIUM NITRATE
 SOLUTIONS
 REPORT NUMBER.... BNWL-B-482
 DATE PUBLISHED ... 76-04-00
 NSA-NUMBER 7666574
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES IN FISSILE SOLUTIONS

ABSTRACT

KNOWLEDGE OF THE EFFECTS OF NEUTRON POISONS ON URANIUM + PLUTONIUM SYSTEMS IS NECESSARY TO BETTER ESTABLISH CRITICALITY SAFETY PROGRAMS. THESE DATA ARE NEEDED IN SETTING OF CRITICALITY SAFETY SPECIFICATIONS FOR STORAGE, PROCESSING AND SHIPPING OF FISSILE MATERIAL WHERE IT IS DESIRED TO HANDLE LARGER QUANTITIES WITH SAFETY AND EFFICIENCY. THESE DATA ARE NEEDED ALSO FOR VALIDATING CALCULATIONAL TECHNIQUES AND CROSS SECTIONS SETS. URANIUM + PLUTONIUM SOLUTIONS CONTAINING 30% PLUTONIUM IN THE TOTAL URANIUM + PLUTONIUM WERE USED IN THESE EXPERIMENTS TO DETERMINE THE EFFECT OF NEUTRON POISONS. CRITICALITY OF HETEROGENEOUS SYSTEMS OF URANIUM DIOXIDE-PLUTONIUM DIOXIDE RODS IN A LATTICE WERE STUDIED WHEN THE URANIUM + PLUTONIUM SOLUTIONS WITH VARIOUS AMOUNTS OF GADOLINIUM AND BORON WERE ADDED TO THE SYSTEM. CRITICALITY OF HOMOGENEOUS SYSTEMS OF THE URANIUM + PLUTONIUM NITRATE WERE DETERMINED WITH VARYING AMOUNTS OF GADOLINIUM AND GADOLINIUM + BORON ADDED TO THE SOLUTION. MEASUREMENTS WERE MADE TO DETERMINE ALSO THE EFFECT OF BORON-GLASS RASCHIG RINGS ON THE CRITICALITY OF THE URANIUM + PLUTONIUM NITRATE SOLUTION SYSTEMS.

1602 ID-NUMBER ID-NUMBER 1602

AUTHOR SCHUSKE, C. L. / PAXTON, H. C.
 TITLE HISTORY OF FISSILE ARRAY MEASUREMENTS IN THE UNITED STATES
 REPORT NUMBER.... NUTYBB, 30, 101-137
 JOURNAL NUCLEAR TECHNOLOGY
 DATE PUBLISHED ... 76-08-00
 NSA-NUMBER 7687711
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

THE FIRST MEASUREMENTS WITH ARRAYS OF FISSILE METAL WERE PERFORMED AT THE LOS ALAMOS SCIENTIFIC LABORATORY IN 1947 AND THE FIRST WITH FISSILE SOLUTIONS WERE PERFORMED AT THE OAK RIDGE CRITICAL EXPERIMENTS FACILITY IN 1949. SINCE THEN, THERE HAVE BEEN MANY OTHER SIGNIFICANT EXPERIMENTS AT SEVERAL U.S. LABORATORIES INCLUDING, IN ADDITION, ROCKY FLATS, BATTELLE-PACIFIC NORTHWEST LABORATORY, AND THE LAWRENCE LIVERMORE LABORATORY. ARRAY TESTS WERE THE PRIMARY SOURCES OF DATA USED IN DEVELOPING CRITICALITY CRITERIA FOR FISSILE-PROCESS PLANTS, AND THEY PROVIDED THE BASIS FOR SEVERAL EMPIRICAL STORAGE MODELS THAT ARE STILL IN USE. SOME OF THE EXPERIMENTAL DATA ALSO SERVE TO VALIDATE MONTE CARLO NEUTRON TRANSPORT CALCULATIONS NOW USED EXTENSIVELY BY THE NUCLEAR SAFETY ENGINEER IN THE DESIGN OF STORAGE AND PROCESSING FACILITIES. IT IS FELT THAT THERE SHOULD BE ADDITIONAL EXPERIMENTAL DATA FOR FURTHER VALIDATION OF CALCULATIONAL METHODS RELIED UPON FOR CRITICALITY SAFETY EVALUATION. THE DEFICIENT AREAS INCLUDE LOW-URANIUM-235-ENRICHED URANIUM, URANIUM-233 WITH AND WITHOUT THORIUM, AND PLUTONIUM-URANIUM MIXTURES. ALSO, CRITICAL DATA ARE LACKING FOR ARRAYS WITH THE CONCRETE REFLECTORS NORMALLY FOUND IN PROCESS-PLANT ENVIRONMENTS, AND ADDITIONAL EXPERIMENTS ON CONCRETE-REFLECTED ARRAYS ARE NEEDED. THE PURPOSE OF THIS PAPER IS TO REVIEW THE HISTORY OF EXPERIMENTS IN THE U.S. WITH ARRAYS OF FISSILE MATERIAL. IN THE COURSE OF THIS REVIEW, THE RESULTING CRITICALITY DATA ARE PRESENTED, SOME FOR CONVENIENT CONTINUING APPLICATION AND SOME TO EXPLAIN THE EVOLUTION OF ENGINEERING MODELS OF STORAGE ARRAYS.

1606 ID-NUMBER ID-NUMBER 1606

AUTHOR SCHUSKE, C. L. / DICKINSON, D. / HUNT, D. C. / ROTHE, R. E. / SHEETS, W. R.
 TITLE REFERENCE CRITICAL EXPERIMENTS. PROGRESS REPORT, JANUARY 1, 1976--MARCH 31, 1976
 REPORT NUMBER.... RFP-NUREG-2517
 DATE PUBLISHED ... 76-05-00
 NSA-NUMBER 7690342
 SITE/PROGRAM ROCKY FLATS - URANYL NITRATE - PLEXIGLASS

ABSTRACT

CALCULATIONAL STUDIES UNDER TASK 3 CONTINUE. THESE PARAMETRIC STUDIES ARE USED AS GUIDANCE IN THE PLANNING AND DESIGN OF EXPERIMENTS. THE PARAMETRIC STUDIES FOR TASKS 4 AND 5 ARE 80 PERCENT COMPLETE. THE FIRST CRITICAL MEASUREMENT UNDER TASK 4 WAS ACCOMPLISHED. THIS MEASUREMENT INVOLVED A MINIMALLY REFLECTED SINGLE CYLINDER WITH AN ENRICHED URANYL NITRATE SOLUTION. EXPLORATORY CALCULATIONS FOR TASKS 6 AND 7 CONTINUE. APPROXIMATELY 75 PERCENT OF THE MATERIALS AND EQUIPMENT NEEDED FOR TASK 4 AND 5 EXPERIMENTS ARE ON HAND, AND THE REMAINING MATERIALS AND EQUIPMENT FOR

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THESE TWO TASKS ARE ON ORDER. ALTHOUGH TASK 1, "PROBLEMS AND PRIORITIES", WAS ESSENTIALLY COMPLETED AND REPORTED IN RFP-NUREG-2481, WE WERE RESPONSIBLE FOR UPDATING TABLE I SEMIANNUALLY. THIS TABLE HAS BEEN APPROPRIATELY RE-ENTITLED "LIST OF AREAS WHERE BENCHMARK MEASUREMENTS ARE NEEDED"

THE FIRST UPDATE HAS BEEN ACCOMPLISHED.

1607 ID-NUMBER ID-NUMBER 1607

AUTHOR SCHUSKE, C. L. / DICKINSON, D. / ROTHE, R. E.
 TITLE REFERENCE CRITICAL EXPERIMENTS. PROGRESS REPORT, APRIL 1, 1976--JUNE 30, 1976
 REPORT NUMBER.... RFP-NUREG-2555
 DATE PUBLISHED ... 76-08-00
 NSA-NUMBER 7697974
 SITE/PROGRAM ROCKY FLATS - URANYL NITRATE - PLEXIGLASS

ABSTRACT

THE GREATER PART OF OUR EFFORT THIS QUARTER WAS THE SET-UP AND PERFORMANCE OF TWENTY-FOUR TASK 4 CRITICAL EXPERIMENTS ON MINIMALLY REFLECTED TANKS CONTAINING URANYL NITRATE SOLUTION AT AN ENRICHMENT OF APPROXIMATELY 93 PERCENT AND A RANGE OF CONCENTRATIONS. A DETAILED GEOMETRY DESCRIPTION OF THE APPARATUS HAS BEEN WRITTEN AND USED TO GENERATE DATA FOR COMPARISON WITH THE EXPERIMENTAL RESULTS.

1608 ID-NUMBER ID-NUMBER 1608

AUTHOR SCHUSKE, C. L.
 TITLE HISTORY OF FISSILE ARRAY MEASUREMENTS IN THE UNITED STATES AND COMMENTS ON THE CURRENT EXPERIMENTS PROGRAM
 REPORT NUMBER.... TANSO, 23, 230
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 76-06-00
 NSA-NUMBER 7698207
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

THE INITIAL IMPETUS FOR EXPERIMENTAL ARRAY MEASUREMENTS WAS, AS ONE WOULD EXPECT, THE PROCESSING, FABRICATION, AND STORAGE OF HIGHLY ENRICHED URANIUM AND PLUTONIUM PRIMARILY AS METAL AND AQUEOUS SOLUTIONS. A RECENT LITERATURE SEARCH REVEALS THAT MORE THAN 90% OF ALL ARRAY MEASUREMENTS WERE WITH THESE MATERIALS.

THE FIRST MEASUREMENTS WITH ARRAYS OF FISSILE METAL WERE PERFORMED AT THE LOS ALAMOS SCIENTIFIC LABORATORY IN 1947 AND THE FIRST WITH FISSILE SOLUTIONS AT THE OAK RIDGE CRITICAL EXPERIMENTS FACILITY IN 1949. SINCE THEN, THERE HAVE BEEN MANY OTHER SIGNIFICANT EXPERIMENTS AT SEVERAL U.S. LABORATORIES INCLUDING ROCKY FLATS, BATTELLE PACIFIC-NORTHWEST LABORATORY, AND THE LAWRENCE LIVERMORE LABORATORY.

TODAY'S EXPERIMENTAL DATA PRIORITIES HAVE SHIFTED FROM HIGHLY ENRICHED FISSILE SYSTEMS TO THOSE IN THE UNDER 5% RANGE WHICH SUPPORT THE REACTOR FUELS PROCESSING AND FABRICATION INDUSTRY.

1612 ID-NUMBER ID-NUMBER 1612

AUTHOR LLOYD, R. C. / CLAYTON, E. D.
 TITLE EFFECT OF BORON AND GADOLINIUM ON THE CRITICALITY OF PLUTONIUM-URANIUM SYSTEMS
 REPORT NUMBER.... TANSO, 23, 234-235
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 76-06-00
 NSA-NUMBER 7698211
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM NITRATE SOLUTIONS

ABSTRACT

EXPERIMENTS WERE PERFORMED TO SUBSTANTIATE THE EFFECTIVENESS OF SOLUBLE NUCLEAR POISONS ON THE CRITICALITY OF PLUTONIUM-URANIUM NITRATE SOLUTIONS AND TO DETERMINE THEIR EFFECTIVENESS FOR CRITICALITY CONTROL ON A HETEROGENEOUS ASSEMBLY OF MIXED-OXIDE FUEL PINS IMMERSSED IN PLUTONIUM- URANIUM NITRATE SOLUTIONS CONTAINING THE SOLUBLE POISONS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1613 ID-NUMBER ID-NUMBER 1613

AUTHOR BIERMAN, S. R./ CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS WITH LOW-MODERATED HOMOGENEOUS MIXTURES OF PLUTONIUM AND URANIUM OXIDES CONTAINING 8 AND 15 WT% PLUTONIUM
 REPORT NUMBER..... TANSO, 23, 235-237
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 76-06-00
 NSA-NUMBER 7698212
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

ABSTRACT

DATA FROM THE LATEST IN A SERIES OF EXPERIMENTS TO DEFINE THE CRITICALITY PARAMETERS OF UNDERMODERATED, HOMOGENEOUS OXIDE MIXTURES OF PLUTONIUM AND URANIUM ARE PRESENTED IN THIS PAPER. DATA FROM PRECEDING EXPERIMENTS HAVE BEEN REPORTED. THESE LATEST MEASUREMENTS WERE CARRIED OUT WITH FUEL MIXTURES CONTAINING ABOUT 8 AND 15 WT% PLUTONIUM IN THE PLUTONIUM + URANIUM AND HAVING HYDROGEN/(PLUTONIUM + URANIUM) ATOMIC RATIOS OF ABOUT 7 AND 3, RESPECTIVELY. AS IN THE PAST, WITH THIS HIGH A CONCENTRATION OF OXIDE, THE EXPERIMENTS WERE PERFORMED WITH SOLID COMPACTS OF PLUTONIUM DIOXIDE-URANIUM DIOXIDE-POLYSTYRENE 5.09 CM SQUARE AND HAVING THICKNESSES OF ABOUT 5.09 AND 1.3 CM. EACH COMPACT WAS CLAD WITH MM&M #471 TAPE. A COMPLETE DESCRIPTION IS GIVEN FOR EACH OF THE TWO FUELS, THE CLADDING MATERIAL, AND THE PLEXIGLAS REFLECTOR USED IN THE EXPERIMENTS. IN BOTH FUEL MIXTURES THE PLUTONIUM CONTAINED ABOUT 11.5 WT% PLUTONIUM-240 AND THE URANIUM WAS DEPLETED TO ABOUT 0.2 WT% URANIUM-235.

NEUTRON MULTIPLICATION MEASUREMENTS WERE MADE ON FULLY REFLECTED PARALLELEPIPEDS OF EACH FUEL. FOR THE 8 WT% PLUTONIUM-ENRICHED FUEL MIXTURE, THE GEOMETRY RANGED FROM THE NEAR CUBIC TO A RELATIVELY THIN SLAB. HOWEVER, BECAUSE OF THE PROHIBITIVELY LARGE VOLUME REQUIRED FOR CRITICALITY WITH THE 15 WT% PLUTONIUM FUEL, THE EXPERIMENTS WERE LIMITED TO A SINGLE NEAR-CUBIC ASSEMBLY.

1614 ID-NUMBER ID-NUMBER 1614

AUTHOR JOZEFOWICZ, EDWARD T.
 TITLE THE BASIC STATIC PARAMETERS FOR WWR-SM LATTICES WITH WATER CHANNELS. ESTIMATION OF HETEROGENEITY EFFECT ON NEUTRON AGE.
 REPORT NUMBER..... NUKLEONIKA, 15, 399-410
 JOURNAL NUKLEONIKA
 DATE PUBLISHED ... 70-04-00
 NSA-NUMBER 25:15394
 SITE/PROGRAM GERMANY - URANIUM(36%) LATTICES (WWR-SM)

ABSTRACT

INVESTIGATIONS OF THE BASIC STATIC CHARACTERISTICS OF WWR-SM LATTICES (36% ENRICHED MULTITUBE FUEL, WATER MODERATED) WITH INCREASED WATER-TO-FUEL RATIO ARE DESCRIBED.

1618 ID-NUMBER ID-NUMBER 1618

AUTHOR BIERMAN, S. R./ CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS WITH UNMODERATED PLUTONIUM OXIDE.
 REPORT NUMBER..... NUTYBB, 11, 185-190
 JOURNAL NUCLEAR TECHNOLOGY
 DATE PUBLISHED ... 71-06-00
 NSA-NUMBER 25:39321
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

THE RESULTS AND ANALYSES PRESENTED ARE FROM THE LATEST SERIES OF EXPERIMENTS IN A CONTINUING PROGRAM FOR DETERMINING THE CRITICAL PARAMETERS OF PLUTONIUM MIXTURES HAVING CONCENTRATIONS TYPICAL OF WET POWDERS, PRECIPITATES, SLURRIES, AND POLYMERS. PREVIOUS MEASUREMENTS IN THIS PROGRAM WERE MADE ON 15 HYDROGEN/PLUTONIUM FUEL HAVING PLUTONIUM-240 ISOTOPIC CONCENTRATIONS OF 2.2 AND 8.08 WT% AND ON 5 HYDROGEN/PLUTONIUM FUEL HAVING A PLUTONIUM-240 ISOTOPIC CONCENTRATION OF 11.46 WT% THIS LATEST SERIES OF EXPERIMENTS WAS CONDUCTED WITH FUEL IN WHICH THE PLUTONIUM-240 ISOTOPIC CONTENT HAS BEEN INCREASED TO 18.35 WT% AND THE HYDROGEN/PLUTONIUM ATOMIC RATIO DECREASED TO ESSENTIALLY ZERO.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1622 ID-NUMBER ID-NUMBER 1622

AUTHOR LLOYD, R. C./ CLAYTON, E. D./ HANSEN, L. E.
 TITLE CRITICALITY OF PLUTONIUM NITRATE SOLUTION CONTAINING SOLUBLE GADOLINIUM.
 REPORT NUMBER..... TANSO, 14, 037
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-06-00
 NSA-NUMBER 25:39681
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

CRITICALITY DATA ON THE EFFECT OF SOLUBLE POISONS ARE NEEDED FOR MORE ACCURATE ESTABLISHMENT OF NUCLEAR SAFETY LIMITS IN THE STORAGE AND PROCESSING OF FISSILE SOLUTIONS, SINCE FEW EXPERIMENTAL DATA ARE AVAILABLE. A RESEARCH EFFORT TO PROVIDE DATA ON POISONED SYSTEMS IS CONTINUING WITH EXPERIMENTS USING GADOLINIUM IN PLUTONIUM NITRATE SOLUTIONS. GADOLINIUM WAS CHOSEN FOR THIS STUDY BECAUSE OF ITS HIGH NEUTRON CROSS SECTION, HIGH SOLUBILITY, AND COMPATIBILITY IN THE SEPARATION PROCESS. THE PRESENT EFFORT IS ORIENTED TOWARD PROVIDING DATA ON THE EFFECTS OF GADOLINIUM ADDITIONS FOR NUCLEAR SAFETY GUIDANCE AND TO PROVIDE EXPERIMENTAL BENCHMARKS FOR CHECKING CALCULATIONAL TECHNIQUES AND CROSS SECTION SETS.

1624 ID-NUMBER ID-NUMBER 1624

AUTHOR HUNT, D. C./ ROTHE, R. E.
 TITLE CRITICALITY ANALYSIS OF ENRICHED URANIUM METAL SPHERES UNDERGOING DISSOLUTION.
 REPORT NUMBER..... TANSO, 14, 038-039
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-06-00
 NSA-NUMBER 25:39683
 SITE/PROGRAM ROCKY FLATS - SOLID UNITS IN FISSILE SOLUTIONS

ABSTRACT

CRITICALITY MEASUREMENTS AND CALCULATIONS ON ENRICHED 93.2 WT% URANIUM-235 METAL SPHERES SYMMETRICALLY IMMERSED IN ENRICHED 93.2 WT% URANIUM-235 URANYL NITRATE SOLUTION HAVE BEEN PRESENTED PREVIOUSLY. THE PRESENT INTERPRETATION OF THE SAME DATA CONSIDERS THE CRITICALITY SAFETY OF AN ENRICHED URANIUM METAL SPHERE IMMERSED, INITIALLY, IN NONFISSILE LIQUID (E.G., ACID). AS THE METAL DISSOLVES, THE FISSILE CONCENTRATION OF THE SOLUTION INCREASES UNTIL THE TWO INTERACTING FISSILE REGIONS TOGETHER ACHIEVE CRITICALITY. HERE, THE URANIUM IN SOLUTION IS ASSUMED HOMOGENEOUSLY DISTRIBUTED.

1625 ID-NUMBER ID-NUMBER 1625

AUTHOR CURRIE, R. L./ PARKS, P. B./ JARRIEL, J. L.
 TITLE REACTIVITY MEASUREMENTS ON LARGE URANIUM-235-ALUMINUM FORMS IN WATER
 REPORT NUMBER..... TANSO, 14, 039-040
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-06-00
 NSA-NUMBER 25:39684
 SITE/PROGRAM SAVANNAH RIVER - LARGE URANIUM-ALUMINUM FUEL FORMS IN WATER

ABSTRACT

THIS PAPER REPORTS EXPERIMENTS ON REGULARLY SPACED, RECTANGULAR, SUBCRITICAL ARRAYS OF LARGE URANIUM-235-ALUMINUM ALLOY FUEL FORMS IN WATER.

1626 ID-NUMBER ID-NUMBER 1626

AUTHOR BIERMAN, S. R./ CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS WITH MIXED OXIDES OF PLUTONIUM AND URANIUM CONTAINING 15 AND 30 WT% PLUTONIUM.
 REPORT NUMBER..... TANSO, 14, 040-041
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-06-00
 NSA-NUMBER 25:39685
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

A RESEARCH EFFORT HAS BEEN INITIATED AT THE CRITICAL MASS LABORATORY AT BATTELLE-NORTHWEST TO INVESTIGATE LMFBR FUELS. THE INITIAL SERIES OF EXPERIMENTS WAS DESIGNED TO OBTAIN CRITICALITY DATA ON HYDROGENOUS MIXTURES OF PLUTONIUM-DIOXIDE-URANIUM-DIOXIDE AT CONCENTRATIONS THAT WILL PROVIDE DATA OVER THE WIDEST POSSIBLE RANGE IN THE 8 TO 30 WT% ENRICHMENT REGION.

1627 ID-NUMBER ID-NUMBER 1627

AUTHOR PASCHALL, R. K. / KLANN, P. G.
 TITLE NEUTRON SPECTRUM MEASUREMENTS IN A COMPACT FAST-SPECTRUM CRITICAL ASSEMBLY.
 REPORT NUMBER..... TANSO, 14, 004-005
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-06-00
 NSA-NUMBER 25:41513
 SITE/PROGRAM ATOMICS INTERNATIONAL - URANIUM NITRIDE - LITHIUM - MOLYBDENUM REFLECTED FAST REACTOR

ABSTRACT

DIFFERENTIAL NEUTRON SPECTRA WERE MEASURED IN THE CENTER OF A FAST-SPECTRUM MOLYBDENUM- REFLECTED CRITICAL ASSEMBLY, USING SPHERICAL PROTON-RECOIL DETECTORS. THE CRITICAL ASSEMBLY WAS BUILT TO INVESTIGATED GEOMETRICAL VARIABLES AND REACTIVITY EFFECTS OF MATERIALS FOR A SMALL, FAST- SPECTRUM CONCEPTUAL REACTOR (LITHIUM-COOLED, URANIUM-235 NITRIDE-FUELED). MEASUREMENTS WERE MADE AT ATOMICS INTERNATIONAL WHERE THE CRITICAL ASSEMBLY WAS DESIGNED, BUILT, AND OPERATED. CALCULATIONS WERE MADE AT THE NASA LEWIS RESEARCH CENTER.

1628 ID-NUMBER ID-NUMBER 1628

AUTHOR LESAGE, L. G. / BOHN, E. M. / MARSHALL, J. E. / KARAM, R. A. / TILL, C. E. / LEWIS, R. A. / SALVATOIRES, M.
 TITLE INITIAL EXPERIMENTAL RESULTS FROM ZPR-6 ASSEMBLY 7, THE SINGLE-ZONE DEMONSTRATION REACTOR BENCHMARK ASSEMBLY.
 REPORT NUMBER..... TANSO, 14, 017-018
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-06-00
 NSA-NUMBER 25:41514
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6

ABSTRACT

ASSEMBLY 7 OF ZPR-6 IS THE FIRST AND LEAST COMPLEX OF THE SERIES OF THREE ASSEMBLIES TO BE CONSTRUCTED ON ZPR-6 AND ZPPR AS PART OF THE DEMONSTRATION REACTOR BENCHMARK PROGRAM. IT IS A LARGE, DILUTE PLUTONIUM-OXIDE-FUELED SINGLE-ZONE CORE WITH THE ONE-DRAWER UNIT-CELL COMPOSITION THAT MATCHES BOTH THE INNER-CORE COMPOSITION OF ZPPR ASSEMBLY AND THE PIN-CALANDRIA COMPOSITION OF THE VARIABLE TEMPERATURE RODDED ZONE. THE BLANKET OF ASSEMBLY 7 IS DEPLETED URANIUM, AND THE CORE'S FERTILE-TO-FISSILE RATIO IS ABOUT 6.5.

1629 ID-NUMBER ID-NUMBER 1629

AUTHOR LEWIS, R. A. / LESAGE, L. G. / TILL, C. E. / MARSHALL, J. E. / BOHN, E. M. / SALVATOIRES, M. / STANFORD, G. S.
 TITLE LMFBR DEMONSTRATION REACTOR BENCHMARK CRITICAL EXPERIMENTS PROGRAM -- INITIAL PLATE-ROD HETEROGENEITY MEASUREMENTS.
 REPORT NUMBER..... TANSO, 14, 018-019
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-06-00
 NSA-NUMBER 25:41515
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6

ABSTRACT

AN INITIAL SET OF MEASUREMENTS HAS BEEN CARRIED OUT TO EVALUATE THE EFFECT ON MEASURED CORE PHYSICS PARAMETERS OF THE CONFIGURATIONAL HETEROGENEITY DIFFERENCES BETWEEN THE NORMAL PLATE-FORM ZPR FAST CRITICAL ASSEMBLIES AND RODDED ASSEMBLIES TYPICAL OF A PLUTONIUM-PLUTONIUM-DIOXIDE-FUELED LMFBR. THESE MEASUREMENTS ARE THE FIRST SET OF A SERIES OF HETEROGENEITY MEASUREMENTS PLANNED FOR THE ANL LMFBR DEMONSTRATION PLANT CRITICAL EXPERIMENTS PROGRAM CURRENTLY UNDERWAY ON ZPR-6 (ASSEMBLY 7) AND ZPPR (ASSEMBLIES 2 AND 3).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1630 ID-NUMBER ID-NUMBER 1630

AUTHOR KAISER, R. E./ AMUNDSON, P. I./ FORRESTER, R. J./ NEWMARK, B.
 TITLE MEASUREMENT AND ANALYSIS OF SPACE-DEPENDENT PARAMETERS IN A DEMONSTRATION PLANT BENCHMARK CRITICAL.
 REPORT NUMBER..... TANSO, 14, 019-020
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-06-00
 NSA-NUMBER 25:41516
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPPR (DEMONSTRATION PLANT BENCHMARKS)

ABSTRACT

THE DEMONSTRATION PLANT BENCHMARK CRITICAL, ZPPR ASSEMBLY 2, IS A TWO- ZONE SYSTEM WITH EQUAL ZONE VOLUMES AND AN ENRICHMENT RATIO OF 1:5, OUTER ZONE/INNER ZONE. SEVERAL MEASUREMENTS HAVE BEEN PERFORMED, INCLUDING COUNTER TRAVERSES, SMALL-SAMPLE REACTIVITY TRAVERSES, AND THE WORTH AS A FUNCTION OF RADIAL POSITION OF A CALIFORNIUM-252 NEUTRON SOURCE, WHICH PROVIDE COMPARISONS FOR ANALYTICAL TECHNIQUES IN ZONED REACTORS. IN ADDITION, CENTRAL FISSION RATIOS HAVE BEEN MEASURED AND USED TO NORMALIZE THE FISSION COUNTER TRAVERSES AND THUS OBTAIN FISSION RATIOS AS A FUNCTION OF RADIAL POSITION.

COUNTER TRAVERSES WERE MADE FOR BORON-10(N, ALPHA) AND FOR PLUTONIUM-239, URANIUM-235, AND URANIUM-238 FISSION FROM CORE CENTER THROUGH THE RADIAL BLANKET AND REFLECTOR REGIONS. AGREEMENT WITH CALCULATED VALUES, EXCEPT IN THE RADIAL REFLECTOR AND THE OUTER RADIAL BLANKET, WAS GOOD. CALCULATIONS WERE PERFORMED BY TWO-DIMENSIONAL DIFFUSION THEORY WITH HETEROGENEOUSLY WEIGHTED CROSS SECTIONS.

1631 ID-NUMBER ID-NUMBER 1631

AUTHOR MENEGHETTI, D. / KEENEY, W. P. / VOSBURGH, R. O. / SIMON, G. G. / STENSTROM, D. G. / PHILLIPS, K. E. / GASIDLO, J. M.
 TITLE EXPERIMENTS AND ANALYSES OF HETEROGENEOUS CORES AND NEUTRON SPECTRA IN EBR-II CRITICAL ASSEMBLIES ON ZPR-3.
 REPORT NUMBER..... TANSO, 14, 020-021
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-06-00
 NSA-NUMBER 25:41517
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

A SERIES OF HETEROGENEOUSLY LOADED, STAINLESS-STEEL-REFLECTED CRITICAL ASSEMBLIES IN WHICH ASSEMBLY MATRIX ELEMENT COMPOSITIONS SIMULATE EBR-II SUBASSEMBLY TYPES HAS BEEN STUDIED ON THE ARGONNE ZERO POWER FACILITY, ZPR-3. THE STUDIES ARE DIRECTED TOWARD THE PROPOSED USE OF A STAINLESS- STEEL RADIAL REFLECTOR IN EBR-II AND ARE AN EXTENSION OF THE EBR-II-TYPE HOMOGENEOUS CORES SURROUNDED BY DEPLETED-URANIUM-RICH, NICKEL-RICH, OR STEEL-RICH RADIAL REFLECTORS, WHICH HAVE BEEN REPORTED. CURRENTLY, THE EBR-II IS RADIALY REFLECTED BY A BLANKET RICH IN DEPLETED URANIUM.

1632 ID-NUMBER ID-NUMBER 1632

AUTHOR KARAM, R. A./ STANFORD, G. S./ ROBINSON, R.
 TITLE ANISOTROPIC EFFECTS IN A 4000-LITER URANIUM DIOXIDE FAST CORE, ZPR-6 ASSEMBLY 6A.
 REPORT NUMBER..... TANSO, 14, 021-022
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-06-00
 NSA-NUMBER 25:41518
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6

ABSTRACT

ANISOTROPIC EFFECTS IN RELATIVELY SMALL FAST REACTORS WHERE THE SPECTRUM WAS HARD WERE INVESTIGATED BY BELL ET AL. IN THIS PAPER, ANISOTROPIC EFFECTS IN A DEMONSTRATION PLANT BENCHMARK CRITICAL, ZPR-6 ASSEMBLY 6A, WHERE THE SPECTRUM IS RELATIVELY SOFT, WERE CALCULATED FOR THE UNIT- CELL FLUX STRUCTURE, THE CRITICAL SIZE, AND ACTIVATION DISTRIBUTION.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1633 ID-NUMBER ID-NUMBER 1633

AUTHOR DAUGHTRY, J. W. / POND, R. B. / FLEISCHMAN, R. M. / SWANSON, C. S. / RUSCH, G. K. / KIER, P. H.

TITLE FTR-3 CRITICAL ASSEMBLY AND EXPERIMENTAL PROGRAM.

REPORT NUMBER..... TANSO, 14, 024-025

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 71-06-00

NSA-NUMBER 25:41520

SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-9 (FAST ROCKET)

ABSTRACT

FTR-3 WAS THE THIRD OF A SERIES OF RELATIVELY SIMPLE CRITICAL ASSEMBLIES BUILT BY ARGONNE NATIONAL LABORATORY FOR THE PURPOSE OF OBTAINING DATA FOR TESTING THE ANALYTICAL METHODS BEING DEVELOPED TO DESIGN THE FAST TEST REACTOR (FTR). FTR-3 WAS SLIGHTLY MORE COMPLEX THAN THE FIRST TWO ASSEMBLIES OF THE SERIES, FTR-1 AND FTR-2. IT HAD A CYLINDRICAL, TWO-ZONE PLUTONIUM-OXIDE/URANIUM-OXIDE CORE SURROUNDED BY A RING OF 16 SIMULATED BORON CONTROL RODS. ITS RADIAL AND AXIAL REFLECTORS WERE COMPOSED OF NICKEL, STAINLESS STEEL, AND SODIUM. WHENEVER POSSIBLE, QUARTER CORE SYMMETRY WAS MAINTAINED THROUGHOUT THE FTR-3 EXPERIMENTS TO SIMPLIFY THE ANALYSIS.

1635 ID-NUMBER ID-NUMBER 1635

AUTHOR CRAMER, S. N.

TITLE MONTE CARLO ANALYSIS OF FAST CRITICAL ASSEMBLIES USING ENDF/B I AND II DATA.

REPORT NUMBER..... TANSO, 14, 348

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 71-06-00

NSA-NUMBER 25:41563

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS ; LOS ALAMOS - URANIUM(92%) METAL SPHERES - CALCULATIONS ; LOS ALAMOS - PLUTONIUM METAL SPHERES - CALCULATIONS

ABSTRACT

EVALUATION OF SEVERAL BENCHMARK REACTORS HAS BEEN MADE WITH ENDF/B PHASE I AND PHASE II DATA. THESE CALCULATIONS WERE MADE USING THE ESP CODE. ESP IS A MONTE CARLO CODE DESIGNED FOR GENERAL REACTOR ANALYSIS, WITH AN ENERGY RANGE OF 0.001 EV TO 15 MEV AND CAPABLE OF HANDLING COMPLICATED REACTOR AND REACTOR CELL GEOMETRIES. INPUT DATA TO THE CODE MUST BE IN THE ENDF/B LIBRARY TAPE FORMAT, AND ALL PHASE I AND PHASE II DATA APPLICABLE TO REACTOR CALCULATIONS CAN BE UTILIZED.

1636 ID-NUMBER ID-NUMBER 1636

AUTHOR HIRONS, THOMAS J./ BATTAT, M. E.

TITLE CALCULATIONS OF FAST CRITICAL ASSEMBLIES USING LASL AND ENDF/B VERSION II DATA.

REPORT NUMBER..... TANSO, 14, 348-349

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 71-06-00

NSA-NUMBER 25:41564

SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES - CALCULATIONS ; LOS ALAMOS - PLUTONIUM METAL SPHERES - CALCULATIONS

ABSTRACT

CONSIDERABLE EFFORT HAS BEEN EXPENDED AT LOS ALAMOS TOWARD THE ESTABLISHMENT OF A CONSISTENT SET OF URANIUM AND PLUTONIUM CROSS SECTIONS THAT CAN BE USED TO YIELD ACCURATE NEUTRONICS CALCULATIONS FOR A WIDE RANGE OF FAST-NEUTRON ASSEMBLIES. THE PURPOSE OF THIS PAPER IS TO COMPARE NEUTRONICS CALCULATIONS MADE WITH DATA FROM THIS LASL LIBRARY AND WITH DATA FROM THE ENDF/B VERSION II FILE. THE ASSEMBLIES GODIVA AND JEZEBEL WERE CHOSEN FOR THE CALCULATIONS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1637 ID-NUMBER ID-NUMBER 1637

AUTHOR DEBRUE, J. / LEENDERS, L. / MOTTE, F. / VAN DEN BROECK, H. / DERAMAIX, P.
/ DE WAECH, F.

TITLE A BASIC EXPERIMENTAL REACTOR PHYSICS PROGRAM ON URANIUM-DIOXIDE/PLUTONIUM-DIOXIDE/WATER LATTICES

REPORT NUMBER..... TANSO, 14, 377-379

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 71-06-00

NSA-NUMBER 25:41567

SITE/PROGRAM BELGIUM - VENUS CRITICAL (URANIUM-PLUTONIUM DIOXIDE - WATER)

ABSTRACT

A THREE-YEAR PROGRAM HAS BEEN CONDUCTED IN THE VENUS CRITICAL FACILITY AT MOL AIMED AT OBTAINING REFERENCE DATA FOR THE CALIBRATION OF COMPUTER CODES, USED FOR PLUTONIUM RECYCLE DESIGN CALCULATIONS. ABOUT 130 CRITICAL CONFIGURATIONS WERE INVESTIGATED TO STUDY SYSTEMATICALLY THE MOST IMPORTANT NEUTRONIC CHARACTERISTICS. THIS WORK INCLUDED INTEGRAL, LOCAL, AND FINE-STRUCTURE MEASUREMENTS. THE AVAILABLE MATERIAL ALLOWED PARTICULARLY INTERESTING EXPERIMENTS, E.G., THE 0.7/5 AND 0.7/4 FUELS, CONTAINING THE SAME FISSILE PLUTONIUM AMOUNT, BUT HAVING A DIFFERENT PLUTONIUM-240 CONTENT. THE PROGRAM ALSO INCLUDED BORIC ACID POISONED MODERATOR CONFIGURATIONS.

1642 ID-NUMBER ID-NUMBER 1642

AUTHOR HUNT, D. C./ BOSS, M. R.

TITLE PLUTONIUM METAL CRITICALITY MEASUREMENTS.

REPORT NUMBER..... JAABA, 25, 241-251

JOURNAL JOURNAL OF NUCLEAR ENERGY

DATE PUBLISHED ... 71-06-00

NSA-NUMBER 25:57718

SITE/PROGRAM ROCKY FLATS - URANIUM(93%) METAL - SPHERES

ABSTRACT

THE RESULTS OF A SERIES OF CRITICAL MASS MEASUREMENTS ON ALPHA PHASE PLUTONIUM METAL 5.9 WT% PLUTONIUM-240 ARE REPORTED. THE ASSEMBLIES INVESTIGATED WERE SPHERES AND HEMISPHERES EITHER UNREFLECTED OR REFLECTED BY COMBINATIONS OF STEEL AND OIL. THE SPHERICAL CRITICAL MASSES ARE DEDUCED FROM MEASUREMENTS ON ASYMMETRIC SPHERICAL ASSEMBLIES WHILE THE HEMISPHERICAL CRITICAL PARAMETERS ARE OBTAINED DIRECTLY. A TOTAL OF 42 CRITICAL MASSES WERE MEASURED.

1644 ID-NUMBER ID-NUMBER 1644

AUTHOR CURRIE, R. L./ PARKS, P. B./ JARRIEL, J. L.

TITLE STATIC AND PULSED REACTIVITY MEASUREMENTS ON LARGE URANIUM-235 FUEL FORMS IN WATER.

REPORT NUMBER..... NUTYBB, 12, 356-362

JOURNAL NUCLEAR TECHNOLOGY

DATE PUBLISHED ... 71-12-00

NSA-NUMBER 25:60212

SITE/PROGRAM SAVANNAH RIVER - LARGE URANIUM-ALUMINUM FUEL FORMS IN WATER

ABSTRACT

THE PURPOSE OF THIS PAPER IS TO REPORT EXPERIMENTS ON LARGE HOLLOW CYLINDERS OF HIGHLY ENRICHED URANIUM-235-ALUMINUM ALLOY FUEL. THE EXPERIMENTS CONSISTED OF STATIC AND PULSED MEASUREMENTS OF PARAMETERS RELATED TO THE REACTIVITY OF REGULARLY SPACED, SUBCRITICAL ARRAYS OF LARGE HOLLOW CYLINDERS OF HIGHLY ENRICHED URANIUM-235-ALUMINUM ALLOY FUEL IN WATER. CALCULATIONS WITH THE MGBS-TGAN CODES AND WITH THE KENO CODE WERE COMPARED TO THE MEASUREMENTS.

1646 ID-NUMBER ID-NUMBER 1646

AUTHOR JOHNSON, E. B.

TITLE NUCLEAR CRITICALITY OF INTERSECTING CYLINDERS OF 5% URANIUM-235 ENRICHED URANYL FLUORIDE AQUEOUS SOLUTION

REPORT NUMBER..... TANSO, 14, 678

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

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NSA-NUMBER 26:02164

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM OAK RIDGE - URANYL(5%)FLUORIDE INTERSECTING CYLINDERS

ABSTRACT

A PROGRAM OF EXPERIMENTS INVESTIGATING THE CRITICAL CONDITIONS OF INTERSECTING CYLINDERS OF FISSILE MATERIAL HAS BEEN INAUGURATED TO FURTHER DESIGN OF PROCESSES FOR FISSILE MATERIAL OF LOW URANIUM-235 CONTENT AND TO FURTHER THE DEVELOPMENT OF ANALYTICAL METHODS APPLICABLE TO NUCLEAR CRITICALITY.

PRESENT WORK REPORTS THE RESULTS OF MEASUREMENTS AND CALCULATIONS OF URANYL FLUORIDE AQUEOUS SOLUTIONS OF VARIOUS CHEMICAL CONCENTRATIONS IN WHICH THE URANIUM WAS ENRICHED TO 5.0% IN URANIUM- 235.

1647 ID-NUMBER ID-NUMBER 1647

AUTHOR HUNT, D. C./ ROTHE, R. E.

TITLE CRITICALITY MEASUREMENTS ON URANIUM METAL SPHERES IMMersed IN URANIUM SOLUTION.

REPORT NUMBER..... NSENAO, 46, 076-087

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 71-10-00

NSA-NUMBER 26:03953

SITE/PROGRAM ROCKY FLATS - SOLID UNITS IN FISSILE SOLUTIONS

ABSTRACT

THE RESULTS OF CRITICALITY MEASUREMENTS ON 93.16% ENRICHED URANIUM METAL SPHERES SYMMETRICALLY IMMersed IN ENRICHED URANYL NITRATE SOLUTION CYLINDERS ARE REPORTED. THE SOLUTION CYLINDERS ARE 26. 5, 38.4, AND 51.1 CM IN DIAMETER WITH HEIGHTS RANGING FROM 16 TO 70 CM. SOLUTION CONCENTRATIONS, EXPRESSED IN GRAMS OF URANIUM PER LITER, ARE 11.47, 12.55, 13.12, 21.25, 24.20, 24.72, 103.0, AND 104.8. TWENTY-SEVEN CRITICAL SYSTEMS ARE IDENTIFIED. THE EXPERIMENTAL CRITICAL PARAMETERS OF EACH SYSTEM ARE COMPARED WITH COMPUTED VALUES OBTAINED BY TRANSPORT (DTF) AND MONTE CARLO (KENO) METHODS. RESULTS FROM NEITHER METHOD EXHIBIT A SYSTEMATIC DIFFERENCE FROM EXPERIMENTAL VALUES; THE AVERAGE DIFFERENCE IN THE CRITICAL RADIUS IS 2.5% FOR DTF AND 2.0% FOR KENO. THE EFFECTS OF EXPERIMENTAL PERTURBATIONS ARE DETERMINED EXPERIMENTALLY AND CALCULATIONALLY.

1648 ID-NUMBER ID-NUMBER 1648

AUTHOR ZOLOTAR, B. A. / SALVATOIRES, M. / BINGMAN, B. M. / LEWIS, E. E.

TITLE COMPARATIVE STUDY OF HETEROGENEITY TREATMENTS FOR ZRP PLATE CELLS.

REPORT NUMBER..... TANSO, 14, 848-849

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 71-10-00

NSA-NUMBER 26:03984

SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6 - CALCULATIONS

ABSTRACT

HETEROGENEITY CALCULATIONS FOR ZRP PLATE LATTICES PLAY AN IMPORTANT PART IN THE ANALYSIS OF FAST CRITICALS. SEVERAL TREATMENTS OF THIS HETEROGENEITY HAVE BEEN DEVELOPED AND THIS WORK COMPARES THE CALCULATION OF RESONANCE CROSS SECTIONS BY THREE DIFFERENT METHODS.

1649 ID-NUMBER ID-NUMBER 1649

AUTHOR MUELLER, R. E. / PAGE, E. M. / KOMATA, M.

TITLE A COMPARATIVE ANALYSIS OF METHODS FOR CALCULATING HETEROGENEITY EFFECTS IN FAST CRITICAL ASSEMBLIES. PART 1. METHODS.

REPORT NUMBER..... TANSO, 14, 849-850

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 71-10-00

NSA-NUMBER 26:03985

SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6 - CALCULATIONS

ABSTRACT

A COMPARATIVE ANALYSIS OF METHODS OF DETERMINING HETEROGENEITY EFFECTS IN FAST PLATE-TYPE CRITICAL EXPERIMENTS HAS RECENTLY BEEN COMPLETED. THIS SUMMARY DESCRIBES THE METHODS AND INVESTIGATES THE ASSOCIATED MODELING ASSUMPTIONS. ANALYSIS OF THE COMPUTED HETEROGENEITY EFFECTS IS GIVEN IN THE COMPANION SUMMARY.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1650 ID-NUMBER ID-NUMBER 1650

AUTHOR PAGE, E. M./ MUELLER, R. E.
 TITLE A COMPARATIVE ANALYSIS OF METHODS FOR CALCULATING HETEROGENEITY EFFECTS IN FAST CRITICAL EXPERIMENTS. PART-2. ANALYSIS.
 REPORT NUMBER..... TANSO, 14, 851-852
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-10-00
 NSA-NUMBER 26:03986
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS : ARGONNE NATIONAL LABORATORY - ZPR-6 - CALCULATIONS

ABSTRACT

HETEROGENEITY BEHAVIOR FOR SELECTED PLATE-TYPE FAST CRITICALS HAS BEEN ANALYZED IN DETAIL. AS DISCUSSED IN THE COMPANION SUMMARY, SELF-SHIELDING HETEROGENEITY EFFECTS WERE DETERMINED BY A VOLUME-WEIGHTING TECHNIQUE, WHILE SEVERAL METHODS WERE EMPLOYED TO DETERMINE THE FLUX DISTRIBUTION EFFECTS.

1655 ID-NUMBER ID-NUMBER 1655

AUTHOR MIHALCZO, J. T.
 TITLE A HIGHLY ENRICHED URANIUM METAL SPHERE ASSEMBLY.
 REPORT NUMBER..... TANSO, 14, 675-677
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-10-00
 NSA-NUMBER 26:04063
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL SPHERES

ABSTRACT

THE SPHERICAL CRITICAL MASS OF ABOUT 93% URANIUM-235 ENRICHED URANIUM METAL WHICH HAS BEEN USED AS A BENCHMARK PROBLEM FOR VERIFICATION OF CALCULATIONAL METHODS IS BASED ON THE DELAYED CRITICAL MASS MEASUREMENTS MADE ON GODIVA CORRECTED TO STANDARD CONDITIONS. A NEAR SPHERICAL MASS OF URANIUM(93.2), RECENTLY SURPLUSED FROM AN EXPERIMENTAL PROGRAM EXAMINING FAST REACTOR BEHAVIOR WITH AN ACCELERATOR BOOSTER, WAS RE-MACHINED TO A SPHERICAL RADIUS OF 3.466 INCH. THE DEVICE IS TO BE USED IN A STUDY OF NEUTRON KINETIC PARAMETERS. THE DATA OBTAINED FOR THE DELAYED CRITICAL CONFIGURATION CONFIRM THE RE-EVALUATED CRITICAL PARAMETERS RECENTLY REPORTED BY HANSEN AND PAXTON.

1656 ID-NUMBER ID-NUMBER 1656

AUTHOR HOOGERP, J. C./ HANSEN, G. E.
 TITLE UNREFLECTED URANIUM-235/CARBON (RATIO OF 1 TO 182) CRITICAL ASSEMBLY
 REPORT NUMBER..... TANSO, 14, 677-678
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 71-10-00
 NSA-NUMBER 26:04064
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE

ABSTRACT

THE LOS ALAMOS CRITICAL ASSEMBLY KNOWN AS HONEYCOMB IS INTENDED TO SUPPLEMENT METAL ASSEMBLIES AS A SOURCE OF EFFECTIVE NEUTRON CROSS SECTIONS IN THE 0.1-MEV REGION. IT IS A 48-INCH CUBE OF INTERLEAVED URANIUM(93.15) FOIL AND GRAPHITE PLATES IN A TUBULAR ALUMINUM MATRIX (78 X 78 X 72 INCH), FOR WHICH THE CARBON TO URANIUM-235 ATOMIC RATIO IS 182.

1658 ID-NUMBER ID-NUMBER 1658

AUTHOR NOMOTO, S./ IIJIMA, T.
 TITLE CURRENT STATUS OF FAST REACTOR CRITICAL EXPERIMENTS.
 REPORT NUMBER..... NIPPON GENSIRYOKU GAKKAISHI, 13, 582-597
 DATE PUBLISHED ... 71-10-00
 NSA-NUMBER 26:06340
 SITE/PROGRAM JAPAN - FAST CRITICAL ASSEMBLY (FCA)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THIS REPORT PRESENTS A CURRENT SURVEY OF EXPERIMENTAL TECHNIQUES AND ANALYSES IN FAST CRITICAL EXPERIMENTS FOR LARGE FAST REACTORS.

IT CONSISTS OF FOUR PARTS: (1) A REVIEW OF THE DISCREPANCIES OBSERVED BETWEEN THE CALCULATED RESULTS AND THE INTEGRAL DATA OBTAINED BY CRITICAL FACILITIES, AND THE UNCERTAINTIES CONTAINED IN NUCLEAR DATA, (2) A DESCRIPTION OF THE PROCEDURES USED AND THE PROBLEMS ENCOUNTERED IN CRITICAL EXPERIMENTS, ESPECIALLY FOR PLUTONIUM-FUELED CORES, (3) SURVEY OF EXPERIMENTAL TECHNIQUES FOR THE MEASUREMENT OF REACTIVITY COEFFICIENTS, SAMPLE REACTIVITY WORTHS, REACTION RATES, NEUTRON SPECTRA AND KINETIC PARAMETERS, (4) A DISCUSSION OF PROBLEMS IN THE ANALYSES OF EXPERIMENTAL DATA.

1663 ID-NUMBER ID-NUMBER 1663

AUTHOR CLAYTON, E. D./ BIERMAN, S. R.

TITLE CRITICALITY PROBLEMS OF ACTINIDE ELEMENTS.

REPORT NUMBER..... ACT. LAN. REV., 1, 409-432

JOURNAL ACTINIDES REVIEWS(AMSTERDAM)

DATE PUBLISHED ... 71-09-00

NSA-NUMBER 26:23420

SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

CONSIDERABLE DATA NOW EXIST FOR CRITICALITY CONTROL GUIDANCE ON URANIUM-233, URANIUM-235, AND PLUTONIUM-239. POTENTIAL REQUIREMENTS FOR OTHER ACTINIDE ELEMENTS COULD NOW LEAD TO PRODUCTION IN SIGNIFICANT QUANTITIES WHEN MEASURED AGAINST THE AMOUNTS THAT COULD RESULT IN CRITICALITY. THUS, IT IS APPROPRIATE TO CONSIDER THE CRITICALITY ASPECTS OF OTHER FISSIONABLE ISOTOPES IN VIEW OF CURRENT AND FUTURE PRODUCTION IN ADDITION TO THE THREE SPECIFIC ISOTOPES ABOVE.

1669 ID-NUMBER ID-NUMBER 1669

AUTHOR RAFFETY, S. J. / MIHALCZO, J. T.

TITLE HOMOGENEOUS CRITICAL ASSEMBLIES OF 2 AND 3 PERCENT URANIUM-235-ENRICHED URANIUM IN PARAFFIN.

REPORT NUMBER..... NSENAO, 48, 433-443

JOURNAL NUCLEAR SCIENCE AND ENGINEERING

DATE PUBLISHED ... 72-08-00

NSA-NUMBER 27:03015

SITE/PROGRAM OAK RIDGE - URANIUM(2-5%) - PARAFFIN

ABSTRACT

A SERIES OF CLEAN CRITICAL EXPERIMENTS HAS BEEN PERFORMED WITH HOMOGENEOUS MIXTURES OF FINELY DIVIDED 2 AND 3% ENRICHED URANIUM TETRAFLUORIDE DISPERSED IN PARAFFIN WITH HYDROGEN TO URANIUM-235 ATOMIC RATIO VARYING FROM 133 TO 972. THE ASSEMBLIES WERE CONSTRUCTED IN RECTANGULAR GEOMETRY, AND MINIMUM CRITICAL MASSES AND VOLUMES IN CYLINDRICAL AND SPHERICAL GEOMETRIES WERE OBTAINED FROM BUCKLING CONVERSIONS.

1671 ID-NUMBER ID-NUMBER 1671

AUTHOR LLOYD, R. C./ CLAYTON, E. D./ BIERMAN, S. R.

TITLE CRITICALITY OF PLUTONIUM-URANIUM NITRATE SOLUTIONS.

REPORT NUMBER..... TANSO, 15, 803-804

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 72-11-00

NSA-NUMBER 27:05774

SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM NITRATE SOLUTIONS

ABSTRACT

EXPERIMENTS WERE PERFORMED WITH PLUTONIUM-URANIUM NITRATE SOLUTIONS IN WATER-REFLECTED SPHERICAL AND CYLINDRICAL VESSELS. THE EXPERIMENTS IN SPHERICAL GEOMETRY INVOLVED LOW PLUTONIUM-240 CONTENT (4.6% PLUTONIUM-240) MATERIAL WITH THE PLUTONIUM CONCENTRATION IN THE URANIUM BEING 30 WT% OF THE TOTAL PLUTONIUM-URANIUM CONCENTRATION IN THE FIRST TWO EXPERIMENTS AND 15 WT% IN THE LATTER ONE; THOSE IN CYLINDRICAL GEOMETRY WERE PERFORMED WITH HIGHER PLUTONIUM-240 CONTENT 23% PLUTONIUM- 240 MATERIAL IN WHICH THE PLUTONIUM CONTENT WAS 6%

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1673 ID-NUMBER ID-NUMBER 1673

AUTHOR BIERMAN, S. R./ CLAYTON, E. D.
 TITLE CRITICALITY EXPERIMENTS OF LWR MIXED OXIDES AT 20 HYDROGEN:PLUTONIUM+
 URANIUM.
 REPORT NUMBER..... TANSO, 15, 805-806
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 72-11-00
 NSA-NUMBER 27:05776
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

ABSTRACT

LIGHT-WATER REACTOR FUELS NORMALLY CONSIST OF NATURAL OR DEPLETED URANIUM ENRICHED WITH UP TO 8 WT% PLUTONIUM. CRITICALITY DATA, EVEN ON URANIUM SYSTEMS AT THIS LOW A URANIUM-235 ENRICHMENT, ARE SPARSE. FOR HOMOGENEOUS URANIUM ENRICHED WITH PLUTONIUM, DATA ARE ESSENTIALLY NONEXISTENT. TO OBTAIN CRITICALITY DATA IN THIS AREA, EXPERIMENTS WERE RECENTLY COMPLETED WITH A PLUTONIUM- DIOXIDE/URANIUM-DIOXIDE/POLYSTYRENE MIXTURE CONTAINING 7.6 WT% PLUTONIUM IN THE PLUTONIUM PLUS URANIUM. THE HYDROGEN TO (PLUTONIUM + URANIUM) ATOMIC RATIO OF THE FUEL MIXTURE WAS 19.5, WHICH IS NEAR THE OPTIMUM CONCENTRATION FOR MINIMUM CRITICAL VOLUME.

1676 ID-NUMBER ID-NUMBER 1676

AUTHOR LLOYD, R. C./ BIERMAN, S. R./ CLAYTON, E. D.
 TITLE CRITICALITY OF PLUTONIUM NITRATE SOLUTIONS CONTAINING BORATED RASCHIG
 RINGS.
 REPORT NUMBER..... NSENAO, 50, 127-134
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 73-02-00
 NSA-NUMBER 27:20414
 SITE/PROGRAM HANFORD - PLUTONIUM AND URANIUM NITRATE SOLUTIONS WITH RASHIG RINGS ;
 HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

EXPERIMENTAL CRITICALITY DATA ON BORATED RASCHIG RINGS IN PLUTONIUM NITRATE SOLUTIONS ARE PRESENTED FOR USE IN ESTABLISHING CRITICALITY SAFETY LIMITS AND IN VERIFYING CALCULATIONAL METHODS FOR THESE TYPE SYSTEMS. THE DATA COVER THE CONCENTRATION RANGE BETWEEN 63- AND 412- GRAMS PLUTONIUM/LITER FOR BOROSILICATE-GLASS RASCHIG RINGS CONTAINING 0.5 AND 4.0 WT% BORON, AND STAINLESS-STEEL RASCHIG RINGS CONTAINING 1 WT% BORON.

1677 ID-NUMBER ID-NUMBER 1677

AUTHOR BIERMAN, S. R./ CLAYTON, E. D./ HANSEN, L. E.
 TITLE CRITICAL EXPERIMENTS WITH HOMOGENEOUS MIXTURES OF PLUTONIUM AND URANIUM
 OXIDES CONTAINING 8, 15, AND 30 WT% PLUTONIUM.
 REPORT NUMBER..... NSENAO, 50, 115-126
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 73-02-00
 NSA-NUMBER 27:20415
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

ABSTRACT

DATA ARE PRESENTED FROM CRITICAL EXPERIMENTS WITH MIXED PLUTONIUM AND URANIUM OXIDE FUELS CONTAINING 30.0, 14.62, AND 7.89 WT% PLUTONIUM AND HAVING HYDROGEN TO (PLUTONIUM + URANIUM) ATOMIC RATIOS OF 47.4, 30.6, AND 51.8, RESPECTIVELY. IN ADDITION TO THE EXPERIMENTAL RESULTS, WHICH CAN BE USED DIRECTLY AS INTEGRAL BENCHMARK CHECKPOINTS, DERIVED CRITICAL SIZES ARE PRESENTED FOR HOMOGENEOUS MIXTURES IN SLAB, SPHERICAL, AND CYLINDRICAL GEOMETRIES AT THE THREE EXPERIMENTAL ATOMIC RATIOS.

1682 ID-NUMBER ID-NUMBER 1682

AUTHOR TUCK, G./ CLARK, H. E./ ALVAREZ, D. L.
 TITLE ENRICHED URANIUM METAL-SOLUTION SYSTEMS SEPARATED BY NEUTRON POISONS.
 REPORT NUMBER..... NUTYBB, 18, 216-224
 JOURNAL NUCLEAR TECHNOLOGY
 DATE PUBLISHED ... 73-06-00

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

NSA-NUMBER 28:03485
 SITE/PROGRAM ROCKY FLATS - SOLID UNITS IN FISSILE SOLUTIONS

ABSTRACT

CRITICAL PARAMETERS ARE GIVEN FOR A SERIES OF EXPERIMENTS ON URANIUM METAL SPHERES IMMERSED IN URANYL NITRATE SOLUTION. THE URANIUM IN BOTH REGIONS IS ENRICHED TO 93.2% URANIUM-235. IN SOME CONFIGURATIONS, THE TWO FISSILE REGIONS WERE SEPARATED BY 0.33-CM-THICK SPHERICAL SHELLS OF MILD STEEL OR BORON STAINLESS STEEL. THESE EXPERIMENTS WERE PART OF AN INVESTIGATION OF THE UNCOUPLING EFFECTS OF MILD STEEL AND BORON STAINLESS STEEL.

1683 ID-NUMBER ID-NUMBER 1683

AUTHOR LLOYD, R. C./ CLAYTON, E. D./ HANSEN, L. E./ BIERMAN, S. R.
 TITLE CRITICALITY OF PLUTONIUM NITRATE SOLUTIONS IN SLAB GEOMETRY.
 REPORT NUMBER.... NUTYBB, 18, 225-230
 JOURNAL NUCLEAR TECHNOLOGY
 DATE PUBLISHED .. 73-06-00
 NSA-NUMBER 28:03486
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

A SERIES OF CRITICALITY EXPERIMENTS WAS PERFORMED ON PLUTONIUM NITRATE SOLUTIONS IN SLAB GEOMETRY. THE SOLUTIONS CONTAINED PLUTONIUM AT CONCENTRATIONS RANGING BETWEEN 58 AND 412 GRAM PLUTONIUM/LITER FOR MATERIAL WITH THREE DIFFERENT ISOTOPIC CONTENTS: 4.6, 18.4, AND 23.2 WT% PLUTONIUM-240. ACID MOLARITIES VARIED FROM 1.6 TO 5.000 THE EXPERIMENTS WERE PERFORMED WITH A VARIABLE THICKNESS SLAB-TYPE VESSEL OF 42-INCH HEIGHT AND WIDTH, WHOSE THICKNESS COULD BE ADJUSTED WITH AND WITHOUT A WATER REFLECTOR AND ALSO WITH A 1-INCH-THICK PLEXIGLAS REFLECTOR.

THE CRITICAL EXPERIMENT DATA FROM THE FINITE SLABS WERE CORRECTED TO YIELD VALUES OF CRITICAL THICKNESSES FOR ONE-DIMENSIONAL INFINITE SLABS, I.E., SLABS OF FINITE THICKNESS BUT OF INFINITE HEIGHT AND WIDTH. ANALYTICAL CORRECTIONS, BASED ON EXPERIMENTAL DATA, WERE SUBSEQUENTLY USED TO CORRECT THE CRITICAL INFINITE SLAB THICKNESSES FOR MATERIALS EXTRANEOUS TO THE PLUTONIUM SOLUTIONS, SUCH AS THE EFFECT OF THE STAINLESS-STEEL VESSEL WALLS AND ROOM RETURN NEUTRONS. THE ANALYSIS PROVIDED VALUES FOR CLEAN ONE-DIMENSIONAL ASSEMBLIES THAT WERE THEN USED AS AN INTEGRAL CHECK OF CALCULATIONAL METHODS USING CROSS SECTIONS FROM THE ENDF/B-II DATA FILE. THE COMPUTED VALUES OF K(EFF) FOR THESE "CLEAN ASSEMBLIES" RANGED BETWEEN 0.988 AND 1.040; THE VALUES INCREASED SOMEWHAT WITH INCREASING CONCENTRATION. (AUTH).

1684 ID-NUMBER ID-NUMBER 1684

AUTHOR SCHUSKE, C. L.
 TITLE EXPERIMENTAL PROGRAMS AT THE DOW ROCKY FLATS NUCLEAR SAFETY LABORATORY.
 REPORT NUMBER.... TANSO, 16, 157-158
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED .. 73-06-00
 NSA-NUMBER 28:13414
 SITE/PROGRAM ROCKY FLATS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THE DOW NUCLEAR SAFETY FACILITY HAS THE PRIMARY GOAL OF SUPPORTING THE THE DOW-AEC PRODUCTION COMPLEX AT ROCKY FLATS. THIS IS ACCOMPLISHED BY PERFORMING PERTINENT EXPERIMENTS TO PROVIDE CHECKS FOR OUR COMPUTATIONAL METHODS. THE LAB BEGAN OPERATIONS IN SEPTEMBER OF 1965. SINCE THAT TIME, WE HAVE PERFORMED APPROXIMATELY 1000 CRITICALS AND CRITICAL APPROACHES WITH PLUTONIUM AND ENRICHED URANIUM. A LARGE NUMBER OF MEASUREMENTS WERE PERFORMED WITH CLOSE-FITTING HEMISPHERICAL ASSEMBLIES. THESE ASSEMBLIES WERE REFLECTED WITH OIL AND STEEL AND OIL COMBINATIONS. THE LAST EXPERIMENTAL SERIES DISCUSSED CONSISTS OF THE USE OF BORON STAINLESS PLATES TO POISON A LARGE VOLUME OF FISSILE SOLUTION.

1685 ID-NUMBER ID-NUMBER 1685

AUTHOR LECORCHE, P.
 TITLE CRITICAL MASS LABORATORY PROGRAM IN FRANCE.
 REPORT NUMBER.... TANSO, 16, 158-159
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
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 NSA-NUMBER 28:13415
 SITE/PROGRAM FRANCE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

EXPERIMENTAL NUCLEAR CRITICALITY SAFETY STUDIES STARTED IN SACLAY IN 1960 WITH ALECTO EXPERIMENTS USING NITRATE SOLUTIONS OF PLUTONIUM-239, URANIUM-235, AND URANIUM-233.

SINCE 1963 THEY HAVE BEEN CONDUCTED MAINLY AT THE VALDUC CRITICAL MASS LABORATORY. PLUTONIUM NITRATE SOLUTIONS WERE USED IN VARIOUS GEOMETRIES: SLABS, CYLINDERS, AND ANNULAR CYLINDERS. THE EFFECTS OF ACID MOLARITY AND PLUTONIUM-240 CONTENT WERE STUDIED; PLUTONIUM-240 CONTENT VARIED FROM 1.5 UP TO 10 WT% SOME EXPERIMENTS WERE MADE WITH A SMALL AMOUNT OF PLUTONIUM CONTAINING 37 WT% PLUTONIUM-240.

THE CRITICALITY OF URANIUM AT LOW HYDROGEN/URANIUM ATOMIC RATIOS (5.7 TO 82) HAS BEEN INVESTIGATED. SOME INTERACTION STUDIES HAVE BEEN MADE USING 294-MM-I.D. CYLINDERS CONTAINING EITHER URANYL OR PLUTONIUM NITRATE SOLUTIONS AND 250-M-I.D. CYLINDERS WITH PLUTONIUM NITRATE SOLUTIONS. NEUTRONIC ISOLATING PROPERTIES OF DIFFERENT MATERIALS HAVE BEEN STUDIED IN THE COURSE OF THESE EXPERIMENTS.

1686 ID-NUMBER ID-NUMBER 1686

AUTHOR CHALMERS, J. H.

TITLE EXPERIMENTAL CRITICALITY IN THE UNITED KINGDOM.

REPORT NUMBER.... TANSO, 16, 160-161

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 73-06-00

NSA-NUMBER 28:13416

SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - URANIUM-PLUTONIUM OXIDES - POLYTHENE

ABSTRACT

AT THE PRESENT TIME, THERE ARE NO EXPERIMENTAL CRITICALITY FACILITIES OPERATING IN THE UK; NOR, INDEED, ARE ANY PROGRAMS OF CRITICAL MASS MEASUREMENTS CURRENTLY PLANNED.

THE LAST EXPERIMENTS CONDUCTED INVESTIGATED THE CRITICAL PARAMETERS OF MIXTURES OF PLUTONIUM AND URANIUM FOR 30 WT% PLUTONIUM, OVER THE RANGE HYDROGEN/PLUTONIUM 18.6 TO 1461.

SOLUTION MEASUREMENTS WERE MADE BY LANE AND PARKER WITH MIXTURES OF PLUTONIUM-NITRATE AND URANYL-NITRATE AT HYDROGEN/PLUTONIUM ATOMIC RATIOS OF 224, 795, 1372, AND 1461. THE PLUTONIUM-240 CONTENT WAS 5.63%

1687 ID-NUMBER ID-NUMBER 1687

AUTHOR LACEY, P.G.

TITLE CRITICAL LATTICE DATA IN SUPPORT OF SAFE FUEL HANDLING CRITERIA.

REPORT NUMBER.... TANSO, 16, 161

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

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NSA-NUMBER 28:13417

SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - SAXTON REACTOR - URANIUM AND PLUTONIUM OXIDES WITH WATER

ABSTRACT

THIS PAPER DISCUSSES CRITICAL EXPERIMENT LATTICE DATA USED IN SUPPORT OF DEVELOPING SAFE FUEL HANDLING CRITERIA OUTSIDE REACTORS FOR BOTH URANIUM- AND PLUTONIUM-BEARING NUCLEAR FUEL. FROM THESE AND OTHER SUPPORTING DATA, APPLICABLE CRITERIA FOR SAFE HANDLING OF POWDERS, PELLETS, FUEL RODS, AND FUEL ASSEMBLIES WERE ESTABLISHED.

STANDARD REACTOR DESIGN CODES AND BUCKLING-TO-SHAPE CONVERSION FORMULAE HAVE BEEN USED TO DETERMINE MINIMUM CRITICAL DIMENSIONS FOR OPTIMALLY MODERATED AND FULLY REFLECTED UNITS, INCLUDING SPHERICAL, PLANAR, AND CYLINDRICAL GEOMETRIES. FROM THESE MINIMUM CRITICAL MASS VALUES AND DIMENSIONS, SAFE MASS LIMITS AND DIMENSIONS FOR ISOLATED UNITS WERE DETERMINED BY USING GENERALLY ACCEPTED SAFETY FACTORS TAKEN FROM THE LITERATURE. THROUGH THE USE OF APPROPRIATE CRITICAL EXPERIMENT LATTICE CONFIGURATIONS, IT WAS POSSIBLE NOT ONLY TO VERIFY MINIMUM CRITICAL DIMENSIONS FOR SEVERAL CONFIGURATIONS, BUT TO MAKE COMPARISONS BETWEEN THE CALCULATED LIMITING-SAFE PARAMETERS AND THE ACTUAL CONFIGURATIONS REQUIRED TO PRODUCE CRITICALITY.

1691 ID-NUMBER ID-NUMBER 1691

AUTHOR RUECKERT, N.T./ THOMAS, W.

TITLE CRITICALITY SAFETY OF PIPE INTERSECTIONS FOR PLUTONIUM NITRATE SOLUTIONS.

REPORT NUMBER.... ATOMKERNENERGIE, 21, 197-202

DATE PUBLISHED ... 73-03-00

NSA-NUMBER 28:22141

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM ROCKY FLATS - INTERSECTING CYLINDERS - CALCULATIONS

ABSTRACT

FOR PLUTONIUM NITRATE SOLUTION SOME SIMPLE MODELS OF INTERSECTION HAVE BEEN CALCULATED BY MONTE CARLO METHOD FOR VARIOUS REFLECTOR CONDITIONS. COMPUTATIONAL METHOD IS CHECKED AGAINST EXPERIMENT.

1692 ID-NUMBER ID-NUMBER 1692

AUTHOR LECORCHE, P. / MANGIN, D. / MAUBERT, L. / REVOL, H.

TITLE CRITICALITY OF 4% URANIUM-235 ENRICHED URANIUM URANYL FLUORIDE SOLUTIONS

REPORT NUMBER..... CEA-N-1649

DATE PUBLISHED ... 73-08-00

NSA-NUMBER 29:01051

SITE/PROGRAM FRANCE - URANIUM(4%)FLUORIDE SOLUTIONS

ABSTRACT

THE RESULTS OF CRITICAL EXPERIMENTS WITH AQUEOUS 4% URANIUM-235 ENRICHED SOLUTIONS IN CYLINDRICAL AND SPHERICAL GEOMETRIES ARE PRESENTED. A 0.548 TO 1.084 G/CC URANIUM CONCENTRATION RANGE WAS INVESTIGATED. VARIOUS CALCULATIONS ARE COMPARED WITH EXPERIMENTS. CALCULATIONS WERE USED TO ESTABLISH A COMPLETE CRITICALITY TABLE FOR URANYL FLUORIDE (4%) SOLUTIONS. (FR)

1694 ID-NUMBER ID-NUMBER 1694

AUTHOR SMOTREL, J. R.

TITLE LIGHT-WATER-MODERATED REACTIVITY OF TUBULAR SLUG PAIRS CONTAINING 1.1 WT% URANIUM-235

REPORT NUMBER..... DP-MS-73-41

DATE PUBLISHED ... 73-11-00

NSA-NUMBER 29:08415

SITE/PROGRAM SAVANNAH RIVER - URANIUM(1.1%) SLUGS IN WATER

ABSTRACT

EXPERIMENTS IN THE EXPONENTIAL FACILITY AT THE SAVANNAH RIVER LABORATORY HAVE PROVIDED A BASIS FOR SAFE STORAGE AND HANDLING OF SLIGHTLY ENRICHED TUBULAR URANIUM SLUGS. THE REACTIVITIES OF LIGHT- WATER-MODERATED AND REFLECTED ARRAYS OF CLUSTERED FUEL SLUGS ENRICHED TO 1.1 WT% URANIUM-235 WERE MEASURED AS A FUNCTION OF PITCH, BOTH SQUARE AND TRIANGULAR. THIS WORK REPRESENTS AN EXPANSION OF NUCLEAR SAFETY DATA PRESENTLY AVAILABLE BY PROVIDING NEW DATA ON LARGER AND CONCENTRIC TUBULAR ASSEMBLIES. THESE DATA CAN BE USED TO EXTEND EXPERIMENTAL CORRELATIONS OF CALCULATIONAL CODES. (AUTH).

1695 ID-NUMBER ID-NUMBER 1695

AUTHOR JOHNSON, E. B. / FOX, J. K.

TITLE CRITICAL MASS STUDIES. PART XII. ROVER REACTOR FUEL ELEMENTS

REPORT NUMBER..... ORNL-TM-0264

DATE PUBLISHED ... 62-09-18

NSA-NUMBER 29:08419

SITE/PROGRAM OAK RIDGE - ROVER PROJECT URANIUM CARBIDE - GRAPHITE, URANIUM DIOXIDE - GRAPHITE

ABSTRACT

CRITICAL EXPERIMENTS WERE PERFORMED WITH FUEL ELEMENTS FOR THE PROJECT ROVER KIWI-B-2A REACTOR TO DETERMINE NUCLEARLY SAFE CONDITIONS FOR THEIR PRODUCTION, STORAGE, AND TRANSPORTATION. EACH ELEMENT IS A 0.746-INCH-DIA AND 50.5-INCH-LONG URANIUM CARBIDE-GRAPHITE CYLINDER CONTAINING SEVEN UNIFORMLY SPACED LONGITUDINAL HOLES. THE URANIUM CONCENTRATION IS 400 MILLIGRAM/CC, OF WHICH 93.15% IS URANIUM-235, YIELDING A CARBON/URANIUM-235 ATOMIC RATIO OF ABOUT 90. THROUGHOUT THE EXPERIMENTS EACH ELEMENT WAS ENCASED IN A SEALED ALUMINUM TUBE. IN ORDER TO ESTABLISH BOTH THE MINIMUM CRITICAL NUMBER OF WATER-MODERATED AND -REFLECTED ELEMENTS AND THE RELATIONSHIP BETWEEN MODERATION AND CRITICAL NUMBER, SEVERAL CRITICAL ARRAYS COVERING A WIDE RANGE OF MODERATION WERE ASSEMBLED. IT WAS FOUND THAT THE MINIMUM CRITICAL NUMBER OF 66 ELEMENTS, CONTAINING ABOUT 5 KILOGRAM OF URANIUM-235, OCCURRED AT AN HYDROGEN/URANIUM-235 ATOMIC RATIO OF 380. THE CRITICAL NUMBER OF UNMODERATED ELEMENTS IN A REFLECTED ARRAY WAS GREATER THAN 2500.

EXPERIMENTS WERE ALSO PERFORMED WITH URANIUM OXIDE-GRAPHITE ELEMENTS FROM AN EARLY STAGE OF PRODUCTION. THE MINIMUM CRITICAL NUMBER OF FULL-LENGTH ELEMENTS IN A MODERATED AND REFLECTED ARRAY WAS 40, CONTAINING ABOUT 4.6 KILOGRAM OF URANIUM-235. THE HYDROGEN/URANIUM-235 ATOMIC RATIO WAS 270.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SEVERAL ADDITIONAL EXPERIMENTS ESTABLISHED THAT THE DESIGNS OF THE SHIPPING CONTAINERS AND GRAPHITIZING FIXTURE USED FOR THE ELEMENTS ARE CONSERVATIVE. (AUTH).

1696 ID-NUMBER ID-NUMBER 1696

AUTHOR LANE, R. C. / PARKER, C.
 TITLE MEASUREMENT OF THE CRITICAL SIZE OF SOLUTIONS OF PLUTONIUM AND NATURAL URANIUM NITRATES WITH PLUTONIUM/URANIUM RATIO OF 0.3
 REPORT NUMBER..... AWRE-0-58/73
 DATE PUBLISHED ... 73-12-00
 SITE/PROGRAM UNITED KINGDOM, ALDERMASTON - URANIUM-PLUTONIUM OXIDES - POLYTHENE

ABSTRACT

THIS REPORT DESCRIBES PART OF AN EXPERIMENTAL INVESTIGATION, CARRIED OUT WHILE AWRE WERE PART OF THE UKAEA, OF THE CRITICAL SIZE AND OTHER REACTIVITY PARAMETERS OF MIXTURES OF PLUTONIUM AND NATURAL URANIUM HAVING A PLUTONIUM CONTENT OF 30% MEASUREMENTS OF THE CRITICAL SIZE, NEUTRON SPECTRUM AND PROMPT DECAY CONSTANT OF A MIXTURE OF PLUTONIUM DIOXIDE AND URANIUM DIOXIDE AT A DENSITY OF 1 GRAM PLUTONIUM/LITRE, MODERATED BY POLYTHENE TO GIVE HYDROGEN/PLUTONIUM = 18.6 HAVE BEEN REPORTED. THE PRESENT WORK EXTENDS THE CRITICAL SIZE MEASUREMENTS TO ESSENTIALLY THERMAL CORES WHICH ARE MORE CONVENIENTLY STUDIED USING SOLUTIONS OF THE FISSILE ISOTOPES IN NITRIC ACID.

1699 ID-NUMBER ID-NUMBER 1699

AUTHOR WALSH, V.
 TITLE LCRE FUEL ELEMENT CRITICALITY MEASUREMENTS AT ORNL
 REPORT NUMBER..... TIM-891
 DATE PUBLISHED ... 65-09-00
 NSA-NUMBER 29:23536
 SITE/PROGRAM OAK RIDGE - LCRE FUEL ELEMENTS

ABSTRACT

A SERIES OF LIGHT-WATER MODERATED LATTICE MEASUREMENTS, USING LCRE FUEL PINS, WERE PERFORMED FOR CANEL AT ORNL BY THE CRITICAL FACILITIES GROUP UNDER THE DIRECTION OF A. DIXON CALLIHAN. THE PROGRAM CONSISTED OF DETERMINING:

- A) THE CRITICAL MASS OF FUEL PINS AS A FUNCTION OF LATTICE SPACING;
- B) THE REACTIVITY EFFECT OF REPLACING, 1) FUEL MATERIAL IN THE CORE WITH BERYLLIUM OXIDE END REFLECTOR MATERIAL, 2) BERYLLIUM OXIDE END REFLECTOR MATERIAL WITH VOID, AND 3) WATER MODERATOR WITH ZYGLO-22;
- C) THE TEMPERATURE COEFFICIENT OF THE MOST REACTIVE LATTICE.

1700 ID-NUMBER ID-NUMBER 1700

AUTHOR MAGNUSON, D. W.
 TITLE CRITICAL EXPERIMENTS WITH ENRICHED URANIUM DIOXIDE
 REPORT NUMBER..... Y-DR-120
 DATE PUBLISHED ... 73-11-30
 NSA-NUMBER 29:24866
 SITE/PROGRAM OAK RIDGE - URANIUM OXIDE - ALCOHOL CANS - ARRAYS

ABSTRACT

ARRAY CRITICAL EXPERIMENTS HAVE BEEN PERFORMED WITH SMALL AND LARGE ENRICHED URANIUM-DIOXIDE UNITS, WITH EXTERNAL MODERATOR BETWEEN UNITS AND WITH INTERNAL MODERATOR IN THE FORM OF AN ALCOHOL URANIUM-DIOXIDE SLURRY.

1701 ID-NUMBER ID-NUMBER 1701

AUTHOR BROWN, C. L.
 TITLE STATUS OF EXPERIMENTAL CRITICALITY DATA FOR (PLUTONIUM,URANIUM)DIOXIDE FUEL RODS
 REPORT NUMBER..... BNWL-SA-4935
 DATE PUBLISHED ... 74-06-00
 NSA-NUMBER 30:05550

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

A COMPLETE SUMMARY OF EXPERIMENTAL CRITICALITY DATA FOR PLUTONIUM-DIOXIDE-URANIUM-DIOXIDE FUEL RODS IN WATER IS PRESENTED. THE INFORMATION PRESENTED IS SUFFICIENTLY COMPLETE FOR USE IN COMPUTER CODE VALIDATION.

THE EXPERIMENTAL DATA APPLICABLE TO LWR FUEL CRITICALITY SAFETY ARE REASONABLY COMPLETE. MEASUREMENTS COVER ROD SIZES FROM 0.34 TO 0.50 INCH; PLUTONIUM-240 CONTENT IN THE RANGE OF 8 TO 24 WT%; AND FUEL ENRICHMENTS FROM 1.5 TO 6.6 WT% PLUTONIUM-DIOXIDE. THIS SPAN PROVIDES A GOOD BASIS FOR CALCULATIONS DIRECTED TOWARD THE CRITICALITY SAFETY OF PWR AND BWR PLUTONIUM RECYCLE FUELS.

THE EXPERIMENTAL DATA APPLICABLE TO LMFBR FUELS ARE MUCH LESS EXTENSIVE. ONLY ONE FUEL HAS BEEN MEASURED TO DATE. TO PROVIDE AN ADEQUATE DATA BASE FOR CRITICALITY SAFETY IN THE LONG TERM, ADDITIONAL LATTICE CRITICAL EXPERIMENTS WILL UNDOUBTEDLY BE NEEDED.

1702 ID-NUMBER ID-NUMBER 1702

AUTHOR HANDLEY, G. R. / HOPPER, C. M.

TITLE VALIDATION OF THE KENO CODE FOR NUCLEAR CRITICALITY SAFETY CALCULATIONS OF MODERATED, LOW-ENRICHED URANIUM SYSTEMS

REPORT NUMBER..... Y-1948

DATE PUBLISHED ... 74-06-13

NSA-NUMBER 30:10501

SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

THE MONTE CARLO COMPUTER CODE, KENO, WAS EMPLOYED TO CALCULATE 40 CRITICAL EXPERIMENTS WITH URANIUM ENRICHMENTS IN THE URANIUM-235 ISOTOPE OF 5% OR LESS. A VARIETY OF GEOMETRIES AND MATERIALS WERE CONSIDERED. THE CODE INPUT PARAMETERS AND THE 16-ENERGY-GROUP CROSS SECTIONS ARE INCLUDED. IT IS CONCLUDED THAT THE CODE AND CROSS SECTIONS ARE ADEQUATE AND THAT RELIABLE CRITICALITY SAFETY CALCULATIONS MAY BE MADE FOR SYSTEMS OF GENERAL INTEREST, PROVIDED THE LIMITS OF VALIDATED APPLICABILITY ARE NOT EXCEEDED. (AUTH).

1703 ID-NUMBER ID-NUMBER 1703

AUTHOR HOOGERP, J. C. / HANSEN, G. E. / PAXTON, H. C.

TITLE BARE 93%-ENRICHED-URANIUM-CARBON(170) ASSEMBLY

REPORT NUMBER..... LA-4798-MS

DATE PUBLISHED ... 74-03-00

NSA-NUMBER 30:20409

SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE

ABSTRACT

THE "HONEYCOMB" CRITICAL ASSEMBLY CONSIDERED HERE IS A NOMINAL CUBE OF URANIUM(93.15) FOIL AND GRAPHITE PLATES REGULARLY INTERLEAVED SUCH THAT THE CARBON-TO-URANIUM ATOMIC RATIO IS 170. THE ASSEMBLY DESCRIPTION IS CORRECTED EMPIRICALLY TO A HOMOGENEOUS NEAR-CUBE REFLECTED ONLY BY A LOW-DENSITY ALUMINUM MATRIX THAT EXTENDS THROUGH THE CORE AND TO THE OUTSIDE. CRITICAL SPECIFICATIONS FOR CHECKING CALCULATIONS ARE GIVEN IN X, Y, Z COORDINATES AND IN EQUIVALENT R, Z COORDINATES.

1704 ID-NUMBER ID-NUMBER 1704

AUTHOR STEWART, S. L. / HARTMAN, A. K. / CRICK, S. C.

TITLE EVALUATION AND ANALYSIS OF ZPPR ASSEMBLY 3 CRITICAL EXPERIMENTS

REPORT NUMBER..... GEAP-14001

DATE PUBLISHED ... 74-04-00

NSA-NUMBER 30:25893

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPPR (DEMONSTRATION PLANT BENCHMARKS) - CALCULATIONS

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS HAVE BEEN PERFORMED IN ZPPR ASSEMBLY 3 INVESTIGATE THE EFFECTS OF THE CONTROL SYSTEM ON NUCLEAR PARAMETERS OF A DEMONSTRATION PLANT AS PART OF THE DEMONSTRATION PLANT BENCHMARK CRITICAL PROGRAM. THE INTENT OF ZPPR-3 WAS TO EXAMINE THE INFLUENCE OF A SPECIFIC CONTROL SYSTEM DESIGN ON THE NUCLEAR PARAMETERS OF A TYPICAL LMFBR DEMONSTRATION REACTOR. THE PRINCIPAL REACTOR PARAMETERS EXPERIMENTALLY STUDIED IN ZPPR-3 WERE POWER DISTRIBUTION, CONTROL WORTH, AND SODIUM VOID REACTIVITY EFFECTS. ZPPR-3 WAS A 2400 LITER TWO ENRICHMENT ZONE CORE WITH

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

19 SIMULATED CONTROLS RODS. THE EXPERIMENTAL PROGRAM IS DIVIDED INTO 3 PHASES CORRESPONDING TO END-OF-CYCLE, MIDDLE-OF-CYCLE, AND BEGINNING OF-CYCLE CONTROL CONDITIONS. THE ANALYTICAL APPROACH USED WAS TO USE NORMAL REACTOR DESIGN METHODS WHERE POSSIBLE AND TO CALIBRATE THESE METHODS AGAINST EXPERIMENTAL DATA. MOST ANALYSIS WAS PERFORMED WITH TWO-DIMENSIONAL (X, Y GEOMETRY) DIFFUSION THEORY CALCULATIONS IN 6 ENERGY GROUPS. (AUTH).

1705 ID-NUMBER ID-NUMBER 1705

AUTHOR BIERMAN, S. R./ CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS TO MEASURE THE NEUTRON POISONING EFFECTS OF COPPER AND COPPER-CADMIUM PLATES
 REPORT NUMBER..... BNWL-B-338
 DATE PUBLISHED ... 74-01-00
 NSA-NUMBER 30:32958
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

ABSTRACT

SHIPPING CASKS, STORAGE FACILITIES, AND PROCESS VESSELS INVOLVED IN HANDLING FISSILE MATERIALS CONTAIN NEUTRON ABSORBING MATERIALS - EITHER FOR THEIR NEUTRON ABSORBING PROPERTIES OR FOR STRUCTURAL REASONS. THESE TYPES OF SYSTEMS CAN BE FULLY UTILIZED, SAFELY, ONLY IF THE NEUTRON ABSORBERS ARE PROPERLY ACCOUNTED FOR IN THE CRITICALITY ANALYSES. THE REACTIVITY WORTH OF TWO SUCH MATERIALS, COPPER AND COPPER CONTAINING 1 WT% CADMIUM, WAS RECENTLY MEASURED AT THE BATTELLE-NORTHWEST OPERATED CRITICAL MASS LABORATORY. THE RESULTS OF THESE MEASUREMENTS ARE PRESENTED IN THIS PAPER AND PROVIDE A SET OF CLEAN, WELL DEFINED, POISONED CRITICAL ASSEMBLIES THAT CAN BE USED TO CHECK CALCULATIONAL TECHNIQUES AND CROSS SECTION DATA.

1707 ID-NUMBER ID-NUMBER 1707

AUTHOR LLOYD, R. C./ CLAYTON, E. D.
 TITLE CRITICALITY OF HETEROGENEOUS SYSTEMS: URANIUM OXIDE -- PLUTONIUM OXIDE SOLIDS IN FISSILE SOLUTION CONTAINING GADOLINIUM NITRATE
 REPORT NUMBER..... BNWL-SA-5100
 DATE PUBLISHED ... 74-07-00
 NSA-NUMBER 31:04039
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES IN FISSILE SOLUTIONS

ABSTRACT

A SERIES OF CRITICALITY EXPERIMENTS WAS PERFORMED TO DETERMINE THE EFFECTIVENESS OF SOLUBLE POISON (GADOLINIUM NITRATE) ON CRITICALITY OF A HETEROGENEOUS ASSEMBLY OF FFTF-TYPE FUEL PINS IN PLUTONIUM/URANIUM NITRATE SOLUTION. THE ARRANGEMENT SIMULATES THE SIMPLEST APPROACH TO A POSSIBLE DISSOLVER CONFIGURATION, WHEREIN DURING THE DISSOLUTION PROCESS, A HETEROGENEOUS SYSTEM OF SOLIDS IN FISSILE SOLUTION (THE PARTLY DISSOLVED FUEL) WOULD RESULT.

1708 ID-NUMBER ID-NUMBER 1708

AUTHOR FISCHER, E. A. / MC GRATH, P. E.
 TITLE PHYSICS INVESTIGATIONS OF TWO PLUTONIUM-FUELED FAST CRITICAL ASSEMBLIES: SNEAK-7A AND 7B
 REPORT NUMBER..... EURFNR-1193
 DATE PUBLISHED ... 74-03-00
 NSA-NUMBER 31:05239
 SITE/PROGRAM GERMANY - SNEAK (FAST BREEDER)

ABSTRACT

TWO PLUTONIUM-FUELED FAST CRITICAL ASSEMBLIES OF DIFFERENT ENRICHMENT WERE STUDIED IN THE KARLSRUHE FAST CRITICAL FACILITY SNEAK FOR THE PURPOSE OF TESTING CROSS SECTION DATA AND CALCULATIONAL METHODS. THE MEASUREMENTS SUITABLE FOR SUCH PURPOSE ARE CENTRAL REACTION RATES AND REACTIVITY WORTHS. TO INVESTIGATE THE DISCREPANCY IN THE REACTIVITY SCALE OF FAST REACTORS MEASUREMENTS OF THE NORMALIZATION INTEGRAL AND BETA-EFFECTIVE WERE PERFORMED. IN ADDITION, MEASUREMENTS OF THE CORE MATERIAL BUCKLING, WHICH CHARACTERIZES THE CORE MATERIAL INDEPENDENT OF ITS GEOMETRY AND ENVIRONMENT, WERE ALSO INCLUDED.

THE MEASUREMENT PROCEDURES EMPLOYED ARE DESCRIBED IN SOME DETAIL. THE EVALUATION OF THE MEASUREMENTS WAS PERFORMED WITH THE MOST RECENT CROSS SECTION SETS AND COMPUTER CODES AVAILABLE AT KARLSRUHE. SOME OF THE EVALUATIONS WERE ALSO PERFORMED WITH A CROSS SECTION SET BASED ON ENDF/B DATA.

III. BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1710 ID-NUMBER ID-NUMBER 1710

AUTHOR MAGNUSON, D. W.
 TITLE CRITICALITY CALCULATIONS FOR PLUTONIUM-DIOXIDE/URANIUM-DIOXIDE/WATER
 MIXTURES USING ENDF/B VERSION III CROSS SECTION DATA AND 123 GROUP XSRDRN
 TRANSPORT CODE
 REPORT NUMBER..... ORNL-TM-4767
 DATE PUBLISHED ... 74-12-00
 NSA-NUMBER 31:12159
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM DIOXIDE ELEMENTS IN WATER

ABSTRACT

RECENTLY, THE ENDF/B VERSION III CROSS SECTION DATA WERE CONVERTED TO THE FORMAT NECESSARY FOR USE IN THE XSRDRN TRANSPORT CODE WHICH HAS THE OPTION OF CALCULATING THE ABSORPTION FOR EACH RESONANCE USING THE NORDHEIM INTEGRAL METHOD SEPARATE FROM THE MORE SLOWLY VARYING CROSS SECTIONS. CALCULATIONS OF K(EFF) OF A NUMBER OF CRITICAL EXPERIMENTS WERE PERFORMED TO PROVIDE AN ESTIMATE OF THE BIAS OF THE CALCULATIONAL METHOD.

1711 ID-NUMBER ID-NUMBER 1711

AUTHOR JOHNSON, E. B.
 TITLE NUCLEAR CRITICALITY OF INTERSECTING CYLINDERS OF AQUEOUS URANYL FLUORIDE
 SOLUTIONS
 REPORT NUMBER..... Y-DR-129
 DATE PUBLISHED ... 74-10-31
 NSA-NUMBER 31:20554
 SITE/PROGRAM OAK RIDGE - URANYL(5%)FLUORIDE INTERSECTING CYLINDERS

ABSTRACT

THE FIRST EXPERIMENTAL DETERMINATIONS OF THE CRITICALITY OF AQUEOUS SOLUTIONS OF URANYL FLUORIDE, IN WHICH THE URANIUM WAS ENRICHED TO 5% IN URANIUM-235, IN INTERSECTING CYLINDERS HAVE BEEN MADE. THESE EXPERIMENTS WERE DESIGNED TO PROVIDE BENCHMARKS FOR CALCULATIONAL METHODS. TWO TYPES OF INTERSECTIONS WERE INVESTIGATED: A 30 DEGREE LATERAL FORMED BY CYLINDERS ABOUT 28 CM IN DIAMETER AND A CROSS FORMED BY CYLINDERS OF FOUR DIAMETERS, BETWEEN 26.7 AND 28.6 CM. SOLUTION CONCENTRATIONS BETWEEN 907 AND 745 GRAM OF URANIUM PER LITER WERE MADE CRITICAL. COMPARISON OF KENO CALCULATIONS, USING TWO DIFFERENT CROSS-SECTION SETS, WITH THE EXPERIMENTS SHOWED GENERALLY VERY GOOD AGREEMENT. (AUTH).

1712 ID-NUMBER ID-NUMBER 1712

AUTHOR ESTES, B. F. / MORRIS, F. M. / PHILBIN, J. S.
 TITLE CRITICALITY EVALUATION OF THE ACPR FUEL-ELEMENT STORAGE RACK
 REPORT NUMBER..... SLA-74-0271
 DATE PUBLISHED ... 75-02-00
 NSA-NUMBER 31:26508
 SITE/PROGRAM SANDIA, ALBUQUERQUE - ACPR STORAGE RACK

ABSTRACT

THE STORAGE RACK FOR STANDARD FUEL ELEMENTS USED IN THE SANDIA ANNULAR CORE PULSE REACTOR HAS BEEN SUBJECTED TO A SERIES OF MEASUREMENTS TO DEMONSTRATE ITS CRITICALITY SAFETY ASPECTS. THIS REPORT DESCRIBES THE MEASUREMENTS AND PRESENTS THE RESULTS OF AN ANALYTICAL EVALUATION OF CRITICALITY FACTORS FOR THE STORAGE RACK. (AUTH).

1719 ID-NUMBER ID-NUMBER 1719

AUTHOR HANSEN, G. E. / PAXTON, H. C.
 TITLE A TUNGSTEN-CARBIDE CRITICAL ASSEMBLY
 REPORT NUMBER..... LA-5946-MS
 DATE PUBLISHED ... 75-06-00
 NSA-NUMBER 32:16304
 SITE/PROGRAM LOS ALAMOS - TCCA (TUNGSTEN CARBIDE CRITICAL ASSEMBLY)

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE TUNGSTEN-CARBIDE CRITICAL ASSEMBLY MAINLY CONSISTS OF THREE CLOSE-FITTING SPHERICAL SHELLS: A HIGHLY ENRICHED URANIUM SHELL ON THE INSIDE, A TUNGSTEN-CARBIDE SHELL SURROUNDING IT, AND A STEEL SHELL ON THE OUTSIDE. IDEAL CRITICAL SPECIFICATIONS INDICATE A RATHER LOW COMPUTED VALUE OF $k(\text{EFF})$. OBSERVED AND CALCULATED FISSION-RATE DISTRIBUTIONS FOR URANIUM-235, URANIUM-238, AND NEPTUNIUM-237 ARE COMPARED, AND CALCULATED LEAKAGE NEUTRONS PER FISSION IN VARIOUS ENERGY GROUPS ARE GIVEN.

1720 ID-NUMBER ID-NUMBER 1720

AUTHOR BERNARD, W./ HELMICK, H. H./ JARVIS, G. A./ PLASSMANN, E. A./ WHITE, R. H.

TITLE RESEARCH PROGRAM ON PLASMA CORE ASSEMBLY

REPORT NUMBER.... LA-5971-MS

DATE PUBLISHED ... 75-05-00

NSA-NUMBER 32:16305

SITE/PROGRAM LOS ALAMOS - URANIUM BERYLLIUM SYSTEMS (ROVER, PLASMA CORE, CAVITY ASSEMBLY)

ABSTRACT

AN OPERATING CRITICAL ASSEMBLY HAVING A 1.024-M-DIAM BY 1.055-M-HIGH CAVITY REFLECTED BY 0.48 M OF BERYLLIUM HAS BEEN CONSTRUCTED OF RESIDUAL BERYLLIUM REFLECTOR SEGMENTS, CONTROL DRUMS, DRIVE MOTORS, AND CONTROL CONSOLE FROM THE SOLID CORE NUCLEAR ROCKET DEVELOPMENT PROGRAM. THE CRITICAL MASS FOR URANIUM DISTRIBUTED THROUGHOUT THE CAVITY IS 16.9 KG U(93.2), WHICH IS HIGH BECAUSE OF NEUTRON UNDERMODERATION IN THE REFLECTOR DUE TO POROSITY AND POISON CONTAMINANTS IN THE BERYLLIUM AND GRAPHITE REFLECTOR COMPONENTS. A FLUX TRAPPING BERYLLIUM ANNULUS, 0.546-M-I.D. BY 0.89-M-O.D., CENTERED IN THE CAVITY, REDUCED THE CRITICAL MASS TO 6.7 KG U(93.2). THIS ARRANGEMENT WILL PERMIT OPERATION WITH A URANIUM HEXAFLUORIDE ZONE INSIDE THE FLUX TRAP DRIVEN BY AN OUTER URANIUM-GRAPHITE FUEL ZONE. THE FISSION DENSITY INSIDE THE FLUX TRAP IS APPRECIABLY HIGHER THAN IN THE OUTER FUEL ZONE. (AUTH)

1721 ID-NUMBER ID-NUMBER 1721

AUTHOR PAXTON, H. C. / JARVIS, G. A. / BYERS, C. C.

TITLE REFLECTOR-MODERATED CRITICAL ASSEMBLIES

REPORT NUMBER.... LA-5963

DATE PUBLISHED ... 75-07-00

NSA-NUMBER 32:25301

SITE/PROGRAM LOS ALAMOS - URANIUM BERYLLIUM SYSTEMS (ROVER, PLASMA CORE, CAVITY ASSEMBLY)

ABSTRACT

EXPERIMENTS WITH REFLECTOR-MODERATED CRITICAL ASSEMBLIES WERE PART OF THE ROVER PROGRAM AT THE LOS ALAMOS SCIENTIFIC LABORATORY (LASL). THESE ASSEMBLIES WERE CHARACTERIZED BY THICK HEAVY WATER OR BERYLLIUM REFLECTORS SURROUNDING LARGE CAVITIES THAT CONTAINED HIGHLY ENRICHED URANIUM AT LOW AVERAGE DENSITIES. BECAUSE INTEREST IN THIS TYPE OF SYSTEM HAS BEEN REVIVED BY LASL PLASMA CAVITY ASSEMBLY STUDIES, MORE DETAILED DESCRIPTIONS OF THE EARLY ASSEMBLIES THAN HAD BEEN AVAILABLE IN THE UNCLASSIFIED LITERATURE ARE PROVIDED. (AUTH)

1722 ID-NUMBER ID-NUMBER 1722

AUTHOR MOWERY, A.L.

TITLE ANALYSIS IN SUPPORT OF THE FLEXIBLE CRITICAL EXPERIMENT

REPORT NUMBER.... WANL-TME-749

DATE PUBLISHED ... 64-04-15

NSA-NUMBER 32:27295

SITE/PROGRAM WESTINGHOUSE, ASTRONUCLEAR LABORATORY - FLEXIBLE CRITICAL EXPERIMENT (GRAPHITE)

ABSTRACT

THE FCX EXPERIMENTAL PROGRAM IS DESIGNED TO PROVIDE DATA WITH WHICH SYSTEMATIC NUCLEAR INVESTIGATIONS MAY BE CARRIED OUT TO VERIFY AND IMPROVE THE STANDARD DESIGN METHODS USED FOR NERVA NUCLEAR CALCULATIONS. THE PURPOSE IS TO REDUCE THE UNCERTAINTY IN THE PREDICTION OF SUCH FACTORS AS CRITICAL MASS, POWER DISTRIBUTION, REACTIVITY COEFFICIENTS, RADIATION HEATING, AND KINETIC PARAMETERS IN NERVA SYSTEMS. THE PRIMARY DESIGN CRITERION OF FCX IS MINIMIZATION OF IN-CORE STRUCTURAL MATERIAL AND IMPURITIES SO THAT THE CLEANEST POSSIBLE CRITICAL EXPERIMENTS CAN BE PERFORMED. THE RESULTS OF AN INVESTIGATION OF THE NUCLEAR CHARACTERISTICS, ESPECIALLY STATIC NUCLEAR PARAMETERS, OF THE FLEXIBLE CRITICAL EXPERIMENT (FCX) ARE DESCRIBED. THE CRITICAL RADIUS AND MASS WERE DETERMINED FOR A WIDE RANGE OF LOADINGS, VOID FRACTIONS, AND REFLECTOR TYPES AND THICKNESSES. CONTROL ROD WORTHS, REACTIVITY COEFFICIENTS OF IMPORTANT MATERIALS, TEMPERATURE COEFFICIENTS, AND AVERAGE NEUTRON LIFETIMES WERE OBTAINED FOR ARRAYS SPANNING THE RANGE OF FCX

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

CONFIGURATIONS. IN PLANNING EXPERIMENTS THESE RESULTS ARE USEFUL BOTH IN DESIGNING THE REACTOR PHYSICAL COMPOSITION AND IN EVALUATING THE POTENTIAL HAZARDS. SPECIFICATION OF THE FUELED AND UNFUELED GRAPHITE ELEMENTS WAS INVESTIGATED TO ENSURE SUFFICIENTLY LOW EXPERIMENTAL UNCERTAINTIES. AN UNCERTAINTY ANALYSIS DERIVED FROM THE RESULTS OF THE STATIC NUCLEAR CALCULATIONS IS INCLUDED. A SHORT HISTORY OF GRAPHITE-URANIUM SYSTEMS SHOWS THE RANGE OF EARLIER STUDIES. THE POTENTIAL EXTENSION OF THIS RANGE BY THE FCX PROGRAM AND ITS RELATION TO THE NERVA PROGRAM IS INDICATED. (AUTH).

1724 ID-NUMBER ID-NUMBER 1724

AUTHOR FORD, W. E. / WESTFALL, R. M. / WEBSTER, C. C.
 TITLE A 218 NEUTRON GROUP MASTER CROSS SECTION LIBRARY FOR CRITICALITY SAFETY STUDIES
 REPORT NUMBER..... TANSO, 22, 290-291
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 75-11-00
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER - CALCULATIONS ; OAK RIDGE - URANYL(4.9%)FLUORIDE - WATER - CALCULATIONS

ABSTRACT

THE AMPX SYSTEM WAS USED TO GENERATE A P-3 218 NEUTRON GROUP MASTER CROSS-SECTION LIBRARY FROM ENDF/B-IV DATA FOR THE FUEL, STRUCTURAL, AND NEUTRON-ABSORBING MATERIALS TABULATED. THE LIBRARY IS THE DATA BASE FOR THE GENERATION OF BROAD-GROUP CROSS SECTIONS FOR SHIPPING CASK CALCULATIONS AND OTHER CRITICALITY SAFETY ANALYSES USING CODES SUCH AS KENO AND ANISN.

ADEQUACY OF THE GROUP STRUCTURE AND VALIDITY OF SELECTED DATA SETS FROM THE LIBRARY WERE TESTED BY CALCULATIONS OF K-EFF FOR TWO BENCHMARK CRITICAL EXPERIMENTS.

1727 ID-NUMBER ID-NUMBER 1727

AUTHOR PAXTON, H. C.
 TITLE LOS ALAMOS CRITICAL-MASS DATA
 REPORT NUMBER..... LA-3067-MS(REV.)
 DATE PUBLISHED ... 75-11-00
 NSA-NUMBER 33:12691
 SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THE ORIGINAL VERSION OF THIS REPORT TABULATES CRITICAL MASSES OF SIMPLE SYSTEMS, WHICH HAVE BEEN MEASURED THROUGH THE YEAR 1963. THIS REVISION ADDS DATA THROUGH OCTOBER 1975, AND MODIFIES SOME OF THE OLD CRITICAL SPECIFICATIONS THAT HAVE BEEN REEVALUATED. THE OLD FORMAT AND SYMBOLISM ARE RETAINED TO SIMPLIFY REPRODUCTION.

1728 ID-NUMBER ID-NUMBER 1728

AUTHOR MC NEANY, S. R. / JENKINS, J. D.
 TITLE COMPARISON OF HANSEN--ROACH AND ENDF/B-IV CROSS SECTIONS FOR URANIUM CRITICALITY CALCULATIONS
 REPORT NUMBER..... ORNL-TM-5113
 DATE PUBLISHED ... 76-01-00
 NSA-NUMBER 33:12692
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

A COMPARISON IS MADE BETWEEN CRITICALITY CALCULATIONS PERFORMED USING ENDF/B-IV CROSS SECTIONS AND THE 16-GROUP HANSEN--ROACH LIBRARY AT ORNL. THE AREA INVESTIGATED IS HOMOGENEOUS SYSTEMS OF HIGHLY ENRICHED URANIUM IN SIMPLE GEOMETRIES. CALCULATIONS ARE COMPARED WITH EXPERIMENTAL DATA FOR A WIDE RANGE OF HYDROGEN/URANIUM RATIOS. RESULTS SHOW THAT CALCULATIONS OF K(EFF) MADE WITH THE HANSEN--ROACH CROSS SECTIONS AGREE WITHIN 1.5 PERCENT FOR THE EXPERIMENTS CONSIDERED. RESULTS USING ENDF/B-IV CROSS SECTIONS WERE IN GOOD AGREEMENT FOR WELL-THERMALIZED SYSTEMS, BUT DISCREPANCIES UP TO 7 PERCENT IN K(EFF) WERE OBSERVED IN FAST AND EPITHERMAL SYSTEMS. (AUTH)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1730 ID-NUMBER ID-NUMBER 1730

AUTHOR MITAKE, S./ WATARUMI, C./ MIYAWAKI, Y./ TAKEDA, E.
 TITLE EXPERIMENTAL STUDIES ON 20 PERCENT ENRICHED URANIUM-LIGHT WATER ASSEMBLY.
 3. CRITICAL BUCKLING MEASUREMENTS.
 REPORT NUMBER.... BULL. TOKYO INST. TECH. 96, 1-21
 DATE PUBLISHED ... 70-03-00
 NSA-NUMBER 25:03912
 SITE/PROGRAM JAPAN - URANIUM(20%) - WATER

ABSTRACT

HERE, THE EXPERIMENTS PERFORMED ON OUR 20 PER CENT ENRICHED URANIUM-LIGHT WATER SUBCRITICAL ASSEMBLY WILL BE REPORTED. THE EXPERIMENTAL PROCEDURES USED ARE EXPONENTIAL PILE METHOD AND SUBSTITUTION METHOD.

1732 ID-NUMBER ID-NUMBER 1732

AUTHOR BROWN, C. L. / ROGERS, C. A.
 TITLE CRITICAL APPROACH AND EXPONENTIAL EXPERIMENTS WITH PROTOTYPE FFTF DRIVER
 FUEL PINS IN WATER.
 REPORT NUMBER.... TANSO, 13, 663-664
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-11-00
 NSA-NUMBER 25:04280
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM DIOXIDE ELEMENTS IN WATER

ABSTRACT

MATERIAL BUCKLINGS AND EXTRAPOLATION DISTANCES HAVE BEEN MEASURED FOR 25.2 WT% PLUTONIUM- DIOXIDE - NATURAL URANIUM-DIOXIDE FUEL PINS IN WATER. THE PINS USED IN THE EXPERIMENTS ARE A PROTOTYPE DESIGN OF DRIVER FUEL PINS THAT WILL BE USED IN THE FAST FLUX TEST FACILITY. THIS WORK IS PART OF A CRITICALITY MEASUREMENTS AND CALCULATIONAL PROGRAM TO PROVIDE SAFE LIMITS FOR THE FABRICATION, STORAGE, SHIPMENT, AND REPROCESSING OF FFTF FUELS.

1733 ID-NUMBER ID-NUMBER 1733

AUTHOR LLOYD, R. C./ CLAYTON, E. D.
 TITLE CRITICALITY OF PLUTONIUM NITRATE SOLUTIONS CONTAINING RASCHIG RINGS.
 REPORT NUMBER.... TANSO, 13, 664-665
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-11-00
 NSA-NUMBER 25:04281
 SITE/PROGRAM HANFORD - PLUTONIUM AND URANIUM NITRATE SOLUTIONS WITH RASHIG RINGS ;
 HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

A NEW STANDARD FOR THE USE OF RASCHIG RINGS AS NEUTRON ABSORBERS IN SOLUTIONS OF FISSILE MATERIALS HAS BEEN UNDER PREPARATION BY THE ANS FOR SEVERAL YEARS. FEW DATA, HOWEVER, EXIST ON THE USE OF RASCHIG RINGS IN SYSTEMS OF URANIUM AND PLUTONIUM.

EXPERIMENTS WERE RECENTLY PERFORMED TO OBTAIN FURTHER DATA FOR USE IN ESTABLISHING CRITICALITY SAFETY GUIDELINES AND FOR CHECKING CALCULATIONAL MODELS FOR POISONED SYSTEMS. THESE EXPERIMENTS PROVIDE THE FIRST KNOWN DATA ON STAINLESS-STEEL RASCHIG RINGS FOR USE IN CRITICALITY CONTROL AND ALSO DATA ON BOROSILICATE-GLASS RASCHIG RINGS IN PLUTONIUM SOLUTIONS.

1737 ID-NUMBER ID-NUMBER 1737

AUTHOR HUNT, D. C./ ROTHE, R. E.
 TITLE CRITICALITY CALCULATIONS AND MEASUREMENTS ON ENRICHED URANIUM METAL-
 SOLUTION COMBINATIONS.
 REPORT NUMBER.... TANSO, 13, 662-663
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-11-00
 NSA-NUMBER 25:06100
 SITE/PROGRAM ROCKY FLATS - SOLID UNITS IN FISSILE SOLUTIONS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

CRITICALITY MEASUREMENTS AND CALCULATIONS ON ENRICHED (93.2 WT% URANIUM-235) METAL SPHERES SYMMETRICALLY IMMERSSED IN ENRICHED (93.2 WT% URANIUM-235) URANYL NITRATE SOLUTION HAVE BEEN PRESENTED. THE MEASURED CRITICAL MASSES OF THE METAL SPHERES AND THE TOTAL URANIUM MASSES AT CRITICALITY WERE REPORTED FOR URANIUM SOLUTION CYLINDERS OF THREE NOMINAL CONCENTRATIONS, THREE DIAMETERS, AND SEVERAL HEIGHTS. TRANSPORT THEORY CALCULATIONS WERE REPORTED ON SYSTEMS WHICH APPROXIMATED THE EXPERIMENTAL ASSEMBLIES. IN THIS PAPER, 25 ADDITIONAL DTF CALCULATIONS APPROXIMATING THE SYMMETRIC EXPERIMENTAL ASSEMBLIES ARE PRESENTED.

1739 ID-NUMBER ID-NUMBER 1739

AUTHOR KAISER, R. E./ NORRIS, R. J./ OLSON, A. P./ PAIK, N. C.
 TITLE PREDICTED CHARACTERISTICS WITH ACTUAL OBSERVATION FOR THE DEMONSTRATION REACTOR BENCHMARK ASSEMBLY ZPPR-2.
 REPORT NUMBER..... TANSO, 13, 732
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-11-00
 NSA-NUMBER 25:06113
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPPR (DEMONSTRATION PLANT BENCHMARKS)

ABSTRACT

ZPPR ASSEMBLY 2 IS PART OF THE DEMONSTRATION REACTOR BENCHMARK CRITICAL ASSEMBLY PROGRAM. IT IS A LARGE, ZONED, CRITICAL ASSEMBLY DESIGNED TO TO SIMULATE THE COMPOSITIONS AND CONFIGURATIONS OF THE LMFBR DEMONSTRATION PLANTS.

ASSEMBLY 2 IS A SIMULATED OXIDE-FUELED CORE WITH TWO ENRICHMENT ZONES OF EQUAL VOLUME, SURROUNDED BY A URANIUM-DIOXIDE-SODIUM BLANKET AND A STEEL REFLECTOR. THE CORE VOLUME FRACTIONS ARE 32% OXIDE FUEL EQUIVALENT, 40% SODIUM, 19% STEEL, AND 9% VOID.

1741 ID-NUMBER ID-NUMBER 1741

AUTHOR KAISER, R. E./ NORRIS, R. J./ PAIK, N. C.
 TITLE MATERIAL WORTH MEASUREMENTS IN THE BENCHMARK CRITICAL ASSEMBLY ON ZPPR.
 REPORT NUMBER..... TANSO, 13, 734-735
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-11-00
 NSA-NUMBER 25:06115
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPPR (DEMONSTRATION PLANT BENCHMARKS)

ABSTRACT

A SERIES OF SMALL-SAMPLE REACTIVITY MEASUREMENTS WAS MADE ON ZPPR ASSEMBLY 2, THE DEMONSTRATION PLANT BENCHMARK CRITICAL ASSEMBLY, AND COMPARED WITH ANALYTICAL RESULTS. THIS ASSEMBLY IS A TWO-ZONE SYSTEM WHICH REPRODUCES MANY OF THE ESSENTIALS OF CURRENT DEMONSTRATION REACTOR CONCEPTS, AND HAS A MUCH LARGER CRITICAL MASS AND CRITICAL VOLUME THAN ANY OTHER PLUTONIUM- FUELED CRITICAL FACILITY YET BUILT.

1744 ID-NUMBER ID-NUMBER 1744

AUTHOR DICKINSON, D./ SCHUSKE, C. L.
 TITLE EMPIRICAL MODEL FOR SAFE PIPE INTERSECTIONS CONTAINING FISSILE SOLUTION.
 REPORT NUMBER..... NUTYBB, 10, 179-187
 JOURNAL NUCLEAR TECHNOLOGY
 DATE PUBLISHED ... 71-02-00
 NSA-NUMBER 25:08459
 SITE/PROGRAM ROCKY FLATS - INTERSECTING CYLINDERS - CALCULATIONS ; OAK RIDGE - URANYL(5%)FLUORIDE INTERSECTING CYLINDERS - CALCULATIONS

ABSTRACT

AN EMPIRICAL MODEL IS PRESENTED FOR CALCULATING SAFE NUCLEAR CRITICALITY PARAMETERS FOR SYSTEMS OF INTERSECTING PIPES CONTAINING ENRICHED URANYL NITRATE SOLUTION. THE MODEL, WHICH APPLIES TO SYSTEMS CONSISTING OF A MAIN PIPE (THE CENTRAL COLUMN) FROM WHICH SMALLER PIPES (ARMS) BRANCH OFF, USES AS A CRITICALITY PARAMETER THE AREA OF INTERSECTION OF THE ARMS WITH THE COLUMN. MAXIMUM SAFE VALUES FOR BOTH THE CENTRAL COLUMN DIAMETER AND THE AREA OF INTERSECTION OF THE ARMS WITH THE COLUMN ARE PROVIDED FOR CONDITIONS OF MINIMAL, NOMINAL, OR FULL REFLECTION.

THE CURRENT MODEL, AND EXTENSION OF AN EARLIER ONE, IS BASED ON MONTE CARLO CALCULATIONS AS WELL AS ON EXPERIMENTAL DATA. A REVIEW OF THE EXPERIMENTAL AND CALCULATIONAL DATA IS INCLUDED. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1747 ID-NUMBER ID-NUMBER 1747

AUTHOR KARAM, R. A./ MARSHALL, J. E./ DANCE, K. D.
 TITLE ANALYSIS OF HETEROGENEITY AND SODIUM-VOID EFFECTS IN A 2700-LITER URANIUM CARBIDE FAST CORE, ZPR-6 ASSEMBLY 5.
 REPORT NUMBER..... NSENAO, 43, 005-026
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 71-01-00
 NSA-NUMBER 25:12825
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6 - CALCULATIONS

ABSTRACT

THE HETEROGENEITY AND SODIUM VOID EFFECTS IN ZPR-6 ASSEMBLY 5, A 2700- LITER URANIUM-CARBIDE CORE, WERE ANALYZED USING ENDF/B DATA.

1750 ID-NUMBER ID-NUMBER 1750

AUTHOR ROTHE, R. E./ SCHUSKE, C. L./ HICKS, E. E.
 TITLE CRITICALITY OF A URANIUM-SOLUTION SLAB UNDER VARIOUS REFLECTOR CONDITIONS.
 REPORT NUMBER..... NUAPA, 07, 505-512
 JOURNAL NUCLEAR APPLICATIONS AND TECHNOLOGY
 DATE PUBLISHED ... 69-12-00
 NSA-NUMBER 24:04122
 SITE/PROGRAM ROCKY FLATS - URANYL NITRATE - PLEXIGLASS

ABSTRACT

EXPERIMENTAL DATA ARE PRESENTED TO SHOW THE CONDITIONS UNDER WHICH A COMPLEX FISSILE SYSTEM MAY BE CONSERVATIVELY APPROXIMATED BY A SIMPLER SYSTEM. THE COMPLEX SYSTEM CONSISTS OF AN UNPOISONED URANIUM-SOLUTION SLAB IN CONTACT, ON ONE FACE, WITH A THICK REGION OF HEAVILY BORON- POISONED URANIUM SOLUTION. THE SIMPLER SYSTEM CONSISTS OF AN UNPOISONED URANIUM-SOLUTION SLAB REFLECTED, ON ONE FACE, BY PLEXIGLAS. MEASURED CRITICAL THICKNESSES ARE REPORTED FOR URANIUM-SOLUTION SLABS UNREFLECTED, REFLECTED ON ONE FACE ONLY, AND REFLECTED ON BOTH FACES BY PLEXIGLAS.

1752 ID-NUMBER ID-NUMBER 1752

AUTHOR YUROVA, L. N. / KLYUYEV, L. M. / KRYUKOV, A. P. / PETROV, V. N. / POLYAKOV, A. A. / REDKIN, A. F. / RUKHLO, V. P. / TSURIKOV, V. F. / TROFIMOV, A. P. / BOLSHAKOV, V. A.
 TITLE THE LADA PHYSICS TEST STAND
 REPORT NUMBER..... PHYSICS OF NUCLEAR REACTORS-COLLECTION OF WORKS, NO. 1, MOSCOW, ATOMIZDAT, 1968, PP 32-38
 DATE PUBLISHED ... 68-00-00
 NSA-NUMBER 24:04147
 SITE/PROGRAM USSR - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THE STAND WAS BUILT AT MOSCOW ENGINEERING PHYSICS INSTITUTE. THE EQUIPPING AND ADJUSTING WAS COMPLETED IN 1967. THE STAND IS INTENDED FOR WORK WITH SUBCRITICAL AND CRITICAL SYSTEMS THE POWER LEVEL OF WHICH DOES NOT EXCEED 10 WATTS. CRITICAL ASSEMBLIES TO BE TESTED IN THE DEVICE ARE PLACED IN A SHAFT OF DIMENSIONS 300 X 300 X 400 CM. THE PLACE FOR THE CRITICAL ASSEMBLY IS SEPARATED FROM THE PLACE FOR THE CONTROL PANEL BY BIOLOGICAL SHIELDING OF CONCRETE 110 CM THICK. THE DEVICE IS EQUIPPED WITH AN AUTOMATIC EMERGENCY SHIELDING SYSTEM WHICH WORKS IF THE POWER OF THE CRITICAL ASSEMBLY EXCEEDS A GIVEN LEVEL OR RISES TOO RAPIDLY. THE CRITICAL LEVEL CAN BE ACHIEVED EITHER BY INCREASING THE FUEL LOAD OR BY RAISING THE LEVEL OF THE MODERATOR IN THE CORE AND REFLECTOR. THE M1 URANIUM-WATER ASSEMBLY WITH A CORE OF EK-10 ELEMENTS WAS USED TO CARRY OUT START-UP OPERATIONS ON THE DEVICE. CURRENT RECORDING INSTRUMENTS ENSURED RELIABLE CONTROL OF THE POWER LEVEL AND THE RATE OF GOING UP, BEGINNING WITH 0.001 WATTS. WORKING EXPERIENCE ON THE M1 CRITICAL ASSEMBLY SHOWED THAT THE "LADA" PHYSICAL TEST STAND IS CONVENIENT AND SAFE TO USE. (L. M.).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1754 ID-NUMBER ID-NUMBER 1754

AUTHOR MATSUBARA, TAKEO/ MUKOYAMA, TAKESHI/ TADA, HIROMITSU/ TSUJI, YOSHIO.
 TITLE MEASUREMENTS OF LATTICE PARAMETERS WITH A SINGLE FUEL ASSEMBLY IN ORGANIC COOLANT MATERIAL.
 REPORT NUMBER..... NIPPON GENSHIYOKU GAKKAISHI, 11, 600-605
 DATE PUBLISHED ... 69-04-00
 NSA-NUMBER 24:04160
 SITE/PROGRAM JAPAN - URANIUM DIOXIDE RODS - LATTICE

ABSTRACT

A METHOD FOR DETERMINING LATTICE PARAMETERS WITH A SINGLE FUEL ASSEMBLY IS DISCUSSED. THE PURPOSE OF THE EXPERIMENTS WAS TO EXPLORE THE POSSIBILITY OF APPLYING THE METHOD TO MEASUREMENTS IN ORGANIC COOLANT SYSTEMS.

IN ORDER TO EVALUATE A NEW FUEL ASSEMBLY, IT SHOULD BE VERY USEFUL TO BE ABLE TO MEASURE THE PARAMETERS EFFECTIVELY USING SMALL FACILITIES. THE APPARATUS USED FOR THE PRESENT STUDY CONSISTED OF A CYLINDRICAL VESSEL (100 CM INNER DIAMETER AND 200 CM HEIGHT) CONTAINING AN ORGANIC COOLANT-- SANTOWAX OMP.

THE FUEL ASSEMBLY USED WAS A 22-ROD URANIUM-OXIDE CLUSTER, FIXED IN THE CENTER OF THE CYLINDRICAL VESSEL. THE DATA OBTAINED WERE COMPARED WITH THE RESULTS CALCULATED BY COMPUTER USING ESTABLISHED NUCLEAR DATA AND CODES.

THE DISCREPANCY BETWEEN THE MEASURED AND CALCULATED VALUES WAS FOUND TO BE WITHIN 2% IN THE LATTICE SPACES OF 16 CM AND 20 CM. THUS THE METHOD WOULD APPEAR TO BE PRACTICALLY APPLICABLE TO ORGANIC COOLANT SYSTEMS, AT LEAST IN THE RANGE OF THE LATTICE SPACES COVERED BY THE PRESENT EXPERIMENT. (AUTH).

1757 ID-NUMBER ID-NUMBER 1757

AUTHOR HANSEN, L. E./ BIERMAN, S. R./ LLOYD, R. C./ CLAYTON, E. D.
 TITLE CRITICALITY OF PLUTONIUM DIOXIDE-URANIUM DIOXIDE AQUEOUS MIXTURES
 REPORT NUMBER..... TANSO, 12, 869-870
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 69-11-00
 NSA-NUMBER 24:07191
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

ABSTRACT

CRITICAL EXPERIMENTS WERE PERFORMED USING DEPLETED URANIUM (0.222 WT% URANIUM-235) LAYERS INTERSPERSED WITHIN PLUTONIUM-DIOXIDE/POLYSTYRENE SYSTEMS AT HYDROGEN TO PLUTONIUM ATOMIC RATIOS OF 5 AND 15. CRITICALITY DATA FOR THE EXPERIMENTAL ARRAYS ARE SUMMARIZED.

1761 ID-NUMBER ID-NUMBER 1761

AUTHOR TUCK, G. / CLARK, H. E.
 TITLE SLAB CYLINDER-ARRAY EXPERIMENTAL DATA.
 REPORT NUMBER..... TANSO, 12, 875-877
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 69-11-00
 NSA-NUMBER 24:07195
 SITE/PROGRAM ROCKY FLATS - SOLID UNITS IN FISSILE SOLUTIONS

ABSTRACT

THE EXPERIMENTALLY MEASURED CRITICAL PARAMETERS GIVEN HERE ARE FOR A 490 GRAMS URANIUM PER LITER URANYL NITRATE SOLUTION SYSTEM WHICH CONSISTS OF AN ARRAY OF VERTICAL CYLINDERS RESTING ON AND INTERACTING WITH A 120-CM-SQUARE HORIZONTAL SLAB. THE PARAMETERS VARIED WERE THE ARRAY HEIGHT (0 TO 100 CM), THE NUMBER OF CYLINDERS (0 TO 16), THE CYLINDER DIAMETER (11.0 TO 21.3 CM), AND THE SLAB THICKNESS. THE SLAB-ARRAY SYSTEMS, HAVING 9 AND 16 CYLINDERS OF 13.6-CM DIAM, WERE REFLECTED WITH A 10-CM-THICK REFLECTOR. ALL OTHER MEASUREMENTS WERE ESSENTIALLY UNREFLECTED. THE CRITICAL THICKNESS OF THE SLAB ALONE WAS ALSO MEASURED.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1762 ID-NUMBER ID-NUMBER 1762

AUTHOR HUNT, D. C./ BOSS, M. R.
 TITLE PLUTONIUM METAL CRITICALITY MEASUREMENTS.
 REPORT NUMBER..... TANSO, 12, 872-873
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 69-11-00
 NSA-NUMBER 24:07196
 SITE/PROGRAM ROCKY FLATS - URANIUM(93%) METAL - SPHERES

ABSTRACT

THE RESULTS OF A SERIES OF CRITICAL MASS MEASUREMENTS ON ALPHA PLUTONIUM METAL ASSEMBLIES REFLECTED BY MILD STEEL AND/OR OIL ARE REPORTED. THE PLUTONIUM ASSEMBLIES ARE EITHER SPHERES OR HEMISPHERES BUILT UP FROM NESTED SUBASSEMBLIES.

1765 ID-NUMBER ID-NUMBER 1765

AUTHOR LLOYD, R. C./ CLAYTON, E. D./ HANSEN, L. E.
 TITLE CRITICALITY OF PLUTONIUM NITRATE SOLUTION SLABS HAVING HIGH PLUTONIUM-240 CONTENT.
 REPORT NUMBER..... TANSO, 12, 870-872
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 69-11-00
 NSA-NUMBER 24:07199
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

COMPREHENSIVE EXPERIMENTS HAVE NOW BEEN PERFORMED AT THE PACIFIC NORTHWEST LABORATORY IN SLAB GEOMETRY FOR DETERMINING THE CRITICAL DIMENSIONS OF BARE AND REFLECTED SLABS OF PLUTONIUM-NITRATE SOLUTION WITH HIGH (18.4 WT%) PLUTONIUM-240 CONTENT. THE SYSTEMS EXAMINED EXPERIMENTALLY WERE UNREFLECTED, PARTIALLY REFLECTED WITH ONE INCH OF PLEXIGLAS, AND FULLY REFLECTED WITH WATER.

1768 ID-NUMBER ID-NUMBER 1768

AUTHOR MATLOCK, R. G./ KAISER, R. E./ GASIDLO, J. M.
 TITLE REACTIVITY EFFECTS IN CRITICAL FACILITIES DUE TO FISSION ISOTOPE DECAY.
 REPORT NUMBER..... TANSO, 12, 652-653
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 69-11-00
 NSA-NUMBER 24:07241
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 ; ARGONNE NATIONAL LABORATORY, IDAHO - ZPPR (DEMONSTRATION PLANT BENCHMARKS)

ABSTRACT

A PLUTONIUM CRITICAL EXPERIMENTS PROGRAM, IN SUPPORT OF THE FTR DEVELOPMENT, HAS BEEN UNDERWAY AT ARGONNE NATIONAL LABORATORY'S ZPR-3 AND ZPPR FOR THE PAST TWO YEARS. MEASUREMENTS ON ZPPR SHOWED A SYSTEMATIC REACTIVITY LOSS, WITH TIME, WHICH COULD NOT BE ATTRIBUTED TO TEMPERATURE EFFECTS OR OTHER KNOWN EXPERIMENTAL UNCERTAINTIES. A PRELIMINARY INVESTIGATION OF REACTIVITY CHANGES DUE TO THE LOSS OF RADIOACTIVE PLUTONIUM ISOTOPES LED TO A MORE DETAILED ANALYSIS OF THE EFFECTS OF PLUTONIUM-241 DECAY.

1769 ID-NUMBER ID-NUMBER 1769

AUTHOR KARAM, R. A./ MARSHALL, J. E.
 TITLE CRITICAL MASS SENSITIVITY TO THE TREATMENT OF HETEROGENEITY EFFECTS IN A LARGE URANIUM CARBIDE FAST CORE, ASSEMBLY 5 OF ZPR-6.
 REPORT NUMBER..... TANSO, 12, 718-719
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 69-11-00
 NSA-NUMBER 24:07277
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6 - CALCULATIONS

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

TWO MAIN TYPES OF HETEROGENEITY EFFECTS ARE ASSOCIATED WITH FAST CRITICALS LOADED IN PLATE GEOMETRY: FAST AND RESONANCE. THE FAST EFFECT DEPENDS ON THE PHYSICAL SHAPE OF THE FISSILE MATERIALS, I.E., THICKNESSES AND LENGTHS OF COLUMNS, AND ON THE PHYSICAL SEPARATION BETWEEN THE FISSILE AND FERTILE PLATES. IT GIVES A POSITIVE CONTRIBUTION TO THE REACTIVITY OF THE SYSTEM.

RESONANCE NEUTRONS ARE READILY ABSORBED AT THE PLATE SURFACE RESULTING IN FEWER SUCH NEUTRONS REACHING THE PLATE INTERIOR AND THUS LOWERING THE AVERAGE REACTION RATES. RESONANCE SELF-SHIELDING CONTRIBUTES NEGATIVELY THROUGH THE FISSION POSITIVELY THROUGH THE CAPTURE PROCESSES. IT CONTRIBUTES EITHER POSITIVELY OR NEGATIVELY THROUGH SCATTERING EVENTS; THE SIGN IS DETERMINED BY THE RELATIVE IMPORTANCE OF THE NEUTRON BEFORE AND AFTER SCATTERING.

THE CRITICAL MASS OF ASSEMBLY 5 OF ZPR-6 WAS CALCULATED WITH VARIOUS CROSS-SECTION SETS (25 GROUPS) GENERATED FROM ENDF/B DATA TO EVALUATE THE MAGNITUDE OF THE VARIOUS TYPES OF HETEROGENEITY EFFECTS. THE CROSS-SECTION SETS WERE USED WITH 1-D AND 2-D DIFFUSION CODES AND WITH 1-D TRANSPORT CODE.

1772 ID-NUMBER ID-NUMBER 1772

AUTHOR CHOW, R. H. / BIERMAN, S. R.

TITLE PULSED-NEUTRON DETERMINATION OF K(EFF) AND TAU IN LOW-ENRICHMENT URANYL NITRATE.

REPORT NUMBER..... TANSO, 12, 889-890

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 69-11-00

NSA-NUMBER 24:07348

SITE/PROGRAM HANFORD - URANYL(2.3%) NITRATE CUBES

ABSTRACT

VALUES OF K(EFF) AND THE NEUTRON AGE TO THERMAL ENERGY HAVE BEEN DETERMINED BY PULSING BARE, HOMOGENEOUS ASSEMBLIES OF ANHYDROUS URANYL NITRATE SALT OF 11.2 HYDROGEN/URANIUM ATOMIC RATIO, AND 2.26 WT% URANIUM-235 ENRICHMENT. ONE ASSEMBLY WAS A 21 INCH CUBE; THE OTHER A PARALLELEPIPED, 21 X 21 X 14 INCH. EACH ASSEMBLY WAS FACED EXTERNALLY WITH SHEET CADMIUM. THE NEUTRON PULSES WERE PRODUCED BY THE KAMAN NUCLEAR A-800 GENERATOR IN 3- TO 5-MICROSECOND BURSTS AT 2 PER SECOND, OR 4 PER SECOND.

1781 ID-NUMBER ID-NUMBER 1781

AUTHOR MAHALINGAM, L. M./ SHANKAR SINGH, R.

TITLE ANALYSIS OF ZPR-3 FAST CRITICAL ASSEMBLY 48 WITH RECENT CROSS-SECTION DATA.

REPORT NUMBER..... PROC. NUCL. PHYS. SOLID STATE PHYS. SYMP. BOMBAY (1968), 2, 408-411

CONFERENCE NUCLEAR PHYSICS AND SOLID STATE PHYSICS SYMPOSIUM, BOMBAY, 28-31 DECEMBER, 1968

DATE PUBLISHED ... 68-12-00

NSA-NUMBER 24:16246

SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

A COMPARISON BETWEEN CALCULATED AND EXPERIMENTALLY DETERMINED VALUES OF A PHYSICAL PARAMETER HELPS ONE TO CHECK THE CALCULATIONAL METHODS AND THE DATA USED IN THE CALCULATIONS. TO PROVIDE SOME MEASURE OF THE CURRENT UNCERTAINTIES IN THE PREDICTION OF NUCLEAR PARAMETERS FOR FAST REACTORS, THE EXPERIMENTAL RESULTS OF ASSEMBLY 48 OF ZERO POWER REACTOR-III HAVE BEEN CHOSEN TO BE COMPARED WITH THE CALCULATED VALUES. IT WAS A PLUTONIUM FUELLED, SOFT SPECTRUM, SIMPLE GEOMETRY CRITICAL ASSEMBLY EXPERIMENTED AT ANL. THE PRESENT ANALYSIS OF THIS ASSEMBLY HAS BEEN DONE WITH OUR 22-GROUP CROSS- SECTION SET TO STUDY THE EFFECTS OF THE RECENT CROSS-SECTION DATA.

1782 ID-NUMBER ID-NUMBER 1782

AUTHOR SHUKLA, V. K./ GARG, S. B.

TITLE A 26 GROUP CROSS-SECTION SET AND THE ANALYSIS OF ZPR-6 ASSEMBLY 4 Z

REPORT NUMBER..... PROC. NUCL. PHYS. SOLID STATE PHYS. SYMP. BOMBAY (1968), 2, 412-415

CONFERENCE NUCLEAR PHYSICS AND SOLID STATE PHYSICS SYMPOSIUM, BOMBAY, 28-31 DECEMBER, 1968

DATE PUBLISHED ... 68-12-00

NSA-NUMBER 24:16247

SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-6 - CALCULATIONS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE NEUTRONIC BEHAVIOUR OF A FAST POWER REACTOR CAN BE DETERMINED BY SOLVING THE NEUTRON TRANSPORT AND THE DIFFUSION EQUATIONS IN THE REACTOR MEDIA WITH MULTIGROUP TECHNIQUE. SEVERAL MULTIGROUP CROSS-SECTION SETS ARE AVAILABLE TO DO THESE STUDIES AND THEY HAVE SUCCESSFULLY REPRODUCED THE MEASURED PARAMETERS IN SOME OF THE ASSEMBLIES. THE CROSS-SECTIONS, STRICTLY SPEAKING, DEPEND ON THE REACTOR COMPOSITION AND THUS EACH ASSEMBLY REQUIRES A UNIQUE SET FOR ITS ANALYSIS - A PROPOSITION WHICH IS TOO TEDIOUS TO REALIZE IN PRACTICE. A SINGLE CROSS-SECTION SET, WHICH CAN CALCULATE THE SMALL ASSEMBLIES IN WHICH NEUTRONS STAY IN THE KEV AND THE MEV REGIONS AND THE LARGE DILUTE SYSTEMS IN WHICH NEUTRONS ARE SLOWED DOWN TO EV REGION, IS THUS THE MOST DESIRABLE TOOL IN REACTOR TECHNOLOGY. TO MEET THIS END A 26 GROUP CROSS-SECTION SET HAS BEEN PREPARED.

1791 ID-NUMBER ID-NUMBER 1791

AUTHOR TILL, C. E./ DAVEY, W. G./ LEWIS, R. A./ PALMER, R. G.
 TITLE ARGONNE NATIONAL LABORATORY CRITICAL EXPERIMENT PROGRAM.
 REPORT NUMBER..... CONF-690634, 040-049
 CONFERENCE THE BRITISH NUCLEAR ENERGY SOCIETY -- THE PHYSICS OF FAST REACTOR
 OPERATION AND DESIGN -- INTERNATIONAL CONFERENCE, LONDON, 24-26 JUNE 1969
 DATE PUBLISHED ... 69-06-24
 NSA-NUMBER 24:22455
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - GENERAL DESCRIPTIONS, INFORMATION, AND
 SUMMARIES

ABSTRACT

THE ANL CRITICAL FACILITIES ARE DESCRIBED BRIEFLY, IN THE CONTEXT OF THEIR CAPABILITIES AND LIMITATIONS, AND CERTAIN MAJOR MODIFICATIONS TO THE FACILITIES THAT REDUCE OR REMOVE SOME OF THESE LIMITATIONS ARE DESCRIBED. THE DIRECTIONS OF THE CURRENT PROGRAM ARE OUTLINED, AND THE RESULTS FROM TWO RECENT SERIES OF BASIC PHYSICS ASSEMBLIES OF GENERAL INTEREST ARE GIVEN IN SOME DETAIL. THE FIRST SERIES ARE NULL-REACTIVITY ASSEMBLIES THAT GIVE INTEGRAL INFORMATION ON THE PLUTONIUM-239 ALPHA IN THE KILOVOLT ENERGY REGION, AND THE SECOND SERIES ARE SIMPLE-COMPOSITION PLUTONIUM FUELED ASSEMBLIES THAT GIVE GENERAL INFORMATION ON PLUTONIUM CROSS SECTIONS. IN EACH CASE, THE MAJOR EXPERIMENTAL RESULTS ARE COMPARED WITH ANALYSIS MADE USING ENDF/B DATA. THE PLANNED PROGRAM OF LARGE PLUTONIUM-FUELED BENCHMARK ASSEMBLIES IS THEN OUTLINED BRIEFLY AND AS AN EXAMPLE OF THE CURRENT STATUS OF ONE OF THE MORE IMPORTANT MEASUREMENTS MADE ON ASSEMBLIES OF THIS KIND, THE MEASUREMENTS OF THE URANIUM-238 DOPPLER EFFECT ARE SELECTED FOR DISCUSSION IN DETAIL. THE DISCUSSION FIRST GIVES THE RESULTS OF MEASUREMENTS MADE TO ESTABLISH THE MEASUREMENT TECHNIQUE ITSELF, AND THEN FOCUSES ON THE STATUS OF COMPARISONS OF THE MEASUREMENTS WITH ANALYSES MADE USING ENDF/B DATA.

1794 ID-NUMBER ID-NUMBER 1794

AUTHOR KIEFHABER, E./ KUESTERS, H./ SCHMIDT, J. J./ BACHMANN, H./ KRIEG, B./
 STEIN, E./ THIEM, D./ WAGNER, K./ HINKELMANN, B./ SIEP, I.
 TITLE EVALUATION OF FAST CRITICAL EXPERIMENTS BY USE OF RECENT METHODS AND DATA.
 REPORT NUMBER..... CONF-690634, 094-100
 CONFERENCE THE BRITISH NUCLEAR ENERGY SOCIETY -- THE PHYSICS OF FAST REACTOR
 OPERATION AND DESIGN -- INTERNATIONAL CONFERENCE, LONDON, 24-26 JUNE 1969
 DATE PUBLISHED ... 69-06-24
 NSA-NUMBER 24:22506
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

THE ANALYSIS OF A SERIES OF FAST CRITICAL EXPERIMENTS, WITH THE LATEST INFORMATION ON BASIC NUCLEAR DATA, WAS PERFORMED IN THE ATTEMPT TO FIND REASONS FOR THE KNOWN DEVIATIONS BETWEEN THEORETICAL PREDICTION AND EXPERIMENTAL RESULT. FIRST, THE THEORETICAL METHODS USED AND THE ERRORS DUE TO CERTAIN APPROXIMATIONS (TRANSPORT EFFECTS, MULTIGROUP SCHEME) ARE DISCUSSED. FROM THE VARIOUS DATA UNCERTAINTIES THOSE OF THE CROSS SECTIONS OF HEAVY ISOTOPES WERE INVESTIGATED. IN INELASTIC SCATTERING THE EFFECT OF THE REPLACEMENT ON ABN PROBABILITIES BY KARLSRUHE DATA IS CONSIDERED. THE RESULTS OF THIS INVESTIGATION WILL HOPEFULLY ALLOW JUDGING TO A HIGHER DEGREE OF CONFIDENCE THE ACCURACY OF THE PREDICTED PHYSICAL PROPERTIES OF LARGE FAST POWER REACTORS. (AUTH) (UK).

1795 ID-NUMBER ID-NUMBER 1795

AUTHOR BARRE, J. Y./ HEINDLER, M./ LACAPELLE, T./ RAVIER, J.
 TITLE LESSONS DRAWN FROM INTEGRAL EXPERIMENTS ON A SET OF MULTIGROUP CROSS
 SECTIONS.
 REPORT NUMBER..... CONF-690634, 165-179
 CONFERENCE THE BRITISH NUCLEAR ENERGY SOCIETY -- THE PHYSICS OF FAST REACTOR
 OPERATION AND DESIGN -- INTERNATIONAL CONFERENCE, LONDON, 24-26 JUNE 1969

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

DATE PUBLISHED ... 69-06-24
 NSA-NUMBER 24:22507
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

TWO METHODS OF USING INTEGRAL EXPERIMENTS TO IMPROVE THE BASIC NEUTRON DATA OF A MULTIGROUP CROSS SECTION SET ARE DESCRIBED. FIRST A STATISTICAL ANALYSIS OF A LARGE NUMBER OF INTEGRAL PARAMETERS MEASURED IN FAST CRITICAL ASSEMBLIES INDICATE MODIFICATIONS IN CROSS SECTIONS FOR URANIUM-235, URANIUM-238, PLUTONIUM-239 AND IRON, LEADING TO A NEW CROSS SECTION SET. SECONDLY, THE UTILITY OF SPECIFIC CRITICAL EXPERIMENTS FOR BASIC NEUTRON DATA IS DEMONSTRATED FOR THE CAPTURE CROSS SECTION OF NICKEL AND HIGH ENERGY CROSS SECTIONS OF FISSILE ISOTOPES. (AUTH) (UK).

1799 ID-NUMBER ID-NUMBER 1799

AUTHOR ENDLER, A.
 TITLE CRITICAL EXPERIMENTS AND ZERO-POWER MEASUREMENTS WITH THE CRITICAL FACILITY "RAKE" FOR THE POWER LEVEL INCREASING OF THE RFR REACTOR.
 REPORT NUMBER.... KERNERGIE, 13, 6-11
 DATE PUBLISHED ... 70-01-00
 NSA-NUMBER 24:24888
 SITE/PROGRAM GERMANY - RFR REACTOR

ABSTRACT

THE RESULTS ARE PRESENTED OF CRITICAL EXPERIMENTS USING THE FUEL ELEMENTS E-CH 1 PROVIDED FOR THE POWER LEVEL INCREASING OF THE RFR REACTOR. A DESCRIPTION OF BOTH THE STRUCTURE AND THE OPTIMIZATION OF A WORKING CHARGE IS INCLUDED. THE ZERO-POWER EXPERIMENT DATA NECESSARY FOR THE START-UP OF THE POWER REACTOR ARE ANALYZED.

1801 ID-NUMBER ID-NUMBER 1801

AUTHOR KIEFHABER, E./ SCHMIDT, J. J.
 TITLE EVALUATION OF FAST CRITICAL EXPERIMENTS USING RECENT METHODS AND DATA.
 REPORT NUMBER.... EURFNR-0858
 DATE PUBLISHED ... 70-09-00
 NSA-NUMBER 25:15387
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS ; GERMANY - SNEAK (FAST BREEDER) - CALCULATIONS ; GERMANY - SUAK - CALCULATIONS

ABSTRACT

IN THIS WORK WE STUDY SYSTEMATICALLY THE INFLUENCE OF CHANGES IN NUCLEAR DATA ON THE CALCULATED VALUES FOR THE CRITICALITY AND OTHER IMPORTANT PARAMETERS OF CRITICAL ASSEMBLIES. THE ANALYSIS IS DONE FOR A VARIETY OF ASSEMBLIES WHICH DIFFER IN GEOMETRY, MATERIAL COMPOSITION, AND ENERGY DISTRIBUTION OF THE NORMAL AND ADJOINT FLUX. THE PRIMARY OBJECTIVE IS:

- (A) TO DETECT DEFICIENCIES IN NUCLEAR DATA AND CALCULATIONAL METHODS,
- (B) TO GET FIRST PRELIMINARY IMPROVEMENTS AND,
- (C) TO GET INDICATIONS IN WHICH RESPECT AND IN WHICH MAY FURTHER LONG-RANGE IMPROVEMENTS SHOULD BE CARRIED ON.

THE LONG-RANGE AIM OF THIS KIND OF INVESTIGATIONS IS TO PROVIDE OR ESTABLISH SATISFACTORY NUCLEAR DATA AND CALCULATIONAL METHODS WHICH CAN RELIABLY BE APPLIED TO THE CALCULATION OF FAST CRITICAL ASSEMBLIES AND OF LARGE FAST POWER REACTORS. IN THE PRESENT INVESTIGATION THE DIFFERENCES BETWEEN CALCULATED AND MEASURED RESULTS FOR THE CRITICAL ASSEMBLIES STUDIED ARE NOT YET REDUCED TO A SATISFACTORY LEVEL. THEREFORE THIS STUDY MUST BE CONSIDERED AS ONE STEP IN THE DESIRED DIRECTION BUT FURTHER INVESTIGATIONS ALONG THE SAME LINE WILL BE NECESSARY.(AUTH).

1804 ID-NUMBER ID-NUMBER 1804

AUTHOR DAVIS, E. C. / SMITH, R. I. / WILLIAMS, L. D.
 TITLE CRITICAL EXPERIMENTS IN AN MTR MOCKUP USING PHOENIX FUEL.
 REPORT NUMBER.... BNWL-1481
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 25:18170
 SITE/PROGRAM HANFORD - MTR - PHOENIX FUEL ELEMENTS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

UTILIZATION OF PLUTONIUM-240 AS A CONVERTIBLE POISON IN PLUTONIUM-FUELED SYSTEMS IS BEING STUDIED UNDER THE PHOENIX FUEL REACTOR PROGRAM AT PACIFIC NORTHWEST LABORATORY (PNL). AN EXTENSIVE EXPERIMENTAL PROGRAM USING PHOENIX FUEL IN A CRITICAL MOCKUP OF THE MATERIALS TESTING REACTOR (MTR) HAS BEEN COMPLETED IN THE PLUTONIUM RECYCLE CRITICAL FACILITY (PRCF) AT PNL. THE PRCF-PHOENIX MOCKUP DUPLICATED AS CLOSELY AS POSSIBLE THE PHYSICAL CONFIGURATION OF THE MTR IN ORDER TO DETERMINE THE CHARACTERISTICS OF SUCH A CORE. THE EXPERIMENTS PERFORMED IN THIS MOCKUP PROVIDED INFORMATION ON THE REACTIVITY EFFECTS AND POWER DISTRIBUTIONS TO BE EXPECTED OF AN MTR-PHOENIX FUEL CORE PRIOR TO THE LOADING OF A FULL CORE IN THE MTR. THESE DATA HAVE PROVIDED AN EXCELLENT TEST OF THE COMPUTATIONAL METHODS CURRENTLY BEING APPLIED TO PHOENIX FUEL CORES. THE RESULTS OF THE PRCF EXPERIMENTS ARE PRESENTED IN THIS REPORT. (AUTH).

1805 ID-NUMBER ID-NUMBER 1805

AUTHOR BOEHNEL, K./ MEISTER, H.
 TITLE FAST REACTOR LATTICE EXPERIMENT FOR INVESTIGATION OF K(INF) AND REACTION RATE RATIOS IN SNEAK, ASSEMBLY 5.
 REPORT NUMBER.... EURFNR-0861
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 25:18173
 SITE/PROGRAM GERMANY - SNEAK (FAST BREEDER)

ABSTRACT

A FAST REACTOR LATTICE EXPERIMENT WAS CARRIED OUT IN THE ZERO-POWER FACILITY SNEAK, ASSEMBLY 5, TO DETERMINE K(INF) AND REACTION RATE RATIOS. THE ASSEMBLY CONSISTS OF A CENTRAL TEST ZONE SURROUNDED BY AXIAL AND RADIAL DRIVER REGIONS. THE TEST ZONE CONTAINS PLATELETS OF PLUTONIUM OXIDE/URANIUM OXIDE MIXED OXIDE, DEPLETED AND NATURAL URANIUM METAL, AND GRAPHITE AS A MODERATING MATERIAL. ITS COMPOSITION WAS CHOSEN TO RENDER K(INF) CLOSE TO UNITY.

THE K(INF)-VALUES OF SYSTEMS WITH DIFFERENT CARBON/URANIUM-238-RATIO WERE DETERMINED BY VOIDING A CENTRAL REGION OF THE TEST ZONE AND MEASURING ASSOCIATED REACTIVITY CHANGE. FISSION RATES OF URANIUM-235 AND URANIUM-238 INSIDE THE LATTICE CELL WERE MEASURED WITH SOLID STATE TRACK DETECTORS, THE URANIUM-238-CAPTURE RATE BY ACTIVATION OF DEPLETED URANIUM FOILS AND SUBSEQUENT GAMMA-X-RAY COINCIDENCE COUNTING. THE EXPERIMENTAL RESULTS ARE COMPARED WITH 26-GROUP CALCULATIONS USING DIFFERENT METHODS AND CROSS SECTION SETS.

1806 ID-NUMBER ID-NUMBER 1806

AUTHOR TUCK, G. / CLARK, H. E.
 TITLE CRITICAL PARAMETERS OF A URANIUM SOLUTION SLAB--CYLINDER SYSTEM.
 REPORT NUMBER.... RFP-1314
 DATE PUBLISHED ... 70-12-16
 NSA-NUMBER 25:18177
 SITE/PROGRAM ROCKY FLATS - SOLID UNITS IN FISSION SOLUTIONS

ABSTRACT

CRITICAL PARAMETERS ARE REPORTED FOR URANIUM-SOLUTION SYSTEMS CONSISTING OF EQUALLY SPACED VERTICAL CYLINDERS ARRANGED IN A SQUARE ARRAY RESTING ON THE BOTTOM OF A 20.3-CM HIGH SQUARE SLAB TANK. SOME OF THESE SYSTEMS WERE REFLECTED EXTERNALLY. BOTH THE CYLINDERS AND THE SLAB CONTAINED URANYL-NITRATE SOLUTION HAVING 490 G OF URANIUM (93.2 WT% URANIUM-235)/LITER.

CRITICAL PARAMETERS ARE REPORTED FOR A 490-GRAM PER LITER URANYL NITRATE (93.2 WEIGHT-PERCENT URANIUM-235) SYSTEM WHICH CONSISTED OF AN AN ARRAY OF VERTICAL CYLINDERS RESTING ON AND INTERACTING WITH A 120-CENTIMETER SQUARE HORIZONTAL SLAB. THE PARAMETERS VARIED WERE THE ARRAY SOLUTION HEIGHT, THE NUMBER OF CYLINDERS, THE CYLINDER DIAMETER, AND THE SLAB THICKNESS. THE SLAB-ARRAY SYSTEM, HAVING NINE AND SIXTEEN 13.6-CENTIMETER DIAMETER CYLINDERS, WAS ALSO REFLECTED WITH A 10.2-CENTIMETER THICK REFLECTOR. ALL OTHER MEASUREMENTS WERE ESSENTIALLY REFLECTED. THE CRITICAL THICKNESS OF THE SLAB ALONE WAS MEASURED ALSO.

IN ADDITION, TWO CASES OF SPECIAL INTEREST TO THE CRITICALITY ENGINEER WERE INVESTIGATED. THESE INCLUDED THE EFFECT OF TWO 2-LITER BOTTLES OF SOLUTION NEAR THE CENTER OF A 16-CYLINDER ARRAY AND THE EFFECT OF VERTICAL SEPARATION BETWEEN THE ARRAY OF CYLINDERS AND THE SOLUTION SLAB. (AUTH)

1811 ID-NUMBER ID-NUMBER 1811

AUTHOR ROBINSON, W. R. / LESAGE, L. G. / POND, R. B.
 TITLE SUMMARY OF CRITICAL-MASS CONFIGURATIONS, MATERIAL CONCENTRATIONS, AND CONTROL-ROD WORTHS FOR ZPR-9 ZONED FAST CRITICAL ASSEMBLIES 11-25.
 REPORT NUMBER.... ANL-7773
 DATE PUBLISHED ... 71-03-00

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

NSA-NUMBER 25:41501
SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-9 (FAST ROCKET)

ABSTRACT

A DETAILED REVIEW HAS BEEN MADE OF ZPR-9 ASSEMBLIES 11-25 OF THE "AS-BUILT" REACTOR PROPERTIES INCLUDING REGIONAL RADII, CRITICAL MASSES, REGIONAL ATOMIC CONCENTRATIONS, AND MEASURED CONTROL-ROD WORTHS. THIS REVIEW WAS MADE IN ORDER TO PROCESS AND COMPILE THE DATA IN A CONSISTENT MANNER. NOT INCLUDED IN THE REVIEW ARE THE ROCKET CRITICAL-ASSEMBLY PROGRAM PRIOR TO ASSEMBLY 11 AND THE FTR CRITICAL STUDIES SUCCEEDING ASSEMBLY 25. (AUTH).

1812 ID-NUMBER ID-NUMBER 1812

AUTHOR CASINI, G./ PAILLON, M.
TITLE COMPARATIVE ANALYSIS OF CRITICAL AND EXPONENTIAL EXPERIMENTS BY HETEROGENEOUS METHODS.
REPORT NUMBER..... EUR-4362
DATE PUBLISHED ... 70-00-00
NSA-NUMBER 25:44154
SITE/PROGRAM ITALY - HEAVY WATER - CALCULATIONS

ABSTRACT

IN THE PAPER IS OUTLINED A COMPARATIVE ANALYSIS BETWEEN CRITICAL AND EXPONENTIAL EXPERIMENTS CARRIED-OUT IN THE ISPRA HEAVY WATER FACILITIES ECO AND EXPO. IN THE MEASUREMENTS, THE TEST FUEL ELEMENTS WERE CLUSTERS OF NATURAL URANIUM METAL AND CARBIDE WITH SEVENTEEN AND NINETEEN RODS PER BUNDLE, COOLED BY AN ORGANIC LIQUID.

1814 ID-NUMBER ID-NUMBER 1814

AUTHOR DABROWSKI, C./ MALEWSKI, S.
TITLE PHYSICAL AND GEOMETRICAL PARAMETERS OF ANNA CRITICAL ASSEMBLIES. PART 1.
REPORT NUMBER..... INR-1288
DATE PUBLISHED ... 71-00-00
NSA-NUMBER 25:46292
SITE/PROGRAM POLAND - ANNA CRITICAL ASSEMBLY

ABSTRACT

SEVERAL CRITICAL ANNA ASSEMBLIES HAVE BEEN ANALYSED WITH THE AIM TO DETERMINE THEIR PHYSICAL PARAMETERS FROM THE CALCULATION OF THE FINE STRUCTURE FLUX DISTRIBUTIONS IN THE ELEMENTARY CELLS AND OF THE SLOWING-DOWN AND RESONANCE EFFECTS. THESE PARAMETERS HAVE BEEN USED TO DETERMINE THE CRITICAL SIZES AND NEUTRON DENSITY DISTRIBUTIONS IN TWO-GROUP DIFFUSION APPROXIMATION. A COMPARISON OF THE CALCULATED DATA WITH THE AVAILABLE EXPERIMENTAL RESULTS HAS BEEN CARRIED OUT. (AUTH).

1815 ID-NUMBER ID-NUMBER 1815

AUTHOR KUTCHER, J. W./ DAVIS, E. C.
TITLE THE MTR-PHOENIX FUEL EXPERIMENT- CRITICAL TEST AND BURNUP RESULTS.
REPORT NUMBER..... BNWL-1593
DATE PUBLISHED ... 71-06-00
NSA-NUMBER 25:48298
SITE/PROGRAM HANFORD - MTR - PHOENIX FUEL ELEMENTS

ABSTRACT

THE MTR-PHOENIX FUEL EXPERIMENT WAS A BURNUP EXPERIMENT IN THE MATERIALS TESTING REACTOR (MTR) WITH A PLUTONIUM-ALUMINUM ALLOY FUELED CORE, FOLLOWING A COMPREHENSIVE SET OF CRITICAL EXPERIMENTS. THIS EXPERIMENT UTILIZED PHOENIX FUEL, A MIXTURE OF PLUTONIUM ISOTOPES WITH A RELATIVELY HIGH CONTENT OF PLUTONIUM-240.

THE WORK DESCRIBED IN THIS REPORT INCLUDES THE LOADING OF THE MTR TO CRITICAL WITH THE PHOENIX FUEL CORE; THE ZERO POWER MEASUREMENTS OF SHIM ROD AND REGULATING ROD WORTHS, POWER DISTRIBUTIONS THROUGHOUT THE CORE, KINETIC PARAMETERS, AND REACTIVITY WORTHS OF LOSS OF COOLANT AND LOSS OF FUEL PLATES; AND THE VARIATION OF SOME OF THE ABOVE PARAMETERS AS THE BURNUP OF THE CORE PROCEEDED. THE BURNUP HISTORY OF THE MTR-PHOENIX CORE IS ALSO PRESENTED. THE RESULTS ARE COMPARED, WHERE POSSIBLE, WITH RESULTS OBTAINED IN THE PRCF-PHOENIX EXPERIMENT AND WITH CALCULATIONS. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1816 ID-NUMBER ID-NUMBER 1816

AUTHOR ENGSTROM, S. L./ BENNETT, R. A.
 TITLE ANALYSIS OF FTR PHASE B CRITICAL EXPERIMENTS. PART 4. ZPR-3 ASSEMBLY 56B.
 REPORT NUMBER..... HEDL-TME-71-41
 DATE PUBLISHED ... 71-05-00
 NSA-NUMBER 25:48307
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

CRITICAL EXPERIMENTS IN SUPPORT OF THE DESIGN OF THE FAST FLUX TEST REACTOR HAVE BEEN CARRIED OUT IN ZPR-3 ASSEMBLIES 48, 48A, 51, 52 A THROUGH F, AND 56B, BY PERSONNEL OF ARGONNE NATIONAL LABORATORY. THIS REPORT PRESENTS THE RESULTS AND ANALYSIS OF THE EXPERIMENTS PERFORMED IN ASSEMBLY 56B. MEASURED AND CALCULATED VALUES ARE PRESENTED OF CRITICAL MASS, CONTROL ROD WORTHS, FUEL COLUMN WORTHS, CENTRAL FISSION RATIOS, AND SPATIAL REACTION RATES. TWO DIMENSIONAL DIFFUSION THEORY IS USED WITH A 26 ENERGY GROUP BASIC CROSS SECTION SET. (AUTH).

1817 ID-NUMBER ID-NUMBER 1817

AUTHOR FINN, H. F. / PRUVOST, N. L. / KOLAR, O. C. / PIERCE, G. A.
 TITLE SUMMARY OF EXPERIMENTALLY DETERMINED PLUTONIUM ARRAY CRITICAL CONFIGURATIONS
 REPORT NUMBER..... UCRL-51041
 DATE PUBLISHED ... 71-05-10
 SITE/PROGRAM LIVERMORE - PLUTONIUM ARRAYS

ABSTRACT

IN THIS REPORT, WE PRESENT EXPERIMENTALLY DETERMINED CRITICAL CONFIGURATIONS FOR 28 ONE-, TWO-, AND THREE-DIMENSIONAL PLUTONIUM ARRAYS. THESE ARRAYS INCLUDE UNMODERATED, MODERATED, AND EXTERNALLY REFLECTED SYSTEMS. THE BASIC ARRAY PART CONSISTS OF A 3-KG MASS OF ALPHA-PHASE PLUTONIUM IN THE SHAPE OF A RIGHT CIRCULAR CYLINDER. THE MODERATOR CONSISTS OF CYLINDRICAL MOCK HIGH-EXPLOSIVE JACKETS IN THREE THICKNESSES--1.27, 2.55, AND 3.82 CM. EIGHT DIFFERENT ARRAY UNITS WERE CONSTRUCTED BY USING ONE OR TWO OF THE BASIC PLUTONIUM PARTS, WITH OR WITHOUT THE MODERATOR JACKETS. THE EXTERNAL REFLECTOR MATERIAL IS POLYETHYLENE. (AUTH).

1822 ID-NUMBER ID-NUMBER 1822

AUTHOR PAIK, N. C./ PITTERLE, T. A./ DURSTON, C.
 TITLE INTEGRAL TESTING OF MODIFICATIONS TO ENDF/B VERSION II DATA.
 REPORT NUMBER..... CONF-710301, 1, 44-50
 CONFERENCE THIRD CONFERENCE ON NEUTRON CROSS SECTION TECHNOLOGY, KNOXVILLE, 15 MARCH 1971
 DATE PUBLISHED ... 71-08-00
 NSA-NUMBER 26:01642
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS ; ARGONNE NATIONAL LABORATORY, IDAHO - ZPPR (DEMONSTRATION PLANT BENCHMARKS) - CALCULATIONS ; ARGONNE NATIONAL LABORATORY - ZPR-6 - CALCULATIONS

ABSTRACT

THIS PAPER DESCRIBES THE RESULTS OF INTEGRAL TESTING AGAINST CRITICAL EXPERIMENTS OF ENDF/B VERSION II DATA AND OF MODIFICATIONS TO THIS DATA. MODIFICATIONS OF THE DATA HAVE BEEN TESTED AGAINST EXPERIMENT INDIVIDUALLY AND COLLECTIVELY TO OBTAIN A MODIFIED DATA SET WHICH YIELDS IMPROVED AGREEMENT WITH INTEGRAL EXPERIMENTS OF INTEREST TO LMFBR DESIGN ANALYSES. ELEVEN CRITICAL ASSEMBLIES HAVE BEEN ANALYZED IN THIS STUDY INCLUDING ASSEMBLIES COVERING A WIDE RANGE OF NEUTRON SPECTRA, FISSION/FERTILE RATIOS, AND CORE SIZE WITH BOTH URANIUM BLANKETS AND NICKEL REFLECTORS. ASSEMBLIES OF PARTICULAR INTEREST TO LMFBR DESIGN INCLUDE ZPPR-2, ZPR-3-56B, ZPR-3-48, ZPR-6-6A AND ZPR-6-7. EIGENVALUES HAVE BEEN CALCULATED TO BETTER THAN 1% ACCURACY FOR NINE OF ELEVEN ASSEMBLIES WITH ONLY ZEBRA 2 AND 3 HAVING EIGENVALUES 1.3% LOW. CENTRAL REACTION RATE RATIO CALCULATIONS WITH ADJUSTED ENDF/B VERSION II DATA ARE SHOWN TO BE IN GOOD AGREEMENT WITH MEASURED RATIOS. THIS ADJUSTED DATA IMPROVES THE CENTRAL MATERIAL WORTHS IN ZPR-3-48. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1823 ID-NUMBER ID-NUMBER 1823

AUTHOR HUNTER, R. E. / CREMER, C. C. / WORLTON, D. R.
 TITLE INTEGRAL COMPARISONS FOR FAST CRITICAL ASSEMBLIES.
 REPORT NUMBER.... CONF-710301, 1, 58-64
 CONFERENCE THIRD CONFERENCE ON NEUTRON CROSS SECTION TECHNOLOGY, KNOXVILLE, 15 MARCH 1971
 DATE PUBLISHED .. 71-08-00
 NSA-NUMBER 26:01644
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES - CALCULATIONS ; LOS ALAMOS - PLUTONIUM METAL SPHERES - CALCULATIONS ; ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

COMPARISONS ARE MADE BETWEEN EXPERIMENTAL AND CALCULATED INTEGRAL PARAMETERS FOR PLUTONIUM AND URANIUM FAST NEUTRON ASSEMBLIES, AND IMPLICATIONS OF THESE COMPARISONS ON THE "BEST-FIT" TO MICROSCOPIC DATA ARE DISCUSSED FOR A NUMBER OF CASES, INCLUDING THE (N, GAMMA) CROSS SECTION FOR URANIUM-238 AND THE FISSION SPECTRUM FOR URANIUM-235. INTEGRAL PARAMETERS USED IN THESE COMPARISONS INCLUDE BARE AND REFLECTED ASSEMBLY CRITICAL MASSES, SPECTRAL INDICES, AND CENTRAL CORE-REPLACEMENT REACTIVITY CONTRIBUTIONS. (AUTH).

1824 ID-NUMBER ID-NUMBER 1824

AUTHOR COWAN, C. L./ HUTCHINS, B. A./ TURNER, J. E.
 TITLE ADJUSTMENTS TO ENDF/B, VERSION II DATA WHICH IMPROVE THE AGREEMENT BETWEEN CALCULATED AND MEASURED PARAMETERS FOR FAST BENCHMARK CRITICAL ASSEMBLIES.
 REPORT NUMBER.... CONF-710301, 1, 72-78
 CONFERENCE THIRD CONFERENCE ON NEUTRON CROSS SECTION TECHNOLOGY, KNOXVILLE, 15 MARCH 1971
 DATE PUBLISHED .. 71-08-00
 NSA-NUMBER 26:01646
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

EIGENVALUES, REACTION RATE RATIOS AND REACTIVITY WORTHS WHICH HAVE BEEN CALCULATED WITH THE ENDF/B, VERSION II DATA TEND TO BE IN POOR AGREEMENT WITH THE MEASURED VALUES FOR A NUMBER OF FAST CRITICAL ASSEMBLIES. FOR THIS REASON IT HAS BEEN NECESSARY TO ADJUST THE VERSION II DATA FOR USE IN THE DEMONSTRATION PLANT AND LMFBR DESIGN EFFORT. MODIFICATIONS TO THE COARSE GROUP CROSS SECTIONS WHICH IMPROVE THE AGREEMENT BETWEEN CALCULATED AND MEASURED INTEGRAL PARAMETERS FOR THE CRITICAL ASSEMBLIES ARE DESCRIBED. THE PRINCIPAL MODIFICATION IS A 5-10% INCREASE IN THE PLUTONIUM-239 FISSION CROSS SECTION BETWEEN 10 AND 600 KEV. OTHER ADJUSTMENTS INCLUDE HIGHER FISSION CROSS SECTIONS FOR URANIUM-235 AND HIGHER FISSION, LOWER CAPTURE AND LOWER INELASTIC CROSS SECTIONS FOR URANIUM-238. (AUTH).

1829 ID-NUMBER ID-NUMBER 1829

AUTHOR HESS, A. L./ GASIDLO, J. M./ LONG, J. K./ AMUNDSON, P. I./ KEENEY, W. P.
 TITLE CRITICAL STUDIES OF A 440-LITER FAST-REACTOR CORE FUELED WITH URANIUM ENRICHED TO 17 PERCENT (ZPR-3 ASSEMBLY 41).
 REPORT NUMBER.... ANL-6732
 DATE PUBLISHED .. 71-06-00
 NSA-NUMBER 26:06325
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

ZPR-3 ASSEMBLY 41 WAS A CYLINDRICAL FAST-REACTOR SYSTEM COMPOSED OF A DILUTE URANIUM CORE SURROUNDED BY A THICK, DEPLETED-URANIUM BLANKET. THE FUEL, A FIVE-TO-ONE MIXTURE OF URANIUM-238 AND URANIUM-235, AMOUNTED TO 35 VOL % OF THE CORE, AND THIS WAS DILUTED WITH 18 VOL % ALUMINUM, 14 VOL % STEEL, AND 33 VOL % VOID. A CRITICAL MASS OF 494 KG OF URANIUM-235 WAS MEASURED FOR THIS COMPOSITION. BASIC PHYSICS EXPERIMENTS INCLUDED MEASUREMENTS OF SPECTRAL INDICES, MATERIAL REACTIVITY COEFFICIENTS, AND FLUX PROFILES. THE WORTHS OF STEEL AND ALUMINUM AS REFLECTORS, RELATIVE TO URANIUM, WERE INVESTIGATED IN RADIAL AND AXIAL BLANKET REGIONS. STUDIES WERE CARRIED OUT TO DETERMINE THE RELATIVE MERITS OF THREE BREEDER-BLANKET CONCEPTS: AN EBR-II-TYPE BLANKET (WITH 40 VOL % URANIUM, 40 VOL % SODIUM, AND 20 VOL % STEEL); A URANIUM-CARBIDE-TYPE BLANKET (WITH 20 VOL % URANIUM, 20 VOL % CARBON, 40 VOL % SODIUM, AND 20 VOL % STEEL); AND A TWO-ZONE BLANKET WITH AN INNER ZONE OF EBR-II-TYPE BLANKET AND AN OUTER ZONE CONTAINING GRAPHITE INSTEAD OF URANIUM. WORTHS OF BORON CARBIDE NEAR THE CORE IN TWO BLANKET TYPES WERE MEASURED TO EVALUATE A ROTARY- CONTROL-ROD CONCEPT FOR FAST REACTORS. THIS REPORT CONTAINS EXPERIMENTAL DETAILS AND THE RESULTS OF ALL MEASUREMENTS.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1833 ID-NUMBER ID-NUMBER 1833

AUTHOR ASAKA, R.
 TITLE ANALYSIS OF CRITICAL EXPERIMENTS ON THE SORA MOCKUP BY THE S-N METHOD.
 REPORT NUMBER..... EUR-4876
 DATE PUBLISHED ... 71-07-00
 NSA-NUMBER 26:14517
 SITE/PROGRAM OAK RIDGE - SORA REACTOR (FAST, PULSED, NAK)- CALCULATIONS

ABSTRACT

THIS REPORT SUMMARIZES THE RESULTS OF THE ANALYSIS OF THE CRITICAL EXPERIMENT FOR THE PULSED FAST REACTOR SORA BY THE USE OF THE CARLSON S-N METHOD. SIX-GROUP TWO-DIMENSIONAL S-4 CALCULATIONS OF THE REACTIVITY FOR MEASURED CRITICAL CONFIGURATIONS CONFIRM THAT THE CRITICALITY OF THE SORA REACTOR CAN BE PREDICTED TO WITHIN ABOUT 1% IN THE REACTIVITY WITH THE WELL KNOWN CROSS-SECTIONS TESTED FOR SPHERICAL CRITICAL ASSEMBLIES. AN ANALYSIS OF MEASUREMENTS ON THE REACTIVITY WORTH OF A CONTROL ROD OR SCATTERER SHOWS THAT THE TWO-DIMENSIONAL S-N CODE CAN BE USED TO ESTIMATE THE WORTH WITH A REASONABLE ACCURACY IN THE CASE WHERE A PRECISE TREATMENT OF THE THREE-DIMENSIONAL GEOMETRY IS NOT ESSENTIAL. (AUTH).

1834 ID-NUMBER ID-NUMBER 1834

AUTHOR KAISER, R. E./ GASIDLO, J. M./ LEHTO, W. K./ MADDISON, D. W./ VOSBURGH, R. O./ MOUNTFORD, L. A.
 TITLE EXPERIMENTAL RESULTS FOR ZPR-3 ASSEMBLIES 53 AND 54.
 REPORT NUMBER..... ANL-7882
 DATE PUBLISHED ... 71-11-00
 NSA-NUMBER 26:27562
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

ASSEMBLY 53 WAS THE FOURTH IN A SEQUENCE OF PLUTONIUM-FUELED ZPR-3 BENCHMARK ASSEMBLIES WITH SIMPLE GEOMETRIES AND COMPOSITIONS, THE FIRST THREE BEING ASSEMBLIES 48, 49, AND 50. ALTHOUGH THE CRITICAL MASSES IN THIS SEQUENCE WERE SMALL, THE ADDITION OF GRAPHITE ENSURED THAT THE NEUTRON SPECTRA WERE GENERALLY SIMILAR TO THOSE EXPECTED IN LARGE FAST POWER REACTORS. THE OBJECTIVE OF THE SEQUENCE IS TO PROVIDE INTEGRAL DATA FOR EVALUATING CALCULATIONAL METHODS AND NUCLEAR-DATA COMPILATIONS TO BE USED IN THE DESIGN OF DEMONSTRATION-PLANT LIQUID-METAL FAST BREEDER REACTORS.

ASSEMBLY 54 WAS BUILT TO PROVIDE DATA RELATED TO THE EFFECT OF UNCERTAINTIES IN THE URANIUM-238 DELAYED-NEUTRON PARAMETERS. THE DEPLETED-URANIUM BLANKET ON ASSEMBLY 53 WAS REMOVED AND REPLACED WITH A MILD STEEL REFLECTOR, THUS GREATLY REDUCING THE CONTRIBUTION OF URANIUM-238 FISSION TO THE EFFECTIVE BETA OF THE REACTOR SYSTEM.

THIS REPORT DESCRIBES THE EXPERIMENTAL PROGRAM CARRIED OUT IN THE TWO ASSEMBLIES.

1838 ID-NUMBER ID-NUMBER 1838

AUTHOR MAGNUSON, D. W.
 TITLE CRITICAL THREE-DIMENSIONAL ARRAYS OF NEUTRON INTERACTING UNITS. PART-3. ARRAYS OF URANIUM(93.2) METAL SEPARATED BY VARIOUS MATERIALS.
 REPORT NUMBER..... Y-DR-083
 DATE PUBLISHED ... 72-05-15
 NSA-NUMBER 26:41490
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

POLYETHYLENE-REFLECTED, 8-UNIT ARRAYS OF URANIUM(93.2)-METAL CYLINDERS HAVING PLYWOOD, CELOTEX, FOAMGLAS, AND BORATED PLASTIC FOAM BETWEEN THE FISSION UNITS HAVE BEEN ASSEMBLED TO DELAYED CRITICALITY. CALCULATIONS OF K(EFF) USING THE KENO MONTE CARLO CODE AND HANSEN-ROACH 16-GROUP CROSS SECTIONS ARE IN SATISFACTORY AGREEMENT WITH THE EXPERIMENTAL VALUES. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1839 ID-NUMBER ID-NUMBER 1839

AUTHOR CAIZERGUES, R.
 TITLE INTERPRETATION OF EXPERIMENTS ON AQUEOUS PLUTONIUM NITRATE SOLUTIONS.
 REPORT NUMBER..... CEA-R-4341
 DATE PUBLISHED ... 72-06-00
 NSA-NUMBER 26:51168
 SITE/PROGRAM FRANCE - PLUTONIUM AND URANIUM SOLUTIONS

ABSTRACT

THIS REPORT IS AN APPENDIX TO THE INTERPRETATIONS OF EXPERIMENTS WITH AQUEOUS SOLUTIONS OF PLUTONIUM NITRATE WHICH WERE THE OBJECT OF OUR REPORT CEA-R-3367. IT CONSIDERS THE FOLLOWING STUDIES:

COMPARISON OF EXPERIMENTAL RESULTS WITH CALCULATIONS MADE PRIMARILY WITH THE MONTE CARLO PROGRAM.

COMPARISON OF THE LAPLACIEN MATRICES AND LAPLACIEN GEOMETRIES.

THE NEGATIVE REACTIVITY EFFECT OF FREE ACID: A NEW CALCULATIONAL METHOD PERMITS THE STUDY OF THIS EFFECT WITH REGARD TO THE STRENGTH OF THE CONCENTRATIONS OF PLUTONIUM AND THE FREE RADICAL OF NITROGEN-TRIOXIDE (NO₃-).

EFFECTS OF PLUTONIUM-240.

EXTENSIONS OF THE RESULTS ON THE EFFECT OF THE ACIDITY AND THE PLUTONIUM-240 FOR SPHERES OF PLUTONIUM NITRATE SOLUTIONS. (VEH).

1844 ID-NUMBER ID-NUMBER 1844

AUTHOR HANDLEY, G. R./ HOPPER, C. M.
 TITLE VALIDATION CHECKS OF THE "ANISN" AND "KENO" CODES BY CORRELATION WITH EXPERIMENTAL DATA.
 REPORT NUMBER..... Y-1858
 DATE PUBLISHED ... 72-11-20
 NSA-NUMBER 27:10067
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

THE ONE-DIMENSIONAL, DISCRETE-ORDINATES TRANSPORT COMPUTER CODE ANISN AND THE MONTE CARLO COMPUTER CODE KENO ARE EMPLOYED TO CALCULATE CRITICAL EXPERIMENTS OF VARIOUS GEOMETRIES, MATERIALS, AND URANIUM-235 ENRICHMENTS. THE INPUT PARAMETERS TO THE CODES ARE INCLUDED IN AN APPENDIX. IT IS CONCLUDED THAT RELIABLE CRITICALITY SAFETY CALCULATIONS CAN BE MADE FOR A WIDE RANGE OF SYSTEMS OF GENERAL INTEREST, PROVIDED THE LIMITS OF VALIDATED APPLICABILITY ARE NOT EXCEEDED. (AUTH).

1857 ID-NUMBER ID-NUMBER 1857

AUTHOR MAGNUSON, D. W.
 TITLE CRITICAL THREE-DIMENSIONAL ARRAYS OF NEUTRON INTERACTING UNITS. PART-4. ARRAYS OF URANIUM(93.2) METAL REFLECTED BY CONCRETE AND ARRAYS SEPARATED BY VERMICULITE AND REFLECTED BY POLYETHYLENE.
 REPORT NUMBER..... Y-DR-109
 DATE PUBLISHED ... 73-04-30
 NSA-NUMBER 28:03458
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

CONCRETE-REFLECTED, 8-UNIT AIR-SPACED ARRAYS AND POLYETHYLENE-REFLECTED, 8-UNIT VERMICULITE- SPACED ARRAYS OF 93.2% ENRICHED URANIUM-METAL CYLINDERS HAVE BEEN ASSEMBLED TO NEAR DELAYED CRITICALITY. CALCULATIONS OF K(EFF) USING THE KENO MONTE CARLO CODE AND HANSEN-ROACH 16-GROUP CROSS SECTIONS ARE IN EXCELLENT AGREEMENT WITH EXPERIMENT. THE AVERAGE DIFFERENCE BETWEEN THE EXPERIMENTAL AND CALCULATED K(EFF) WAS +0.0024 FOR THE 14 CONCRETE-REFLECTED EXPERIMENTS AND FOR FOUR VERMICULITE-SPACED ARRAYS WAS -0.0055. (AUTH).

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1862 ID-NUMBER ID-NUMBER 1862

AUTHOR STEVENSON, J. M./ GASIDLO, J. M./ ROGERS, V. C./ SIMONS, G. G./ VOSBURGH, R. O.
 TITLE EXPERIMENTAL RESULTS FOR ZPR-3 ASSEMBLIES 58 AND 59.
 REPORT NUMBER..... ANL-7695
 DATE PUBLISHED ... 70-04-00
 NSA-NUMBER 25:01918
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

THIS REPORT PRESENTS THE RESULTS OF MEASUREMENTS MADE ON ZPR-3 ASSEMBLIES 58 AND 59. THESE ASSEMBLIES HAD A SIMPLE PLUTONIUM-GRAPHITE CELL AND DIFFERED IN THE REFLECTOR, WHICH WAS DEPLETED URANIUM (IN ASSEMBLY 58) OR LEAD (IN ASSEMBLY 59). IN PARTICULAR, THE EXPERIMENTS REPORTED ARE CRITICAL MASS, FISSION-RATE AND PERTURBATION DISTRIBUTIONS, CENTRAL FISSION RATIOS, CENTRAL PERTURBATIONS, THE DOPPLER REACTIVITY EFFECT IN A NATURAL URANIUM OXIDE SAMPLE, AND THE CENTRAL NEUTRON SPECTRUM BY THE PROTON-RECOIL METHOD. SOME OF THE EXPERIMENTS WERE PERFORMED IN BOTH ASSEMBLIES, OTHERS IN ONLY ONE. (AUTH).

1863 ID-NUMBER ID-NUMBER 1863

AUTHOR ANDERSON, JOHN L./ MAYO, WENDELL
 TITLE EFFECT OF ADDING LITHIUM NITRIDE, HAFNIUM, TANTALUM, AND TUNGSTEN TO A FAST-SPECTRUM, MOLYBDENUM-REFLECTED CRITICAL ASSEMBLY.
 REPORT NUMBER..... N-70-26979
 DATE PUBLISHED ... 70-05-00
 NSA-NUMBER 25:01925
 SITE/PROGRAM ATOMICS INTERNATIONAL - URANIUM NITRIDE - LITHIUM - MOLYBDENUM REFLECTED FAST REACTOR

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS, WHICH CONTAIN MATERIALS BEING CONSIDERED FOR A SMALL FAST- SPECTRUM REACTOR, IS BEING PERFORMED BY ATOMICS INTERNATIONAL UNDER CONTRACT TO LEWIS RESEARCH CENTER. THE FIRST OF THE CRITICAL ASSEMBLIES HAS ALREADY BEEN CONSTRUCTED. THE COMPLETED ASSEMBLY, WHICH IS TO BE FORMED IN STAGES, WILL BE A SIMULATION OF A CONCEPTUAL FAST REACTOR WHICH IS TO BE COOLED BY LITHIUM, FUELED WITH URANIUM-235 NITRIDE, AND REFLECTED BY MOLYBDENUM.

IN THE FAST REACTOR CONCEPT CYLINDRICAL URANIUM NITRIDE PELLETS ARE CONTAINED IN TANTALUM ALLOY (T-111) TUBES LINED WITH TUNGSTEN FOIL. A T-111 HONEYCOMB LATTICE IS USED TO MAINTAIN THE POSITION OF THE FUEL ELEMENTS. SIX CONTROL DRUMS CONTAINING BOTH FUEL AND NEUTRON ABSORBER (T-111) ARE USED FOR REACTIVITY CONTROL. THE NEUTRON REFLECTOR IS MADE OF A MOLYBDENUM ALLOY (TZM).

1865 ID-NUMBER ID-NUMBER 1865

AUTHOR COELHOORN, J./ KLIPPEL, H. TH./ DE MEULFMEESTER, F. M./
 TITLE MEASUREMENTS AND CALCULATIONS ON THERMAL, ARGONAUT TYPE, CORES IN THE STEK-FACILITY AT PETTEN.
 REPORT NUMBER..... RCN-118
 DATE PUBLISHED ... 70-02-00
 NSA-NUMBER 25:06093
 SITE/PROGRAM NETHERLANDS - STEK FACILITY (COUPLED FAST-THERMAL)

ABSTRACT

IN NOVEMBER 1967, IT WAS DECIDED TO CONVERT THE EXISTING, HEAVILY SHIELDED, LIGHT WATER CRITICAL EXPERIMENT KRITO AT THE PETTEN SITE OF RCN, INTO A COUPLED FAST-THERMAL SYSTEM, IN THE FAST ZONE OF WHICH BY OSCILLATOR METHODS INTEGRAL CROSS-SECTIONS OF ACTUAL FISSION PRODUCT-MIXTURES, -ELEMENTS AND -NUCLIDES ARE TO BE MEASURED. AFTER COMPLETION OF THE CONSTRUCTION IN EARLY MAY 1969, THE NEW FACILITY, STEK (FAST-THERMAL EXPERIMENT IN KRITO) AND ITS INSTRUMENTATION HAVE BEEN THOROUGHLY TESTED UNTIL A LICENSE WAS OBTAINED FOR THE LOADING OF FUEL IN THE THERMAL ZONE OF THE CORE. THE POSSIBILITY TO BUILD UP THE THERMAL ARGONAUT TYPE CORES IN STEK WAS INCLUDED IN THE DESIGN AND IT WAS DECIDED TO START THE EXPERIMENTAL PROGRAM WITH THE BUILD-UP OF THESE CORES TO OBTAIN EXPERIENCE WITH THE INSTALLATION AND TO HAVE A STARTING POINT IN THE APPROACH OF THE FIRST COUPLED FAST-THERMAL CORE. THUS THE INNER ZONE OF THE CORE WAS COMPLETELY FILLED WITH GRAPHITE ELEMENTS AND THEN FUEL PLATES WERE LOADED IN STEPS AS SYMMETRICALLY AS POSSIBLE IN THE 4 X 10 ELEMENTS IN THE 4 SLABS I, II, III AND IV. ON MAY 22ND, FIRST CRITICALITY WAS OBTAINED WITH A LOADING OF 740 FUEL PLATES, I.E., 15.34 KG URANIUM-235 (MIN. CRITICAL LOADING 725 FUEL PLATES, 15.05 KG). IN THIS 4-SLAB CORE A SERIES OF STANDARD EXPERIMENTS HAVE BEEN PERFORMED SUCH AS THE CALIBRATION OF THE CONTROL PLATES AND STOP RODS, THE MEASUREMENT OF THE THERMAL NEUTRON FLUX DISTRIBUTION AND THE REACTOR POWER, KINETIC EXPERIMENTS TO DETERMINE THE NEUTRON LIFETIME AND COUPLING BETWEEN THE SEPARATE SLABS AND FINALLY OSCILLATOR EXPERIMENTS TO TEST THE OSCILLATOR SYSTEM AND INVERSE KINETIC PROGRAM WITH THE ON-LINE COMPUTER. AFTERWARDS A 3-SLAB CORE, A 2-SLAB CORE (ADJACENT SLABS), A 2-SLAB CORE (OPPOSITE

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SLABS) AND A 1-SLAB CORE HAVE BEEN BUILT UP TO DETERMINE THE CRITICAL MASSES AND NEUTRON LIFETIMES AND THE NEUTRON COUPLING COEFFICIENTS BETWEEN THE SLABS. THE RESULTS OF ALL THESE MEASUREMENTS ARE PRESENTED AND ARE IN SOME CASES COMPARED WITH CALCULATIONS. (AUTH) (NETHERLANDS).

1866 ID-NUMBER ID-NUMBER 1866

AUTHOR HESS, A. L. / KEENEY, W. P. / MC VEAN, R. L.
 TITLE EXPERIMENTS WITH A SERIES OF SMALL, PLUTONIUM-PLUS-URANIUM-FUELED FAST-REACTOR CRITICALS (FARET MOCKUP--ZPR-3 ASSEMBLY 46).
 REPORT NUMBER..... ANL-7215
 DATE PUBLISHED ... 70-01-00
 NSA-NUMBER 25:08114
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

ZPR-3 ASSEMBLY 46 WAS A SERIES OF SMALL PLUTONIUM-PLUS-URANIUM-FUELED FAST-REACTOR CORES STUDIED IN CONJUNCTION WITH DESIGN EFFORTS FOR FARET, A CONCEPTUAL FAST-FUELS TEST REACTOR. SIX DIFFERENT CORES, LABELED A THROUGH F, WERE CONSTRUCTED AS MOCKUPS OF POSSIBLE FARET LOADINGS. CORES A AND B SIMULATED PLUTONIUM CARBIDE-URANIUM CARBIDE-FUELED CORES WITH VOLUMES OF 57 AND 68 LITERS, RESPECTIVELY. CORE C WAS AN 87-LITER SYSTEM WITH AN PLUTONIUM DIOXIDE-URANIUM DIOXIDE FUEL REPRESENTATION. CORES D, E, AND F, WITH VOLUMES OF 80, 108, AND 95 LITERS, RESPECTIVELY, WERE EACH COMPOSED OF FOUR ANNULAR FUEL ZONES. THE DIFFERENT ZONES CONTAINED SIMULATIONS OF OXIDE, CARBIDE, AND ALLOY FUELS AS MOCKUPS OF ENVISAGED MULTIFUELED FARET CORES. AN ADDITIONAL THREE-ZONED CORE, CORE G, WAS USED FOR FAST-REACTOR PHYSICS EXPERIMENTS OF A GENERAL NATURE. PRINCIPAL EXPERIMENTS WITH THE MOCKUPS WERE: EVALUATING THE REACTIVITY CONTROL AFFORDED BY FARET-DESIGN BORON CARBIDE CONTROL RODS, MEASURING WORTHS OF FUEL INTERCHANGES, OBTAINING FLUX DISTRIBUTIONS, AND MEASURING REACTIVITY COEFFICIENTS FOR CORE-CONSTITUENT MATERIALS.

1867 ID-NUMBER ID-NUMBER 1867

AUTHOR NGUYEN-NGOC, H. / CHARBONNEAU, S.
 TITLE CESAR AND CONCORDE. APPLICATION OF THE CONCORDE HEXAGONAL SYNTHESIS PROGRAM TO EXPERIMENTS ON THE CESAR CRITICAL REACTOR.
 REPORT NUMBER..... CEA-N-1276
 DATE PUBLISHED ... 70-10-00
 NSA-NUMBER 25:08130
 SITE/PROGRAM FRANCE - CESAR REACTOR

ABSTRACT

THE APPLICATION OF THE CLASSICAL METHOD OF FINITE DIFFERENCES FOR THE SOLUTION OF THE DIFFUSION EQUATION LEADS LEADS IN GENERAL TO VERY LONG COMPUTATION TIMES SINCE THE HETEROGENEITY OF THE REACTOR FOR WHICH ONE WISHES TO DETERMINE THE FLUX OBLIGES ONE TO UNDERTAKE THE CALCULATIONS IN THREE SPATIAL DIMENSIONS.

THE SYNTHESIS METHOD REDUCES IN PRINCIPLE THE COMPUTATIONAL TIME REQUIREMENTS CONSIDERABLY, BUT THE PRECISION OF THE RESULTS DEPENDS ON A VERIFICATION WITH ACTUAL EXPERIMENTS.

IT IS BECAUSE OF THIS REASONING THAT WE THOUGHT IT TO BE INTERESTING TO COMPARE THE RESULTS OBTAINED WITH THE PROGRAMMES CONCORDE, DCE 231 TO THOSE OF EXPERIMENTS DERIVED ESPECIALLY FROM THE CRITICAL CONFIGURATIONS OF CESAR AT CADARACHE.

OUR FIRST INTERNAL REPORT DEVELOPED A COMPARISON WITH CALCULATIONS WHERE WE DID NOT TAKE INTO ACCOUNT THE HETEROGENEITY OF THE REACTOR. THE RESULTS, SATISFACTORILY ACCURATE WITH REGARD TO THE NEUTRON FLUX BUT NOT TO ITS CRITICALITY VALUE, OBLIGED US TO SEPARATE THE AXIAL AND RADIAL LEAKAGE IN THE EQUATIONS RESOLVED BY CONCORDE. (VEH).

1871 ID-NUMBER ID-NUMBER 1871

AUTHOR ACCINNI, F. / PALAZZI, F. / ZORZOLI, G. B.
 TITLE PRELIMINARY REPORT ON URANIUM METAL TUBE CLUSTER-HEAVY WATER LATTICE MEASUREMENTS. TOPICAL REPORT NO. 2.
 REPORT NUMBER..... CISE-R-100
 DATE PUBLISHED ... 64-02-00
 NSA-NUMBER 24:04088
 SITE/PROGRAM ITALY - HEAVY WATER

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THIS REPORT DESCRIBES ALL THE PRELIMINARY WORK TO SET UP A PROGRAM OF BUCKLING AND FINE FLUX MEASUREMENTS ON HEAVY WATER LATTICES WITH FUEL ELEMENTS MADE UP OF A SEVEN URANIUM TUBE CLUSTER AND WITH POLYSTYRENE TO SIMULATE THE ACTUAL COOLANT.

THE PHILOSOPHY WHICH LED TO THE CHOICE OF THE SET OF EXPERIMENTAL CONFIGURATIONS, THE FUEL ELEMENT DESIGN AND THE RESULTS OF PRELIMINARY CALCULATIONS AND CALIBRATIONS ARE GIVEN IN DETAIL.

1873 ID-NUMBER ID-NUMBER 1873

AUTHOR BACHER, P./ NAUDET, R.

TITLE MEASUREMENTS OF BUCKLINGS BY THE PROGRESSIVE REPLACEMENT METHOD.

REPORT NUMBER.... JAABA, 13, 112-127 (ANL-TRANS-787)

DATE PUBLISHED ... 61-00-00

NSA-NUMBER 24:04152

SITE/PROGRAM FRANCE - HEAVY WATER LATTICES ; FRANCE - GRAPHITE LATTICES

ABSTRACT

THE QUEST FOR COMPETITIVE POWER FROM NUCLEAR REACTORS REQUIRES AN ACCURATE KNOWLEDGE OF NEUTRON BALANCE WITH VARYING GEOMETRICAL AND PHYSICAL LATTICE PARAMETERS. A GREAT NUMBER OF CRITICAL EXPERIMENTS WITH GOOD RELATIVE ACCURACY ARE THEREFORE NEEDED.

THE PROGRESSIVE REPLACEMENT METHOD DESCRIBED HEREAFTER IS PARTICULARLY WELL SUITED TO THIS OBJECTIVE, AS IT IS A DIFFERENTIAL METHOD. IT IS MUCH CHEAPER AND QUICKER THAN THE USUAL CRITICAL EXPERIMENT, BUT HAS COMPARABLE ACCURACY.

IT IS SHOWN IN THE FIRST PART OF THE PAPER HOW THIS METHOD HAS BEEN APPLIED TO HEAVY WATER LATTICES IN THE CRITICAL FACILITY "AQUILON" AND IN THE SECOND PART TO GRAPHITE LATTICES DURING START-UP EXPERIMENTS OF THE G1 AND G2 REACTORS IN MARCOULE. (AUTH).

1874 ID-NUMBER ID-NUMBER 1874

AUTHOR MEHTA, S. L./ SERDULA, K. J.

TITLE INTEGRAL MEASUREMENTS FOR 28-ELEMENT URANIUM-DIOXIDE ASSEMBLIES WITH AIR, WATER, AND AIR-WATER MIXTURE COOLANTS

REPORT NUMBER.... AECL-3416

DATE PUBLISHED ... 69-07-00

NSA-NUMBER 24:05538

SITE/PROGRAM CANADA, CHALK RIVER NUCLEAR LABORATORIES - ZED (URANIUM DIOXIDE LATTICES)

ABSTRACT

DETAILED INTEGRAL MEASUREMENTS WERE MADE FOR HEAVY WATER MODERATED LATTICES OF 28-ELEMENT URANIUM-OXIDE CLUSTERS AT A TRIANGULAR PITCH OF 30 CM. FAST FISSION RATIOS, INITIAL CONVERSION RATIO, AND RADIAL CELL FINE STRUCTURE MEASUREMENTS WERE MADE WITH THREE COOLANTS; WATER OF DENSITIES 1.0 AND 0.41 GRAM/CC AND AIR.

1875 ID-NUMBER ID-NUMBER 1875

AUTHOR PLUMLEE, K. E./ DAUGHTRY, J. W./ JOHNSON, T. W./ ROBINSON, W. R./ SCHULTZ, R. A./ STANFORD, G. S.

TITLE ARGONNE ADVANCED RESEARCH REACTOR CRITICAL EXPERIMENTS.

REPORT NUMBER.... ANL-7483

DATE PUBLISHED ... 69-02-00

NSA-NUMBER 24:05539

SITE/PROGRAM ARGONNE NATIONAL LABORATORY - AARR (ARGONNE ADVANCE RESEARCH REACTOR)

ABSTRACT

CRITICAL EXPERIMENTS WERE PERFORMED TO ASSIST IN THE DESIGN OF A HIGH-PERFORMANCE, STAINLESS STEEL-CLAD URANIUM-DIOXIDE-WATER CORE, CONTAINING ABOUT 60 KG OF HIGHLY ENRICHED URANIUM, FOR THE ARGONNE ADVANCED RESEARCH REACTOR. MEASUREMENTS REPORTED INCLUDE NEUTRON FLUX AND POWER DISTRIBUTIONS, CRITICAL LOADINGS, FLUX LEVELS IN IRRADIATION FACILITIES AND BEAM TUBES, CONTROL- BLADE CALIBRATIONS, WORTH OF VOIDS AND OF VARIOUS NEUTRON-ABSORBING MATERIALS, AND TEMPERATURE COEFFICIENTS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1876 ID-NUMBER ID-NUMBER 1876

AUTHOR BONALUMI, R./ ZORZOLI, G. B.
 TITLE URANIUM METAL-HEAVY WATER LATTICES- A GENERAL SURVEY. TOPICAL REPORT NO. 3.
 REPORT NUMBER.... CISE-R-101
 DATE PUBLISHED ... 64-09-00
 NSA-NUMBER 24:05544
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

THIS REPORT HAS THE TWOFOLD AIM OF PROVIDING A CRITICAL SURVEY OF THE WORLD-WIDE LITERATURE ABOUT EXPERIMENTS ON NATURAL URANIUM METAL FUELLED, HEAVY WATER MODERATED LATTICES, TOGETHER WITH AN EFFORT OF INTERPRETING THE EXPERIMENTAL DATA ON A SOUND THEORETICAL BASIS. THE INTEREST OF THIS SURVEY WAS PRIMARILY CENTERED ON THE MEASUREMENT (AND THEORETICAL PREDICTION) OF MATERIAL BUCKLINGS, ESPECIALLY FOR LATTICE CONFIGURATIONS TYPICALLY ARISING IN THE DESIGN OF POWER REACTORS, IN VIEW OF THE ASSESSMENT OF A PROPER FORMULATION OF THE REACTOR PHYSICS PROBLEMS OCCURRING IN THE CISE FOG COOLED REACTOR PROJECT. HOWEVER, ATTENTION HAS ALSO BEEN PAID TO THE MOST RELIABLE MEASUREMENTS OF DETAILED CELL PARAMETERS (REGARDING FAST FISSION, RESONANCE ESCAPE, THERMAL FINE FLUX DISTRIBUTION, ETC.), IN ORDER FOR A DETAILED CHECK OF THE THEORIES USED AT PRESENT TO BE POSSIBLE.

1877 ID-NUMBER ID-NUMBER 1877

AUTHOR RYDIN, R. A./ BURKE, J./ FEINER, F./ SEEMANN, K. W./ STACEY, W. M.
 TITLE STATIC MEASUREMENTS PREPARATORY TO SPACE-TIME KINETICS EXPERIMENTS IN THE SHA.
 REPORT NUMBER.... KAPL-P-3847
 DATE PUBLISHED ... 69-00-00
 NSA-NUMBER 24:05546
 SITE/PROGRAM GENERAL ELECTRIC CO., KNOLLS ATOMIC POWER LABORATORY - SOLID HOMOGENEOUS ASSEMBLY (SHA)

ABSTRACT

A SERIES OF CLEAN REACTOR KINETICS EXPERIMENTS ON LOOSELY COUPLED CORES HAS BEEN PLANNED FOR THE SOLID HOMOGENEOUS ASSEMBLY. AS THE FIRST STEP IN THIS PROGRAM, A STATIC ANALYSIS OF THE INITIAL EXPERIMENTAL CONFIGURATION WAS PERFORMED USING A THREE-DIMENSIONAL SYNTHESIS DIFFUSION THEORY MODEL CONSTRUCTED OF TWO-DIMENSIONAL X-Y TRIAL FUNCTIONS. FOR THIS MODEL, CROSS SECTIONS PLUS SPECTRUM AND TRANSPORT THEORY CORRECTIONS WERE CALCULATED WITH ZERO- AND ONE-DIMENSIONAL MULTIGROUP TRANSPORT THEORY CODES, WHILE LEAKAGES WERE ESTIMATED FROM TWO-DIMENSIONAL FEW-GROUP RZ DIFFUSION THEORY CALCULATIONS. THE RESULTING MODEL CORRECTLY PREDICTED THE CRITICAL CORE EIGENVALUE, AND GOOD AGREEMENT WAS OBTAINED BETWEEN A SERIES OF MEASURED AND CALCULATED FOIL TRAVERSES. (AUTH).

1878 ID-NUMBER ID-NUMBER 1878

AUTHOR FURNISH, JEAN
 TITLE THE DATA OF NUCLEAR REACTOR PHYSICS, 1967--1968. A BIBLIOGRAPHY.
 REPORT NUMBER.... LA-4225
 DATE PUBLISHED ... 69-09-17
 NSA-NUMBER 24:05559
 SITE/PROGRAM BIBLIOGRAPHIC INFORMATION

ABSTRACT

THIS BIBLIOGRAPHY IS A CONTINUATION OF LA-3740-MS. NUCLEAR SCIENCE ABSTRACTS FOR 1967 AND 1968 HAVE BEEN SEARCHED AND THE PERTINENT ABSTRACTS ARRANGED IN THE FOLLOWING ORDER:

- I. CRITICAL EXPERIMENTS, REASONABLY HOMOGENEOUS.
- II. CRITICAL EXPERIMENTS, LATTICES.
- III. REACTIVITY MEASUREMENTS.
- IV. NEUTRON FLUX SPECTRA.
- V. NEUTRON CROSS SECTIONS.
- VI. LABORATORY SUMMARY REPORTS AND MISCELLANEOUS.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1883 ID-NUMBER ID-NUMBER 1883

AUTHOR ROGERS, C. A./ LLOYD, R. C./ BIERMAN, S. R./ CLAYTON, E. D.
 TITLE REFLECTOR SAVINGS FOR URANYL NITRATE OF LOW ENRICHMENT.
 REPORT NUMBER..... BNWL-1258
 DATE PUBLISHED ... 69-11-00
 NSA-NUMBER 24:11226
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

ABSTRACT

REFLECTOR SAVINGS FOR 2.14 AND 3.04 WT% URANIUM-235 ENRICHED URANYL NITRATE REFLECTING A CUBOIDAL CORE OF PLUTONIUM-DIOXIDE-POLYSTYRENE WERE EXPERIMENTALLY DETERMINED AND COMPARED WITH CALCULATIONS USING THE HFN AND DTF CODES. HFN COMPUTED REFLECTOR SAVINGS CURVES FOR LESS THAN 5.0 WT% URANIUM-235 ENRICHED URANYL NITRATE REFLECTING A SPHERICAL, WATER-MODERATED, URANIUM ROD LATTICE ARE PRESENTED WITH A DISCUSSION OF THE PRINCIPAL PARAMETERS WHICH INFLUENCE REFLECTOR SAVINGS. (AUTH).

1889 ID-NUMBER ID-NUMBER 1889

AUTHOR FAIRBURN, G. T. / PETTUS, W. G. / SNIDOW, N. L.
 TITLE PLUTONIUM LATTICE EXPERIMENT IN UNIFORM LATTICE OF URANIUM-DIOXIDE/1.5%-
 PLUTONIUM-DIOXIDE FUEL
 REPORT NUMBER..... BAW-1357
 DATE PUBLISHED ... 70-08-00
 NSA-NUMBER 24:43804
 SITE/PROGRAM BABCOCK AND WILCOX CO. - PLUTONIUM LATTICE

ABSTRACT

THE PLUTONIUM LATTICE EXPERIMENTS ARE CONDUCTED TO PROVIDE DATA FOR VERIFICATION OF THE ANALYTICAL METHODS AND MODELS DEVELOPED FOR THE DESIGN OF WATER-MODERATED PLUTONIUM RECYCLE CORES. BECAUSE OF THE GREAT EXPENSE OF PERFORMING CONVENTIONAL CRITICAL EXPERIMENTS WITH A VARIETY OF FUELS, THE PROGRAM IS RESTRICTED TO "SMALL LATTICE EXPERIMENTS" (SLE), WHICH ARE ESSENTIALLY PCTR MEASUREMENTS THAT REQUIRE A RELATIVELY SMALL REGION OF THE TEST FUEL SURROUNDED BY BUFFER AND DRIVER REGIONS OF CONVENTIONAL FUEL. THE SYSTEM IS TAILORED TO PROVIDE A CRITICAL ASSEMBLY WITH A SMALL CENTRAL TEST REGION HAVING A NEARLY FLAT FLUX AND ASYMPTOTIC SPECTRUM. THE TEST REGION IS INCREMENTALLY POISONED WITH BORIC ACID UNTIL A VOID SUBSTITUTION YIELDS A NULL REACTIVITY CHANGE. THIS GIVES A PRECISE MEASURE OF THE BORON CONCENTRATION REQUIRED TO REDUCE TO UNITY THE INFINITE MEDIUM MULTIPLICATION FACTOR OF THE TEST LATTICE. COMPARISON OF THIS NUMBER WITH THE CORRESPONDING ANALYTICAL PREDICTION IS A SENSITIVE AND DIRECT CHECK ON THE ADEQUACY OF THE THEORETICAL PROCEDURES. VARIOUS OTHER MEASUREMENTS ARE ALSO TAKEN ON THE POISONED AND UNPOISONED TEST LATTICE FOR OTHER TESTS OF THE ANALYTICAL METHODS AND TO FACILITATE THE DEDUCTION OF $K(\text{INF})$ FOR THE UNPOISONED LATTICE.

THIS REPORT DESCRIBES THE FACILITY, THE EQUIPMENT, AND THE TECHNIQUES OF MEASUREMENT AND PRESENTS THE RESULTS OF THE MEASUREMENTS.

1890 ID-NUMBER ID-NUMBER 1890

AUTHOR UOTINEN, V. O./ WILLIAMS, L. D.
 TITLE EXPERIMENTS AND CALCULATIONS FOR WATER-MODERATED ASSEMBLIES CONTAINING
 URANIUM DIOXIDE -- 2 WT% PLUTONIUM DIOXIDE FUEL RODS
 REPORT NUMBER..... BNWL-SA-1107
 DATE PUBLISHED ... 67-05-23
 NSA-NUMBER 24:43853
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM DIOXIDE ELEMENTS IN WATER

ABSTRACT

CRITICAL EXPERIMENTS HAVE BEEN PERFORMED IN THE PLUTONIUM RECYCLE CRITICAL FACILITY (PRCF) IN SIX CONFIGURATIONS OF URANIUM-DIOXIDE-2 WT% PLUTONIUM-DIOXIDE FUEL RODS. EACH ROD IS MADE OF 1428 GRAMS OF URANIUM-DIOXIDE-PLUTONIUM-DIOXIDE AND IS 36 INCH LONG, 0.508 INCH IN DIAMETER, AND CLAD WITH 0.030 INCH OF ZIRCALOY-2. THE RODS WERE IN A HEXAGONAL LATTICE WITH A LATTICE SPACING OF 0.85 INCH AND A WATER-TO-OXIDE VOLUME RATIO OF 1.83.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1897 ID-NUMBER ID-NUMBER 1897

AUTHOR YOUNG, W. R. / BENNETT, R. A.
 TITLE ANALYSIS OF FTR PHASE B CRITICAL EXPERIMENTS. PART-1. ZPR-3 ASSEMBLY 51.
 REPORT NUMBER..... BNWL-1138
 DATE PUBLISHED ... 70-01-00
 NSA-NUMBER 24:16234
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

THE PURPOSES OF THE FAST FLUX TEST FACILITY (FFTF) CRITICAL EXPERIMENTS PROGRAMS ARE TO PROVIDE EXPERIMENTAL DATA FOR EVALUATION OF CALCULATIONAL METHODS BEING USED IN THE DESIGN OF THE FAST TEST REACTOR (FTR), AND TO PROVIDE EXPERIMENTAL VERIFICATION OF THE DESIGN OF THE FTR. THE PROGRAM HAS BEEN DIVIDED INTO PHASES A, B, AND C. PHASES A AND B ARE PROVIDING VERIFICATION OF CALCULATIONAL MODELS AND SOME BASIC DESIGN DATA. PHASE C WILL BE AN ENGINEERING MOCKUP STUDY. PHASE A CONSISTED OF A STUDY OF CONTROL ROD CONFIGURATIONS IN A PLUTONIUM FUELED NICKEL-SODIUM REFLECTED SYSTEM.

THIS REPORT PRESENTS THE RESULTS OF AN ANALYSIS OF THE FIRST SERIES OF PHASE B EXPERIMENTS. THE EXPERIMENTS WERE PERFORMED BY ARGONNE NATIONAL LABORATORY AND BATTELLE-NORTHWEST PERSONNEL IN ZPR-3, ASSEMBLY 51.

1898 ID-NUMBER ID-NUMBER 1898

AUTHOR BARBRY, F. / BOULY, J. C. / CAIZERGUES, R. / DEILGAT, E. / HOUELLE, M. /
 LECORCHE, P.
 TITLE THEORETICAL AND EXPERIMENTAL RESEARCH INTO THE HETEROGENEOUS POISONING OF
 FISSILE-MATERIAL SOLUTIONS BY TUBES OR RINGS OF BOROSILICATE GLASS.
 REPORT NUMBER..... CEA-R-3931
 DATE PUBLISHED ... 69-12-00
 NSA-NUMBER 24:16238
 SITE/PROGRAM FRANCE - RASCHIG RINGS

ABSTRACT

WE HAVE BEEN LED TO UNDERTAKE AN EXPERIMENTAL AND THEORETICAL STUDY ON THE DECREASE OF REACTIVITY BY TUBES AND RINGS OF BORATED GLASS DUE TO ECONOMIC CONSIDERATIONS ON THE CONTROL OF REACTIVITY. THE RESULTS HAVE BEEN APPLIED TO SOLUTIONS OF URANIUM AND PERMIT THE DEFINITION OF RULES FOR THE STORAGE OF FISSILE MATERIALS WHERE THE LIMITS IMPOSED BY OTHER MODES OF CONTROL HAVE BEEN EXPANDED CONSIDERABLY.

FOR THE EXPERIMENTAL STUDIES, WE HAVE USED EQUIPMENT ORIGINALLY DESIGNED FOR CRITICALITY STUDIES ON THE DISSOLUTION OF INGOTS OF FISSILE MATERIALS IN LIQUID ACIDS. THIS EQUIPMENT WAS WELL SUITED FOR THE PRESENT EXPERIMENTS BECAUSE OF ITS INSTRUMENTATION TO MEASURE THE LEVEL OF SOLUTION, INDEPENDENT OF THAT ON THE SUPPLY TANK FOR THE LIQUID AND READILY SEPARATED FROM THE NETWORK OF CONNECTIVE PIPING, THUS PERMITTING THE ANALYSIS OF THE THERMAL NEUTRON FLUX WITHIN THE POISONED DOMAIN. UNFORTUNATELY, THE DIMENSIONS OF THE EXPERIMENTAL CYLINDER WERE COMPARATIVELY SMALL AND DID NOT PERMIT US TO OBTAIN HIGH PRECISION FOR THE RESULTS OF THIS EXPONENTIAL CRITICALITY STUDY. THE EXPERIMENTAL FACILITY IS DESCRIBED IN GREAT DETAIL TO PERMIT ITS SIMULATION THROUGH MONTE CARLO CALCULATIONS WHICH ARE WELL SUITED TO CALCULATE THE STRUCTURE AND THE ACTIVE MATERIALS OF THE STUDY WITH PRECISION.

1905 ID-NUMBER ID-NUMBER 1905

AUTHOR BALDWIN, M. N. / STERN, M. E.
 TITLE PHYSICS VERIFICATION PROGRAM. PART-3, TASK 4. QUARTERLY TECHNICAL REPORT,
 JANUARY-MARCH 1970.
 REPORT NUMBER..... BAW-3647-17
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 24:36060
 SITE/PROGRAM BABCOCK AND WILCOX CO. - PLUTONIUM LATTICE

ABSTRACT

RESULTS OF A SERIES OF EXPERIMENTS TO MEASURE THE EFFECTS OF LATTICE HETEROGENEITIES ARE PRESENTED. THE WATER MODERATED CRITICAL ASSEMBLY, FUEL RODS, AND POISON RODS ARE DESCRIBED. UNCLAD PYREX GLASS RODS, ALUMINUM-CLAD VICOR GLASS RODS, ALUMINUM-CLAD ALUMINUM OXIDE RODS, AND WATER HOLES WERE SPACED ON SELECTED PATTERNS IN AN OTHERWISE UNIFORM CLEAN LATTICE AND THEIR EFFECTS ON REACTIVITY AND POWER SHAPE WERE DETERMINED. (H.D.R.).

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1906 ID-NUMBER ID-NUMBER 1906

AUTHOR HESS, A. L. / PALMER, R. G. / STEVENSON, J. M.
 TITLE POSTANALYTICAL STUDY OF EIGHT ZPR-3 BENCHMARK CRITICALS USING ENDF/B DATA.
 REPORT NUMBER..... TANSO, 13, 288-289
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 24:33434
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

IN THE PERIOD BETWEEN JUNE 1966 AND DECEMBER 1969, THE ZPR-3 CRITICAL PROGRAM INCLUDED A SERIES OF EIGHT RELATIVELY SIMPLE PLUTONIUM-FUELED ASSEMBLIES, THE PRINCIPAL OBJECTIVE OF WHICH WAS TO PROVIDE A VARIETY OF CLEAN FAST INTEGRAL DATA WITH WHICH TO TEST CURRENT AND ANY FUTURE NEUTRON CROSS-SECTION COMPILATIONS. THIS PAPER REPORTS THE RESULTS OF A SERIES OF UNIFORM PATH CALCULATIONS ON THE ASSEMBLIES AND SOME OF THE IMPORTANT EXPERIMENTS USING THE ENDF/B-MC2 ROUTE IN THE ANL ARC SYSTEM.

1907 ID-NUMBER ID-NUMBER 1907

AUTHOR PALMEDO, P. F. / LUDEWIG, H. / ARONSON, A. L.
 TITLE EFFECT OF HYDROGEN CONTENT OF GRAPHITE IN FAST CRITICAL EXPERIMENTS.
 REPORT NUMBER..... TANSO, 13, 253-254
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 24:33427
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

MANY OF THE CLEAN FAST REACTOR CRITICAL EXPERIMENTS THAT ARE CURRENTLY BEING USED TO TEST CROSS-SECTION SETS AND ANALYTICAL TECHNIQUES INCLUDE GRAPHITE IN THE CORE. ONLY IN RARE CASES IS THERE AN INDICATION GIVEN THAT THE HYDROGEN CONTENT OF THE GRAPHITE HAS BEEN CONSIDERED IN THE ANALYSIS OF THESE EXPERIMENTS. FOR MOST US EXPERIMENTS, THE HYDROGEN CONTENT OF THE GRAPHITE IS NOT EVEN REPORTED. ALTHOUGH USUAL AMOUNTS OF HYDROGEN DO NOT HAVE A SIGNIFICANT EFFECT ON THE CRITICALITY OF SUCH SYSTEMS, OTHER MEASURABLE PARAMETERS MAY BE APPRECIABLY AFFECTED.

1909 ID-NUMBER ID-NUMBER 1909

AUTHOR CARMICHAEL, B. M. / BIGIL, J. C. / MEEM, J. L.
 TITLE CALCULATION AND INTERPRETATION OF THE UHTREX CRITICAL EXPERIMENTS.
 REPORT NUMBER..... LA-4218
 DATE PUBLISHED ... 69-08-00
 NSA-NUMBER 24:38601
 SITE/PROGRAM LOS ALAMOS - UHTREX (ULTRA HIGH TEMPERATURE - GRAPHITE) - CALCULATIONS

ABSTRACT

THE UHTREX (ULTRA HIGH TEMPERATURE REACTOR EXPERIMENT) CRITICAL EXPERIMENTS ARE ANALYZED IN A DETAILED COMPARISON OF CALCULATIONS WITH EXPERIMENT. CRITICAL MASSES AND FLUX PROFILES; CONTROL ROD, FUEL, AND VOID WORTHS; AND TEMPERATURE AND PRESSURE COEFFICIENTS OF REACTIVITY FOR THE REACTOR OPERATING AT LOW POWER AND AMBIENT TEMPERATURE ARE DISCUSSED.

1913 ID-NUMBER ID-NUMBER 1913

AUTHOR PALMER, R. G. / PLUMMER, J. P. / NICHOLSON, R. B.
 TITLE TESTING OF HETEROGENEITY METHODS USED IN FAST REACTOR CRITICAL ANALYSES BY COMPARISON WITH THEORETICAL (GEDANKEN) EXPERIMENTS.
 REPORT NUMBER..... TANSO, 13, 253
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 24:33549
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS ; ARGONNE NATIONAL LABORATORY, IDAHO - ZPPR (DEMONSTRATION PLANT BENCHMARKS) - CALCULATIONS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE EFFECT OF HETEROGENEITY IN THE ANL PLATE-TYPE FAST CRITICALS (ZPPR, ZPR-3, ETC.) IS A COMPLEX PROBLEM FOR WHICH ONLY APPROXIMATE CALCULATIONAL METHODS ARE CURRENTLY AVAILABLE. COMPARISON OF MEASURED AND CALCULATED QUANTITIES DO NOT OFFER CONCLUSIVE TESTS OF SUCH METHODS DUE TO THE ADDITIONAL UNCERTAINTIES IN CROSS-SECTION DATA. ONE APPROACH TO METHODS TESTING IS TO CALCULATE THE RESULTS OF THEORETICAL EXPERIMENTS (GEDANKEN MODELS) THAT ARE COMPLEX ENOUGH TO EXHIBIT SIGNIFICANT HETEROGENEITY EFFECTS BUT WHICH ARE SIMPLE ENOUGH TO BE CALCULATED EXACTLY BY AVAILABLE TECHNIQUES.

1915 ID-NUMBER ID-NUMBER 1915

AUTHOR BIERMAN, S. R. / CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS WITH HOMOGENEOUS PLUTONIUM OXIDE.
 REPORT NUMBER..... TANSO, 13, 379-380
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 24:33452
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS WITH UNMODERATED PLUTONIUM-DIOXIDE WAS RECENTLY COMPLETED AT THE PLUTONIUM CRITICAL MASS LABORATORY OF BATTELLE-NORTHWEST. THESE EXPERIMENTS WERE PART OF A CONTINUING RESEARCH EFFORT CONCERNED WITH DETERMINING THE CRITICALITY PARAMETERS OF UNDERMODERATED PLUTONIUM AS A FUNCTION OF PLUTONIUM-240 ISOTOPIC CONCENTRATION.

1916 ID-NUMBER ID-NUMBER 1916

AUTHOR JOHNSON, E. B.
 TITLE CRITICALITY OF URANIUM(3.85) RODS AND CYLINDRICAL ANNULI IN WATER.
 REPORT NUMBER..... TANSO, 13, 379
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 24:33451
 SITE/PROGRAM OAK RIDGE - URANIUM(1.95,3.85%) METAL CYLINDRICAL ANNULI IN WATER

ABSTRACT

IN RECENT YEARS THE OAK RIDGE CRITICAL EXPERIMENTS FACILITY HAS REPORTED DATA FOR LARGE URANIUM-METAL CYLINDRICAL ANNULI OF 1.95% ENRICHMENT IN URANIUM-235 WITH WATER MODERATOR AND REFLECTOR. THESE STUDIES HAVE BEEN EXTENDED TO METAL ENRICHED TO 3.85% IN URANIUM-235, BOTH AS SOLID RODS AND AS CYLINDRICAL ANNULI.

THE OUTSIDE DIAMETERS OF THE ANNULI WERE 7.2, 6.2, AND 5.2 INCH WITH INSIDE DIAMETERS OF 2.6 INCH SOLID RODS SLIGHTLY LESS THAN 2.6 INCH IN DIAMETER COULD BE INSERTED INTO THESE ANNULI TO PRODUCE EFFECTIVELY SOLID RODS OF EACH OF THE THREE OUTSIDE DIAMETERS. ALL RODS AND ANNULI WERE 30 INCH LONG.

1918 ID-NUMBER ID-NUMBER 1918

AUTHOR LITTLE, W. W. / KIDMAN, R. B. / SCHENTER, R. E. / O'DELL, L. D. / HARDIE, R. W. / STEWART, K. B.
 TITLE ANALYSIS OF CRITICAL EXPERIMENTS USING VERSION II OF THE EVALUATED NUCLEAR DATA FILE (ENDF/B).
 REPORT NUMBER..... TANSO, 13, 304
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 24:33438
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS

ABSTRACT

THE SECOND VERSION (FIRST REVISION) OF THE EVALUATED NUCLEAR DATA FILE (ENDF/B) HAS RECENTLY BEEN RELEASED FROM THE NATIONAL CROSS SECTION CENTER FOR TESTING AND EVALUATION. THIS PAPER DESCRIBES WHAT IS THOUGHT TO BE THE FIRST ANALYSIS OF CRITICAL EXPERIMENTS USING VERSION II. THE CRITICAL ASSEMBLIES STUDIED INCLUDE ZPR-3 ASSEMBLIES 48, 49, 50, 53, 54, AND 56. THESE ARE ALL PLUTONIUM-FUELED CRITICALS RANGING IN VOLUME FROM ABOUT 200 LITERS TO ABOUT 600 LITERS. ALTHOUGH MUCH MORE STUDY IS NEEDED, THESE RESULTS STRONGLY INDICATE THAT THE VERSION II CROSS SECTIONS ARE SUBSTANTIALLY IN ERROR, AND THUS REQUIRE ANOTHER REVISION BEFORE ENDF/B CAN BE RELIABLY EMPLOYED IN LMFBR ANALYSES.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1920 ID-NUMBER ID-NUMBER 1920

AUTHOR CLOUET D'ORVAL, C. / ENGELMANN, P. / HELM, F. / JOURDAN, G. / MEYER-HEINE, A. / PILATE, S. / SCHMITT, P. / TRETIKOFF, O. / VIDAL, R. / WITTEK, G.
 TITLE JOINT EXPERIMENTS ON MASURCA, ERMINE, AND SNEAK IN SUPPORT OF THE FAST BREEDER PROJECTS PHENIX AND SNR.
 REPORT NUMBER..... TANSO, 13, 292-293
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 24:33436
 SITE/PROGRAM GERMANY - SNEAK (FAST BREEDER)

ABSTRACT

IT WAS DECIDED BETWEEN THE CENTERS OF CADARACHE AND KARLSRUHE TO PERFORM THE CRITICAL EXPERIMENTS IN SUPPORT OF THE PHENIX AND SNR PROJECTS AS A JOINT PROGRAM.

THIS COOPERATION, DESIGNED TO MAKE OPTIMAL USE OF THE EXISTING FACILITIES, COMPRISES.

1. AN EXCHANGE OF REACTOR MATERIALS.
2. A CAREFUL INTERCOMPARISON AND ADAPTATION OF EXPERIMENTAL TECHNIQUES.
3. THE EVALUATION OF THE MEASURED RESULTS AT BOTH CADARACHE AND KARLSRUHE AND A JOINT INVESTIGATION OF ANY DISCREPANCIES FOUND BETWEEN DIFFERENT CALCULATIONS AS WELL AS BETWEEN CALCULATIONS AND MEASUREMENTS.

1921 ID-NUMBER ID-NUMBER 1921

AUTHOR BENNETT, R. A. / ENGSTROM, S. L. / NELSON, J. V. / YOUNG, W. R.
 TITLE STATISTICALLY SIGNIFICANT BIASES IN THE FTR NEUTRONICS MODEL.
 REPORT NUMBER..... TANSO, 13, 291
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 24:33435
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3 - CALCULATIONS ; ARGONNE NATIONAL LABORATORY, IDAHO - ZPPR (DEMONSTRATION PLANT BENCHMARKS) - CALCULATIONS

ABSTRACT

CALCULATIONAL MODELS USED IN REACTOR DESIGN ARE BIASED WITH RESPECT TO THE VARIOUS NEUTRONICS CHARACTERISTICS: E.G., CRITICAL MASSES MAY BE CONSISTENTLY OVERESTIMATED. THE BIASES ARE DUE TO SYSTEMATIC ERRORS IN THE MODEL OR THE NUCLEAR DATA WHICH ARE DIFFICULT TO IDENTIFY. IN FACT, ONE IS USUALLY UNABLE, DURING THE COURSE OF THE DESIGN OF ANY SINGLE REACTOR, TO MAKE SIGNIFICANT STRIDES TOWARD ELIMINATING BIASES. ONE IS, RATHER, FACED WITH THE PROBLEM OF IDENTIFYING WHAT BIASES AND UNCERTAINTIES EXIST. THE DESIGN REQUIREMENTS MAY THEN BE APPROPRIATELY ADJUSTED. RESULTS ARE PRESENTED HERE OF A CURRENT ASSESSMENT OF BIASES AND UNCERTAINTIES IN THE FTR NEUTRONICS MODEL. THESE EVALUATIONS ARE BASED UPON ANALYSES OF MEASUREMENTS MADE TO DATE ON CRITICALS BUILT BY ARGONNE NATIONAL LABORATORY, AS A PART OF THE BNW FFTF CRITICAL EXPERIMENTS PROGRAM.

1922 ID-NUMBER ID-NUMBER 1922

AUTHOR KUTCHER, J. W. / DAVIS, E. C. / HEEB, C. M.
 TITLE MTR-PHOENIX FUEL CRITICAL EXPERIMENTS AND ANALYSIS.
 REPORT NUMBER..... TANSO, 13, 245-246
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 24:33425
 SITE/PROGRAM HANFORD - MTR - PHOENIX FUEL ELEMENTS

ABSTRACT

THE MTR-PHOENIX FUEL EXPERIMENT IS A UNIQUE PURE PLUTONIUM-FUELED DEPLETION EXPERIMENT SUPPORTED BY A COMPREHENSIVE SET OF CRITICAL EXPERIMENTS. PHOENIX FUEL IS A MIXTURE OF PLUTONIUM ISOTOPES WITH A RELATIVELY HIGH CONTENT OF PLUTONIUM-240. THE MTR EXPERIMENT IS DESIGNED TO DEMONSTRATE THE LONGER REACTIVITY LIFETIME CHARACTERISTICS OF THIS CONCEPT.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1925 ID-NUMBER ID-NUMBER 1925

AUTHOR HUNT, D. C. / ROTHE, R. E.
 TITLE CRITICALITY MEASUREMENTS ON URANIUM METAL SOLUTION COMBINATIONS.
 REPORT NUMBER..... TANSO, 13, 380-381
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 24:31666
 SITE/PROGRAM FRANCE - PLUTONIUM AND URANIUM SOLUTIONS

ABSTRACT

CRITICAL PARAMETERS ARE NOT WELL KNOWN FOR SYSTEMS WHERE FISSILE METAL SHAPES ARE IMMERSSED IN FISSILE SOLUTIONS; AND YET, MANY OPERATIONS IN A NUCLEAR MATERIALS PROCESSING PLANT ARE OF SUCH A NATURE. A MEASUREMENT PROGRAM WAS INITIATED AT ROCKY FLATS TO PROVIDE SOME OF THESE NEEDED DATA. THE FIRST DATA IN THIS SERIES ARE REPORTED HERE FOR SYSTEMS COMPOSED OF ENRICHED URANIUM METAL SPHERES SYMMETRICALLY POSITIONED WITHIN ENRICHED URANIUM SOLUTION CYLINDERS. IN BOTH THE METAL AND THE SOLUTION THE URANIUM IS ENRICHED TO 93.18 WT% URANIUM-235. THE AVERAGE DENSITY OF THE METAL ASSEMBLIES RANGES FROM 17.7 TO 18.0 GRAM/CC. THE URANYL NITRATE SOLUTION CONCENTRATIONS USED ARE 11.0, 21.3 AND 10.49 GRAM URANIUM PER LITER.

1927 ID-NUMBER ID-NUMBER 1927

AUTHOR FOX, J. K.
 TITLE COMPARISONS OF EXPERIMENT WITH CALCULATIONS FOR STRONGLY ABSORBING ROD LATTICES.
 REPORT NUMBER..... TANSO, 13, 383
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 70-06-00
 NSA-NUMBER 24:31471
 SITE/PROGRAM OAK RIDGE - URANIUM(4.89%) METAL RODS IN WATER (LATTICES)- CALCULATIONS ;
 OAK RIDGE - URANIUM(64.4%)OXIDE - BERYLLIUM OXIDE PINS IN WATER AND URANYL
 NITRATE - CALCULATIONS

ABSTRACT

STRONGLY ABSORBING FUEL PINS SUCH AS EBOR OR EBR-2 FUELS WHEN PLACED IN WATER LATTICES HAVE DEEP FLUX DEPRESSIONS IN THE THERMAL RANGE. FEW-GROUP CALCULATIONS DO NOT GIVE GOOD AGREEMENT WITH EXPERIMENT FOR THESE FUELS. A BETTER SPATIAL AND ENERGY REPRESENTATION OF THE DEPRESSIONS IS OBTAINED IF ONE USES SEVERAL GROUPS IN THE THERMAL RANGE.

SQUARE PITCHED LATTICES OF EBOR PINS IN WATER HAVE BEEN STUDIED.

1931 ID-NUMBER ID-NUMBER 1931

AUTHOR PEDRETTI, E.
 TITLE FIRST CRITICALITY AND CALIBRATION EXPERIMENTS OF THE RC-4 RITMO REACTOR.
 REPORT NUMBER..... RT/FI-(67)7
 DATE PUBLISHED ... 67-00-00
 NSA-NUMBER 24:29053
 SITE/PROGRAM ITALY - RITMO REACTOR

ABSTRACT

THE EXPERIMENTS PERFORMED WITH THE RITMO REACTOR FROM ITS FIRST CRITICALITY, ACHIEVED ON JULY 9, 1965, TO THE DETERMINATION OF REFERENCE REACTOR PROPERTIES, COMPLETED AT THE END OF NOVEMBER 1966, ARE DESCRIBED. RESULTS OBTAINED BY THE APPLICATION OF THE SOURCE-DROP TECHNIQUE FOR THE CALIBRATION OF CONTROL RODS ARE PRESENTED. (AUTH).

1932 ID-NUMBER ID-NUMBER 1932

AUTHOR NOBLE, L. D. / MITZEL, F. / SARMA, B. / WINTZER, D. / LU, Y. S. / KESSLER, G. / PFLASTERER, G. R. / BECKER, R. A. / MANSUR, L.
 TITLE RESULTS OF SEFOR ZERO POWER EXPERIMENTS.
 REPORT NUMBER..... GEAP-13588
 DATE PUBLISHED ... 70-03-00
 NSA-NUMBER 24:29049
 SITE/PROGRAM GENERAL ELECTRIC CO., SAN JOSE - SEFOR REACTOR

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE SEFOR EXPERIMENTAL PROGRAM IS COMPRISED OF A SERIES OF TESTS BEGINNING WITH LOW POWER TESTS, PROCEEDING THROUGH STATIC AND FREQUENCY RESPONSE TESTS AT VARIOUS POWER LEVELS UP TO FULL POWER, AND CULMINATING IN A SERIES OF SUB-PROMPT AND SUPER-PROMPT CRITICAL TRANSIENTS.

THE RESULTS OF THE LOW (ZERO) POWER TESTS ARE REPORTED HERE AND ARE COMPARED WITH CALCULATIONS. THE AGREEMENT BETWEEN EXPERIMENT AND CALCULATION IS GENERALLY GOOD. THE TESTS WERE CONDUCTED AT LOW POWER AND INCLUDED SUCH EXPERIMENTS AS THE APPROACH TO THE MINIMUM CRITICAL CORE SIZE, CALIBRATION OF THE REFLECTOR CONTROL, MEASUREMENT OF FISSION RATE DISTRIBUTIONS, MATERIAL REACTIVITY WORTH MEASUREMENTS, UNIFORM NON-NUCLEAR HEATING OF THE REACTOR TO DETERMINE THE REACTIVITY TEMPERATURE COEFFICIENT, AND THE MEASUREMENT OF THE RATIO OF THE PROMPT NEUTRON LIFETIME TO THE EFFECTIVE DELAYED NEUTRON FRACTION.

1935 ID-NUMBER ID-NUMBER 1935

AUTHOR COLOMB, G. / MANGIN, D. / MAUBERT, L.
 TITLE CRITICALITY OF PLUTONIUM NITRATE SOLUTIONS (19% PLUTONIUM-240)
 REPORT NUMBER..... CEA-N-1898
 DATE PUBLISHED ... 76-09-00
 NSA-NUMBER 7772626
 SITE/PROGRAM FRANCE - PLUTONIUM AND URANIUM SOLUTIONS

ABSTRACT

THE RESULTS OF A CRITICAL APPROACH PERFORMED ON PLUTONIUM NITRATE SOLUTIONS CONTAINING 19% OF PLUTONIUM-240 IN TWO GEOMETRICAL SHAPES ARE PRESENTED; THE FIRST ONE IS ANNULAR CYLINDERS WITH DIAMETERS OF 200 AND 500 MM, THE SECOND ONE IS A PARALLELEPIPED OF GREAT DIMENSIONS: 1300X1300X1000 MM. A TOTAL PLUTONIUM CONCENTRATION RANGE FROM 13.2 TO 105 G/L HAS BEEN EXAMINED. VARIOUS CALCULATION METHODS ARE COMPARED TO EXPERIMENT. A FORMULA HAS BEEN ESTABLISHED WHICH GIVES THE CRITICAL LIMIT CONCENTRATION FOR A PLUTONIUM NITRATE SOLUTION AS A FUNCTION OF ACIDITY AND OF THE PLUTONIUM-240 AND PLUTONIUM-241 PERCENTAGES.

1936 ID-NUMBER ID-NUMBER 1936

AUTHOR SMITH, R. I. / KONZEK, G. J.
 TITLE CLEAN CRITICAL EXPERIMENT BENCHMARKS FOR PLUTONIUM RECYCLE IN LWR'S.
 VOLUME I. FINAL REPORT
 REPORT NUMBER..... PB-255728
 DATE PUBLISHED ... 76-04-00
 NSA-NUMBER 7773546
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM DIOXIDE ELEMENTS IN WATER

ABSTRACT

THE EXPERIMENTAL MEASUREMENTS PROGRAM REPORTED PROVIDES BENCHMARK NEUTRONICS DATA FOR USE IN ASSESSING THE ACCURACY OF NEUTRONICS ANALYSIS METHODS FOR SLIGHTLY ENRICHED URANIUM LATTICES AND FOR MIXED OXIDE (URANIUM DIOXIDE - PLUTONIUM DIOXIDE). A SERIES OF TWELVE LATTICE EXPERIMENTS HAS BEEN PERFORMED TO DETERMINE NEUTRONICS PARAMETERS, SUCH AS THE NUMBER OF FUEL RODS NEEDED TO ACHIEVE CRITICALITY UNBORATED OR THE BORON CONCENTRATION NEEDED IN THE MODERATOR TO ACHIEVE CRITICALITY WHEN BORATED, AND TO MEASURE THE POWER DISTRIBUTIONS THROUGHOUT THE CORES. THE TWELVE EXPERIMENTS CONSISTED OF SIX LATTICES CONTAINING URANIUM DIOXIDE-2.35% URANIUM-235 FUEL AND SIX LATTICES CONTAINING URANIUM DIOXIDE-2 WT% PLUTONIUM DIOXIDE (8% PLUTONIUM-240). THE LATTICE PITCHES WERE SELECTED TO PROVIDE CONFIGURATIONS WHICH WERE UNDERMODERATED, NEAR OPTIMUM MODERATION, OR OVERMODERATED AND WHICH HAD APPROXIMATELY THE SAME WATER-TO-FUEL VOLUME RATIO FOR BOTH FUEL TYPES IN EACH DEGREE OF MODERATION. (GRA)

1938 ID-NUMBER ID-NUMBER 1938

AUTHOR CLARK, H. K.
 TITLE ONE-GROUP ANALYSIS OF CRITICALITY EXPERIMENTS
 REPORT NUMBER..... DP-059
 DATE PUBLISHED ... 54-11-00
 NSA-NUMBER 7783069
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1939 ID-NUMBER ID-NUMBER 1939

AUTHOR SCHUSKE, C. L. / DICKINSON, D. / ROTHE, R. E. / OH, I. / GAYLORD, N. D.
 TITLE REFERENCE CRITICAL EXPERIMENTS. PROGRESS REPORT, OCTOBER 1, 1976--DECEMBER 31, 1976
 REPORT NUMBER..... RFP-NUREG-2622
 DATE PUBLISHED ... 77-02-00
 NSA-NUMBER 7779767
 SITE/PROGRAM ROCKY FLATS - URANIUM(93%) ARRAYS - CONCRETE REFLECTED

ABSTRACT

UPDATED INFORMATION FOR AREAS WHERE BENCHMARK MEASUREMENTS ARE NEEDED WAS SOLICITED FROM VARIOUS ORGANIZATIONS. THIS INFORMATION IS COMPILED INTO A NEW LISTING. SIGNIFICANT CHANGES INCLUDE DE-EMPHASIS IN AREAS DEALING WITH HTGR-TYPE FUEL CYCLES; PRIORITY CHANGES ARE ALSO INCLUDED. SINGLE VESSEL AND MULTIPLE CYLINDER ARRAYS SURROUNDED BY A 25.4-CM-THICK CONCRETE REFLECTOR HAVE BEEN COMPLETED. ABOUT 76 EXPERIMENTS WERE PERFORMED IN THE CONCRETE ENCLOSURE. MONTE CARLO CALCULATIONS ARE PRESENTED FOR SINGLE CYLINDERS IN THE CONCRETE ENCLOSURE. THESE CALCULATIONS, USING HANSEN-ROACH 16-GROUP CROSS SECTION SETS, WERE WITHIN ACCEPTABLE LIMITS OF ERRORS FOR DILUTE SOLUTION, BUT WERE 2 TO 2.5 PERCENT LOW IN K(EFF) FOR THE APPROXIMATELY 350 G URANIUM/LITER SOLUTIONS. THIS TREND IS CONSISTENT WITH THAT FOUND FOR MINIMALLY REFLECTED VESSELS. A 20.3-CM-THICK PLEXIGLAS ENCLOSURE WAS CONSTRUCTED SO THAT THE CRITICALITY OF SINGLE AND MULTIPLE VESSEL ARRAYS CAN BE COMPARED WITH THE CONCRETE-REFLECTED ARRAYS. WORK CONTINUES IN SETTING UP THE 4.5 PERCENT URANIUM-235 FUELS.

1940 ID-NUMBER ID-NUMBER 1940

AUTHOR LLOYD, R. C. / BIERMAN, S. R. / CLAYTON, E. D. / DURST, B. M.
 TITLE CRITICALITY STUDIES OF A NEUTRON MULTIPLIER
 REPORT NUMBER..... TANSO, 24, 123-125
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 76-11-00
 NSA-NUMBER 7725262
 SITE/PROGRAM HANFORD - ENRICHED URANIUM - WATER LATTICES

ABSTRACT

THERE HAS BEEN CONSIDERABLE NEED FOR NEUTRON IRRADIATION UNITS WITH HIGH NEUTRON FLUX FOR USE IN RESEARCH, INDUSTRY, AND EDUCATION. SOURCES OF VARIOUS TYPES HAVE BEEN USED FOR THIS PURPOSE FOR MANY YEARS, BUT HAVE LACKED THE INTENSITY AND VOLUME, WITH LEVEL FLUX, FOR LARGER SAMPLE IRRADIATION. WHILE THE RESEARCH REACTOR CAN PRODUCE THE DESIRABLE NEUTRON FLUX, THE CONSTRUCTION AND OPERATION IS RATHER COSTLY. A NEUTRON MULTIPLIER HAS BEEN DESCRIBED USING A SUBCRITICAL LATTICE OF ENRICHED URANIUM RODS WITH A CENTRAL CYLINDRICAL FLUX TRAP. A CALIFORNIUM-252 SOURCE IS USED TO PROVIDE THE INITIAL NEUTRONS TO DRIVE THE UNIT. THIS LATTICE UNIT WAS LOADED AT THE CRITICAL MASS LABORATORY TO STUDY ASPECTS OF CRITICALITY INCLUDING K(EFF) AND EFFECTS OF TEMPERATURE, VOIDS, AND ADDED MATERIAL.

1941 ID-NUMBER ID-NUMBER 1941

AUTHOR MALEWSKI, S. / DABROWSKI, C.
 TITLE PHYSICAL AND GEOMETRICAL PARAMETERS OF ANNA CRITICAL ASSEMBLIES. PART-2
 REPORT NUMBER..... INR-1456/9A/PR/A
 DATE PUBLISHED ... 73-00-00
 NSA-NUMBER 7729972
 SITE/PROGRAM POLAND - ANNA CRITICAL ASSEMBLY - CALCULATIONS

ABSTRACT

AN EXTENDED ANALYSIS OF FOUR CRITICAL CONFIGURATIONS OF ANNA ASSEMBLY HAS BEEN PERFORMED. DIFFUSION PARAMETERS OF THE THERMAL GROUP AND OF ONE OR THREE EPITHERMAL GROUPS HAVE BEEN DETERMINED. USING THESE DATA THE CRITICAL CALCULATIONS HAVE BEEN CARRIED OUT AND THE MAIN NEUTRON DENSITY DISTRIBUTIONS PRESENTED. THE ROLE OF SOME NEUTRON PROCESSES IN THESE SYSTEMS AND THEIR INFLUENCE ON INTEGRAL PARAMETERS HAS BEEN CONSIDERED. THE CALCULATED QUANTITIES HAVE BEEN COMPARED WITH THE AVAILABLE EXPERIMENTAL DATA.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1942 ID-NUMBER ID-NUMBER 1942

AUTHOR MC FARLANE, H. F. / BECK, C. L.
 TITLE HIGH- PLUTONIUM-240 SECTOR EXPERIMENTS IN ZPPR ASSEMBLY 4
 REPORT NUMBER.... ANL-76-112
 DATE PUBLISHED ... 76-12-00
 NSA-NUMBER 7766339
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPPR (DEMONSTRATION PLANT BENCHMARKS)

ABSTRACT

THE COMPLETE HIGH-PLUTONIUM-240 FUEL EXPERIMENT IN ZPPR ASSEMBLY 4 IS REVIEWED. RESULTS OF CRITICALITY, ENRICHMENT, SMALL-SAMPLE PERTURBATION, SODIUM VOID, URANIUM-238 DOPPLER, CONTROL ROD SUBSTITUTION AND REACTION RATE MEASUREMENTS ARE PRESENTED. COMPARISON OF THESE MEASURED VALUES WITH CALCULATED RESULTS ARE INCLUDED WHERE POSSIBLE. THE RELATIONSHIP BETWEEN THE ZPPR HIGH-PLUTONIUM- 240 FUEL EXPERIMENTS AND THE RESULTS OBTAINED IN PREVIOUS CRITICAL EXPERIMENTS IS CONSIDERED.

1943 ID-NUMBER ID-NUMBER 1943

AUTHOR KELLER, N. A.
 TITLE VALIDATION OF THE KENO AND SU-HAMMER CODES FOR PLUTONIUM SYSTEMS
 REPORT NUMBER.... AECL-5535
 DATE PUBLISHED ... 76-07-00
 NSA-NUMBER 7762837
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER - CALCULATIONS ; HANFORD - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES - CALCULATIONS

ABSTRACT

THE COMPUTER CODES KENO AND SU-HAMMER WERE USED TO CALCULATE A NUMBER OF CRITICAL EXPERIMENTS FOR PLUTONIUM SOLUTIONS, OVER A WIDE RANGE OF HYDROGEN/PLUTONIUM ATOM RATIOS AND A NUMBER OF PLUTONIUM-240 CONTENTS. BOTH CODES PROVED TO BE SUITABLE FOR USE IN CRITICALITY SAFETY CALCULATIONS.

1944 ID-NUMBER ID-NUMBER 1944

AUTHOR KELLER, N. A.,
 TITLE CALCULATION OF FOURTEEN PLUTONIUM-URANIUM CRITICAL EXPERIMENT BENCHMARKS USING KENO AND SU-HAMMER
 REPORT NUMBER.... AECL-5539
 DATE PUBLISHED ... 76-07-00
 NSA-NUMBER 7762838
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

THE FOURTEEN PLUTONIUM-URANIUM CRITICAL BENCHMARKS TABULATED BY BIERMAN WERE CALCULATED USING THE CODES KENO AND SU-HAMMER. BOTH CODES YIELDED K-EFFECTIVES WHICH WERE APPROXIMATELY 1-2% HIGH FOR THE CRITICAL SYSTEMS. THIS BIAS WAS CONSISTENT WITH THOSE OBTAINED FOR PLUTONIUM SYSTEMS.

1946 ID-NUMBER ID-NUMBER 1946

AUTHOR STEWART, H. B. / HOFMANN, P. L. / STORM, M. L. /
 TITLE PHYSICS CONSIDERATIONS IN THE DESIGN OF INTERMEDIATE ENERGY SPECTRUM REACTORS
 REPORT NUMBER.... GENEVA-2, 12, 142-150
 CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958
 DATE PUBLISHED ... 58-09-00
 SITE/PROGRAM GENERAL ELECTRIC CO., KNOLLS ATOMIC POWER LABORATORY - PRELIMINARY PILE ASSEMBLY (PPA)

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE NUCLEAR CHARACTERISTICS OF A WIDE VARIETY OF SODIUM-COOLED, BERYLLIUM-MODERATED, INTERMEDIATE ENERGY CRITICAL ASSEMBLIES HAVE BEEN STUDIED AT THE KNOLLS ATOMIC POWER LABORATORY OVER A PERIOD OF ABOUT EIGHT YEARS. THESE ASSEMBLIES ENCOMPASS A WIDE RANGE OF COMPOSITIONS AS THEY WERE USED TO SIMULATE THE CLEAN AND DEPLETED CONDITIONS IN REACTORS OF INTEREST TO THE INTERMEDIATE POWER BREEDER AND OTHER INTERMEDIATE ENERGY REACTOR PROGRAMS. THE FUEL LOADINGS OF THESE REACTORS RANGED FROM ABOUT 40 TO 125 KG OF URANIUM-235 WHILE THE ASSOCIATED BERYLLIUM-TO-URANIUM RATIOS RANGED FROM ABOUT 195 TO 1.7.

IN THIS PAPER A SHORT DESCRIPTION OF VARIOUS PERTINENT CRITICAL ASSEMBLIES IS GIVEN. REACTIVITY COEFFICIENT MEASUREMENTS IN THESE ASSEMBLIES ARE SUMMARIZED AND THE OBSERVED SPECTRAL DEPENDENCE OF THIS DATA IS INTERPRETED USING PERTURBATION THEORY FORMALISM.

1947 ID-NUMBER ID-NUMBER 1947

AUTHOR HONE, D. W. / CRITOPH, E. / DURET, M. F. / GREEN, R. E. / OKAZAKI, A. /
PEARCE, R. M. / PEASE, L.

TITLE NATURAL-URANIUM HEAVY-WATER LATTICES, EXPERIMENT AND THEORY

REPORT NUMBER.... GENEVA-2, 12, 351-363

CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958

DATE PUBLISHED ... 58-09-00

SITE/PROGRAM CANADA, CHALK RIVER NUCLEAR LABORATORIES - HEAVY WATER LATTICES

ABSTRACT

ACCURATE KNOWLEDGE OF THE REACTIVITY BALANCE IS REQUIRED FOR THE SUCCESSFUL DESIGN AND OPERATION OF A REACTOR. FOR THIS REASON LATTICE EXPERIMENTS AND ANALYSES HAVE BEEN CARRIED OUT AS PART OF THE DESIGN STUDIES OF THE NRX, NRU AND NPD REACTORS. A CONTINUING EXPERIMENTAL AND THEORETICAL PROGRAM IS UNDER WAY TO INCREASE OUR KNOWLEDGE OF THE NEUTRON PHYSICS OF HEAVY-WATER- MODERATED LATTICES AND TO PROVIDE A SOUND BASIS FOR DESIGN STUDIES OF PROPOSED REACTORS.

1948 ID-NUMBER ID-NUMBER 1948

AUTHOR PERSSON, R. / BLOMSJO, E. / ANDERSEN, E. / ASPELUND, O. / DODERLEIN, J.

TITLE EXPONENTIAL EXPERIMENTS ON HEAVY WATER NATURAL URANIUM METAL AND OXIDE
LATTICES

REPORT NUMBER.... GENEVA-2, 12, 364-373

CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958

DATE PUBLISHED ... 58-09-00

SITE/PROGRAM SWEDEN - HEAVY WATER LATTICES

ABSTRACT

OUR EXPONENTIAL ASSEMBLY HAS BEEN DESCRIBED ELSEWHERE AND SOME MEASUREMENTS ON SINGLE-ROD LATTICES HAVE ALSO BEEN REPORTED. THIS PAPER GIVES FIRST A SHORT DESCRIPTION OF SOME UNIQUE FEATURES OF THE EXPERIMENTAL FACILITY AND A THEORETICAL TREATMENT OF MIXED LATTICES, FOLLOWED BY A REPORT ON MEASUREMENTS OF (A) THE BUCKLING FOR LATTICES CONSISTING OF CLUSTERS OF URANIUM METAL AND OXIDE RODS IN HEAVY WATER AT ROOM TEMPERATURE, (B) THE TEMPERATURE COEFFICIENT BETWEEN 10 DEGREES C AND 80 DEGREES C FOR HEAVY WATER AND FOR DIFFERENT LATTICES, AND (C) CONTROL ROD EFFECTIVENESS.

1949 ID-NUMBER ID-NUMBER 1949

AUTHOR BROWN, W. W.

TITLE EXPONENTIAL EXPERIMENTS WITH ORGANIC MODERATED URANIUM LATTICES

REPORT NUMBER.... GENEVA-2, 12, 514-517

CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF
ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958

DATE PUBLISHED ... 58-09-00

SITE/PROGRAM ATOMICS INTERNATIONAL - ORGANIC MODERATED REACTOR

ABSTRACT

THIS REPORT DESCRIBES EXPONENTIAL EXPERIMENTS THAT HAVE BEEN PERFORMED WITH LATTICES OF CYLINDRICAL URANIUM METAL RODS IN LIQUID DIPHENYL. THIS CHOICE OF FUEL PROVIDES A DIRECT COMPARISON WITH THE EXTENSIVE DATA ALREADY EXISTING FOR URANIUM METAL LATTICES IN OTHER MODERATORS. DIPHENYL IS READILY AVAILABLE AND CLOSELY APPROXIMATES THE PROPERTIES OF THE POLYPHENYLS NOW BEING CONSIDERED FOR USE IN REACTORS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THE WORK INCLUDES MEASUREMENT OF THE NUCLEAR PROPERTIES OF BOTH MODERATOR AND LATTICES. FOR THE MODERATOR, THE TRANSPORT MEAN FREE PATH, DIFFUSION LENGTH AND SLOWING DOWN LENGTH WERE MEASURED. FOR THE LATTICES, MEASUREMENTS OF BUCKLING AND THERMAL NEUTRON DISTRIBUTION WITHIN A LATTICE CELL WERE MADE. THE FUEL USED CONSISTS OF 1 INCH DIAMETER URANIUM RODS OF ENRICHMENTS 0.721 (NATURAL) AND 0.912 ATOMIC PER CENT URANIUM-235. FOR EACH ENRICHMENT, LATTICES OF MODERATOR TO FUEL VOLUME RATIOS 1.5, 2.0, 3.0 AND 4.0 WERE STUDIED.

1950 ID-NUMBER ID-NUMBER 1950

AUTHOR BACHER, P. / KOECHLIN, J. C. / DE MAZANCOURT, R. / TESTE DU BAILLER, A. / ZALESKI, C. P.
 TITLE NATURAL URANIUM-GRAPHITE LATTICES
 REPORT NUMBER.... GENEVA-2, 12, 666-684
 CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958
 DATE PUBLISHED ... 58-09-00
 SITE/PROGRAM FRANCE - GRAPHITE LATTICES

ABSTRACT

THIS BEING THE TIME AT WHICH NATURAL URANIUM GRAPHITE-MODERATED REACTORS ARE ENTERING THE INDUSTRIAL PHASE, IT SEEMED PARTICULARLY IMPORTANT TO US TO HAVE A PRECISE KNOWLEDGE OF THE NEUTRON PROPERTIES OF THEIR LATTICES. AMONG THE MANY EXPERIMENTAL RESULTS PUBLISHED CONCERNING THESE LATTICES, THE MAJORITY HAVE BEEN FOUND TO BE UNUSABLE, UNFORTUNATELY. OFTEN THE EXPERIMENTAL ACCURACY WAS NOT SUFFICIENT; ABOVE ALL, THE LACK OF DETAILED INFORMATION CONCERNING THE CONSTITUENTS OF THE LATTICE CAUSED UNCERTAINTY IN ANY INTERPRETATION AND USE OF THE RESULTS.

WE HAVE TAKEN ADVANTAGE OF THE START-UP OF THE MARCOULE REACTORS G1 AND G2 TO PERFORM A SERIES OF LATTICES OF CERTAIN OTHER INSTALLATIONS (TUBULAR OR DIVIDED ELEMENTS, SUB-MODERATED LATTICES, ETC.). IN ORDER TO FACILITATE A PROPER INTERPRETATION OF THE RESULTS, THIS REPORT WILL BEGIN WITH AS DETAILED A DESCRIPTION AS POSSIBLE OF THE LATTICES STUDIED.

THE SECOND PART OF THE PAPER DEALS WITH BUCKLING MEASUREMENTS WHICH HAVE BEEN OBTAINED EITHER BY NEUTRON FLUX DISTRIBUTIONS OR BY THE SUBSTITUTION METHOD, WHOSE PRINCIPLE AS WELL AS AN EXACT EXPERIMENTAL JUSTIFICATION ARE GIVEN IN DETAIL. THE THIRD PART DEALS WITH THE RESULTS OF COMPLEMENTARY MEASUREMENTS MADE ON G1: A STUDY OF MIXED URANIUM-THORIUM LATTICES, THE FACTORS P, F, THE EFFECT OF A CENTRAL GAP, ETC.

1951 ID-NUMBER ID-NUMBER 1951

AUTHOR SNYDER, T. M.
 TITLE THE CRITICAL ASSEMBLY--A NUCLEAR DESIGN TOOL
 REPORT NUMBER.... GENEVA-1, 05, 162-171
 CONFERENCE FIRST UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 8-20 AUGUST 1955
 DATE PUBLISHED ... 55-08-00
 SITE/PROGRAM GENERAL ELECTRIC CO., KNOLLS ATOMIC POWER LABORATORY - PRELIMINARY PILE ASSEMBLY (PPA) ; OAK RIDGE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

A ZERO-POWER OR CRITICAL ASSEMBLY HAS BEEN CONSTRUCTED AND OPERATED BY THE KNOLLS ATOMIC POWER LABORATORY SINCE EARLY 1948. THIS ASSEMBLY WAS DESIGNED WITH THE OBJECTIVE OF PERMITTING STUDY OF AS MANY OF THE NUCLEAR CHARACTERISTICS OF A WIDE VARIETY OF REACTORS AS POSSIBLE. THE EXPERIENCE THROUGH 1950 WAS CONCERNED WITH STUDIES OF INTERMEDIATE NEUTRON ENERGY REACTORS USING HIGHLY ENRICHED URANIUM-235. THE OBJECT OF THESE STUDIES WAS TO EXPLORE THE POSSIBILITY OF BREEDING WITH PLUTONIUM IN AN INTERMEDIATE SPECTRUM. FOR THIS TYPE OF REACTOR THE LABORATORY CHOSE SODIUM AS A COOLANT AND BERYLLIUM AS A MODERATOR.

AT THAT TIME THERE WAS VERY LITTLE AVAILABLE KNOWLEDGE OF NEUTRON CROSS SECTIONS; THEREFORE CALCULATIONS OF THE NEUTRON ENERGY SPECTRUM, CRITICAL MASSES, POWER DISTRIBUTIONS, CONTROL PROPERTIES, ETC., WERE ESPECIALLY DIFFICULT AND UNCERTAIN. THE KAPL "PRELIMINARY PILE ASSEMBLY" WAS BUILT TO SUPPLY ANSWERS TO THESE PROBLEMS.

1952 ID-NUMBER ID-NUMBER 1952

AUTHOR PERSSON, R. / BUSTRAAN, M. / BLOMSJO, E.
 TITLE SOME EXPERIENCES ON AN EXPONENTIAL PILE OF URANIUM AND HEAVY WATER
 REPORT NUMBER.... GENEVA-1, 05, 239-241
 CONFERENCE FIRST UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 8-20 AUGUST 1955
 DATE PUBLISHED ... 55-08-00

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM SWEDEN - HEAVY WATER LATTICES

ABSTRACT

IN SWEDEN WE HAVE, IN CO-OPERATION WITH THE DUTCH-NORWEGIAN ORGANIZATION, JENER, PERFORMED SOME EXPONENTIAL EXPERIMENTS WITH RODS OF NATURAL URANIUM IN HEAVY WATER.

OUR EXPERIMENTAL ARRANGEMENT WAS BUILT WITH PARTICULAR ATTENTION TO FLEXIBILITY AND A RAPID DETERMINATION OF THE MATERIAL BUCKLING.

WE HAVE USED A CYLINDRICAL TANK, 3.0 M HIGH AND 1.0 M IN DIAMETER. THIS DIAMETER WAS CHOSEN PRIMARILY BECAUSE OF A SHORTAGE OF URANIUM BUT ALSO IN ORDER TO HAVE AN EXPONENTIAL DECAY IN THE AXIAL DIRECTION WITHOUT TOO LARGE CORRECTIONS FOR THE HARMONICS AND FOR THE END EFFECT. THE NEUTRON SOURCE, ABOUT 1.5 CURIE RA-BE, IS PLACED 0.5 M ABOVE THE BOTTOM. THE TANK WALL IS OF 10 MM ALUMINUM AND IS COVERED WITH BORON PLASTIC, 3-4 MM THICK. THE PLASTIC (POLYETHYLENE) CONTAINS ABOUT 0.3 GM BORON CARBIDE PER SQUARE CENTIMETER. ITS ADVANTAGES IN COMPARISON TO CADMIUM WILL BE MENTIONED BELOW.

1953 ID-NUMBER ID-NUMBER 1953

AUTHOR COHEN, E. R.

TITLE EXPONENTIAL EXPERIMENTS ON DEUTERIUM-OXIDE--URANIUM LATTICES

REPORT NUMBER..... GENEVA-1, 05, 268-278

CONFERENCE FIRST UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 8-20 AUGUST 1955

DATE PUBLISHED ... 55-08-00

SITE/PROGRAM ATOMICS INTERNATIONAL - URANIUM - HEAVY WATER EXPONENTIAL LATTICES ; NORTH AMERICAN AVIATION - URANIUM - HEAVY WATER EXPONENTIAL LATTICES ; ARGONNE NATIONAL LABORATORY - URANIUM - HEAVY WATER EXPONENTIAL LATTICES

ABSTRACT

A PROGRAM TO INVESTIGATE THE BASIC PHYSICS OF LATTICES OF URANIUM METAL RODS IN A HEAVY-WATER MODERATOR HAS BEEN CARRIED OUT AT NORTH AMERICAN AVIATION, INC. AND, TO A SMALLER EXTENT, AT ARGONNE NATIONAL LABORATORY OVER THE LAST FIVE YEARS. THE BASIC EXPERIMENTAL PROGRAMS HAVE BEEN LIMITED TO THE CONSIDERATION OF RODS OF URANIUM FROM 0.75 TO 2.00 INCH IN DIAMETER. THE LATTICE SPACINGS WERE CHOSEN TO GIVE RATIOS OF MODERATOR VOLUME TO URANIUM VOLUME FROM 15 TO 200. IN ALL CASES THE LATTICE WAS A SQUARE ARRAY. EXPERIMENTS AT THE TWO LABORATORIES WERE COORDINATED AND THE DESIGN OF FACILITIES WAS PLANNED SO THAT INTER-COMPARISONS BETWEEN LABORATORIES COULD BE MADE.

1954 ID-NUMBER ID-NUMBER 1954

AUTHOR BEYER, F. C. / BRYAN, R. H. / HUMMEL, H. H. / LENNOX, D. H. / MARTENS, F. H. / REARDON, W. A. / ROSENZWEIG, N. / SMITH, A. B. / SPINRAD, B. I.

TITLE THE FAST EXPONENTIAL EXPERIMENTS

REPORT NUMBER..... GENEVA-1, 05, 342-346

CONFERENCE FIRST UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 8-20 AUGUST 1955

DATE PUBLISHED ... 55-08-00

SITE/PROGRAM ARGONNE NATIONAL LABORATORY - FAST EXPONENTIAL EXPERIMENT

ABSTRACT

THE FAST EXPONENTIAL EXPERIMENT WAS DESIGNED TO OBTAIN FUNDAMENTAL INFORMATION ABOUT THE PHYSICS OF DILUTE FAST REACTORS IN THE RANGE OF COMPOSITIONS CONTEMPLATED FOR SUCH SYSTEMS AS SET BY SUCH ENGINEERING CONSIDERATIONS AS HEAT TRANSFER, STRUCTURAL SUPPORT AND COOLANT FLOW. THE EXPONENTIAL EXPERIMENT WAS CHOSEN FOR THIS PURPOSE BECAUSE IT COMBINES A LOW INVESTMENT OF FUEL WITH A HIGH DEGREE OF SAFETY.

THE MEASUREMENTS HAVE SO FAR YIELDED ACCURATE VALUES FOR THE BUCKLINGS OF SYSTEMS WITH VARIOUS MIXTURES OF FUEL AND DILUENT MATERIAL, AND WITH ISOTOPIC RATIOS OF URANIUM-238 AND URANIUM-235 IN THE RANGE 3:1 TO 7:1. IN ADDITION, REFLECTOR SAVINGS OF LEAD, IRON, URANIUM, AND ALUMINUM HAVE BEEN MEASURED, AND AN INDICATION OF THE VARIOUS ENERGY SPECTRA HAS BEEN OBTAINED BY MEASURING THE URANIUM-235-URANIUM-238 FISSION RATIO. THE BEHAVIOR OF EQUILIBRIUM NEUTRONS IN NATURAL URANIUM HAS ALSO BEEN INVESTIGATED.

1956 ID-NUMBER ID-NUMBER 1956

AUTHOR KRASNIN, A. K. / DUBOVSKY, B. G.

TITLE A BERYLLIUM MODERATED REACTOR (LETTER)

REPORT NUMBER..... JAABA, 04, 520-521

JOURNAL JOURNAL OF NUCLEAR ENERGY

DATE PUBLISHED ... 57-04-00

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM USSR - URANIUM(10%) - BERYLLIUM

ABSTRACT

TO DETERMINE THE PHYSICAL PARAMETERS OF A BERYLLIUM-MODERATED PILE, THE BRF REACTOR, WHICH HAS A METALLIC BERYLLIUM MODERATOR, WAS CONSTRUCTED. IT IS SITUATED IN THE BUILDING OF THE ATOMIC POWER STATION OF THE ACADEMY OF SCIENCES, AND BECAME CRITICAL IN AUGUST 1954.

POWDERED URANIUM TRIOXIDE CONTAINING 10% URANIUM-235 IS USED FOR THE FUEL. THE MAIN BODY OF THE REACTOR IS A CYLINDER OF DIAMETER 104.0 CM AND HEIGHT 96.0 CM, CONSISTING OF BERYLLIUM BLOCKS.

1957 ID-NUMBER ID-NUMBER 1957

AUTHOR KOUTS, H. / PRICE, G. / DOWNES, K. / SHER, R. / WALSH, V.

TITLE REACTOR PARAMETERS OF A LIGHT WATER-NORMAL URANIUM LATTICE (LETTER)

REPORT NUMBER..... JAABA, 02, 141

JOURNAL JOURNAL OF NUCLEAR ENERGY

DATE PUBLISHED ... 55-11-00

SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - SLIGHTLY ENRICHED URANIUM - WATER LATTICES

ABSTRACT

THE REACTOR PHYSICS GROUP OF BROOKHAVEN NATIONAL LABORATORY HAS MEASURED THE BUCKLING, FAST NEUTRON EFFECT, AND THERMAL UTILIZATION OF A SUB-CRITICAL LATTICE CONSISTING OF 1.1 INCH NORMAL URANIUM RODS, CLAD IN ALUMINUM AND IMMERSSED IN LIGHT WATER. THE ALUMINUM HAD A 1.300 INCH O.D. AND 0.050 INCH WALL THICKNESS. THE RODS WERE SPACED 1.779 INCH BETWEEN CENTRES TO GIVE A WATER-TO-URANIUM VOLUME RATIO OF 1.5:1. THE URANIUM RODS WERE 5 FT LONG AND WERE LOADED IN A CIRCULAR ARRAY ON A GRAPHITE THERMAL COLUMN WITH AN EFFECTIVELY INFINITE WATER REFLECTOR. THESE MEASUREMENTS REPEAT IN PART EARLIER WORK AT ORNL AS REPORTED BY KOUTS, AND BY ROLF PERSSON IN SWEDEN.

1959 ID-NUMBER ID-NUMBER 1959

AUTHOR SMITH, D. R. / GEER, W. U.

TITLE CRITICAL MASS OF A WATER-REFLECTED PLUTONIUM SPHERE

REPORT NUMBER..... NUAPA, 07, 405-408

JOURNAL NUCLEAR APPLICATIONS AND TECHNOLOGY

DATE PUBLISHED ... 69-11-00

SITE/PROGRAM LOS ALAMOS - PLUTONIUM METAL SPHERES

ABSTRACT

WE HAVE DETERMINED THE CRITICAL MASS OF A WATER-REFLECTED PLUTONIUM SPHERE. THE EXPERIMENTAL DATA ARE:

1. PROPERTIES OF METAL: (A) ALL ALPHA-PHASE, (B) HIGH PURITY, AND (C) 94.5% PLUTONIUM-239, 5.18% PLUTONIUM-240.
2. MEASUREMENTS: (A) MASS-5546 G, (B) DIAMETER-8.126 CM AT 20 DEGREES C, (C) DENSITY-19.74 G/CC AT 20 DEGREES C, AND (D) NEUTRON MULTIPLICATION-71 (BASED ON UNREFLECTED VALUE OF 5).
3. REFLECTOR-EFFECTIVELY INFINITE WATER.
4. RESULTS: (A) CRITICAL MASS, OUR EXPERIMENT-5790 PLUS OR MINUS 25 G (EXTRAPOLATED FROM APPROPRIATELY ADJUSTED DATA), (B) DTF CALCULATION, OUR EXPERIMENT-K(EFF) = 1.0037, AND (C) APPLYING ABOVE NORMALIZING FACTOR TO DTF, CRITICAL MASS OF PURE PLUTONIUM-239 -5430 (PLUS OR MINUS 25)G.

1960 ID-NUMBER ID-NUMBER 1960

AUTHOR UOTINEN, V. O. / LAUBY, J. H. / SCHMID, L. C. / STINSON, W. P.

TITLE LATTICES OF PLUTONIUM-ENRICHED RODS IN LIGHT WATER--PART 1: EXPERIMENTAL RESULTS

REPORT NUMBER..... NUTYBB, 15, 257-271

JOURNAL NUCLEAR TECHNOLOGY

DATE PUBLISHED ... 72-08-00

SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM DIOXIDE ELEMENTS IN WATER

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

RESULTS OF EXPERIMENTS CONDUCTED IN THE CRITICAL APPROACH FACILITY ARE PRESENTED FOR A TOTAL OF 48 LATTICES OF PLUTONIUM-ENRICHED RODS. FIVE RODS OF URANIUM DIOXIDE - PLUTONIUM OXIDE RODS RANGING IN PLUTONIUM OXIDE ENRICHMENT FROM 1.5 TO 4.0 WT%, AND THREE KINDS OF ALUMINUM-PLUTONIUM RODS RANGING IN PLUTONIUM ENRICHMENT FROM 2.0 TO 5.0 WT%, WERE USED IN THE EXPERIMENTS. THE LATTICES COVERED A BROAD RANGE OF WATER-TO-ROD VOLUME RATIOS. PARAMETERS REPORTED FOR EACH LATTICE ARE: THE NUMBER OF RODS REQUIRED FOR A CRITICAL LOADING, THE RELAXATION LENGTH MEASURED IN AN EXPONENTIAL LOADING, THE CRITICAL BUCKLING, AND REFLECTOR SAVINGS. FOR FIVE OF THE LATTICES RESULTS ARE ALSO REPORTED OF THE WORTH OF CENTRAL ABSORBER RODS OF BORON AND HAFNIUM. THE RESULTS OF APPROACH-TO-CRITICAL EXPERIMENTS WERE VERIFIED BY COMPARING THEM WITH THE RESULTS OF CRITICAL MEASUREMENTS CONDUCTED IN THREE LATTICES.

1961 ID-NUMBER ID-NUMBER 1961

AUTHOR WINDSOR, H. / TUNNEY, W. J. / PRICE, G. A.
 TITLE EXPONENTIAL EXPERIMENTS WITH LATTICES OF URANIUM-233 OXIDE AND THORIUM OXIDE IN LIGHT AND HEAVY WATER
 REPORT NUMBER..... NSENAO, 42, 150-161
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 70-11-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - URANIUM-233 - THORIUM DIOXIDE LATTICE

ABSTRACT

AN EXTENDED SERIES OF EXPONENTIAL EXPERIMENTS WAS CARRIED OUT UTILIZING URANIUM-233 DIOXIDE- THORIA FUEL ELEMENTS IN UNIFORM ARRAYS IN LIGHT AND HEAVY WATER. IN THIS SERIES THE PRINCIPAL PARAMETERS MEASURED WERE MATERIAL BUCKLING, REFLECTOR SAVINGS, DYSPROSIUM DISADVANTAGE FACTOR, RATIO OF EPICADMIUM TO SUBCADMIUM CAPTURE IN THORIUM, AND RATIO OF THORIUM-232 FISSION TO URANIUM- 233 FISSION. A TOTAL OF 29 CLEAN AND POISONED LATTICES WAS MEASURED.

1962 ID-NUMBER ID-NUMBER 1962

AUTHOR UOTINEN, V. O. / LAUBY, J. H. / STINSON, W. P. / DWIVEDI, S. R.
 TITLE REACTOR KINETIC PARAMETERS OF LATTICES OF PLUTONIUM AND URANIUM IN WATER
 REPORT NUMBER..... NSENAO, 44, 66-71
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 71-04-00
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER ; HANFORD - PLUTONIUM RODS IN WATER

ABSTRACT

THE RATIO BETA(EFFECTIVE)/LIFETIME HAS BEEN DEDUCED FROM REACTOR NOISE MEASUREMENTS IN SEVERAL UNIFORM LIGHT-WATER LATTICES IN THE PLUTONIUM RECYCLE CRITICAL FACILITY. THESE LATTICES INCLUDED ONE IN WHICH THE FISSIONABLE MATERIAL WAS SLIGHTLY ENRICHED URANIUM, ONE IN WHICH THE FISSIONABLE MATERIAL WAS PLUTONIUM, AND FIVE LATTICES IN WHICH THE FISSIONABLE MATERIAL CONTAINED BOTH URANIUM AND PLUTONIUM. THESE MEASUREMENTS SUPPLY A SET OF EXPERIMENTAL DATA OVER A RANGE OF PLUTONIUM ENRICHMENTS THAT ARE APPLICABLE TO PLUTONIUM RECYCLE SITUATIONS IN THERMAL REACTORS. THE MEASURED VALUES OF BETA(EFFECTIVE)/LIFETIME RANGE FROM 33 +/- 3 SEC-1 FOR A LATTICE OF ALUMINUM-PLUTONIUM RODS TO 153 +/- 8 SEC-1 FOR A LATTICE OF URANIUM DIOXIDE RODS. CALCULATED VALUES OF BETA(EFFECTIVE)/LIFETIME, OBTAINED WITH A STRAIGHT-FORWARD REACTOR DESIGN CALCULATIONAL METHOD, ARE IN GOOD AGREEMENT WITH MEASURED VALUES.

1963 ID-NUMBER ID-NUMBER 1963

AUTHOR KATO, W. Y. / ARMANI, R. J. / LARSEN, R. P. / MORELAND, P. E. / MOUNTFORD, L. A. / GASIDLO, J. M. / POPEK, R. J. / SWANSON C. D.
 TITLE AN INTEGRAL MEASUREMENT OF PLUTONIUM-239 AND URANIUM-233 ALPHA
 REPORT NUMBER..... NSENAO, 45, 37-46
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 71-07-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY, IDAHO - ZPR-3

ABSTRACT

INTEGRAL VALUES OF THE CAPTURE-TO-FISSION CROSS-SECTION RATIO FOR PLUTONIUM-239 AND URANIUM- 233 HAVE BEEN MEASURED IN A SOFT SPECTRUM FAST REACTOR CRITICAL ASSEMBLY USING MASS SPECTROMETRIC TECHNIQUES TO DETERMINE THE CAPTURE RATE. VALUES OF 0.363 +/- 0.024 AND 0.10 +/- 0.04 WERE OBTAINED FOR PLUTONIUM-239 AND URANIUM-233, RESPECTIVELY. THE VALUE OF 0.363 +/- 0.024 IS IN GOOD AGREEMENT WITH THE VALUE CALCULATED USING THE REVISED GWIN DIFFERENTIAL CROSS-SECTION DATA FOR PLUTONIUM-239. THE VALUE FOR URANIUM-233 IS WITHIN EXPERIMENTAL ERROR IN AGREEMENT WITH THE VALUE CALCULATED USING ENDF/B DATA.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1964 ID-NUMBER ID-NUMBER 1964

AUTHOR KUNZE, J. F. / LOFTHOUSE, J. H. / COOPER, C. G.
 TITLE BENCHMARK GAS CORE CRITICAL EXPERIMENT
 REPORT NUMBER..... NSENAO, 47, 59-65
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 72-01-00
 SITE/PROGRAM AEROJET NUCLEAR CORPORATION - GAS CORE CRITICAL EXPERIMENT

ABSTRACT

A CRITICAL EXPERIMENT WITH SPHERICAL SYMMETRY HAS BEEN CONDUCTED ON THE GAS CORE NUCLEAR REACTOR CONCEPT. THE NONSPHERICAL PERTURBATIONS IN THE EXPERIMENT WERE EVALUATED EXPERIMENTALLY AND PRODUCE CORRECTIONS TO THE OBSERVED EIGENVALUE OF LESS THAN 1% IN MULTIPLICATION. THE REACTOR CONSISTED OF A LOW DENSITY, CENTRAL URANIUM HEXAFLUORIDE GASEOUS CORE, SURROUNDED BY AN ANNULUS OF VOID OR LOW DENSITY HYDROCARBON, WHICH IN TURN WAS SURROUNDED WITH A 97-CM-THICK HEAVY WATER REFLECTOR.

1965 ID-NUMBER ID-NUMBER 1965

AUTHOR PHELPS, J. / WINDSOR, H. / TAKAHASHI, H. / CONANT, J. / CHANDRAMOLESHWAR, K.
 TITLE CRITICAL EXPERIMENTS FOR THE BROOKHAVEN PULSED FAST REACTOR STUDY
 REPORT NUMBER..... NSENAO, 49, 274-300
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 72-11-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - PULSED FAST REACTOR EXPERIMENT

ABSTRACT

MEASUREMENTS USING A FAST CRITICAL ASSEMBLY WERE PERFORMED IN CONJUNCTION WITH THE BROOKHAVEN FAST RESEARCH REACTOR STUDY. CORES MADE OF HIGHLY ENRICHED URANIUM, STAINLESS STEEL, AND ALUMINUM, REFLECTED MOSTLY BY STAINLESS STEEL WERE USED TO OBTAIN BROAD SURVEY INFORMATION, AND, CONCURRENTLY, TO TEST THE PRELIMINARY THEORETICAL MODEL. QUANTITIES MEASURED INCLUDED CRITICAL MASS, CHARACTERISTICS OF MOVABLE REFLECTOR BLOCKS, PROMPT NEUTRON LIFETIME, WORTH OF MATERIALS IN POTENTIAL CONTROL POSITIONS, NEUTRON YIELD FOR A GIVEN POWER, AND MODERATOR BLOCK CHARACTERISTICS; THE FIRST THREE OF THESE HAVE BEEN COMPARED WITH CALCULATIONS.

1966 ID-NUMBER ID-NUMBER 1966

AUTHOR MIHALCZO, J. T.
 TITLE CRITICALITY OF GRAPHITE- AND POLYETHYLENE-REFLECTED URANIUM(93.2)-METAL CYLINDERS AND ANNULI
 REPORT NUMBER..... NSENAO, 49, 489-504
 JOURNAL NUCLEAR SCIENCE AND ENGINEERING
 DATE PUBLISHED ... 72-12-00
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL CYLINDERS

ABSTRACT

CYLINDERS AND CYLINDRICAL ANNULI OF URANIUM METAL (93.15 WT% URANIUM-235), WITH DIAMETERS VARYING FROM 7 TO 15 INCH, WERE ASSEMBLED TO DELAYED CRITICALITY WITH GRAPHITE REFLECTORS VARYING IN THICKNESS UP TO 18 INCH OR WITH AN EFFECTIVELY INFINITE THICKNESS POLYETHYLENE ON ALL OUTER SURFACES. IN ONE SERIES OF MEASUREMENTS A POLYETHYLENE REFLECTOR WAS ALSO PLACED ADJACENT TO ONLY ONE FLAT SURFACE OF THE CYLINDERS. THE MULTIPLICATION FACTOR CALCULATED BY BOTH S-N TRANSPORT AND MONTE CARLO METHODS, WITH VARIOUS SETS OF CROSS SECTIONS AGREED VERY WELL WITH THE EXPERIMENTAL VALUES. AS A RESULT OF THE HIGH ORDER OF S-N AND THE LARGE NUMBER OF SPATIAL INTERVALS REQUIRED, THE COMPUTING TIME FOR THE TRANSPORT THEORY CALCULATIONS WAS A FACTOR OF 10 LARGER THAN THAT REQUIRED FOR THE MONTE CARLO CALCULATIONS WITH STANDARD DEVIATIONS OF 1%

1969 ID-NUMBER ID-NUMBER 1969

AUTHOR NOAKS, J. W. / CRUDELE, J. S.
 TITLE PRELIMINARY CRITICAL ASSEMBLY FOR SUPER CRITICAL WATER REACTOR, PART-2
 REPORT NUMBER..... ORNL-CF-54-12-21
 DATE PUBLISHED ... 54-12-01
 SITE/PROGRAM OAK RIDGE - SUPER CRITICAL WATER REACTOR

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THIS REPORT RECORDS THE PROGRESS MADE IN THE CRITICAL EXPERIMENTS FOR THE SUPER-CRITICAL WATER REACTOR UP TO MID 1954 WHEN THE PROGRAM WAS SEVERELY CURTAILED BY THE SHIFT IN EMPHASIS TO THE REFLECTOR MODERATED REACTOR. IN THIS SENSE IT IS AN INTERIM REPORT ON LARGELY UNFINISHED WORK AND CANNOT PRESENT FIRM CONCLUSIONS AND COMPARISONS WITH THEORY OR CALCULATIONS. THE MEASUREMENTS WHICH HAVE BEEN MADE WERE PROBABLY INFLUENCED BY THE NON-UNIFORM LOADING OF THE ASSEMBLY, AN EXPEDIENT TO ACHIEVE CRITICALITY AT NEAR DESIGN CONDITIONS, AND ARE NOT, THEREFORE, ENTIRELY AMENABLE TO INTERPRETATION. THE VALUE OF THE CRITICAL MASS IN A UNIFORMLY LOADED CORE IS 10.8 KG URANIUM-235. THE LONGITUDINAL NEUTRON FLUX, MEASURED WITH INDIUM FOILS, IS TYPICAL. THE RADIAL THERMAL FLUX, I.E. NEUTRONS OF ENERGY BELOW THE CADMIUM CUT-OFF, DECREASES SOMEWHAT WITH INCREASING RADIUS BUT NOT AS SEVERELY AS IN A HOMOGENEOUSLY LOADED CORE, THE DECREASE, FROM CENTER TO EDGE, BEING ONLY ABOUT 50% A SOMEWHAT GREATER CHANGE WAS NOTED IN THE IMPORTANCE OF A QUANTITY OF FUEL OVER THE SAME TRAVERSE.

1970 ID-NUMBER ID-NUMBER 1970

AUTHOR FOX, J. K. / MIHALCZO, J. T. / GILLEY, L. W.
 TITLE CRITICAL EXPERIMENTS WITH 2.09% URANIUM-235 ENRICHED URANIUM METAL PLATES
 IN WATER
 REPORT NUMBER..... ORNL-CF-58-8-3
 DATE PUBLISHED ... 58-08-03
 NSA-NUMBER 13:2857
 SITE/PROGRAM OAK RIDGE - URANIUM(2.1%) METAL PLATES IN WATER

ABSTRACT

EXPERIMENTS WERE PERFORMED WITH 2.09% URANIUM-235-ENRICHED URANIUM METAL PLATES IN A LIGHT- WATER-MODERATED AND -REFLECTED ASSEMBLY. EACH PLATE WAS 30 INCH LONG, 3.125 INCH WIDE, AND .25 INCH THICK AND CONTAINED 7.09 KG OF URANIUM. IN THE FIRST ASSEMBLIES THE PLATES WERE ARRANGED IN ROWS WITH EDGES ADJACENT, AND THE SPACING BETWEEN ROWS WAS VARIED FROM .625 TO 1.125 INCH. THE OPTIMUM SPACING WAS ABOUT .875 INCH. WITH THE SPACING BETWEEN ROWS MAINTAINED AT .875 INCH, THE SPACING BETWEEN THE EDGES OF THE PLATES WAS VARIED FROM 0 TO .625 INCH. THE OPTIMUM SPACING BETWEEN EDGES WAS .3125 INCH. THE MINIMUM CRITICAL MASS IN THESE ASSEMBLIES WAS 6.74 KG OF URANIUM-235. (AUTH).

1971 ID-NUMBER ID-NUMBER 1971

AUTHOR FOX, J. K. / GILLEY, L. W.
 TITLE CRITICAL EXPERIMENTS WITH ARRAYS OF ORR AND BSR FUEL ELEMENTS
 REPORT NUMBER..... ORNL-CF-58-9-40
 DATE PUBLISHED ... 58-10-02
 NSA-NUMBER 13:2859
 SITE/PROGRAM OAK RIDGE - ORR AND BSR FUEL ELEMENTS

ABSTRACT

CRITICAL EXPERIMENTS WERE PERFORMED WITH ORR AND BSR FUEL ELEMENTS TO DETERMINE SAFE ARRAYS IN WHICH THE ELEMENTS COULD BE HANDLED AND STORED. THE DATA INDICATE THAT THE OPTIMUM SPACING FOR CRITICALITY OF 168-G ORR ELEMENTS IN WATER IS 0.2 INCH BETWEEN LOCATING BOSSES AND THAT AN INFINITE ARRAY OF VERTICALLY PLACED ELEMENTS ONE ELEMENT HIGH WOULD PROBABLY BE SUBCRITICAL WITH A 1.5 INCH SPACING BETWEEN LOCATING BOSSES. FOR UNIFORM ARRAYS OF ADJACENT ELEMENTS IN WATER, VARIATION IN THE FUEL LOADING PER ELEMENT BETWEEN 140 AND 200 G MADE VERY LITTLE DIFFERENCE IN THE CRITICAL MASS. WHEN 132 ELEMENTS WITH AN AVERAGE LOADING OF 160 G PER ELEMENT WERE CLOSELY PACKED IN WATER IN AN 11 BY 12 ELEMENT ARRAY IN WHICH THE ROWS WERE SEPARATED WITH 20-MIL-THICK CADMIUM SHEETS, NO APPRECIABLE SOURCE NEUTRON MULTIPLICATION WAS OBSERVED; NOR WAS THERE ANY APPRECIABLE MULTIPLICATION WHEN BOTH THE CADMIUM SHEETS AND THE WATER MODERATOR WERE REMOVED AND THE ARRAY WAS SURROUNDED WITH A 12-INCH-THICK PARAFFIN REFLECTOR. A TWO-ROW SLAB-SHAPED ARRAY WITH 24 200-G CENTER ELEMENTS AND 14 168-G ELEMENTS ON EACH END, ALL SPACED 0.2 INCH BETWEEN LOCATING BOSSES, WAS SUBCRITICAL, AND IT APPEARS THAT TWO INFINITELY LONG ROWS OF 168-G ELEMENTS WOULD BE SUBCRITICAL. (AUTH).

1972 ID-NUMBER ID-NUMBER 1972

AUTHOR MIHALCZO, J. T.
 TITLE A SMALL GRAPHITE-REFLECTED URANIUM-DIOXIDE ASSEMBLY
 REPORT NUMBER..... ORNL-TM-0450
 DATE PUBLISHED ... 62-12-28
 SITE/PROGRAM OAK RIDGE - ROVER PROJECT URANIUM CARBIDE - GRAPHITE, URANIUM DIOXIDE -
 GRAPHITE

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

AN UNMODERATED, GRAPHITE REFLECTED, CRITICAL ASSEMBLY OF URANIUM DIOXIDE, ENRICHED TO 93.2 WT% IN URANIUM-235 IS DESCRIBED. THE URANIUM DIOXIDE PELLETS, DENSITY 9.71 G/CC, WERE CONTAINED IN 253 1.27-CM-DIAMETER STAINLESS STEEL TUBES WHICH, IN TURN, ARE CLOSEPACKED IN AN ALUMINUM CONTAINER 22.87 CM IN DIAMETER AND 31.11 CM LONG. TWO COMBINATIONS OF TOP AND SIDE REFLECTORS WERE FOUND TO MAKE THE ASSEMBLY CRITICAL. IN ONE THE THICKNESSES OF THE TOP AND THE SIDE REFLECTORS WERE 12.70 AND 19.25 CM, RESPECTIVELY; IN THE OTHER THESE DIMENSIONS WERE 5.08 AND 24.34 CM. FISSION DISTRIBUTION MEASUREMENTS AXIALLY THROUGH THE ASSEMBLY AND RADially THROUGH THE REFLECTOR SHOWED, IN ONE CASE, A PEAK IN THE REFLECTOR 3.5 GREATER THAN AT THE CENTER OF THE CORE. THE URANIUM-235 CADMIUM RATIO MEASURED IN THE SIDE REFLECTOR RANGED FROM 1.77 TO 2.43.

1973 ID-NUMBER ID-NUMBER 1973

AUTHOR CRUME, E. C. / JOHNSON, E. B.
 TITLE CRITICALITY SAFETY TESTS FOR ROVER REACTOR FUEL ELEMENTS
 REPORT NUMBER.... ORNL-TM-1704
 DATE PUBLISHED ... 66-12-01
 SITE/PROGRAM OAK RIDGE - ROVER PROJECT URANIUM CARBIDE - GRAPHITE, URANIUM DIOXIDE - GRAPHITE

ABSTRACT

CRITICAL EXPERIMENTS WERE PERFORMED WITH WESTINGHOUSE TYPE NRXA-3 AND NRXA-4 FUEL ELEMENTS TO PROVIDE DATA FOR USE IN CRITICALITY SAFETY ANALYSES OF PROJECT ROVER FUEL ELEMENT PRODUCTION, STORAGE, AND TRANSPORTATION. THESE EXPERIMENTS SUPPLEMENT SIMILAR EXPERIMENTS PERFORMED IN 1962 WITH KIWI-B-2A FUEL ELEMENTS, WHICH ARE SIMILAR IN COMPOSITION TO THE NRXA-TYPE ELEMENTS BUT DIFFER IN SEVERAL DESIGN FEATURES. EACH NRXA-TYPE ELEMENT USED IN THE PRESENT EXPERIMENTS IS A NOMINALLY 52-INCH-LONG HEXAGONAL GRAPHITE CYLINDER 0.870 INCH ACROSS POINTS (WITH 0.435 INCH SIDES), CONTAINING 19 UNIFORMLY SPACED LONGITUDINAL HOLES. PYROLYTIC-GRAPHITE-COATED URANIUM DICARBIDE BEADS ARE DISTRIBUTED UNIFORMLY IN THE GRAPHITE TO GIVE AVERAGE URANIUM CONCENTRATIONS OF 0.418 G/CC IN THE NRXA-3 ELEMENTS AND 0.449 G/CC IN THE NRXA-4 ELEMENTS. THE URANIUM IS 93.15 PERCENT BY WEIGHT URANIUM-235, GIVING AVERAGE CARBON:URANIUM-235 ATOMIC RATIOS OF 90 IN THE NRXA-3 ELEMENTS AND 87 IN THE NRXA-4 ELEMENTS.

EXPERIMENTS WERE PERFORMED BOTH WITH THE ELEMENTS DIRECTLY SUBMERGED AND WITH THEM ENCASED IN SEALED ALUMINUM TUBES, 0.94 INCH IN INSIDE DIAMETER, WHICH PREVENTED WATER FROM COMING IN CONTACT WITH THE ELEMENT. IN ORDER TO ESTABLISH BOTH THE MINIMUM CRITICAL NUMBER OF WATER-MODERATED AND -REFLECTED ELEMENTS AND THE RELATIONSHIP BETWEEN MODERATION AND CRITICAL NUMBER, SEVERAL CRITICAL ARRAYS COVERING A WIDE RANGE OF MODERATION WERE ASSEMBLED.

1975 ID-NUMBER ID-NUMBER 1975

AUTHOR MARTIN, A. B. / MANN, M. M.
 TITLE FURTHER CRITICAL EXPERIMENTS ON A SMALL REACTOR OF ENRICHED URANIUM-235 WITH ALUMINUM-WATER MODERATOR AND A BERYLLIUM REFLECTOR
 REPORT NUMBER.... ORNL-0079
 DATE PUBLISHED ... 48-08-17
 NSA-NUMBER 10:7309
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) - ALUMINUM - WATER REACTOR

ABSTRACT

THE EXPERIMENTAL FACILITIES AND OPERATING PROCEDURES WHICH HAVE BEEN USED IN THE CONDUCT OF CRITICAL EXPERIMENTS TO STUDY THE CHARACTERISTICS OF SMALL ENRICHED REACTORS HAVE BEEN DESCRIBED IN MONP-357. THE PURPOSE OF THE PRESENT REPORT IS TO DESCRIBE BRIEFLY CERTAIN IMPROVEMENTS THAT HAVE BEEN MADE IN THE EXPERIMENTAL FACILITIES AND TO PRESENT THE RESULTS OF FURTHER MEASUREMENTS ON CRITICAL MASS AND CRITICAL NEUTRON FLUX DISTRIBUTION IN BERYLLIUM-REFLECTED REACTORS HAVING SQUARE AND THIN SLAB GEOMETRIES. THE CRITICAL MASS OF A REACTOR HAVING THE USUAL URANIUM-ALUMINUM-WATER CORE AND NO REFLECTOR WAS MEASURED AND PRELIMINARY EXPERIMENTS TO DETERMINE THE FAST NEUTRON FLUX IN THESE REACTORS WERE CARRIED OUT. (AUTH).

1976 ID-NUMBER ID-NUMBER 1976

AUTHOR SPENCER, R. M.
 TITLE PRELIMINARY CRITICAL ASSEMBLIES OF THE REFLECTOR MODERATOR REACTOR
 REPORT NUMBER.... ORNL-1770
 DATE PUBLISHED ... 54-11-22
 SITE/PROGRAM OAK RIDGE - REFLECTOR MODERATED REACTOR

III. BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

FIVE PRELIMINARY CRITICAL ASSEMBLIES, PLANNED IN CONJUNCTION WITH A FULL SCALE CIRCULATING FUEL REACTOR, WERE CONSTRUCTED AT THE OAK RIDGE CRITICAL EXPERIMENT FACILITY. THE FIRST ASSEMBLY WAS CONSTRUCTED WITH A BERYLLIUM ISLAND AND REFLECTOR, AND HAD ENRICHED URANIUM DISKS PLACED BETWEEN SODIUM FILLED STAINLESS STEEL CANS ARRANGED IN A FUEL ANNULUS. THE ASSEMBLY WAS CRITICAL WITH 15.1 KG OF URANIUM-235. THE SECOND ASSEMBLY WAS ALSO CONSTRUCTED WITH A BERYLLIUM ISLAND AND REFLECTOR; HOWEVER, A POWDERED MIXTURE OF SODIUM, ZIRCONIUM AND URANIUM FLUORIDES PACKED IN ALUMINUM TUBES WAS USED AS A FUEL, AND FUEL END DUCTS WERE PROVIDED. THE ASSEMBLY WAS CRITICAL WITH 7.7 KG OF URANIUM-235. THE ADDITION OF STRUCTURAL POISONS (FIFTH ASSEMBLY) TO THIS ASSEMBLY INCREASED THE CRITICAL MASS TO 18.2 KG OF URANIUM-235. IN THE THIRD ASSEMBLY THE BERYLLIUM ISLAND AND REFLECTOR WERE REPLACED BY GRAPHITE. WITH 17.3 KG OF URANIUM-235 IN THE FUEL REGION, THIS ASSEMBLY WAS NOT CRITICAL. IN ORDER TO MAKE THE ASSEMBLY CRITICAL APPROXIMATELY 80% OF THE GRAPHITE IN THE ISLAND AND INNER SIX INCHES OF THE REFLECTOR WERE REPLACED BY BERYLLIUM. THE FOURTH ASSEMBLY WAS CONSTRUCTED AS A TWO REGION ASSEMBLY WITH A 1 TO 1 VOLUME RATIO OF GRAPHITE AND POWDERED FUEL IN THE CORE AND A BERYLLIUM REFLECTOR. THIS ASSEMBLY WAS CRITICAL WITH 15.2 KG OF URANIUM-235.

NEUTRON FLUX DISTRIBUTIONS WERE DETERMINED IN THESE ASSEMBLIES USING INDIUM FOIL ACTIVATION. POWER DISTRIBUTIONS WERE DETERMINED USING ALUMINUM CATCHER FOILS IN CONTACT WITH URANIUM FUEL DISKS.

MEASUREMENTS WERE MADE ON THE EFFECT ON REACTIVITY OF PLACING VARIOUS MATERIALS IN THE FUEL AND REFLECTOR REGIONS, AND AN ESTIMATE OF THE NEUTRON LEAKAGE WAS OBTAINED FOR TWO OF THE ASSEMBLIES.

1977 ID-NUMBER ID-NUMBER 1977

AUTHOR WILLIAMS, D. V. P. / MAGNUSON, D. W. / BATCH, M. L. / JOHNSON, W. R. /
LESLIE, J. K. / CALLIHAN, A. D.

TITLE ARMY PACKAGE POWER REACTOR CRITICAL EXPERIMENT

REPORT NUMBER..... ORNL-2128

DATE PUBLISHED ... 56-08-21

NSA-NUMBER 11:13986

SITE/PROGRAM OAK RIDGE - ARMY PACKAGE POWER REACTOR

ABSTRACT

A ZERO POWER MOCKUP OF THE ARMY PACKAGE POWER REACTOR WAS CONSTRUCTED IN THE OAK RIDGE NATIONAL LABORATORY CRITICAL EXPERIMENT FACILITY. THE ASSEMBLY CONSISTED OF 45 FUEL ELEMENTS, IN A 7 X 7 ARRAY WITH THE CORNERS REMOVED, AND WAS CONTAINED IN A LARGE WATER TANK. THE OVERALL CORE DIMENSIONS WERE 21 X 21 X 22 INCH. ENRICHED URANIUM METAL FOILS, 2.5 X 0.002 X 22.0 INCH, EACH CONTAINING 31.1 G OF URANIUM-235 WERE ENCASED IN STAINLESS STEEL SHEETS TO FORM THE FUEL PLATES. ADDITIONAL PLATES OF STAINLESS STEEL AND OF BORON ENCASED IN STAINLESS STEEL WERE USED TO SIMULATE MATERIALS OF THE APPR-1 CORE. EACH TYPE OF PLATE CONTAINED ESSENTIALLY THE SAME AMOUNT OF STEEL. WHEN THE 18 SLOTS OF EACH ELEMENT WERE LOADED WITH PLATES, THE METAL VOLUME FRACTION WAS 0.197 AND WAS KEPT CONSTANT THROUGHOUT THE EXPERIMENTAL PROGRAM. THE NUMBER OF FUEL PLATES PER ELEMENT VARIED FROM 7.5 FOR THE CLEAN REACTOR TO 14.5 FOR A BORON-POISONED ASSEMBLY. THE CRITICAL MASS OF THE CLEAN REACTOR WAS 10.35 KG OF URANIUM-235.

THE ADDITION OF 255 G OF NATURAL BORON TO THE CORE, DISTRIBUTED AMONG THREE PLATES IN EACH ELEMENT, INCREASED THE CRITICAL MASS TO 20.1 KG OF URANIUM-235.

REACTIVITY COEFFICIENTS OF FUEL PLATES, MEASURED IN THE CLEAN REACTOR AS A FUNCTION OF POSITION, GAVE AN AVERAGE FUEL VALUE OF \$0.526/G. THE SPECIFIC MASS REACTIVITY COEFFICIENT WAS DETERMINED OVER A WIDE RANGE OF REACTOR LOADINGS.

THE EFFECTS OF THE HETEROGENEOUS DISTRIBUTIONS OF THE URANIUM AND BORON ON THE CRITICAL MASSES OF THE REACTOR WERE STUDIED BY EXCHANGING SPECIAL FUEL ELEMENTS WITH ASSEMBLY ELEMENTS IN SEVERAL LOCATIONS AND NOTING THE RESULTING CHANGES IN REACTIVITY. THESE DATA AND THE ASSUMPTION THAT THE SPECIFIC MASS REACTIVITY COEFFICIENT IS CONSTANT FOR SMALL CHANGES IN FUEL LOADING WERE USED TO CALCULATE A VALUE OF 9.1 KG OF URANIUM-235 FOR THE CRITICAL MASS OF AN UNPOISONED ARRAY OF APPR- TYPE ELEMENTS.

MEASUREMENTS WERE MADE OF THE VALUE OF THE APPR CONTROL RODS IN VARIOUS LOCATIONS, BOTH INDIVIDUALLY AND COLLECTIVELY, IN TERMS OF THE ADDITIONAL MASS OF URANIUM-235 NECESSARY TO MAINTAIN CRITICALITY. ONE ECCENTRIC CONTROL ROD FULLY INSERTED WAS WORTH 0.68 KG OF URANIUM-235, THE CENTRAL CONTROL ROD 1.70 KG, AND FIVE RODS FULLY INSERTED REQUIRED AN ADDITION OF 12.23 KG TO THE LOADING. IN ADDITION, THE CALIBRATION OF ONE ECCENTRIC ROD BY INCREMENTAL PERIODS GAVE A VALUE OF \$3.8.

POWER AND NEUTRON FLUX DISTRIBUTION MEASUREMENTS WERE MADE IN ALL MAJOR CONFIGURATIONS OF THE CRITICAL ASSEMBLY. MACROSCOPIC NEUTRON FLUX DISTRIBUTIONS WERE MEASURED BY EXPOSING BARE AND CADMIUM-COVERED GOLD FOILS AT VARIOUS POINTS IN THE REACTOR. INTERCELL FLUX DISTRIBUTIONS WERE OBTAINED USING DYSPROSIUM AS THE NEUTRON DETECTOR. THE POWER DISTRIBUTIONS WERE FOUND BY MEASURING THE FISSION FRAGMENT ACTIVITY ON A1 CATCHER FOILS PLACED IN CONTACT WITH THE URANIUM IN SPECIAL FUEL PLATES. CATCHER FOILS, EXPOSED BOTH BARE AND CADMIUM-COVERED, IN THE MIDPLANE OF THE CLEAN REACTOR, INDICATED THAT 91% OF THE FISSIONS WERE PRODUCED BY NEUTRONS HAVING ENERGIES LESS THAN ABOUT 0.5 EV. (AUTH).

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1978 ID-NUMBER ID-NUMBER 1978

AUTHOR FOX, J. K. / GILLEY, L. W.
 TITLE CRITICAL MASS STUDIES: PART XI. CRITICAL PARAMETERS OF URANIUM-ALUMINUM ALLOY SLUGS
 REPORT NUMBER..... ORNL-3272
 DATE PUBLISHED ... 62-05-28
 NSA-NUMBER 20:46994
 SITE/PROGRAM OAK RIDGE - URANIUM SLUGS - WATER (SAVANNAH RIVER FUEL SLUGS)

ABSTRACT

CRITICAL AND NEAR-CRITICAL EXPERIMENTS WERE PERFORMED WITH CYLINDRICAL PIECES OF TWO ALLOYS OF 93%-URANIUM-235-ENRICHED URANIUM AND ALUMINUM TO ESTABLISH SAFE PRACTICES IN FABRICATION AND IN OTHER PROCEDURES. IN ONE SET OF EXPERIMENTS THE URANIUM CONTENT OF THE ALLOY WAS 5.4 WT% AND THE DIAMETER OF THE PIECES WAS 1.015 INCH. THE MINIMUM CRITICAL NUMBER OF 12-INCH-LONG SLUGS IN A SINGLE WATER-REFLECTED AND -MODERATED TIER WAS 134; THE MINIMUM NUMBER IN A DOUBLE TIER WAS ABOUT 165. EXPERIMENTS WITH 8-FT-LONG, OPTIMUMLY SPACED RODS GAVE THE DIAMETER OF AN INFINITELY HIGH, UNREFLECTED CYLINDRICAL ARRAY AS BETWEEN 15 AND 17.5 INCH AND AS APPROXIMATELY 12 INCH FOR A TOTALLY WATER-REFLECTED CYLINDRICAL ARRAY. THE SECOND ALLOY, WHICH WAS STUDIED IN DETAIL EARLIER, CONTAINED 7.6 WT% URANIUM AND WAS MADE INTO CYLINDERS 1.35 INCH IN DIAMETER. THE MINIMUM NUMBER OF 8-INCH-LONG SLUGS WHICH COULD BE MADE CRITICAL IN A SQUARE LATTICE WAS 101, ARRANGED IN TWO TIERS, AND THIS AGREED WITH THE EARLIER RESULTS. THE MINIMUM CRITICAL NUMBER IN A SIMILAR HEXAGONAL LATTICE WAS 100. A DOUBLE TIER OF 1000 CLOSELY PACKED 8-INCH-LONG SLUGS WAS SUBCRITICAL WHEN SUBMERGED IN WATER. THE DIAMETER OF AN INFINITELY LONG, UNREFLECTED CRITICAL CYLINDRICAL ARRAY OF OPTIMUMLY SPACED RODS WAS BETWEEN 15 AND 17.5 INCH; THE DIAMETER OF A WATER-REFLECTED CYLINDRICAL ARRAY WAS ABOUT 12 INCH. IT WAS SHOWN THAT RANDOMLY SPACED SLUGS PRODUCE LESS SOURCE NEUTRON MULTIPLICATION THAN DO LATTICES OF THE SAME OVERALL DENSITY. (AUTH).

1979 ID-NUMBER ID-NUMBER 1979

AUTHOR MC LENDON, J. D. / MORFITT, J. W.
 TITLE CRITICAL MASS TESTS ON ORALLOY MACHINE TURNINGS
 REPORT NUMBER..... Y-A2-71
 DATE PUBLISHED ... 52-02-29
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) FUEL TURNINGS

ABSTRACT

MACHINING OPERATIONS ON ENRICHED URANIUM RESULT IN THE ACCUMULATION OF LARGE AMOUNTS OF MACHINE TURNINGS WHICH MUST BE HANDLED, STORED AND PROCESSED ON A ROUTINE PRODUCTION BASIS. NO EXPERIMENTS OR THEORETICAL DATA HAVE BEEN AVAILABLE AS CRITERIA FOR THE NUCLEAR SAFETY OF THIS MATERIAL. ACCORDINGLY, A BRIEF EXPERIMENTAL PROGRAM WAS UNDERTAKEN AT THE OAK RIDGE CRITICAL MASS LABORATORY, BLDG. 9213, IN ORDER TO BETTER SPECIFY THE CONDITIONS UNDER WHICH MATERIAL OF THIS SORT COULD SUSTAIN A CHAIN REACTION.

THIS REPORT SUMMARIZES THE EXPERIMENTAL RESULTS OBTAINED ON ARRAYS OF ENRICHED URANIUM TURNINGS IN CYLINDRICAL VESSELS. SINCE THE PROBLEM WAS ONE INVOLVING PRODUCTION OPERATIONS, THE PHYSICAL CONDITIONS OF THE EXPERIMENTS WERE SELECTED SO AS TO DUPLICATE ACTUAL PLANT CONDITIONS AS CLOSELY AS POSSIBLE.

1980 ID-NUMBER ID-NUMBER 1980

AUTHOR BAKER, C. P. / DAGHLIAN, H. K. / FRIEDLANDER, G. / HOLLOWAY, M. G. / KERST, D. W. / SCHREIBER, R. E.
 TITLE WATER BOILER
 REPORT NUMBER..... LA-0134
 DATE PUBLISHED ... 44-09-04
 SITE/PROGRAM LOS ALAMOS - WATER BOILERS

ABSTRACT

THE STRUCTURAL FEATURES OF THE URANYL SULPHATE WATER BOILER IN USE AT SITE Y ARE GIVEN IN DETAIL WITH A FULL ACCOUNT OF THE SAFETY FEATURES. RESULTS OF THE CORROSION TESTS ON STAINLESS STEEL OF WHICH THE SPHERE WAS MADE ARE PRESENTED, AND THE FABRICATION OF THE BERYLLIUM OXIDE TAMPOR SURROUNDING THE SPHERE IS DESCRIBED. THE STRUCTURE AND FUNCTION OF THE CONTROL ROD, THE SAFETY ROD, AND THEIR RELATED MECHANICAL SYSTEMS ARE EXPLAINED, AND AN ACCOUNT IS GIVEN OF THE TEMPERATURE- CONTROLLING SYSTEM.

THE ACTIVITY OF THE BOILER WAS MEASURED AS THE MASS OF ACTIVE MATERIAL APPROACHED CRITICALITY; THE RESULTS ARE DISCUSSED IN DETAIL. THE CONTROL ROD WAS CALIBRATED AND THE EFFECT OF TEMPERATURE CHANGE WAS NOTED. MEASUREMENTS WERE ALSO MADE ON THE SUPER-CRITICAL PERIOD. SUBSTITUTING GRAPHITE FOR BERYLLIUM OXIDE AS TAMPOR MATERIAL INCREASED THE CRITICAL AMOUNT; THE INSERTION OF TUBALLOY SLUGS DID NOT IMPROVE THE EFFECTIVENESS OF GRAPHITE TAMPOR GREATLY.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1981 ID-NUMBER ID-NUMBER 1981

AUTHOR BAKER, C. P. / HOLLOWAY, M. G.
 TITLE CRITICAL MASSES OF ENRICHED URANIUM HYDRIDES AND SOME RELATED MEASUREMENTS
 REPORT NUMBER..... LA-0618
 DATE PUBLISHED ... 47-02-03
 SITE/PROGRAM LOS ALAMOS - ENRICHED URANIUM HYDRIDE

ABSTRACT

THE CRITICAL MASSES OF ENRICHED URANIUM-HYDROGEN MIXTURES UNDER VARIOUS CONDITIONS WAS MEASURED, USING TWO ASSEMBLY STRUCTURES EMBODYING SAFETY DEVICES. A TABLE OF CRITICAL MASSES OF URANIUM HYDRIDE IN VARIOUS TAMPERS IS GIVEN. THE NEUTRON DENSITY DISTRIBUTION INSIDE TUNGSTEN CARBIDE AND BERYLLIUM OXIDE TAMPERS WERE MEASURED WITH SEVERAL DETECTORS.

1982 ID-NUMBER ID-NUMBER 1982

AUTHOR KING, L. D. P.
 TITLE CRITICAL ASSEMBLIES, CHAPTER 4, WATER BOILERS
 REPORT NUMBER..... LA-1034
 DATE PUBLISHED ... 47-12-19
 SITE/PROGRAM LOS ALAMOS - WATER BOILERS

ABSTRACT

ESTIMATES FOR THE CRITICAL MASS AND DIMENSIONS OF HOMOGENEOUS MIXTURES OF BOTH PLUTONIUM-239 AND URANIUM-235 IN VARIOUS MODERATING MEDIA WERE REQUIRED EARLY IN 1943. THIS NECESSITY AROSE FROM THE PRODUCTION OF APPRECIABLE AMOUNTS OF ACTIVE MATERIAL IN SOLUTION AT SEPARATION PLANTS. EARLY ESTIMATES OF THESE QUANTITIES WERE MADE BY SEVERAL PEOPLE.

IN AUGUST 1943 IT WAS DECIDED TO BUILD THE SO CALLED "WATER BOILER" AT SITE Y. THE "WATER BOILER" IS A HOMOGENEOUS CHAIN REACTING PILE USING AN ENRICHED URANYL SOLUTION IN WATER. THE PURPOSE OF THIS INSTRUMENT WAS TO GAIN EXPERIENCE IN THE OPERATION AND CONTROL OF A CHAIN REACTING SOURCE AND TO PREPARE PERSONNEL AND EQUIPMENT FOR CRITICAL EXPERIMENTS AS SOON AS KILOGRAMS OF ACTIVE MATERIAL WERE AVAILABLE. THE LACK OF LARGE AMOUNTS OF MATERIAL NECESSITATED THE USE OF A SLOW NEUTRON REACTION, AND THE USE OF THE BEST POSSIBLE TAMPER OR REFLECTOR.

1983 ID-NUMBER ID-NUMBER 1983

AUTHOR HART, F. F.
 TITLE SAFETY TESTS FOR MELTING AND CASTING ORALLOY
 REPORT NUMBER..... LA-1623
 DATE PUBLISHED ... 53-12-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL CYLINDERS

ABSTRACT

THIS REPORT IS A COLLECTION OF DATA WHICH WERE DETERMINED BY SEVERAL SAFETY TESTS TO ASSURE SAFE PROCEDURES DURING THE FABRICATION OF ORALLOY. THESE TESTS INDICATED THAT A 4 INCH ID MELTING CRUCIBLE WHICH HAD BECOME FLOODED FROM THE COOLING COILS OF THE FURNACE WOULD BE CRITICAL WITH ABOUT 23.7 KG OF ORALLOY. A 5 INCH ID CRUCIBLE UNDER SIMILAR CONDITIONS WOULD BE CRITICAL WHEN IT CONTAINED 21.3 KG. A SERIES OF MEASUREMENTS TO SIMULATE MULTIPLE CRUCIBLES IN A MELTING FURNACE INDICATES THAT A FLOODED ARRAY OF FOUR CHARGED CRUCIBLES WITH A SPACING OF 1.6 INCH BETWEEN THE GRAPHITE HEATER JACKETS WOULD HAVE A NEUTRON MULTIPLICATION OF 16.2. IT HAS BEEN SHOWN THAT A 1 INCH THICK ORALLOY PLATE IN INFINITE PARAFFIN TAMPING HAS A CRITICAL MASS OF 58 KG, AND A 1.5 INCH THICK PLATE WITH THE SAME TAMPING HAS A CRITICAL MASS OF 41 KG. ANOTHER TEST SHOWS THAT A FLOODED ORALLOY HEMISPHERE 10 INCH ID WOULD BE CRITICAL WITH A WALL THICKNESS OF 1 INCH AT 60 KG. ALSO GIVEN IN THE LAST SECTION ARE CURVES OF ORALLOY CRITICAL MASS FOR VARIOUS DIAMETER CYLINDERS WITH WATER, PARAFFIN, AND GRAPHITE TAMPING.

1984 ID-NUMBER ID-NUMBER 1984

AUTHOR BRANCH, G. / JONES, H. / RUSH, J. H. / WEINBERG, A. M.
 TITLE WATER LATTICE EXPERIMENTS
 REPORT NUMBER..... CP-2842
 DATE PUBLISHED ... 45-10-26
 SITE/PROGRAM OAK RIDGE - WATER LATTICE EXPERIMENTS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE LAPLACIANS AND MIGRATION AREAS OF WATER-URANIUM ROD LATTICES HAVE BEEN STUDIED BY THE EXPONENTIAL PILE TECHNIQUE. THE BEST MULTIPLICATION (K) OBTAINED AT ROOM TEMPERATURE IN A NO-GAP GEOMETRY WAS 0.993 FOR A VOLUME RATIO OF 1.36 AND A ROD RADIUS OF 1.5 CM. AN ENRICHMENT IN URANIUM-235 TO 0.75% WOULD THEREFORE ALMOST CERTAINLY MAKE AN ORDINARY WATER NO-GAP SYSTEM POTENTIALLY CHAIN REACTING AT ROOM TEMPERATURE. A ONE-CM GAP AROUND THE RODS INCREASED TO K TO 1.003 AND SHIFTED TO OPTIMUM VOLUME RATIO TO 1.56 - THE K OPTIMUM FOR 1.4 - 1.5 CM RODS IS 0.6% HIGHER THAN FOR 1.0 CM RODS - OPPOSITE THAT PREDICTED BY THEORY.

THE REPORT GIVES A DETAILED ACCOUNT WITH DIAGRAMS, PICTURES OF THE EXPERIMENTS, DIMENSIONS OF LATTICES, GRAPHS OF ACTIVITY VS. POSITION, K VS. VOLUME RATIO AT DIFFERENT TEMPERATURES, A SURVEY OF EXPONENTIAL THEORY, PLOTS OF LAPLACIAN VS. WATER TO METAL VOLUME RATIO.

1985 ID-NUMBER ID-NUMBER 1985

AUTHOR SNELL, A. H.
 TITLE CRITICAL EXPERIMENTS OF FLUORINATED AND HYDROGENATED MIXTURES CONTAINING ENRICHED URANIUM
 REPORT NUMBER..... MONP-048
 DATE PUBLISHED ... 46-01-22
 NSA-NUMBER 10:6452
 SITE/PROGRAM OAK RIDGE - URANIUM(24%) - OIL

ABSTRACT

EXPERIMENTS ARE DESCRIBED ON THE CRITICAL SIZES OF ASSEMBLIES OF FLUORINATED, HYDROGENOUS MIXTURES CONTAINING 24% ENRICHED URANIUM. A HYDROGENOUS REFLECTOR WAS USED. THE CRITICAL MASSES OF THE URANIUM AS A FUNCTION OF THE AMOUNT OF HYDROGEN IN THE MIXTURE UNDER THE EXPERIMENTAL CONDITIONS OF DENSITY AND EFFECTIVE MOLECULAR WEIGHT ARE TABULATED. THE EFFECT OF CADMIUM AND BORON SHIELDING BETWEEN THE URANIUM MIXTURE AND THE SURROUNDING REFLECTOR WAS ALSO STUDIED, AND AN EXPERIMENT WAS MADE ON VARYING THE SHAPE FROM A CUBICAL TO AN ELONGATED GEOMETRY. AN ATTEMPT IS MADE TO INTERPRET THE CRITICALITY RESULTS IN TERMS OF PURE URANIUM HEXAFLUORIDE, LEADING TO THE RESULT THAT AT THIS ISOTOPIC CONCENTRATION, AND A DENSITY OF 4.5, ABOUT 36 KG OF URANIUM HEXAFLUORIDE WOULD BE CRITICAL IF LUMPED SURROUNDED CLOSELY BY HYDROGENOUS MATERIAL. (AUTH).

1986 ID-NUMBER ID-NUMBER 1986

AUTHOR MANN, M. M. / MARTIN, A. B.
 TITLE CRITICAL EXPERIMENTS ON A SMALL REACTOR OF ENRICHED URANIUM-235 WITH ALUMINUM-WATER MODERATOR AND DEUTERIUM OXIDE, BERYLLIUM, AND WATER REFLECTORS
 REPORT NUMBER..... MONP-357
 DATE PUBLISHED ... 47-08-18
 NSA-NUMBER 10:3230
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) - ALUMINUM - WATER REACTOR

ABSTRACT

COMPLETE DESCRIPTIONS AND DIAGRAMS ARE GIVEN OF THE EXPERIMENTAL ARRANGEMENTS. RESULTANT CRITICAL MASSES OF URANIUM-235 ARE TABULATED, AND NEUTRON FLUX DISTRIBUTIONS IN THE CRITICAL ASSEMBLY ARE SHOWN. (B.J.H.).

1987 ID-NUMBER ID-NUMBER 1987

AUTHOR GOODWIN, A. / SCHUSKE, C. L. / BIDINGER, G. H.
 TITLE CRITICALITY STUDIES OF ENRICHED URANIUM METAL IN URANYL NITRATE SOLUTIONS
 REPORT NUMBER..... RFP-0182
 DATE PUBLISHED ... 60-01-26
 NSA-NUMBER 14:20783
 SITE/PROGRAM ROCKY FLATS - SOLID UNITS IN FISSILE SOLUTIONS

ABSTRACT

NEUTRON MULTIPLICATION MEASUREMENTS WERE MADE ON 6.5 INCH DIAM CYLINDRICAL ASSEMBLIES OF ENRICHED URANIUM DISCS IMMERSSED IN AQUEOUS SOLUTIONS OF ENRICHED URANYL NITRATE. DIFFUSION CALCULATIONS WERE MADE ON HOMOGENEOUS MIXTURES OF THE ENRICHED URANIUM WITH VARYING HYDROGEN: URANIUM ATOMIC RATIOS. (AUTH).

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1988 ID-NUMBER ID-NUMBER 1988

AUTHOR WOOD, D. E.
 TITLE MATERIAL BUCKLING MEASUREMENTS ON GRAPHITE-URANIUM SYSTEMS AT HANFORD: A SUMMARY TABULATION
 REPORT NUMBER..... HW-69525
 DATE PUBLISHED ... 61-05-00
 NSA-NUMBER 16:9346
 SITE/PROGRAM HANFORD - URANIUM(1%) - GRAPHITE LATTICES

ABSTRACT

MEASUREMENTS OF MATERIAL BUCKLINGS FOR GRAPHITE-URANIUM SYSTEMS ARE SUMMARIZED. A COMPREHENSIVE LISTING AND GUIDE TO THE ORIGINAL DATA SOURCES IS PROVIDED. COMPLETE INFORMATION ON PHYSICAL AND NUCLEAR PROPERTIES OF THE LATTICE AND THE GEOMETRY OF THE EXPONENTIAL ASSEMBLY IS INCLUDED, ALONG WITH SOME OF THE AUXILIARY DATA TAKEN. THE FUEL SIZES VARY FROM 0.925 TO 2.5 INCH IN DIAMETER FOR FIVE DIFFERENT FUEL GEOMETRIES. THE LATTICE SPACINGS VARY FROM 4.1875 TO 15 INCH. OVER 300 MEASUREMENTS OF MATERIAL BUCKLING ARE INCLUDED. (AUTH).

1990 ID-NUMBER ID-NUMBER 1990

AUTHOR KAMAEV, A. V. / DUBOVSKII, B. G. / VAVILOV, V. V. / POPOV, G. A. / PALAMARCHUK, YU. D. / IVANOV, S. P.
 TITLE EXPERIMENTAL INVESTIGATION OF EFFECTS OF INTERACTION OF TWO SUBCRITICAL REACTORS
 REPORT NUMBER..... AEC-TR-4708
 DATE PUBLISHED ... 62-10-09
 NSA-NUMBER 16:2689
 SITE/PROGRAM USSR - INTERACTION EXPERIMENTS

ABSTRACT

CRITICALITY RESULTS ARE GIVEN FOR EXPERIMENTS ON THE INTERACTION OF TWO SUBCRITICAL REACTORS FOR TWO DIFFERENT CONFIGURATIONS. ONE CONFIGURATION (HOMOGENEOUS) WAS TWO CYLINDERS FILLED WITH AN AQUEOUS SOLUTION OF URANYL NITRATE AND SPACED AT DIFFERENT DISTANCES APART. THE OTHER CONFIGURATION (HETEROGENEOUS) WAS A STEEL TANK CONTAINING TWO ALUMINUM GRIDS WITH VARIOUS LOADINGS OF URANIUM BLOCKS AND FILLED WITH WATER. THE INTERACTION AT LARGE DISTANCES IN WATER WAS FOUND TO BE MUCH LESS THAN IN AIR. (D.L.C.).

1991 ID-NUMBER ID-NUMBER 1991

AUTHOR FOX, T. A. / MUELLER, R. A. / FIENO, D.
 TITLE CRITICALITY STUDY OF NASA SOLUTION REACTORS WITH 25.4 CENTIMETER- DIAMETER CYLINDRICAL STAINLESS-STEEL TANKS
 REPORT NUMBER..... NASA-TM-X-2381
 DATE PUBLISHED ... 71-09-00
 SITE/PROGRAM NASA, LEWIS RESEARCH CENTER - URANYL(92%)FLUORIDE - WATER

ABSTRACT

THE NASA ZERO POWER REACTORS I AND II (ZPR-1 AND ZPR-2) HAVE BEEN MODIFIED AND PRESENTLY HAVE 25.4-CENTIMETER-DIAMETER CYLINDRICAL CORE TANKS. THEY ARE FUEL SOLUTION REACTORS USING HIGHLY ENRICHED (93.2 PERCENT URANIUM-235) AQUEOUS URANYL FLUORIDE THAT CAN BE VARIED IN CONCENTRATION. ZPR-1 IS DESIGNED PRIMARILY FOR RADIAL REFLECTOR CRITICALITY STUDIES AND LEAKAGE SPECTRUM MEASUREMENTS FOR THE PURPOSE OF CHECKING CALCULATIONAL MODELS OF VARIOUS REFLECTOR MATERIALS. FOR THIS PURPOSE, ZPR-1 IS CONSTRUCTED WITH A MINIMUM OF SURROUNDING STRUCTURAL OR SCATTERING MATERIAL. ZPR-2 IS A REACTOR THAT IS USED PRIMARILY AS A RADIATION SOURCE FOR THE STUDY OF NEUTRON AND GAMMA ATTENUATION IN SURROUNDING LAYERED SHIELDING MEDIA OR STREAMING THROUGH PENETRATIONS IN PROPOSED SHIELDING CONFIGURATIONS.

THIS REPORT BRIEFLY DESCRIBES THE TWO REACTOR SYSTEMS AND PRESENTS BARE-CORE DATA OBTAINED FROM TESTS USING BOTH REACTORS. THESE DATA INCLUDE CRITICAL MASS, FUNDAMENTAL PROMPT-MODE DECAY CONSTANT, TEMPERATURE COEFFICIENT, AND INCREMENTAL REACTIVITY WORTH AT DELAYED CRITICAL FOR A RANGE OF FUEL CONCENTRATIONS HAVING HYDROGEN TO URANIUM-235 ATOM RATIOS FROM 73.7 TO 280.5. MULTIGROUP TRANSPORT CALCULATIONS WERE MADE FOR THE SAME RANGE OF FUEL CONCENTRATION AND THE RESULTS ARE COMPARED WITH EXPERIMENT.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1992 ID-NUMBER ID-NUMBER 1992

AUTHOR BARDES, R. G. / BROWN, J. R. / DRAKE, M. K. / FISCHER, P. U. / POUND, D. C. / SAMPSON, J. B. / STEWART, H. B.

TITLE HIGH-TEMPERATURE, GAS-COOLED REACTOR CRITICAL EXPERIMENT AND ITS APPLICATION

REPORT NUMBER..... IAEA-AMST.-1963, 3, 035-061

CONFERENCE SYMPOSIUM ON EXPONENTIAL AND CRITICAL EXPERIMENTS HELD BY THE INTERNATIONAL ATOMIC ENERGY AGENCY IN AMSTERDAM, NETHERLANDS, 2-6 SEPTEMBER 1963

DATE PUBLISHED ... 63-09-00

SITE/PROGRAM GENERAL ATOMICS - GRAPHITE CRITICAL ASSEMBLY (HTGR)

ABSTRACT

TWO TYPES OF CRITICAL EXPERIMENTS WERE CONDUCTED IN SUPPORT OF THE 40-MW(E) PEACH BOTTOM HTGR NUCLEAR-DESIGN PROGRAM. THE FIRST WAS THE TEST-LATTICE EXPERIMENT, WHERE DETAILED MEASUREMENTS OF REACTION RATES WERE EXAMINED IN A LATTICE HAVING A COLD NEUTRON SPECTRUM CHARACTERISTIC OF THE HTGR. THIS PROGRAM PROVIDED A METHOD FOR CHECKING THE RESONANCE INTEGRAL OF THORIUM, THE DOPPLER COEFFICIENT OF THORIUM, THE DETAILED FLUX DISTRIBUTION IN THE LATTICE, AND CONTROL-ROD EFFECTIVENESS WITHIN A CELL. THE SECOND EXPERIMENT WAS DESIGNED AS A GROSS TEST OF THE CALCULATIONAL PROCEDURES AND DATA. A SMALL CRITICAL EXPERIMENT HAVING A CLEAN GEOMETRY AND A COMPOSITION SIMILAR TO THAT OF THE HTGR WAS CONSTRUCTED. THIS ASSEMBLY HAD APPROXIMATELY ONE-SIXTH THE VOLUME OF THE HTGR CORE AND WAS SURROUNDED ON ALL SIDES BY A 2-FT GRAPHITE REFLECTOR. OWING TO THE SMALL CORE SIZE AND THE LARGE REFLECTOR AREA, THIS EXPERIMENT PROVIDED A SEVERE TEST OF THE CALCULATIONAL METHODS. EXPERIMENTS WITH THIS FACILITY ENCOMPASSED REACTIVITY-COEFFICIENT MEASUREMENTS, NEUTRON-FLUX DISTRIBUTIONS, EFFECTIVENESS OF GROUPS OF CONTROL RODS, AND A MEASUREMENT OF THE OVERALL TEMPERATURE COEFFICIENT. (N.W.R.).

1993 ID-NUMBER ID-NUMBER 1993

AUTHOR KAPLAN, I. / LANNING, D. D. / PROFIO, A. E. / THOMPSON, T. J.

TITLE MASSACHUSETTS INSTITUTE OF TECHNOLOGY EXPONENTIAL STUDIES OF LOW-ENRICHMENT, HEAVY-WATER LATTICES

REPORT NUMBER..... IAEA-AMST.-1963, 2, 109-146

CONFERENCE SYMPOSIUM ON EXPONENTIAL AND CRITICAL EXPERIMENTS HELD BY THE INTERNATIONAL ATOMIC ENERGY AGENCY IN AMSTERDAM, NETHERLANDS, 2-6 SEPTEMBER 1963

DATE PUBLISHED ... 63-09-00

SITE/PROGRAM MASSACHUSETTS INSTITUTE OF TECHNOLOGY - HEAVY WATER LATTICE PROJECT

ABSTRACT

AN EXPERIMENTAL AND THEORETICAL RESEARCH PROGRAMME ON EXPONENTIAL LATTICES OF NORMAL AND PARTIALLY ENRICHED URANIUM RODS MODERATED BY HEAVY WATER HAS BEEN CARRIED ON AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT) SINCE 1959. THE CHOICE OF EXPONENTIAL RATHER THAN CRITICAL EXPERIMENTS WAS MADE ON THE BASIS OF SIMPLICITY, SAFETY, LOWER COST OF FUEL, AND THE AVAILABILITY OF A HIGH NEUTRON FLUX FROM THE RESEARCH REACTOR.

THE USE OF THE MIT RESEARCH REACTOR AS THE NEUTRON SOURCE MADE IT NECESSARY TO DEVELOP A SPECIAL TECHNIQUE FOR SUPPLYING NEUTRONS FROM THE HORIZONTAL THERMAL COLUMN OF THE REACTOR TO THE EXPONENTIAL TANK WHICH HAS A VERTICAL AXIS. THE TECHNIQUE, WHICH HAS PROVEN SUCCESSFUL, IS BASED ON THE USE OF A CAVITY, OR "HOHLRAUM" ANALOGOUS TO THAT CONSIDERED IN DISCUSSING BLACK-BODY RADIATION. THE LOW ABSORPTION AND HIGH ALBEDO OF THE GRAPHITE MAKE IT POSSIBLE TO CHANGE THE DIRECTION AND LOCAL INTENSITY OF THE MAIN NEUTRON CURRENT, VARY THE CROSS-SECTIONAL AREA BEING SUPPLIED WITH NEUTRONS, AND INCREASE THE FLUX OVER THAT OBTAINED WHEN THE CAVITY IS FILLED WITH GRAPHITE. THE NEUTRON FLUX REDUCTION FROM THE END OF THE THERMAL COLUMN TO THE EXPONENTIAL TANK IS ONLY A FACTOR OF THREE.

SEVERAL VOLUME RATIOS CAN BE INVESTIGATED. MEASUREMENTS OF BUCKLING, RESONANCE CAPTURE, CONVERSION RATIO, AND FAST FISSION ARE MADE, AS WELL AS INTRACELL THERMAL FLUX DISTRIBUTIONS WITH SPECTRUM-SENSITIVE DETECTORS. THE EXPERIMENTS HAVE SHOWN WHERE IMPROVEMENTS IN CALCULATIONS ARE NECESSARY, E. G. IN TREATMENT OF THE CELL BOUNDARY IN THE THERMAL FLUX SPACE-ENERGY DISTRIBUTION.

MOST MEASUREMENTS ARE MADE BY FOIL ACTIVATION. A NUMBER OF TECHNIQUES HAVE BEEN DEVELOPED INCLUDING A COINCIDENCE COUNTING METHOD FOR THE MEASUREMENT OF NEPTUNIUM-239 ACTIVITY IN RESONANCE CAPTURE EXPERIMENTS, LANTHANUM-140 FISSION PRODUCT COUNTING FOR FAST FISSION EXPERIMENTS, AND THERMAL FLUX PLOTS USING FOILS OF GOLD, LUTETIUM, AND EUROPIUM. RESULTS, INCLUDING BUCKLINGS, ARE AVAILABLE SO FAR FOR 2.5-CM NORMAL URANIUM METAL AND 0.65-CM 1.027% ENRICHED METAL.

PRELIMINARY WORK IS IN PROGRESS ON LATTICES WITH CONTROL RODS, MINIATURE LATTICES, TWO-REGION LATTICES, AND HEAVY WATER-WATER MODERATING MIXTURES. PULSED NEUTRON SOURCE MEASUREMENTS OF REACTIVITY AND TIME-OF-FLIGHT MEASUREMENTS OF THE MODERATOR SPECTRUM ARE PLANNED.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1994 ID-NUMBER ID-NUMBER 1994

AUTHOR COELHOORN, J. / ACKERS, J. G. / BUSTRAAN, M. / TAS, A. / ZIJP, W. L. /
NUYSKEN, M. / NIJS, W. W. / HEYBOER, R. J. / LUIDINGA, F.

TITLE THE CRITICAL FACILITY KRITO

REPORT NUMBER..... IAEA-AMST.-1963, 2, 233-256
CONFERENCE SYMPOSIUM ON EXPONENTIAL AND CRITICAL EXPERIMENTS HELD BY THE
INTERNATIONAL ATOMIC ENERGY AGENCY IN AMSTERDAM, NETHERLANDS, 2-6
SEPTEMBER 1963

DATE PUBLISHED ... 63-09-00

SITE/PROGRAM NETHERLANDS - KRITO FACILITY (LOW ENRICHED - WATER)

ABSTRACT

THE ZERO POWER REACTOR KRITO IS INTENDED FOR CRITICAL EXPERIMENTS ON LIGHT-WATER MODERATED POWER REACTORS USING FUEL WITH LOW ENRICHMENT. THE REACTOR WAS DESIGNED BY REACTOR CENTRUM NEDERLAND AND IS ALSO OPERATED BY RCN STAFF.

THE FIRST EXPERIMENTAL PROGRAMME IS PART OF A JOINT UNDERTAKING OF RCN AND EURATOM FOR THE DEVELOPMENT OF A NUCLEAR REACTOR FOR SHIP PROPULSION, KNOWN AS THE NERO-PROJECT. THUS THE PRIMARY OBJECTIVE IS THE MEASUREMENT OF REACTOR PHYSICS PARAMETERS OF THE DESIGNED NERO-CORE.

THIS DESIGN FORESEES A TWO-ZONE CORE OF URANIUM DIOXIDE FUEL CANNED IN ZIRCALOY AND 12 UNIFORMLY DISTRIBUTED CONTROL RODS OF A CADMIUM-SILVER-INDIUM ALLOY, WITH ENRICHMENTS OF 3.1 AND 3.8%

HOWEVER, FOR REASONS OF ECONOMY, IN KRITO USE IS MADE OF ALUMINUM AS CANNING MATERIAL AND BORON CARBIDE AS POISON MATERIAL AND THE EXPERIMENTS WILL BE DONE WITH A CONSTANT MODERATOR-TO-FUEL RATIO.

A SHORT DESCRIPTION OF THE FACILITY AND EXPERIMENTAL PROGRAMME IS GIVEN.

FIRST CRITICALITY WAS ATTAINED ON 29 MARCH 1963. THE RESULTS OBTAINED UNTIL SEPTEMBER 1963 ARE SUMMARIZED.

1995 ID-NUMBER ID-NUMBER 1995

AUTHOR BACH, D. R. / BISTLINE, J. A. / BUNCH, S. I. / CERBONE, R. J. / FEINER, F.
/ SKOLNIK W. / WEINSTEIN, S.

TITLE COMPARISON OF KNOLLS ATOMIC POWER LABORATORY CLEAN CRITICAL AND
SUBCRITICAL EXPERIMENTS WITH CALCULATIONS

REPORT NUMBER..... IAEA-AMST.-1963, 2, 391-445
CONFERENCE SYMPOSIUM ON EXPONENTIAL AND CRITICAL EXPERIMENTS HELD BY THE
INTERNATIONAL ATOMIC ENERGY AGENCY IN AMSTERDAM, NETHERLANDS, 2-6
SEPTEMBER 1963

DATE PUBLISHED ... 63-09-00

SITE/PROGRAM GENERAL ELECTRIC CO., KNOLLS ATOMIC POWER LABORATORY - SOLID HOMOGENEOUS
ASSEMBLY (SHA) ; GENERAL ELECTRIC CO., KNOLLS ATOMIC POWER LABORATORY -
PRESSURIZED TEST REACTOR (PTR)

ABSTRACT

AT THE KNOLLS ATOMIC POWER LABORATORY AN INTENSIVE PROGRAMME OF EXPERIMENTATION AND RELATED CALCULATIONS HAS BEEN UNDERWAY TO ASSESS THE ADEQUACY OF COMPUTATIONAL METHODS AND NUCLEAR DATA FOR HYDROGENOUS SYSTEMS. THE PROGRAMME HAS THREE GENERAL ASPECTS: (1) CLEAN CRITICAL EXPERIMENTS WITH SOLID HOMOGENEOUS FUEL HAVING A HIGH METAL-TO-HYDROGEN VOLUME RATIO; (2) CLEAN, PLATE-FUEL CRITICAL EXPERIMENTS COVERING A LARGE RANGE OF CORE DIMENSION, METAL-TO-WATER RATIO, FUEL DENSITY AND TEMPERATURE; (3) PROMPT-NEUTRON DECAY CONSTANT AND STEADY-STATE SPECTRUM MEASUREMENTS ON SUBCRITICAL SYSTEMS IN THE SAME RANGE OF COMPOSITION.

THE FUEL ELEMENTS FOR THE SOLID HOMOGENEOUS EXPERIMENTS ARE PRESSED COMPACTS OF ZIRCONIUM OXIDE AND HIGHLY ENRICHED URANIUM DIOXIDE POWDERS UNIFORMLY MIXED WITH PARAFFIN. REFLECTOR BLOCKS WITH THE SAME ZIRCONIUM OXIDE-TO-PARAFFIN RATIO AS THE FUEL BLOCKS ALLOW REFLECTED CORES TO BE CONSTRUCTED HAVING UNIFORM SLOWING DOWN CHARACTERISTICS. THE MECHANICS OF THE CRITICAL ASSEMBLY ARE SUCH THAT CRITICAL CONFIGURATIONS ARE SIMPLE RECTANGULAR PARALLELEPIPEDS WITH NO CHANNELS FOR SAFETY OR CONTROL RODS.

CRITICAL SIZE STUDIES OF FAST-LEAKAGE DOMINATED SYSTEMS (BARE AND REFLECTED) HAVE BEEN PERFORMED AND COMPARISONS MADE WITH STANDARD TWO- AND THREE-DIMENSIONAL, FEW-GROUP COMPUTER PROGRAMMES. IN GENERAL THE CALCULATED CRITICALITY CONSTANTS USING THE MOST RECENT NUCLEAR DATA ARE ABOUT 3% HIGH.

THE PLATE EXPERIMENTS DESCRIBED COVERED THE RANGE FROM ROOM TEMPERATURE TO 560 DEGREES F AND 1200 PSI. TO ELIMINATE THE COMPLICATION OF CONTROL-ROD EFFECTS A DETERMINATION OF THE TEMPERATURE AT WHICH THE CORE WAS CRITICAL WAS MADE WITH THE CONTROL RODS ALMOST COMPLETELY WITHDRAWN. WITH THE CURRENTLY AVAILABLE CROSS-SECTION INFORMATION THE CALCULATED CRITICALITY IS CONSISTENTLY HIGH BY ABOUT 2% OVER THE WHOLE RANGE OF EXPERIMENTS.

CALCULATIONS OF THE DECAY CONSTANTS MADE BY THE 1/V POISON REMOVAL TECHNIQUE USING STANDARD FEW-GROUP DIFFUSION CODES EMPLOYING GROUP-DEPENDENT BOUNDARY CONDITIONS SHOW AGREEMENT TO WITHIN A FEW PER CENT OF THE MEASURED DECAY CONSTANTS IN THE RANGE FROM 100 TO 45000 PER SECOND.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

COMPARISON OF THE SLOW CHOPPER SPECTRUM MEASUREMENTS WITH CALCULATED SPECTRA USING THE MOST RECENT BOUND-HYDROGEN KERNELS FOR BOTH WATER AND POLYETHYLENE SHOW GOOD AGREEMENT EXCEPT FOR HIGHLY ABSORBING WATER SYSTEMS. IN THE LATTER CASE, THE MEASURED SPECTRA ARE APPARENTLY EVEN SOFTER THAN THE FREE ATOM CALCULATED SPECTRA.

1996 ID-NUMBER ID-NUMBER 1996

AUTHOR MANSFIELD, W. K. / KIM, J. M.
 TITLE EXPONENTIAL EXPERIMENTS WITH WATER AND NATURAL URANIUM
 REPORT NUMBER..... IAEA-AMST.-1963, 1, 457-467
 CONFERENCE SYMPOSIUM ON EXPONENTIAL AND CRITICAL EXPERIMENTS HELD BY THE
 INTERNATIONAL ATOMIC ENERGY AGENCY IN AMSTERDAM, NETHERLANDS, 2-6
 SEPTEMBER 1963
 DATE PUBLISHED ... 63-09-00
 SITE/PROGRAM UNITED KINGDOM, UNIVERSITY OF LONDON - NATURAL URANIUM LATTICES

ABSTRACT

A REPORT IS GIVEN OF A SERIES OF EXPONENTIAL EXPERIMENTS PERFORMED ON THE QUEEN MARY COLLEGE SUBCRITICAL ASSEMBLY. THIS ASSEMBLY CONSISTS OF A 4.5 FT ALUMINUM CORE TANK IN WHICH UP TO 4 TONS OF ALUMINUM-CLAD NATURAL URANIUM IN THE FORM OF 1.2 IN DIAM BARS, 43.25 IN LONG, ARE SUPPORTED VERTICALLY BY A SERIES OF LATTICE PLATES. INITIALLY A 10-C PO-BE NEUTRON SOURCE (2.5E10 N/S) WAS USED TO PROVIDE THE NEUTRON FLUX BUT LATER MEASUREMENTS WERE MADE USING A SAMES, 150 KV NEUTRON GENERATOR.

BUCKLING MEASUREMENTS WERE MADE FOR MODERATOR-FUEL RATIOS OF 1.73, 2.48, AND 3.18 USING INDIUM FOILS, BF3 COUNTERS AND URANIUM-235 FISSION CHAMBERS AS DETECTORS. MIGRATION AREAS WERE DETERMINED FOR THE SAME RATIOS OF MODERATOR-TO-FUEL BY MEANS OF THE BORON POISONING TECHNIQUE.

THE NOVEL FEATURES OF THE RESULTS WERE THE APPARENT VARIATION OF THE MATERIAL BUCKLING (A) WITH FUEL LOADING AND (B) WITH THE TYPE OF DETECTOR EMPLOYED. THE REASONS FOR THESE VARIATIONS ARE DISCUSSED AND THEIR GENERAL SIGNIFICANCE TO EXPONENTIAL EXPERIMENTS IN HYDROGENOUS MEDIA DEVELOPED THEORETICALLY.

1997 ID-NUMBER ID-NUMBER 1997

AUTHOR GIBSON, I. H. / WALKER, J.
 TITLE PULSED SOURCE MEASUREMENTS ON A URANIUM-WATER SUBCRITICAL ASSEMBLY
 REPORT NUMBER..... IAEA-AMST.-1963, 1, 469-479
 CONFERENCE SYMPOSIUM ON EXPONENTIAL AND CRITICAL EXPERIMENTS HELD BY THE
 INTERNATIONAL ATOMIC ENERGY AGENCY IN AMSTERDAM, NETHERLANDS, 2-6
 SEPTEMBER 1963
 DATE PUBLISHED ... 64-00-00
 SITE/PROGRAM UNITED KINGDOM, UNIVERSITY OF BIRMINGHAM - NATURAL URANIUM - WATER

ABSTRACT

AN UNREFLECTED ASSEMBLY OF NATURAL URANIUM AND LIGHT WATER HAS BEEN USED IN CONJUNCTION WITH A PULSED SOURCE OF NEUTRONS FOR DECAY-TIME MEASUREMENTS AT DIFFERENT BUCKLINGS. FOUR DIFFERENT LATTICE PITCHES OVER THE RANGE 3.94 CM TO 5.08 CM WERE OBTAINED BY USING DIFFERENT PAIRS OF ACCURATELY MACHINED LATTICE PLATES AND IN EACH CASE THE URANIUM WAS IN THE FORM OF BARS 109.8 CM LONG AND 3.0 CM DIAMETER. THE FUEL WAS MOUNTED HORIZONTALLY AND LOADINGS UP TO APPROXIMATELY 6 TONS WERE INVOLVED. SPATIAL HARMONICS WERE ELIMINATED OR SELECTED BY APPROPRIATE PLACING OF A SMALL SCINTILLATION DETECTOR. EXPERIMENTAL RESULTS SHOWING THE DEPENDENCE OF DECAY CONSTANT ON BUCKLING ARE PRESENTED AND COMPARED WITH THEORETICAL VALUES.

1998 ID-NUMBER ID-NUMBER 1998

AUTHOR TRIPLETT, J. R. / SCHMID, L. C. / PETERSON, R. E. / DUNN, R. E. / REGIMBAL, J. J.
 TITLE PLUTONIUM RECYCLE REACTOR CRITICAL TESTS
 REPORT NUMBER..... TANSAO, 04, 115-116
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-06-00
 SITE/PROGRAM HANFORD - PLUTONIUM RECYCLE TEST REACTOR

ABSTRACT

THE PRTR ACHIEVED CRITICALITY ON NOVEMBER 21, 1960. SINCE THAT DATE A CONSIDERABLE AMOUNT OF ZERO-POWER TESTING HAS BEEN PERFORMED. THE FOLLOWING RESULTS ARE AMONG THOSE OF PARTICULAR INTEREST IN THE HEAVY WATER REACTOR FIELD; A COMPLETE DESCRIPTION OF ALL TESTS IS ALSO AVAILABLE.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

1999 ID-NUMBER ID-NUMBER 1999

AUTHOR HURLEY, T. J. / O'NEILL, G. F.
 TITLE MEASURED NUCLEAR PARAMETERS FOR NATURAL URANIUM ROD LATTICES IN HEAVY WATER
 REPORT NUMBER..... TANSO, 04, 295-296
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-11-00
 SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES
 IN HEAVY WATER

ABSTRACT

FULL SETS OF NUCLEAR LATTICE CONSTANTS WERE MEASURED FOR VARIOUS SYSTEMS OF NATURAL URANIUM RODS IN HEAVY WATER OVER A WIDE RANGE OF ROD CLUSTER SIZES AND SPACINGS. THE FUEL RODS WERE 1 INCH IN DIAM AND CLAD WITH 0.032 INCH OF ALUMINUM. CLUSTER SIZES INCLUDED 1, 3, 7, AND 19 ROD BUNDLES. LATTICE SPACINGS RANGED FROM 7.00 TO 21.00 INCH. BUCKLING VALUES HAVE BEEN PREVIOUSLY REPORTED FOR THESE LATTICES.

2000 ID-NUMBER ID-NUMBER 2000

AUTHOR WINGFIELD, E. C. / HENNELLY, E. J.
 TITLE COMPARISON OF EXPONENTIAL AND CRITICAL BUCKLINGS FOR NATURAL URANIUM RODS
 IN HEAVY WATER
 REPORT NUMBER..... TANSO, 04, 296-298
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-11-00
 SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES
 IN HEAVY WATER

ABSTRACT

A PREVIOUS STUDY INDICATED THE POSSIBILITY OF DIFFERENCES BETWEEN BUCKLINGS MEASURED FOR HEAVY-WATER/URANIUM LATTICES IN CRITICAL ASSEMBLIES AND THOSE MEASURED IN EXPONENTIALS. THE CRITICAL BUCKLINGS OBTAINED FROM ZEEP, AT CHALK RIVER, WERE APPROXIMATELY 30 MICRO B (1 MICRO B = 1.0×10^{-6} PER CM²) LOWER THAN THE EXPONENTIAL BUCKLINGS OBTAINED WITH THE SAME LATTICE AT NORTH AMERICAN AVIATION (NAA). SUFFICIENT DATA HAVE NOT BEEN AVAILABLE TO ASCERTAIN IF SIMILAR DIFFERENCES CAN BE GENERALLY EXPECTED BETWEEN EXPONENTIAL AND CRITICAL BUCKLING MEASUREMENTS.

AS PART OF AN EXTENSIVE EXPONENTIAL-CRITICAL INTERCOMPARISON, BUCKLING MEASUREMENTS IN 42 LATTICES OF 1 INCH NATURAL URANIUM METAL RODS IN HEAVY-WATER HAVE BEEN MADE IN AN EXPONENTIAL FACILITY, THE SUBCRITICAL EXPERIMENT (SE), AT TWO MODERATOR PURITIES.

A SYSTEMATIC COMPARISON WAS MADE BETWEEN THESE EXPONENTIAL BUCKLINGS AND HIGHLY PRECISE BUCKLINGS THAT WERE MEASURED IN A LARGE CRITICAL FACILITY, THE PROCESS DEVELOPMENT PILE (PDP). FUEL USED IN THESE WAS A PORTION OF WHAT HAD BEEN USED IN THE PDP. A SYSTEMATIC TREND IN THE DIFFERENCES BETWEEN THE SE AND PDP BUCKLINGS IS SHOWN.

2001 ID-NUMBER ID-NUMBER 2001

AUTHOR KLANN, P. G. / DECHAND, C. O. / FEIN, E. / WRIGHT, W. B.
 TITLE CRITICAL EXPERIMENTS WITH LOW ENRICHED DOUBLE ANNULAR SUPERHEATER FUEL
 ELEMENTS IN LIGHT WATER AND THEIR ANALYSIS
 REPORT NUMBER..... TANSO, 04, 298-299
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-11-00
 SITE/PROGRAM COMBUSTION ENGINEERING - LOW ENRICHED FUEL ELEMENTS IN WATER

ABSTRACT

CRITICALITY AND POWER DISTRIBUTION MEASUREMENTS WERE MADE WITH CLEAN UNIFORM HEXAGONAL ARRAYS OF THESE ELEMENTS WITH THE INTERIOR COOLANT ANNULI BOTH VOIDED AND FLOODED FOR THE PURPOSE OF CHECKING ANALYSIS METHODS. DOUBLE ANNULAR FUEL ELEMENTS ARE OF INTEREST IN THE DESIGN OF INTEGRAL NUCLEAR SUPERHEAT REACTORS. THE DOUBLE ANNULAR GEOMETRY OF THE ELEMENTS REQUIRED EXTENSION OF PRESENT METHODS FOR CALCULATING RESONANCE ESCAPE PROBABILITY AND REQUIRED APPLICATION OF EXISTING METHOD FOR CALCULATING THERMAL DISADVANTAGE FACTOR TO MORE COMPLEX GEOMETRIES. LATTICE PITCHES OF 1.875 AND 2.092 INCHES WERE INVESTIGATED, WHICH CORRESPOND WITH THE ANNULI VOIDED, TO WATER TO OXIDE VOLUME RATIOS OF 1.085 AND 1.718, RESPECTIVELY. THE CORES WERE HEXAGONAL CYLINDERS, MODERATED AND REFLECTED WITH LIGHT WATER. CRITICALITY WAS OBTAINED BY ADJUSTING WATER HEIGHT. POWER DISTRIBUTIONS WERE MEASURED BY ACTIVATING THE FUEL ELEMENTS AND COUNTING THE FISSION PRODUCT ACTIVITY.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2002 ID-NUMBER ID-NUMBER 2002

AUTHOR MILEY, G. H. / GILLESPIE, R. D. / POLLARD, J. W. / BISTLINE, J. A.
 TITLE DESCRIPTION AND ANALYSIS OF SOME "OVER-MODERATED" CRITICAL EXPERIMENTS
 FROM 68-550 DEGREES FARENHEIT
 REPORT NUMBER..... TANSO, 04, 299-300
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-11-00
 SITE/PROGRAM GENERAL ELECTRIC CO., KNOLLS ATOMIC POWER LABORATORY - PRESSURIZED TEST
 REACTOR (PTR)

ABSTRACT

RECENT OVER-MODERATED LIGHT WATER-ZIRCALOY-URANIUM-235 CRITICAL EXPERIMENTS PERFORMED IN THE PRESSURIZED TEST REACTOR AT KAPL AFFORDED AN UNUSUAL CHECK OF ANALYTICAL TECHNIQUES, SINCE IN SOME CASES TWO CLEAN CRITICAL (ROD-FREE) TEMPERATURES WERE OBTAINED FOR A SINGLE CORE.

EXPERIMENTAL REACTIVITY RESULTS ARE SUMMARIZED AS ARE THE CORE SPECIFICATIONS. ALL OF THE CORES WERE RECTANGULAR PARALLELEPIPEDS, DIVIDED INTO FOUR EQUAL QUADRANTS BY TWO MUTUALLY PERPENDICULAR "CROSS WATER GAPS" (ROD CHANNELS) AND WERE CHARACTERIZED BY EXTREME HETEROGENEITY, FUEL PLATE SPACING BEING ABOUT 1 INCH.

2003 ID-NUMBER ID-NUMBER 2003

AUTHOR MILEY, G. H. / MILLER, B. / HOLMES, J. H.
 TITLE DESCRIPTION AND ANALYSIS OF SOME SEMI-DISTRIBUTED BORON CORES
 REPORT NUMBER..... TANSO, 04, 300-301
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-11-00
 SITE/PROGRAM GENERAL ELECTRIC CO., KNOLLS ATOMIC POWER LABORATORY - PRESSURIZED TEST
 REACTOR (PTR)

ABSTRACT

RECENT CRITICAL EXPERIMENTS IN THE PRESSURIZED TEST REACTOR AT KAPL ARE UNIQUELY CHARACTERIZED BY "SEMI-DISTRIBUTED" POISON (BORON-STEEL PLATES ADJACENT TO EVERY SECOND OR THIRD FUEL PLATE). THE VERY COMPLEX POWER DISTRIBUTION PERTURBATIONS THUS PRODUCED HAVE BEEN ANALYZED WITH GOOD ACCURACY BY MEANS OF TWO DIFFERENT TECHNIQUES THAT ARE MODIFICATIONS OF CONVENTIONAL ANALYTIC METHODS. REACTIVITY AND TEMPERATURE COEFFICIENT RESULTS BASED ON THESE TECHNIQUES ALSO SHOW FAIR AGREEMENT WITH EXPERIMENT, BUT SOME DISCREPANCIES ARE NOTED.

ASSEMBLIES WERE RECTANGULAR AND MEASURED 24 X 24 X 30 INCH. ALL WERE LIGHT WATER MODERATED AND REFLECTED, WITH ENRICHED URANIUM-ZIRCALOY CONSTRUCTION AND A METAL TO WATER RATIO OF 0.5. FUEL PLATES WERE UNIFORMLY DISTRIBUTED WITH ABOUT 0.33 INCH SPACING AND WITH A TOTAL LOADING OF 15.48 KG URANIUM-235 AND 40.6 BORON-10. CORE 225 WAS CLOSE-PACKED, BUT CORE 225B WAS DIVIDED INTO FOUR EQUAL QUADRANTS BY THE INTRODUCTION OF 1 INCH MUTUALLY PERPENDICULAR WATER GAPS.

2004 ID-NUMBER ID-NUMBER 2004

AUTHOR MIHALCZO, J. T. / KINNEY, W. E.
 TITLE EXPERIMENTS AND CALCULATIONS ON UNMODERATED URANIUM-MOLYBDENUM ALLOY
 CRITICAL ASSEMBLIES
 REPORT NUMBER..... TANSO, 04, 302-303
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-11-00
 SITE/PROGRAM OAK RIDGE - ORNL FAST BURST REACTOR (FBR) - HEALTH PHYSICS RESEARCH
 REACTOR (HPRR)

ABSTRACT

CRITICAL DIMENSIONS, FISSION RATE DISTRIBUTIONS, AND VOID COEFFICIENTS OF REACTIVITY OF THREE UNMODERATED, UNREFLECTED ASSEMBLIES OF A 10 W/O MOLYBDENUM-90 W/O URANIUM (93.2 W/O URANIUM-235) ALLOY HAVE BEEN MEASURED TO SUPPORT THE DESIGN OF AN UNMODERATED AND UNREFLECTED RESEARCH REACTOR CAPABLE OF PRODUCING 50 MICROSEC BURSTS OF ABOUT 1.0×10^{17} FISSIONS. THE CRITICAL DIMENSIONS OF NINE ASSEMBLIES WITH PLEXIGLAS AND 0.025-CM THICK CADMIUM SHEET AS REFLECTORS WERE DETERMINED. MULTIGROUP TRANSPORT THEORY CALCULATIONS WERE MADE TO PREDICT CRITICAL DIMENSIONS OF THE UNREFLECTED ASSEMBLIES; VOID COEFFICIENTS OF REACTIVITY WERE COMPUTED BY ONE-GROUP AND MULTIGROUP TRANSPORT THEORY AND BY PERTURBATION THEORY.

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2005 ID-NUMBER ID-NUMBER 2005

AUTHOR SRIKANTIAH, G.
 TITLE ANALYSIS OF A BERYLLIUM MODERATED CRITICAL EXPERIMENT
 REPORT NUMBER..... TANSO, 04, 303-304
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-11-00
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) - BERYLLIUM - CALCULATIONS

ABSTRACT

USING THE RECENTLY AVAILABLE DATA ON BERYLLIUM CROSS-SECTIONS, A STUDY WAS MADE OF THE BERYLLIUM MODERATED CRITICAL EXPERIMENT: CA-18 OF THE OAK RIDGE NATIONAL LABORATORY. PREVIOUS NUCLEAR DATA WERE INADEQUATE FOR ACCURATE CALCULATION OF CRITICALITY. IN VIEW OF THE RECENT IMPROVEMENT IN CROSS-SECTION DATA FOR BOTH BERYLLIUM AND URANIUM-235, THE ESTIMATED VALUE OF EFFECTIVE MULTIPLICATION FACTOR IS 1.015 WHICH EXCEEDS THE MEASURED VALUE OF 1.002 BY ABOUT 1 PERCENT. TAKEN INTO ACCOUNT IN THE ESTIMATION OF THIS VALUE WERE THE EFFECT OF ANISOTROPIC SCATTERING, THE FAST EFFECT IN BERYLLIUM, THE SELF-SHIELDING EFFECT, AND THE EFFECT OF REFLECTION DUE TO THE ASSEMBLY STRUCTURE.

2006 ID-NUMBER ID-NUMBER 2006

AUTHOR POWELL, R. R. / WILLIAMS, P. M.
 TITLE PRESSURE TUBE REACTOR CRITICAL EXPERIMENT
 REPORT NUMBER..... TANSO, 04, 304-305
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-11-00
 SITE/PROGRAM AMF - PRESSURE TUBE REACTOR

ABSTRACT

AS PART OF A DEVELOPMENT PROGRAM FOR A VERY HIGH POWER POOL REACTOR, KNOWN AS THE PRESSURE TUBE REACTOR, A CRITICAL EXPERIMENT WAS PERFORMED BY INSTALLING A TEMPORARY CORE STRUCTURE IN THE POOL REACTOR FACILITY OF INDUSTRIAL REACTOR LABORATORIES, INC., PLAINSBORO, NEW JERSEY, OF WHICH AMF IS A PART-OWNER. THE PTR IS LIGHT WATER MODERATED AND FUELED WITH AN ALUMINUM CLAD URANIUM- ALUMINUM ALLOY. THE VOLUME COMPOSITION OF THE CORE IS SIMILAR TO THAT OF A TYPICAL POOL REACTOR AS SHOWN.

2007 ID-NUMBER ID-NUMBER 2007

AUTHOR SNIDOW, N. L. / CLARK, R. H. / BARKSDALE, C. E. / LEWIS, R. H. / ENGELDER, T. C.
 TITLE CRITICAL EXPERIMENTS ON 4% ENRICHED URANIUM DIOXIDE LATTICES MODERATED BY HEAVY-WATER - WATER MIXTURES
 REPORT NUMBER..... TANSO, 04, 305
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-11-00
 SITE/PROGRAM BABCOCK AND WILCOX CO. - URANIUM(4%)DIOXIDE - WATER - HEAVY WATER

ABSTRACT

A SERIES OF THERMAL AND EPITHERMAL CRITICAL EXPERIMENTS WAS PERFORMED TO DEMONSTRATE THE REACTIVITY HOLD-DOWN OF HEAVY WATER IN CONVENTIONAL LIGHT WATER LATTICES AND STUDY THE NUCLEAR PROPERTIES OF LATTICES MODERATED BY HEAVY WATER-WATER MIXTURES. THE FUEL RODS CONSISTED OF 4%- ENRICHED URANIUM DIOXIDE SWAGED IN STAINLESS STEEL, 0.444 INCH ID, 0.475 INCH OD AND 66.7 INCH ACTIVE LENGTH. EACH ROD CONTAINED 56.61 GMS URANIUM-235. THE ROD TO MODERATOR VOLUME RATIO IN THE LATTICE WAS 1.0 IN ALL CASES. THE EXPERIMENTS WERE PERFORMED IN A 60-INCH DIAM ALUMINUM TANK SO THAT A FINITE RADIAL REFLECTOR EXISTED.

2008 ID-NUMBER ID-NUMBER 2008

AUTHOR WITTKOPF, W. A. / ROACH, K. E.
 TITLE NUCLEAR ANALYSIS OF 4% ENRICHED URANIUM DIOXIDE LATTICES MODERATED BY HEAVY-WATER - WATER MIXTURES
 REPORT NUMBER..... TANSO, 04, 305-306
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-11-00
 SITE/PROGRAM BABCOCK AND WILCOX CO. - URANIUM(4%)DIOXIDE - WATER - HEAVY WATER

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

NUCLEAR PARAMETERS OF 4%-ENRICHED URANIUM DIOXIDE LATTICES MODERATED BY HEAVY WATER-WATER MIXTURES WERE CALCULATED AND THESE RESULTS WERE COMPARED WITH EXPERIMENTAL MEASUREMENTS. THE CRITICAL ASSEMBLIES USED WERE CLEAN, UNIFORM LATTICES OF APPROXIMATE CYLINDRICAL GEOMETRY. PHYSICAL PROPERTIES COMMON TO ALL ASSEMBLIES ARE GIVEN. THE ASSEMBLIES DIFFER IN HEAVY WATER CONCENTRATION, BORON CONCENTRATION, CORE RADIUS, AND REFLECTOR THICKNESS.

2009 ID-NUMBER ID-NUMBER 2009

AUTHOR BALL, R. M.
 TITLE INITIAL OPERATION AND EXPERIMENTATION WITH THE CONSOLIDATED EDISON THORIUM REACTOR
 REPORT NUMBER..... TANSO, 04, 307
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-11-00
 SITE/PROGRAM BABCOCK AND WILCOX CO. - THORIUM - URANIUM PHYSICS EXPERIMENT

ABSTRACT

PRIOR TO THE FINAL INSTALLATION OF THE REACTOR CORE IN THE CONSOLIDATED EDISON THORIUM REACTOR AT INDIAN POINT, NEW YORK, THE COMPLETED NUCLEAR PORTION WAS CHECKED AT THE BABCOCK & WILCOX CRITICAL EXPERIMENT LABORATORY. INITIAL CRITICALITY WAS REACHED ON JUNE 29, 1961.

THE FUEL, A MIXTURE OF THORIUM OXIDE AND HIGHLY (93%) ENRICHED URANIUM OXIDE, IS IN PELLET FORM WITH A DENSITY OF 9.25 G/CC. THE CORE CONTAINS A TOTAL OF 17,207 KG OF THORIA MIXED WITH THE URANIUM DIOXIDE IN SIX DIFFERENT RATIOS.

2010 ID-NUMBER ID-NUMBER 2010

AUTHOR WOLFE, W. B. / MACK, R. J.
 TITLE SOME RECENT ZERO-POWER PHYSICS MEASUREMENTS ON THE ORGANIC MODERATED REACTOR EXPERIMENT
 REPORT NUMBER..... TANSO, 04, 310
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 61-11-00
 SITE/PROGRAM ATOMICS INTERNATIONAL - ORGANIC MODERATED REACTOR

ABSTRACT

THE THIRD CORE LOADING OF THE ORGANIC MODERATED REACTOR EXPERIMENT (OMRE) HAS BEEN RECENTLY COMPLETED. THE THIRD CORE LOADING IS AN ELLIPTICAL ARRAY OF 31 FUEL ELEMENTS, FOUR OF WHICH ARE DEVELOPMENTAL FUEL ELEMENT EXPERIMENTS. THE REMAINING 27 ELEMENTS ARE THE STANDARD 16-PLATE, STAINLESS STEEL CLAD, CERMET DRIVER ELEMENTS USED IN THE PREVIOUS CORE LOADINGS. A FAIRLY COMPREHENSIVE GROUP OF ZERO- AND LOW-POWER PHYSICS MEASUREMENTS HAVE BEEN PERFORMED IN CONJUNCTION WITH THE LOADING OF THIS PRESENT CORE.

2011 ID-NUMBER ID-NUMBER 2011

AUTHOR UROVA, L. N. / POLYAKOV, A. A. / KLENOV, G. I. / MOROSOV, I. G. / INYUTIN, E. I. / SIDOROV, G. I.
 TITLE A STUDY OF THE PHYSICAL CHARACTERISTICS OF HYDROGEN-CONTAINING REACTORS IN THE CRITICAL REGION
 REPORT NUMBER..... AECL-2330, 233-250
 DATE PUBLISHED ... 64-00-00
 SITE/PROGRAM USSR - ORGANIC COOLED MODERATORS

ABSTRACT

THE PHYSICS OF REACTORS USING AN ORGANIC MODERATOR-COOLANT IS, IN MANY RESPECTS, SIMILAR TO THE PHYSICS OF AN AQUEOUS REACTOR, SINCE IN BOTH CASES HYDROGEN PLAYS THE MAIN ROLE IN THE PROCESS OF NEUTRON MODERATION. HOWEVER, THE HYDROGEN DENSITY IN ORGANIC MODERATORS MAY BE SIGNIFICANTLY DIFFERENT FROM ITS DENSITY IN WATER. IT IS THEREFORE EXPECTED THAT THERE WILL BE SOME DIFFERENCES IN THE VALUES OF THE CORE PARAMETERS BETWEEN ORGANIC AND AQUEOUS-MODERATED REACTORS. THE OPTIMUM LATTICE PITCH AND ALSO THE NEUTRON LEAKAGE FROM THE SYSTEM, BOTH OF WHICH DEPEND TO A CONSIDERABLE EXTENT ON THE VALUES OF THE MODERATING PARAMETERS AND THE DIFFUSION OF THERMAL NEUTRONS, MUST ALSO BE DIFFERENT FOR ORGANIC AND AQUEOUS REACTORS. BECAUSE OF THE ABOVE CONSIDERATIONS AN EXPERIMENTAL COMPARISON OF THE TWO MODERATORS, IN IDENTICAL CRITICAL CONDITIONS IS OF INTEREST.

IN THE EXPERIMENTS TO BE DESCRIBED THE ORGANIC MODERATOR WAS CHOSEN FROM THE CLASS OF ALKYL-SUBSTITUTED POLYPHENYLS, VIZ. MONO-ISOPROPYL-DIPHENYL, C(SUB-15)H(SUB-16). THE SCHEMATIC OF THE CRITICAL TEST ASSEMBLY IS SHOWN.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2012 ID-NUMBER ID-NUMBER 2012

AUTHOR NEELEY, V. I. / LLOYD, R. C. / CLAYTON, E. D.
 TITLE NEUTRON MULTIPLICATION MEASUREMENTS WITH PLUTONIUM-ALUMINUM ALLOY RODS IN LIGHT WATER
 REPORT NUMBER..... HW-64866, 137-142
 DATE PUBLISHED ... 60-04-20
 SITE/PROGRAM HANFORD - PLUTONIUM RODS IN WATER

ABSTRACT

CRITICAL MASS DATA WERE NEEDED FOR PLUTONIUM-ALUMINUM ALLOY FUEL ELEMENTS IN SUPPORT OF THE PLUTONIUM RECYCLE PROGRAM. THE DATA WOULD BE USED IN THE PREPARATION OF NUCLEAR SAFETY SPECIFICATIONS CONCERNING THE HANDLING AND STORAGE OF THIS KIND OF FISSIONABLE MATERIAL. THE CRITICAL MASS DATA WOULD ALSO PROVIDE DESIRABLE CHECK POINTS FOR CORRELATING CRITICAL MASS CALCULATIONS WITH EXPERIMENTS FOR HETEROGENEOUS PLUTONIUM SYSTEMS.

TO OBTAIN THESE DATA, NEUTRON MULTIPLICATION AND EXPONENTIAL EXPERIMENTS WERE CONDUCTED WITH PLUTONIUM-ALUMINUM ALLOY RODS HAVING 5 WT PER CENT PLUTONIUM ENRICHMENT. THESE RODS WERE 24 INCH LONG AND 0.506 INCH IN DIAMETER AND WERE CLAD IN 0.030 INCH ZIRCALOY-2 WITH 0.020 INCH AND 0.125 INCH THICK END CAPS. THE AVERAGE ROD CONTAINED 11.01 GRAMS OF PLUTONIUM. THIS GAVE A ZIRCONIUM/PLUTONIUM ATOMIC RATIO OF 31.92 AND AN ALUMINUM/PLUTONIUM ATOMIC RATIO OF 168.20. THE PLUTONIUM CONTAINED 5 WT PER CENT PLUTONIUM-240.

THESE EXPERIMENTS WERE CONDUCTED IN THE TTR REACTOR ROOM USING THE VESSELS AND SAFETY SYSTEM ORIGINALLY SET UP FOR THE HETEROGENEOUS 3 PER CENT ENRICHED URANIUM EXPERIMENTS.

2013 ID-NUMBER ID-NUMBER 2013

AUTHOR LLOYD, R. C.
 TITLE EXPONENTIAL MEASUREMENTS OF NATURAL URANIUM - WATER SYSTEMS
 REPORT NUMBER..... HW-64866, 150-151
 DATE PUBLISHED ... 60-04-20
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

A SERIES OF EXPONENTIAL MEASUREMENTS WAS STARTED WITH 0.925 INCH DIAMETER NATURAL URANIUM FUEL ELEMENTS IN WATER. THESE MEASUREMENTS WERE BEING DONE TO OBTAIN FURTHER DATA ON THE CRITICAL MASS OF NATURAL URANIUM IN LIGHT WATER AND TO OBTAIN BUCKLING VALUES FOR THE INTERPRETATION OF PLANNED EXPERIMENTS INVOLVING A THREE PER CENT ENRICHED URANIUM LATTICE REFLECTED BY A NATURAL URANIUM TAMPER. THIS SIZE OF NATURAL URANIUM RODS, WHICH WAS READILY AVAILABLE, WAS OF INTEREST SINCE THE 0.925 INCH ROD WOULD PROVIDE BUCKLING VALUES CLOSE TO THE MAXIMUM BUCKLING AS INDICATED BY CALCULATIONS.

2014 ID-NUMBER ID-NUMBER 2014

AUTHOR LLOYD, R. C.
 TITLE EXPONENTIAL EXPERIMENTS WITH POISONED MODERATOR
 REPORT NUMBER..... HW-64866, 148-149
 DATE PUBLISHED ... 60-04-20
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

A SERIES OF MEASUREMENTS WERE COMPLETED FOR DETERMINING THE AMOUNT OF NEUTRON ABSORBER TO "SAFE" A HETEROGENEOUS SYSTEM OF 1.007 PER CENT ENRICHED URANIUM RODS. THIS INFORMATION CAN BE USED FOR DETERMINING THE AMOUNT OF POISON NEEDED IN DISSOLVER BATCHES AS A SECONDARY SAFETY CONTROL AGAINST CRITICALITY.

THE FUEL RODS WERE 0.925 INCH IN DIAMETER, AND 44 INCH IN LENGTH. THEY WERE ENCASED IN ALUMINUM TUBES HAVING A WALL THICKNESS OF 0.032 INCH. EIGHTY-FIVE OF THE FUEL RODS WERE LOADED INTO A STAINLESS STEEL TANK HAVING A 0.0625 INCH WALL THICKNESS. THE LATTICE AND MODERATOR WHICH CONTAINED THE POISON WAS SEPARATED FROM THE LIGHT WATER REFLECTOR BY THIS STAINLESS STEEL TANK. INCREMENTS OF BORIC ACID WERE ADDED TO THE MODERATOR UNTIL THE BUCKLING BECAME NEGATIVE.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2015 ID-NUMBER ID-NUMBER 2015

AUTHOR LLOYD, R. C. / CLAYTON, E. D. / SMITH, R. B.
 TITLE CRITICAL APPROACH AND EXPONENTIAL MEASUREMENTS WITH 3.1% ENRICHED URANIUM RODS IN LIGHT WATER
 REPORT NUMBER..... HW-64866, 143-147
 DATE PUBLISHED ... 60-04-20
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

A SERIES OF EXPONENTIAL AND CRITICAL APPROACH MEASUREMENTS HAVE PREVIOUSLY BEEN MADE WITH 3.063 PER CENT ENRICHED URANIUM RODS IN WATER. FUEL ROD SIZES WERE 0.925, 0.600, 0.300 AND 0.175 INCHES IN DIAMETER. THE URANIUM WAS ENCASED IN THIN WALLED ACRYLIC RESIN TUBES; A HEXAGONAL PATTERN WAS USED FOR THE LATTICE ASSEMBLIES. THE TUBES WERE ASSUMED EQUIVALENT TO WATER SINCE ONE MEASUREMENT WITH INCREASED AMOUNTS OF ACRYLIC RESIN MATERIAL SHOWED A VERY SMALL CHANGE IN THE MEASURED CRITICAL MASS. LOADINGS WERE TAKEN TO 96 PER CENT OF THE PREDICTED CRITICAL MASS.

A SUMMARY LISTING OF THE RESULTS IS GIVEN.

2016 ID-NUMBER ID-NUMBER 2016

AUTHOR GEER, W. U. / SMITH, D. R.
 TITLE MEASUREMENT OF THE CRITICAL MASS OF A WATER-REFLECTED PLUTONIUM SPHERE
 REPORT NUMBER..... TANSO, 11, 378
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 68-06-00
 SITE/PROGRAM LOS ALAMOS - PLUTONIUM METAL SPHERES

ABSTRACT

SEVERAL MEASUREMENTS OF CRITICAL OR NEAR-CRITICAL REFLECTED PLUTONIUM ASSEMBLIES HAVE BEEN REPORTED FOR A VARIETY OF REFLECTOR MATERIALS. ALTHOUGH THESE PROVIDE A REASONABLE ESTIMATE OF THE CRITICAL MASS TO BE EXPECTED FOR A WATER-REFLECTED METAL SPHERE, A DIRECT MEASUREMENT WAS CONSIDERED WORTHWHILE.

A SPHERE OF HIGH PURITY PLUTONIUM WAS FABRICATED AND MACHINED TO A MASS OF 5546 G WITH AN AVERAGE DENSITY OF 19.74 G/CC AT 20 DEGREES C. A CLOSE-FITTING PLEXIGLAS SHELL ABOUT 5/16 INCH THICK PROVIDED AN HERMETIC SEAL FOR THE SPHERE. A 0.0005 INCH COATING OF COPPER INSIDE THE SHELL PREVENTED THE PLUTONIUM ALPHA PARTICLES FROM DECOMPOSING THE PLASTIC.

THE MULTIPLICATION OF THE FULLY REFLECTED SPHERE CORRESPONDED TO A VALUE OF K(EFF) OF ABOUT 0.99.

2017 ID-NUMBER ID-NUMBER 2017

AUTHOR PIERCE, G. A. / MORTON, J. R.
 TITLE MEASURED CRITICAL SPACINGS OF PLUTONIUM ARRAYS - PART 1
 REPORT NUMBER..... TANSO, 11, 378-379
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 68-06-00
 SITE/PROGRAM LIVERMORE - PLUTONIUM ARRAYS

ABSTRACT

THE EXPERIMENTAL OBJECTIVES OF THE LAWRENCE RADIATION LABORATORY'S PLUTONIUM ARRAY PROGRAM ARE 1) TO PROVIDE CLEAN CRITICAL DATA TO USE IN THE NORMALIZATION OF COMPUTATIONAL TECHNIQUES, AND 2) TO DEVELOP DATA EXPECTED TO BE USEFUL FOR INTERPOLATION AND EXTRAPOLATION FOR APPLICATION TO ACTUAL SYSTEMS OF INTEREST. THE MOST COMMON APPLICATION IS A CONSIDERATION OF THE CRITICALITY SAFETY OF A STORAGE OR TRANSPORTATION ARRAY OF FISSILE MATERIAL. THIS IS THE FIRST EXPERIMENTAL PROGRAM OF CRITICAL PLUTONIUM METAL ARRAYS.

PHASE I OF THE PROGRAM CONSISTED OF SMALL ARRAYS OF UP TO 27 3-KG PARTS OF ALPHA-PHASE PLUTONIUM METAL OF DENSITY 19.5 G/CC, 93.6 WT% PLUTONIUM-239. EACH PART HAS THE FORM OF A RIGHT CIRCULAR CYLINDER 6.53 CM IN DIAMETER AND 4.63-CM TALL. EACH PART IS PACKAGED INSIDE A CLOSE-FITTING, DEEP-DRAWN, SEAMLESS ALUMINUM CAN WITH A STEEL LID. THE AVERAGE PART WEIGHT IS 3.026 KG. THIS IS SOMEWHAT LESS THAN HALF THE CRITICAL MASS OF A REFLECTED CYLINDER OF THE SAME DIAMETER. THUS, TWO PARTS MAY BE SAFELY STACKED TOGETHER TO PRODUCE A 6-KG UNIT WHICH CAN ALSO BE ARRANGED IN ARRAYS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2018 ID-NUMBER ID-NUMBER 2018

AUTHOR FINN, H. F. / PIERCE, G. A.
 TITLE MEASURED CRITICAL SPACINGS OF PLUTONIUM ARRAYS - PART 2
 REPORT NUMBER..... TANSO, 11, 379-380
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 68-06-00
 SITE/PROGRAM LIVERMORE - PLUTONIUM ARRAYS

ABSTRACT

LARGE CRITICAL ARRAYS USING AS MANY AS 128 3-KG PLUTONIUM PARTS HAVE BEEN CONSTRUCTED RECENTLY AS PART OF PHASE II OF THE LAWRENCE RADIATION LABORATORY PLUTONIUM ARRAY PROGRAM. ARRAYS 4 X 4 X 4 OF 3- AND 6-KG PLUTONIUM PARTS WITH AND WITHOUT MODERATOR JACKETS WERE ASSEMBLED ON A NEW SPLIT- TABLE MACHINE, BUILT WHEN A SMALLER ASSEMBLY MACHINE PROVED INADEQUATE FOR ARRAYS LARGER THAN 3 X 3 X 3.

2019 ID-NUMBER ID-NUMBER 2019

AUTHOR BIERMAN, S. R. / HANSEN, L. E. / LLOYD, R. C. / CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS WITH HOMOGENEOUS PLUTONIUM DIOXIDE - POLYSTYRENE AT 5 HYDROGEN:PLUTONIUM
 REPORT NUMBER..... TANSO, 11, 380-381
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 68-06-00
 SITE/PROGRAM HANFORD - PLUTONIUM DIOXIDE - POLYSTYRENE COMPACTS

ABSTRACT

ONE OF THE RESEARCH PROGRAMS AT THE PLUTONIUM CRITICAL MASS LABORATORY OF BATTELLE-NORTHWEST IS CONCERNED WITH DETERMINING THE CRITICALITY PARAMETERS OF UNDERMODERATED PLUTONIUM AS A FUNCTION OF MODERATION AND PLUTONIUM-240 ISOTOPIC CONCENTRATION. THIS PROGRAM IS ORIENTED TOWARD PROVIDING EXPERIMENTAL DATA THAT CAN BE USED IN ESTABLISHING CRITICALITY SAFETY GUIDES AND IN CHECKING CALCULATIONAL MODELS OVER THE INTERMEDIATE NEUTRON ENERGY SPECTRUM. THERE IS A PARTICULAR NEED FOR DATA AGAINST WHICH THEORETICAL ANALYSES OF PLUTONIUM-240 EFFECTS CAN BE COMPARED.

THE INITIAL SERIES OF MEASUREMENTS IN THIS PROGRAM WAS MADE ON 15HYDROGEN:PLUTONIUM FUEL HAVING PLUTONIUM-240 ISOTOPIC CONCENTRATIONS OF 2.2 AND 8 WT% THE RESULTS FROM THESE INITIAL EXPERIMENTS HAVE ALREADY BEEN REPORTED AS HAS A DESCRIPTION OF THE EXPERIMENTAL FACILITY. THIS PAPER IS CONCERNED WITH THE RESULTS AND ANALYSIS OF THE LATEST SERIES OF ANALOGOUS EXPERIMENTS IN WHICH THE PLUTONIUM-240 ISOTOPIC CONCENTRATION HAS BEEN INCREASED TO 11.5 WT% AND THE ATOMIC HYDROGEN:PLUTONIUM DECREASED TO 5.

2020 ID-NUMBER ID-NUMBER 2020

AUTHOR LLOYD, R. C. / CLAYTON, E. D. / HANSEN, L. E.
 TITLE CRITICALITY OF PLUTONIUM NITRATE SOLUTIONS IN SLAB GEOMETRY
 REPORT NUMBER..... TANSO, 11, 381-382
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 68-06-00
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

CRITICAL THICKNESSES OF INFINITE SLABS OF PLUTONIUM NITRATE SOLUTION HAVE BEEN DERIVED FROM DATA ON SPHERES AND CYLINDERS, BUT NO DATA APPEAR IN THE OPEN LITERATURE ON THE DIRECT MEASUREMENT OF CRITICAL THICKNESSES FOR THIN SLABS OF PLUTONIUM NITRATE SOLUTION. EXPERIMENTS HAVE BEEN CONDUCTED AT THE CRITICAL MASS LABORATORY OF THE PACIFIC NORTHWEST LABORATORY USING A VARIABLE- THICKNESS SLAB-TYPE VESSEL TO DETERMINE CRITICAL THICKNESSES OF BARE AND REFLECTED INFINITE SLABS OF PLUTONIUM NITRATE SOLUTION. THE EXPERIMENTS PROVIDE DATA FOR NUCLEAR CRITICALITY SAFETY APPLICATIONS IN HANDLING AND PROCESSING PLUTONIUM AND FOR CHECKING COMPUTATIONAL METHODS.

2021 ID-NUMBER ID-NUMBER 2021

AUTHOR MAGNUSON, D. W.
 TITLE CRITICAL EXPERIMENTS AT HYDROGEN:URANIUM-235 RATIOS FROM 0 TO 5
 REPORT NUMBER..... TANSO, 11, 383
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 68-06-00

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM: OAK RIDGE - URANIUM(93%) - POLYETHYLENE SLABS

ABSTRACT

A SERIES OF CRITICAL EXPERIMENTS WAS PERFORMED AT OAK RIDGE NATIONAL LABORATORY TO INVESTIGATE THE DEPENDENCE OF THE CRITICAL PARAMETERS FOR SMALL VALUES OF HYDROGEN:URANIUM-235 RATIO. THE PRIMARY MOTIVATION FOR THIS EFFORT WAS NUCLEAR CRITICALITY SAFETY SO THAT MEASUREMENTS OF CRITICAL MASS WOULD BE COMPLETED FOR ALL RANGES OF MODERATION. HOWEVER, THE EXPERIMENTS WERE DONE IN SIMPLE RECTANGULAR GEOMETRY WITHOUT OTHER MATERIALS OR LARGE VOIDS AND ARE IDEALLY SUITED FOR COMPARISON TO CALCULATIONS TO CHECK VARIOUS REACTOR CODES.

THE UNREFLECTED CRITICAL EXPERIMENTS WERE PERFORMED FOR HYDROGEN:URANIUM-235 RATIOS FROM 0 TO 5 USING LAYERS OF URANIUM METAL ENRICHED TO 93.15 WT% URANIUM-235 AND POLYETHYLENE OR PLEXIGLAS MODERATORS. POLYETHYLENE-MODERATED AND -REFLECTED EXPERIMENTS HAVE BEEN COMPLETED FOR THE SAME RANGE OF MODERATION. IN ADDITION, SOME UNREFLECTED TEFLON-MODERATED EXPERIMENTS WERE PERFORMED.

2022 ID-NUMBER ID-NUMBER 2022

AUTHOR: JOHNSON, E. B. / NEWLON, C. E.

TITLE: THE EFFECT OF STEEL - WATER REFLECTORS ON THE CRITICALITY OF LOW-ENRICHED URANYL FLUORIDE SOLUTION

REPORT NUMBER....: TANSO, 11, 383-384

JOURNAL: TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ...: 68-06-00

SITE/PROGRAM: OAK RIDGE - URANYL(4.9%)FLUORIDE - WATER

ABSTRACT

THE EFFECT OF COMPOSITE REFLECTORS OF STEEL AND WATER ON THE REACTIVITY OF SINGLE CYLINDERS OF AQUEOUS SOLUTION OF LOW-ENRICHED URANIUM HAS BEEN STUDIED. THE RESULTS ARE APPLICABLE IN THE EVALUATION OF THE NUCLEAR CRITICALITY SAFETY OF SHIPPING CONTAINERS AND PROVIDE BASES FOR THE VERIFICATION OF CALCULATIONAL MODELS.

THE SOLUTION WAS CONTAINED IN EACH OF TWO STAINLESS-STEEL CYLINDERS HAVING 0.079-CM-THICK WALLS; THE SOLUTION DIAMETERS WERE 33.02 AND 39.09 CM. THE THICKNESS OF LATERAL STEEL REFLECTORS ADJACENT TO THE SOLUTION RANGED UP TO 5.08 CM AND WAS SURROUNDED BY AN INFINITELY THICK WATER REFLECTOR. THERE WAS NO TOP OR BOTTOM REFLECTOR.

2023 ID-NUMBER ID-NUMBER 2023

AUTHOR: MIHALCZO, J. T.

TITLE: MONTE CARLO CALCULATIONS OF THICK-GRAPHITE-REFLECTED URANIUM-METAL CRITICAL ASSEMBLIES

REPORT NUMBER....: TANSO, 11, 385-386

JOURNAL: TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ...: 68-06-00

SITE/PROGRAM: OAK RIDGE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

THE NEUTRON MULTIPLICATION FACTOR FOR A VARIETY OF URANIUM-METAL ANNULI AND CYLINDERS SURROUNDED WITH THICK CARBON REFLECTORS HAS BEEN MEASURED AND CALCULATED BY A MONTE CARLO METHOD. THE MATERIAL WITHIN THE ANNULI WAS CARBON OR AIR. THE THICKNESS ON THE SIDE, TOP, AND BOTTOM REFLECTOR WAS EQUAL IN ANY ONE ASSEMBLY. THE DENSITY OF THE INDIVIDUAL PIECES OF TYPE-HLM GRAPHITE VARIED BETWEEN 1.688 AND 1.783 G/CC. THE URANIUM METAL WAS ENRICHED TO 93.2% IN URANIUM-235 AND HAS BEEN DESCRIBED PREVIOUSLY.

2024 ID-NUMBER ID-NUMBER 2024

AUTHOR: PRUVOST, N. L. / PEFLEY, G. V.

TITLE: MONTE CARLO CALCULATIONS FOR ARRAYS OF PLUTONIUM UNITS

REPORT NUMBER....: TANSO, 11, 386-387

JOURNAL: TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ...: 68-06-00

SITE/PROGRAM: LIVERMORE - PLUTONIUM ARRAYS - CALCULATIONS

ABSTRACT

THE ABILITY OF THE MONTE CARLO TECHNIQUE TO CALCULATE CRITICAL CONFIGURATIONS OF ARRAYS OF AIR- SPACED UNITS IS OF FUNDAMENTAL IMPORTANCE FOR MANY PROBLEMS THAT ARISE IN CRITICALITY SAFETY. HOWEVER, THE RELIABILITY OF THE TECHNIQUE HAS NOT BEEN DEMONSTRATED FOR ARRAYS WHOSE UNITS ARE THEMSELVES QUITE COMPLICATED IN GEOMETRY AND MATERIALS. THE PURPOSE OF

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

THIS PAPER IS TO SHOW THAT FOR SOME ARRAYS WITH UNITS MODERATED AND PARTIALLY DECOUPLED BY INTERSTITIAL MATERIAL, A DETAILED MONTE CARLO CALCULATION IS CAPABLE OF PREDICTING CRITICAL CONFIGURATIONS.

2025 ID-NUMBER ID-NUMBER 2025

AUTHOR CHITWOOD, R. A.

TITLE THE APPLICATION OF THE HAMMER COMPUTER CODE TO EX-REACTOR CRITICALITY CALCULATIONS

REPORT NUMBER..... TANSO, 11, 387-389

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 68-06-00

SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER - CALCULATIONS

ABSTRACT

THE HAMMER SYSTEM, A COMPUTER CODE DEVELOPED BY J. E. SUICH AND H. C. HONECK, HAS BEEN EMPLOYED WITH SOME SUCCESS ON ARRAYS OF SLIGHTLY ENRICHED URANIUM TUBES IN LIGHT WATER. THE AGREEMENT BETWEEN CALCULATIONS AND BENCHMARK EXPERIMENTS HAS BEEN GOOD ENOUGH TO JUSTIFY USING THE CALCULATIONS AS THE BASIS FOR SOME CRITICALITY SAFETY LIMITS AT DOUGLAS UNITED NUCLEAR. AT THIS STAGE OF DEVELOPMENT IT IS PROBABLY PREMATURE TO EXTEND THE CALCULATIONS TO FUEL DESIGNS THAT DIFFER GREATLY FROM EXPERIMENTAL CHECK POINTS. HOWEVER, THE CRITICALITY PARAMETERS GENERATED FROM HAMMER CALCULATIONS HAVE BEEN CONSERVATIVE IN ALL SYSTEMS EXAMINED TO DATE.

2026 ID-NUMBER ID-NUMBER 2026

AUTHOR HOOGERP, J. C.

TITLE UNREFLECTED PLEXIGLASS-GRAPHITE-URANIUM CRITICAL MEASUREMENTS

REPORT NUMBER..... TANSO, 11, 389-390

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 68-06-00

SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE

ABSTRACT

THIS SERIES OF MEASUREMENTS WAS STIMULATED BY CRITICALITY QUESTIONS ASSOCIATED WITH THE PROCESSING AND HANDLING OF GRAPHITE-URANIUM FUEL FOR ROVER REACTORS. IT IS DIRECTED SPECIFICALLY TOWARD MIXTURES OF THIS FUEL WITH WATER OR OTHER HYDROGENOUS MATERIAL, IN THE HOPE OF REDUCING LARGE UNCERTAINTIES ATTACHED TO COMPUTED CRITICAL MASSES THAT HAD BEEN USED FOR SAFETY GUIDANCE.

TO SIMULATE NEAR-HOMOGENEOUS MIXTURES OF ROVER FUEL AND WATER, UNREFLECTED CRITICAL PARALLELEPIPEDS OF URANIUM(93.16) MODERATED WITH PLEXIGLAS OR PLEXIGLAS-GRAPHITE COMBINATIONS WERE SET UP WITHIN THE ALUMINUM MATRIX OF A SPLIT-TABLE ASSEMBLY MACHINE.

2027 ID-NUMBER ID-NUMBER 2027

AUTHOR FINN, H. F. / PIERCE, G. A. / PRUVOST, N. L. / PEFLEY, G. V.

TITLE EFFECT OF UNIT CELL SHAPE VARIATION IN A CRITICAL ARRAY OF PLUTONIUM METAL PARTS

REPORT NUMBER..... TANSO, 11, 674

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 68-11-00

SITE/PROGRAM LIVERMORE - PLUTONIUM ARRAYS

ABSTRACT

SIX MEASUREMENTS HAVE BEEN PERFORMED AT THE LAWRENCE RADIATION LABORATORY TO INVESTIGATE SYSTEMATIC GEOMETRY CHANGES IN A CRITICAL, REGULARLY SPACED 4 X 4 X 4 ARRAY OF PLUTONIUM PARTS. CONTRARY TO EXPECTATION, THESE MEASUREMENTS SHOW THAT THE SMALLEST UNIT CELL VOLUME OCCURS FOR A NEARLY CUBICAL ARRAY.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2028 ID-NUMBER ID-NUMBER 2028

AUTHOR JOHNSON, E. B.
 TITLE CRITICAL LATTICES OF URANIUM(4.89) RODS IN WATER AND IN AQUEOUS BORON SOLUTION
 REPORT NUMBER..... TANSO, 11, 674-675
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 68-11-00
 SITE/PROGRAM OAK RIDGE - URANIUM(4.89%) METAL RODS IN WATER (LATTICES)

ABSTRACT

EARLIER MEASUREMENTS OF CRITICAL WATER-MODERATED AND -REFLECTED LATTICES OF 4.89% URANIUM-235 ENRICHED URANIUM RODS 1.31, 2.07, AND 2.49 CM IN DIAMETER, WHICH PROVIDED REFERENCE FOR CALCULATION OF THE CRITICALITY OF HETEROGENEOUS ASSEMBLIES OF URANIUM OF THIS ENRICHMENT, HAVE BEEN EXTENDED TO RODS 0.76 CM IN DIAMETER. THE INFLUENCE OF THE LATTICE PITCH ON THE CRITICAL DIMENSIONS WAS DETERMINED BY CONSTRUCTING SEVERAL LATTICES IN BOTH SQUARE AND TRIANGULAR PATTERNS. THE DATA WERE THEN TRANSFORMED, BY EQUATING BUCKLINGS USING AN EXTRAPOLATION DISTANCE OF 6 CM, TO EQUIVALENT SPHERES FOR COMPARISON WITH CLARK'S CALCULATIONS.

2029 ID-NUMBER ID-NUMBER 2029

AUTHOR LLOYD, R. C. / CLAYTON, E. D.
 TITLE THE CRITICALITY OF HIGH BURNUP PLUTONIUM
 REPORT NUMBER..... TANSO, 15, 307
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 72-06-00
 SITE/PROGRAM HANFORD - PLUTONIUM NITRATE IN WATER

ABSTRACT

A SERIES OF EXPERIMENTS HAS BEEN COMPLETED WITH PLUTONIUM OBTAINED FROM EXTREME HIGH BURNUP FUEL TO ESTABLISH THE COMBINED EFFECTS OF THE VARIOUS ISOTOPES OF PLUTONIUM ON CRITICALITY.

2030 ID-NUMBER ID-NUMBER 2030

AUTHOR BIERMAN, S. R. / CLAYTON, E. D.
 TITLE CRITICAL EXPERIMENTS WITH MIXED OXIDES OF PLUTONIUM AND URANIUM CONTAINING 8 AND 30 WT% PLUTONIUM
 REPORT NUMBER..... TANSO, 15, 307-309
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 72-06-00
 SITE/PROGRAM HANFORD - URANIUM-PLUTONIUM MIXED OXIDES

ABSTRACT

A RESEARCH EFFORT IS PRESENTLY UNDER WAY AT THE HANFORD CRITICAL MASS LABORATORY TO PROVIDE THE DATA ON HOMOGENEOUS PLUTONIUM DIOXIDE-URANIUM DIOXIDE MIXTURES IN WELL-DEFINED, SIMPLE GEOMETRIES. EXPERIMENTAL RESULTS FROM THE INITIAL TWO SETS OF FUELS IN THIS PROGRAM HAVE BEEN REPORTED AND CONSISTED OF PLUTONIUM DIOXIDE-URANIUM DIOXIDE-POLYSTYRENE MIXTURES CONTAINING 30 AND 14.62 WT% PLUTONIUM IN THE PLUTONIUM-URANIUM AND HAVING H/X ATOMIC RATIOS OF 47.4 AND 30.6, RESPECTIVELY. SINCE THAT TIME, EXPERIMENTS HAVE BEEN COMPLETED WITH TWO ADDITIONAL SETS OF MIXED- OXIDE FUEL. ONE OF THESE AGAIN HAD A PLUTONIUM ENRICHMENT OF ABOUT 30 WT% BUT AN H/X ATOMIC RATIO OF ONLY 3. THE OTHER SET OF FUEL CONTAINED 7.89 WT% PLUTONIUM IN THE PLUTONIUM-URANIUM AND HAD AN H/X ATOMIC RATIO OF 51.8.

2031 ID-NUMBER ID-NUMBER 2031

AUTHOR HANSEN, L. E. / CLAYTON, E. D.
 TITLE THEORY-EXPERIMENT TESTS USING ENDF/B VERSION II CROSS-SECTION DATA
 REPORT NUMBER..... TANSO, 15, 309-310
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 72-06-00
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS; HANFORD - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

THE ENDF/B DATA HAVE BEEN CHECKED AGAINST INTEGRAL EXPERIMENTS FOR A NUMBER OF FAST CRITICAL ASSEMBLIES, BUT LITTLE HAS BEEN REPORTED CONCERNING THE USE OF THESE DATA WHEN APPLIED TO THE MORE GENERAL CASES ENCOUNTERED IN NUCLEAR CRITICALITY SAFETY; I.E., THE CONDITIONS TO BE ENCOUNTERED EXTERNAL TO THE REACTORS REQUIRE CONSIDERATION OF THERMAL AND INTERMEDIATE, AS WELL AS FAST SYSTEMS. UNFORTUNATELY, THE CHECKS MADE ON FAST CRITICAL ASSEMBLIES PROVIDE LITTLE, OR NO, ASSURANCE OF RELIABILITY IN REGARD TO THE FIRST TWO SYSTEMS.

THIS PAPER DESCRIBES THE RESULTS OF INTEGRAL TESTING AGAINST MORE THAN 40 EXPERIMENTS SELECTED FOR THEIR SIMPLICITY OF GEOMETRY, IN WHICH THE FUEL COMPOSITIONS EXTEND OVER A WIDE RANGE OF MODERATION FROM THERMAL TO THE HIGHLY UNDERMODERATED SYSTEM. THE CRITICAL EXPERIMENTS EXAMINED WERE ALL HOMOGENEOUS IN NATURE, INCLUDING A NUMBER OF PLUTONIUM DIOXIDE-POLYSTYRENE AND PLUTONIUM DIOXIDE-URANIUM(DEPLETED)DIOXIDE-POLYSTYRENE MIXTURES, AS WELL AS A VARIETY OF PLUTONIUM NITRATE SOLUTION EXPERIMENTS AND TWO CASES OF MIXED PLUTONIUM-URANIUM NITRATE SOLUTIONS. THE HYDROGEN-TO-PLUTONIUM ATOMIC RATIOS EXAMINED RANGED FROM 0 TO 1100. THE PLUTONIUM-240 CONTENT OF THE PLUTONIUM VARIED BETWEEN 2.2 AND 18.35 WT%

2032 ID-NUMBER ID-NUMBER 2032

AUTHOR KLOVERSTROM, F. A. / DECK, R. M. / REYENGA, A. J.

TITLE CRITICAL DIMENSIONS OF UNREFLECTED BERYLLIUM OXIDE SYSTEMS FUELED BY THIN ENRICHED URANIUM FOILS

REPORT NUMBER.... TANSO, 02, 2, 162-163

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 59-06-00

SITE/PROGRAM LIVERMORE - URANIUM(93%) - BERYLLIUM OXIDE SYSTEMS

ABSTRACT

A SERIES OF CRITICAL MEASUREMENTS ON UNREFLECTED PARALLELEPIPEDS BUILT OF ENRICHED (93.2%) URANIUM FOILS AND BERYLLIUM OXIDE BLOCKS HAVE BEEN MADE FOR FIVE FUEL DENSITIES. THE OBJECT OF THIS PROGRAM WAS TO PROVIDE DATA FOR NORMALIZATION OF MACHINE CRITICALITY CALCULATIONS, AND THE SYSTEMS WERE THEREFORE MADE "CLEAN." THE ONLY MATERIAL PRESENT OTHER THAN BERYLLIUM OXIDE AND URANIUM WAS A SMALL AMOUNT OF TEFLON (FOIL COATINGS) AND A STEEL DIAPHRAGM, THE EFFECT OF WHICH WAS EXPERIMENTALLY DETERMINED.

2033 ID-NUMBER ID-NUMBER 2033

AUTHOR ENGELDER, T. C. / GIESLER, H. W. / FARRARR, J. P.

TITLE REACTIVITY AND FLUX MEASUREMENTS IN HIGHLY REFLECTED URANIUM-235-BISMUTH-GRAPHITE CRITICAL EXPERIMENTS

REPORT NUMBER.... TANSO, 02, 2, 168-169

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 59-06-00

SITE/PROGRAM BABCOCK AND WILCOX CO. - LIQUID METAL FUEL REACTOR EXPERIMENT

ABSTRACT

THE LIQUID METAL FUEL REACTOR EXPERIMENT (LMFRE) RESEARCH AND DEVELOPMENT PROGRAM INCLUDES A SERIES OF CRITICAL EXPERIMENTS ON URANIUM-235-BISMUTH-GRAPHITE CORES, HIGHLY REFLECTED BY GRAPHITE. THESE EXPERIMENTS HAVE A TWO-FOLD PURPOSE: (1) TO PROVIDE EXPERIMENTAL DATA ON HIGHLY REFLECTED CYLINDRICAL CORES OF RELATIVELY SIMPLE GEOMETRY THAT REQUIRE TWO-DIMENSIONAL ANALYSIS, AND (2) TO SUPPLY NUCLEAR AND ENGINEERING PARAMETERS FROM A SPECIFIC ENGINEERING MOCK-UP OF THE LMFRE WHICH MAY INCLUDE SUCH FEATURES AS FUEL PLENUMS, FUEL IN THE END AND SIDE REFLECTORS, TEST HOLES, ETC. DATA FROM THE FIRST PHASE OF THIS PROGRAM ARE PRESENTED IN THIS PAPER.

2034 ID-NUMBER ID-NUMBER 2034

AUTHOR CHERNICK, J.

TITLE ANALYSIS OF THE CLEAN BUCKLINGS OF 1.3 PERCENT ENRICHED URANIUM-WATER LATTICES

REPORT NUMBER.... BNL-01578

DATE PUBLISHED ... 53-04-06

SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - SLIGHTLY ENRICHED URANIUM - WATER LATTICES

ABSTRACT

THE EXPERIMENTAL RESULTS ON THE RELAXATION LENGTHS OF THE CLEAN, 0.6 INCH DIAMETER, 1.3% URANIUM-235 ENRICHED URANIUM-WATER LATTICES HAVE BEEN COMPLETED FOR THE 2:1, 3:1, AND 4:1 WATER TO FUEL VOLUME RATIOS. ON THE BASIS OF THE EXPERIMENTAL RESULTS OBTAINED TO DATE, WE HAVE INVESTIGATED SOME OF THE QUESTIONS RELATING TO THE ACCURACY WITH WHICH THE BUCKLINGS OF THESE WATER LATTICES CAN BE DETERMINED.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2035 ID-NUMBER ID-NUMBER 2035

AUTHOR LLOYD, R. C. / SMITH, R. B. / CLAYTON, E. D.
 TITLE NEUTRON MULTIPLICATION MEASUREMENTS OF HETEROGENEOUS 3.1 PERCENT ENRICHED URANIUM-WATER SYSTEMS
 REPORT NUMBER..... TANSO, 01, 2, 062-063
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 59-06-00
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

THE DESIGN OF EFFICIENT SYSTEMS FOR PROCESSING SPENT POWER REACTOR FUEL ELEMENTS REQUIRES INFORMATION ON THE CRITICAL MASSES INVOLVED. TO OBTAIN SOME OF THE NEEDED INFORMATION, APPROACH-TO- CRITICAL EXPERIMENTS WERE CARRIED OUT WITH LIGHT-WATER-MODERATED AND -REFLECTED HEXAGONAL-LATTICE ASSEMBLIES USING ENRICHED SOLID URANIUM FUEL ELEMENTS. THE URANIUM-235 CONTENT OF THE URANIUM WAS 3.063 WT% EXPERIMENTS WERE MADE FOR FUEL ELEMENTS OF 0.925-, 0.600-, AND 0.300-IN. O.D. WITH THE WATER/URANIUM RATIOS FOR LATTICE SPACINGS TO SPAN MAXIMUM BUCKLING AND MINIMUM CRITICAL MASS.

2036 ID-NUMBER ID-NUMBER 2036

AUTHOR KOUTS, H.
 TITLE LIGHT WATER LATTICE STUDIES
 REPORT NUMBER..... BNL-01812
 DATE PUBLISHED ... 53-10-07
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - SLIGHTLY ENRICHED URANIUM - WATER LATTICES

ABSTRACT

INFORMATION IS PROVIDED BY MEASUREMENTS IN A SERIES OF EXPONENTIAL ASSEMBLIES WHICH DIFFER IN URANIUM ENRICHMENT, MODERATOR-TO-FUEL VOLUME RATIO, AND ROD DIAMETER. THE ENRICHMENT RANGE BEING EXPLORED VARIES FROM 1.3% TO 1%, THE ROD DIAMETERS VARY FROM .600 INCH TO .250 INCH, AND THE VOLUME RATIOS LIE IN THE RANGE FROM 4:1 TO 1:1 (AND IN SOME CASES ARE EVEN SMALLER). THE QUANTITIES BEING MEASURED ARE F, ETA, P, BUCKLING, MIGRATION AREA, AND REFLECTOR SAVINGS (SINCE THE ASSEMBLIES ARE REFLECTED). SIMILAR MEASUREMENTS REPORTED AT THE LAST REACTOR INFORMATION MEETING WERE DONE WITH .750 INCH DIAMETER RODS WITH 1% NOMINAL ENRICHMENT.

2037 ID-NUMBER ID-NUMBER 2037

AUTHOR SPANO, A. H. / METCALF, D. R.
 TITLE EXPERIMENTAL AND THEORETICAL REACTIVITY STUDIES OF STAINLESS STEEL FUEL ELEMENTS
 REPORT NUMBER..... TANSO, 02, 2, 041-042
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 59-11-00
 SITE/PROGRAM PHILLIPS PETROLEUM CO. - SPERT FUEL ELEMENTS

ABSTRACT

CLEAN CRITICAL EXPERIMENTS HAVE BEEN CONDUCTED ON A NUMBER OF LIGHT WATER-MODERATED AND REFLECTED SLAB CONFIGURATIONS OF SPERT III FUEL ELEMENTS. THE OBJECTIVE OF THESE EXPERIMENTS HAS BEEN TO OBTAIN CRITICALITY DATA ON RELATIVELY SIMPLE LATTICES WHICH ARE EITHER ROD-FREE OR SINGLE- RODDED. THESE DATA MAY BE USED TO VERIFY SEPARATELY THE REACTOR CONSTANTS AND THE CONTROL ROD ANALYSIS USED IN A PREVIOUS FOUR-GROUP MULTI-REGION CALCULATION FOR THE OPERATIONAL SPERT III CORE.

2038 ID-NUMBER ID-NUMBER 2038

AUTHOR NESTOR, C. W.
 TITLE A COMPARISON OF SOME CRITICALITY CALCULATIONS WITH EXPERIMENT
 REPORT NUMBER..... TANSO, 02, 2, 042-043
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 59-11-00
 SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER - CALCULATIONS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

RECENTLY SEVERAL CRITICAL EXPERIMENTS HAVE BEEN DONE AT ORNL WITH LIGHT WATER SOLUTIONS OF URANYL NITRATE IN AN ESSENTIALLY BARE SPHERE 27 INCHES IN DIAMETER. CRITICALITY CALCULATIONS WERE PERFORMED FOR THE TWO EXPERIMENTS DESCRIBED WITH FOUR PROCEDURES TO OBTAIN INFORMATION CONCERNING THEIR RELIABILITY IN CALCULATIONS FOR SIMPLE REACTORS.

2039 ID-NUMBER ID-NUMBER 2039

AUTHOR MIHALCZO, J. T. / LYNN, J. J.

TITLE MULTIPLICATION MEASUREMENTS WITH SLABS OF ENRICHED URANIUM

REPORT NUMBER..... TANSO, 02, 2, 080

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 59-11-00

SITE/PROGRAM OAK RIDGE - URANIUM(93%) METAL SLABS

ABSTRACT

A SERIES OF NEUTRON MULTIPLICATION MEASUREMENTS WITH ARRAYS OF 1 BY 8 BY 10 INCH SLABS OF 93.4% URANIUM-235 ENRICHED URANIUM METAL HAVE BEEN MADE TO PROVIDE DATA FROM WHICH SAFETY CRITERIA FOR THE STORAGE OF THESE FISSIONABLE UNITS CAN BE ESTABLISHED. EACH SLAB CONTAINED 22.9 KG OF URANIUM-235. A MAXIMUM OF 125 UNITS WAS ASSEMBLED. THE ARRAYS STUDIED WERE CUBIC LATTICES OF THE UNITS AND WERE USUALLY PARALLELEPIPEDAL IN SHAPE. ARRAYS WERE BOTH UNMODERATED AND PLEXIGLAS-MODERATED AND WERE SURROUNDED IN MOST CASES BY A 1-INCH THICK PLEXIGLAS REFLECTOR.

2040 ID-NUMBER ID-NUMBER 2040

AUTHOR SKEEN, C. H. / BROWN, W. W.

TITLE A THORIUM-URANIUM EXPONENTIAL EXPERIMENT

REPORT NUMBER..... TANSO, 02, 2, 080-084

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 59-11-00

SITE/PROGRAM ATOMICS INTERNATIONAL - ADVANCED EPITHERMAL THORIUM REACTOR

ABSTRACT

BECAUSE OF UNCERTAINTIES IN THE KNOWLEDGE OF THE NUCLEAR PROPERTIES OF THORIUM FUEL AND LATTICES CONTAINING THIS FUEL, AN EXPERIMENTAL STUDY WAS MADE OF A THORIUM BASED FUEL THAT IS TO BE LOADED INTO THE SODIUM REACTOR EXPERIMENT (SRE) IN THE NEAR FUTURE. AN EXPONENTIAL EXPERIMENT WAS PERFORMED WITH A SQUARE-CELLED LATTICE OF 7-ROD ELEMENTS (.75 INCH DIAMETER RODS) SPACED 9.5 INCH APART IN GRAPHITE. THE FUEL IS A THORIUM-URANIUM-235 ALLOY CONTAINING 7.6% URANIUM BY WEIGHT WHICH IS 93.13 ATOMIC PER CENT URANIUM-235. THE FUEL ELEMENTS WERE 5 FEET LONG. THE SUBCRITICAL LATTICE WAS PLACED ON THE THERMAL COLUMN OF A WATER BOILER REACTOR WHICH SERVED AS THE SOURCE OF NEUTRONS FOR THE ASSEMBLY.

2041 ID-NUMBER ID-NUMBER 2041

AUTHOR WOOD, D. E. / ENDRES, G. W. R.

TITLE GRAPHITE - URANIUM EXPONENTIAL MEASUREMENTS FOR LARGE FUEL ELEMENTS

REPORT NUMBER..... TANSO, 02, 2, 084-085

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 59-11-00

SITE/PROGRAM HANFORD - URANIUM(1%) - GRAPHITE LATTICES

ABSTRACT

EXPONENTIAL MEASUREMENTS AT HANFORD ON GRAPHITE - URANIUM LATTICES NOW INCLUDE A WIDE RANGE OF PHYSICAL PARAMETERS. STUDIES HAVE BEEN MADE FOR LATTICE SPACINGS FROM 4.1875 INCH TO 15 INCH SOLID ROD SIZES FROM 0.926 INCH DIAMETER TO 2.5 INCH DIAMETER, AND FUEL CONFIGURATIONS OF SOLID ROD, TUBULAR, TUBE-AND-TUBE, AND CLUSTER ELEMENTS. FOR SOME OF THE FUEL GEOMETRIES, DIFFERENT WATER-TO- URANIUM AND -ALUMINUM RATIOS HAVE BEEN MEASURED, AND SEVERAL STUDIES OF ENRICHMENTS OTHER THAN NATURAL URANIUM HAVE BEEN MADE. RESULTS OBTAINED SINCE THE LAST PREVIOUS REPORTS INCLUDE BUCKLINGS FOR 2.5 INCH AND 1.92 INCH SOLID ELEMENTS, 2.5 INCH TUBE-AND-TUBE ELEMENTS, AND 2-CLUSTER ELEMENTS, ALL NATURAL URANIUM.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2042 ID-NUMBER ID-NUMBER 2042

AUTHOR ZWETZIG, G. B. / BELLER, L. S. / FIELD, H. C. / MOUNTFORD, L. A. / TUTTLE, R. J.

TITLE INITIAL EXPERIMENTS WITH THE ORGANIC-MODERATED REACTOR CRITICAL ASSEMBLY

REPORT NUMBER..... TANSO, 02, 2, 085-086

JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY

DATE PUBLISHED ... 59-11-00

SITE/PROGRAM ATOMICS INTERNATIONAL - ORGANIC MODERATED REACTOR

ABSTRACT

INITIAL OPERATING EXPERIENCE HAS BEEN OBTAINED ON AN ORGANIC-MODERATED REACTOR CRITICAL ASSEMBLY USING SLIGHTLY ENRICHED URANIUM FUEL AT ELEVATED TEMPERATURES. THE SPECIAL TECHNIQUES REQUIRED FOR OPERATION AND EXPERIMENTATION AT HIGH TEMPERATURES HAVE BEEN EXPLORED, AND A START HAS BEEN MADE TOWARD EVALUATION OF TWO PROPOSED CORE AND POISON-ROD DESIGNS.

THE SYSTEM IS BASICALLY SIMILAR TO MANY EXISTING LIQUID SYSTEMS. THE CORE VESSEL ACCOMMODATES CORES UP TO 5 FEET IN DIAMETER BY 5 FEET TALL AND A WIDE VARIETY OF GRID STRUCTURES. A MODERATOR DUMP SYSTEM AND SEPARATE STORAGE IS EMPLOYED. HEATING AND INSULATION ALLOW OPERATION UP TO A TEMPERATURE OF 600 F. POISON RODS ARE CABLE ACTUATED AND CAN BE USED IN ANY LATTICE POSITION.

2043 ID-NUMBER ID-NUMBER 2043

AUTHOR KOUTS, H. / PRICE, G. A. / DOWNES, K. / SHER, R. / WALSH, V.

TITLE BUCKLING OF LIGHT-WATER MODERATED LATTICES OF .387-INCH DIAMETER, 1.027% ENRICHED URANIUM RODS

REPORT NUMBER..... BNL-02184

DATE PUBLISHED ... 55-02-07

SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - SLIGHTLY ENRICHED URANIUM - WATER LATTICES

ABSTRACT

EXPERIMENTAL VALUES OF THE BUCKLING OF LATTICES OF .387 INCH DIAMETER, 1.027% ENRICHED URANIUM RODS IN LIGHT-WATER ARE REPORTED. THE MEASUREMENTS WERE MADE IN AN EXPONENTIAL EXPERIMENT, AS PART OF A CONTINUING PROGRAM OF STUDY OF ORDINARY WATER, SLIGHTLY ENRICHED URANIUM SYSTEMS.

2044 ID-NUMBER ID-NUMBER 2044

AUTHOR CALLIHAN, A. D. / CRONIN, D. F.

TITLE CRITICAL EXPERIMENTS WITH URANIUM OF INTERMEDIATE URANIUM-235 CONTENT

REPORT NUMBER..... ORNL-CF-55-10-97

DATE PUBLISHED ... 55-10-21

SITE/PROGRAM OAK RIDGE - URANIUM(37.5%)HEXAFLUORIDE - CUBES

ABSTRACT

INVESTIGATION OF THE CRITICAL CONDITIONS OF URANIUM, ENRICHED TO HIGH CONCENTRATION IN THE URANIUM-235 ISOTOPE AND IN A FORM SIMULATING URANIUM HEXAFLUORIDE AT NEAR MAXIMUM DENSITY, WAS BEGUN AT THE ORNL CRITICAL EXPERIMENTS LABORATORY IN JULY 1955. THE EXPERIMENTS PERFORMED TO DATE HAVE DETERMINED THE CRITICAL MASSES OF APPROXIMATELY CUBICAL ARRAYS ENCLOSED IN AN HYDROGENOUS REFLECTOR WITH LITTLE OR NO INTERMIXED HYDROGEN. SOME ESTIMATES HAVE BEEN MADE OF THE CRITICAL MASSES WITHOUT REFLECTOR. THESE RESULTS EXTEND THE MEASUREMENTS MADE PREVIOUSLY.

2045 ID-NUMBER ID-NUMBER 2045

AUTHOR CALLIHAN, A. D. / MC LENDON, J. D. / MORFITT, J. W.

TITLE CRITICALITY TEST ON P-10 ALLOY SLUGS

REPORT NUMBER..... K-0644

DATE PUBLISHED ... 50-07-11

SITE/PROGRAM OAK RIDGE - URANIUM SLUGS - WATER (HANFORD FUEL ELEMENTS)

III BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

AN INVESTIGATION HAS BEEN MADE OF THE NEUTRON MULTIPLICATION BY SEVERAL ARRAYS OF SLUGS OF AN ENRICHED URANIUM-ALUMINUM ALLOY FOR THE PURPOSE OF DETERMINING THE NUCLEAR SAFETY OF A PROPOSED SHIPPING CONTAINER. IT WAS DETERMINED THAT THE PROPOSED DESIGN, A TWO DIMENSIONAL SQUARE ARRAY OF 100 SLUGS SPACED 3.125 INCH ON CENTERS, WAS ADEQUATE. IT WAS APPARENT FROM THE EXPERIMENT THAT SUCH A SINGLE LAYER ARRAY COULD BE SAFELY EXTENDED INDEFINITELY. HOWEVER, 145 IRREGULARLY SIZED SLUGS, CONTAINING 6.92 KG URANIUM-235, WERE MADE CRITICAL WHEN SUBMERGED IN WATER IN A TWO DIMENSIONAL SQUARE ARRAY IN WHICH EACH SLUG WAS 2.2 INCH FROM EACH OF THE FOUR NEAREST NEIGHBORS, THE URANIUM DENSITY IN THE LATTICE BEING DOUBLE THAT IN THE PROPOSED SHIPPING CONTAINER. IT HAS NOT BEEN DEMONSTRATED THAT THE EXPERIMENT WAS DONE WITH OPTIMUM URANIUM DISTRIBUTION.

2046 ID-NUMBER ID-NUMBER 2046

AUTHOR FEINER, F. / WEINSTEIN, S. / OAKS, W. C. / COOPER, K. V.
 TITLE PRECISE CRITICALITY DETERMINATIONS IN THE SOLID HOMOGENEOUS ASSEMBLY
 REPORT NUMBER..... TANSO, 05, 344-345
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 62-11-00
 SITE/PROGRAM GENERAL ELECTRIC CO., KNOLLS ATOMIC POWER LABORATORY - SOLID HOMOGENEOUS ASSEMBLY (SHA)

ABSTRACT

PROPERLY DESIGNED CRITICAL-ASSEMBLY EXPERIMENTS CAN OFTEN BE USED TO DETERMINE THE ADEQUACY OF GROUP CONSTANTS USED IN REACTOR CALCULATIONS. BUT BECAUSE OF THE ASSUMPTIONS THAT NEED TO BE MADE ABOUT FUEL SELF-SHIELDING AND THE HOMOGENIZATION OF CORE-SUPPORT STRUCTURE AND CHANNELS, THE USUAL HETEROGENEOUS CORE COMPARISONS INVOLVE SEVERAL PERCENT UNCERTAINTIES. HOMOGENEOUS-SOLUTION EXPERIMENTS HAVE BEEN USED TO DETERMINE CRITICAL SIZES VERY ACCURATELY BUT CAN BE USED ONLY FOR LOW-METAL-FRACTION COMPOSITIONS BECAUSE OF THE LIMITED SOLUBILITY OF THE METALLIC SALTS IN WATER. TO ACCOMMODATE LARGE METAL FRACTIONS, BUT STILL RETAIN THE ADVANTAGES OF HOMOGENEITY, THE SOLID HOMOGENEOUS ASSEMBLY (SHA) IS DESIGNED WITH THE METALLIC ELEMENTS AND FUEL AS VERY FINE POWDERS DISPERSED IN PARAFFIN.

2047 ID-NUMBER ID-NUMBER 2047

AUTHOR WINDSOR, H.
 TITLE BUCKLINGS AND DISADVANTAGE FACTORS OF SEVERAL WATER-MODERATED, 1.25%-ENRICHED URANIUM METAL SLAB LATTICES
 REPORT NUMBER..... TANSO, 06, 052-053
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 63-06-00
 SITE/PROGRAM BROOKHAVEN NATIONAL LABORATORY - SLIGHTLY ENRICHED URANIUM - WATER LATTICES

ABSTRACT

MEASUREMENTS OF BUCKLINGS, REFLECTOR SAVINGS, INDIUM-CADMIUM RATIOS AND THERMAL DISADVANTAGE FACTORS WERE PERFORMED ON WATER-MODERATED EXPONENTIAL ASSEMBLIES MADE UP OF BARE URANIUM METAL SLABS OF 1.25% ENRICHMENT. THE SLABS ARE 0.122 X 2 X 48 INCHES, AND FOR THE MACROSCOPIC MEASUREMENTS WERE ARRANGED IN CONTINUOUS SHEETS 0.125 INCH THICK BY 48 INCHES HIGH OF SELECTED WIDTHS SPACED IN A ROW TO GIVE THE DESIRED VOLUME RATIOS. THE WATER-TO-URANIUM RATIOS INVESTIGATED WERE NOMINALLY 4:1, 3:1, 2:1, 1.5:1, AND 1:1. THE DISADVANTAGE FACTORS WERE MEASURED IN SMALLER LATTICES MADE UP OF VARNISHED 16-INCH LONG, BUT OTHERWISE SIMILAR, FUEL ELEMENTS. THE VALUES OF THE MEASURED BUCKLINGS, REFLECTOR SAVINGS, INDIUM-CADMIUM RATIOS, AND DISADVANTAGE FACTORS ARE GIVEN.

2048 ID-NUMBER ID-NUMBER 2048

AUTHOR BENTON, F. D. / GRAVES, W. E.
 TITLE MEASUREMENTS OF BUCKLINGS AND VOID EFFECTS IN HEAVY-WATER-MODERATED, ORGANIC- OR WATER-COOLED LATTICES OF URANIUM DIOXIDE ROD CLUSTERS
 REPORT NUMBER..... TANSO, 06, 053-054
 JOURNAL TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY
 DATE PUBLISHED ... 63-06-00
 SITE/PROGRAM SAVANNAH RIVER - PROCESS DEVELOPMENT PILE - URANIUM AND PLUTONIUM LATTICES IN HEAVY WATER

ABSTRACT

BUCKLINGS WERE MEASURED FOR FUEL ASSEMBLIES CONSISTING OF CLUSTERS OF 19, 31, OR 37 URANIUM DIOXIDE RODS IN HOUSING TUBES FILLED WITH ORGANIC, WATER, OR AIR. THESE ASSEMBLIES WERE CHOSEN TO COVER AN EXTREME RANGE OF HYDROGENOUS COOLANT VOLUMES RATHER THAN TO MOCK UP CANDIDATE POWER- REACTOR FUEL ASSEMBLIES. THE URANIUM DIOXIDE RODS CONSISTED OF 0.500 INCH DIAMETER SINTERED PELLETS OF 10.4 G/CC AVERAGE DENSITY STACKED IN ALUMINUM TUBES 0.020 INCH THICK AND OF 0.54 INCH

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

O.D. THESE RODS WERE ASSEMBLED IN TRIANGULAR ARRAYS TO FORM CLUSTERS. THE CLUSTERS WERE PLACED IN ALUMINUM HOUSING TUBES, WHICH IN MOST CASES WERE SELECTED TO ALLOW ONLY A SMALL PORTION OF THE COOLANT TO LIE BETWEEN THE OUTER CLUSTER BOUNDARY AND THE HOUSING WALL. DOWTHERM A (A MIXTURE OF 26.5% DIPHENYL AND 73.5% DIPHENYL OXIDE) AND WATER WERE USED TO SIMULATE COOLANTS. CLUSTERS IN AIR- FILLED HOUSINGS WERE ALSO MEASURED.

2049 ID-NUMBER ID-NUMBER 2049

AUTHOR FELD, B. T.

TITLE SUMMARY OF KNOWN CRITICAL MASSES OF URANIUM-235 AND PLUTONIUM-239

REPORT NUMBER.... LA-0309

DATE PUBLISHED ... 45-06-14

SITE/PROGRAM LOS ALAMOS - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THE FOLLOWING TABLES SUMMARIZE OUR PRESENT KNOWLEDGE OF THE CRITICAL MASSES OF ACTIVE MATERIALS IN VARIOUS CONFIGURATIONS. BY CRITICAL MASS IS MEANT THE AMOUNT OF ACTIVE MATERIAL (URANIUM-235 OR PLUTONIUM-239) REQUIRED TO PRODUCE A CHAIN REACTION WHICH WILL JUST MAINTAIN ITSELF ON ALL THE NEUTRONS (INCLUDING THE DELAYED) EMITTED IN FISSION. THE FIGURES QUOTED HAVE BEEN EXPERIMENTALLY DETERMINED WHENEVER POSSIBLE; WHERE THEORETICAL FIGURES ARE THE ONLY ONES AVAILABLE, AN ATTEMPT IS MADE TO INCLUDE A CONFIGURATION WHICH HAS ALSO BEEN INVESTIGATED EXPERIMENTALLY AND FOR WHICH THE THEORETICAL VALUE HAS BEEN CALCULATED IN THE SAME WAY. UNLESS OTHERWISE STATED, THE CORE OF ACTIVE MATERIAL IS SPHERICAL IN SHAPE.

2050 ID-NUMBER ID-NUMBER 2050

AUTHOR BAYARD, R. T. / HOVATTER, K. R. / MOREWITZ, H. A. / ZISSIS, G. J.

TITLE CRITICAL EXPERIMENTS ON LIGHTLY ENRICHED URANIUM-ZIRCONIUM ASSEMBLY

REPORT NUMBER.... WAPD-PM-32

DATE PUBLISHED ... 55-10-11

SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - PWR CRITICAL EXPERIMENTS

ABSTRACT

THE FIRST CRITICAL ASSEMBLY STUDIED IN THE PWR FLEXIBLE CRITICAL FACILITY WAS A SLIGHTLY ENRICHED URANIUM-ZIRCONIUM AND WATER REACTOR. THE EFFECTIVE MASS ENRICHMENT WAS 1.23 PER CENT. THE EFFECTIVE METAL-TO-WATER VOLUME RATIO WAS 0.80. THIS REPORT DESCRIBES THE EXPERIMENTS WHICH WERE PERFORMED WITH THIS ASSEMBLY. ATTEMPTS HAVE BEEN MADE TO ANALYZE CERTAIN PORTIONS OF THE EXPERIMENTAL DATA, AND THESE ATTEMPTS ARE ALSO REPORTED.

2051 ID-NUMBER ID-NUMBER 2051

AUTHOR MORFITT, J. W.

TITLE MINIMUM CRITICAL MASS AND UNIFORM THERMAL NEUTRON CORE FLUX IN AN EXPERIMENTAL REACTOR

REPORT NUMBER.... Y-1023

DATE PUBLISHED ... 53-12-01

SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

THE RELATIONSHIP BETWEEN MINIMUM CRITICAL MASS AND UNIFORM THERMAL NEUTRON CORE FLUX HAS BEEN EXPERIMENTALLY INVESTIGATED IN A WATER-MODERATED WATER-REFLECTED NUCLEAR REACTOR EMPLOYING URANIUM-235 AS FUEL. THE REACTOR VESSEL WAS A RIGHT CIRCULAR CYLINDER OF ALUMINUM, 72 CM IN DIAMETER AND 91.4 CM LONG. THE CORE, 30.2 CM IN DIAMETER, WAS DIVIDED INTO 5 CONCENTRIC REGIONS BY ALUMINUM PARTITIONS AND WAS SURROUNDED BY AN EFFECTIVELY INFINITE WATER REFLECTOR ON ITS LATERAL SURFACE ONLY. THE THEORETICAL FUEL DISTRIBUTION WAS THAT GIVEN BY A CALCULATION METHOD DEVELOPED IN A THEORETICAL TREATMENT OF THE PROBLEM BY GOERTZEL, WHO DEMONSTRATED MATHEMATICALLY THAT THE CONDITION OF MINIMUM CRITICAL MASS IN A SUITABLY CHOSEN THERMAL REACTOR REQUIRED THAT THE THERMAL NEUTRON FLUX BE UNIFORM EVERYWHERE IN THE CORE. THE EXPERIMENTAL RESULTS CLEARLY ESTABLISH THE VALIDITY OF THE GOERTZEL THEORY.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2052 ID-NUMBER ID-NUMBER 2052

AUTHOR DEBRUE, J. / MEWISSEN, L. / MOTTE, F. / BASSELIER, J. / DELRUE, R. /
FOSSOUL, E. / HAUBERT, N. / LAMOTTE, H. / STIEVENART, M. / VAN DEYCK, D.

TITLE RESULTS OF SUBCRITICAL EXPERIMENTS CARRIED OUT ON 5 PERCENT ENRICHED
WATER/URANIUM DIOXIDE LATTICES

REPORT NUMBER..... EURAEC-1882(ANNEX)
DATE PUBLISHED ... 67-00-00
NSA-NUMBER 22:34494
SITE/PROGRAM FRANCE - URANIUM(5%)DIOXIDE - WATER LATTICE

ABSTRACT

RESULTS OF PHYSICS MEASUREMENTS CARRIED OUT ON SUBCRITICAL ASSEMBLIES USING URANIUM DIOXIDE WITH A 5% URANIUM-235 ENRICHMENT IN THE THETIS REACTOR ARE GIVEN. THE LATTICES STUDIED WERE OF THE SQUARE PITCH TYPE AND THE WATER/URANIUM DIOXIDE RATIO HAD SUCCESSIVELY THE FIVE FOLLOWING VALUES: 1.51, 2.63, 4.13, 6.33, AND 9.35. THE MAXIMUM NUMBER OF FUEL ELEMENTS AVAILABLE WAS 500, THESE HAVING A USEFUL LENGTH OF 376.5 MM AND A USEFUL DIAMETER OF 7.6 MM. THE CLADDING IS STEEL (304) WITH A THICKNESS OF 0.2 MM.

2053 ID-NUMBER ID-NUMBER 2053

TITLE EXPERIMENTS AND ANALYSIS ON BERYLLIUM OXIDE MODERATED CORES CONTAINING
HYDROGEN

REPORT NUMBER..... GAMD-2837
DATE PUBLISHED ... 62-01-22
NSA-NUMBER 17:36866
SITE/PROGRAM GENERAL ATOMICS - BERYLLIUM OXIDE MODERATED CORE WITH HYDROGEN

ABSTRACT

THE REACTIVITIES OF A NUMBER OF CORES CONTAINING BERYLLIUM OXIDE AND POLYETHYLENE, WHICH SIMULATED WATER FLOODING, WERE MEASURED AND CALCULATED. OTHER DETERMINATIONS INCLUDED CORE SYMMETRICS, REACTIVITY WORTHS OF RODS AND ROD VOIDS, AND PERTURBATIONS ON ASSEMBLY REACTIVITIES. THE EXPERIMENTAL ARRANGEMENTS AND MEASUREMENTS, THE CALCULATIONAL METHODS USED IN THE ANALYSIS, AND THE RESULTS OF THE ANALYTICAL-EXPERIMENTAL COMPARISON ARE DESCRIBED. (D.C.W.).

2054 ID-NUMBER ID-NUMBER 2054

AUTHOR BYERS, C. C.

TITLE GRAPHITE-MODERATED, GRAPHITE-REFLECTED CRITICAL ASSEMBLIES

REPORT NUMBER..... AECU-3605
DATE PUBLISHED ... 57-00-00
SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE

ABSTRACT

GRAPHITE-MODERATED, GRAPHITE REFLECTED CRITICAL ASSEMBLIES HAVE BEEN SET UP IN THE LASL HONEYCOMB REMOTELY CONTROLLED MACHINE. INFORMATION HAS BEEN OBTAINED ON THE CRITICAL MASSES OF SYSTEMS HAVING CARBON/ORALLOY RATIOS OF 6650 AND 4093. A THIRD SYSTEM AT A SMALLER RATIO IS PLANNED. THE REACTIVITY CONTRIBUTION OF CHANNELS THROUGH THE CORE AND REFLECTOR WAS DETERMINED.

2055 ID-NUMBER ID-NUMBER 2055

AUTHOR NOAKS, J. W.

TITLE THE ALCO PRODUCTS, INC. CRITICALITY FACILITY. DESCRIPTION AND OPERATION

REPORT NUMBER..... APAE-36
DATE PUBLISHED ... 58-07-16
SITE/PROGRAM ALCO PRODUCTS, INC. - ARMY PACKAGE POWER REACTOR

ABSTRACT

THE ALCO PRODUCTS CRITICALITY FACILITY, SITE LOCATION, AND OPERATING PROCEDURES ARE DESCRIBED IN DETAIL, INCLUDING THE HANDLING OF FISSIONABLE MATERIAL AND THE OPERATING PROCEDURES FOR THE SAFE PERFORMANCE OF CRITICAL EXPERIMENTS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2056 ID-NUMBER ID-NUMBER 2056

AUTHOR PANISZCZYN, J. B.
 TITLE COMPOSITION OF FPR-1, 2, 2A, AND 3A
 REPORT NUMBER..... KAPL-M-JBP-1
 DATE PUBLISHED ... 56-05-24
 SITE/PROGRAM GENERAL ELECTRIC CO., KNOLLS ATOMIC POWER LABORATORY - FPR CRITICAL FACILITY

ABSTRACT

FOUR REACTORS WITH EITHER A DIFFERENT $K(\infty)$ OR A DIFFERENT GEOMETRY HAVE BEEN BROUGHT TO CRITICAL IN THE FPR CRITICAL FACILITY. THIS REPORT DESCRIBES BOTH THE COMPOSITION AND GEOMETRY FOR THESE REACTORS.

2057 ID-NUMBER ID-NUMBER 2057

AUTHOR HARTLEY, W. H.
 TITLE SLAB EXPERIMENTS. III. URANIUM OXIDE REFLECTOR
 REPORT NUMBER..... WAPD-PWR-PH-126
 DATE PUBLISHED ... 56-07-00
 SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - PWR CRITICAL EXPERIMENTS

ABSTRACT

EXPERIMENTS SIMILAR TO THOSE PERFORMED ON AN ENRICHED SLAB SEED WITH URANIUM METAL REFLECTOR HAVE BEEN MADE WITH A URANIUM OXIDE REFLECTOR. DIFFERENTIAL CONTROL ROD WORTH AND DIFFERENTIAL MODERATOR WORTH CURVES WERE OBTAINED AND WERE COMPARED WITH SIMILAR CURVES OBTAINED FROM THE METAL REFLECTED SLAB. FROM THESE CURVES, THE EXCESS REACTIVITY OF A SLAB WAS DETERMINED FROM A MEASUREMENT OF THE SLAB CRITICAL HEIGHT. MEASUREMENTS OF FLUX SHAPES IN THREE DIRECTIONS WERE MADE IN ORDER TO DETERMINE CRITICAL BUCKLINGS IN THE VERTICAL AND ONE HORIZONTAL DIRECTION AND TO INVESTIGATE WATER CHANNEL FLUX PEAKING.

2058 ID-NUMBER ID-NUMBER 2058

AUTHOR BEALL, S. E. / BREAZEALE, W. M. / BRIGGS, R. B. / CALLIHAN, A. D. / JORDAN, W. H.
 TITLE INTERIM REPORT OF NEUTRON AND GAMMA EXPERIMENTS ON THE MTR MOCK-UP
 REPORT NUMBER..... CF-50-5-140
 DATE PUBLISHED ... 50-05-11
 SITE/PROGRAM OAK RIDGE - MTR MOCKUP

ABSTRACT

A FULL SCALE MODEL OF THE MATERIALS TESTING REACTOR (MTR), CALLED THE MOCK-UP, WAS CONSTRUCTED AT OAK RIDGE NATIONAL LABORATORY FOR THE PURPOSE OF INVESTIGATING MANY MECHANICAL AND HYDRAULIC FEATURES IN THE MTR DESIGN. AT THE CONCLUSION OF THE HYDRAULIC EXPERIMENTS, IT BECAME APPARENT THAT EVEN THOUGH INITIAL CRITICAL EXPERIMENTS HAD BEEN DONE PREVIOUSLY THE OPERATION OF THE MOCK-UP AS A LOW POWER REACTOR WAS DESIRABLE IN ORDER TO INVESTIGATE CERTAIN NUCLEAR ASPECTS OF THE MTR DESIGN. MORE SPECIFICALLY, THE OBJECTIVES OF THE PROGRAM WERE OUTLINED AS FOLLOWS:

- (1) DETERMINATION OF CRITICAL MASS FOR NORMAL SLAB LOADING.
- (2) MEASUREMENT OF NEUTRON AND/OR GAMMA FLUXES AT APPROXIMATELY 100 WATTS POWER LEVEL IN (A) THE LATTICE, (B) THE WATER ABOVE THE LATTICE, (C) THE EXPERIMENTAL HOLES, (D) THROUGHOUT THE GRAPHITE.
- (3) TESTING OF CONTROL AND SAFETY CIRCUITS AND CALIBRATION OF CONTROL RODS.
- (4) MEASUREMENT OF TEMPERATURE COEFFICIENT OF REACTIVITY.
- (5) DETERMINATION OF EFFECT OF WATER FLOW AND AIR BUBBLES ON REACTIVITY.
- (6) DETERMINATION OF RESPONSE TIME OF REGULATING ROD SERVO-MECHANISM TO RAPID CHANGES IN REACTIVITY.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2059 ID-NUMBER ID-NUMBER 2059

AUTHOR BROWN, J. R. / NOORDHOFF, B. H. / PROFIO, A. E. / BATESON, W. O.
 TITLE REACTOR PROPERTIES OF WATER MODERATED SLIGHTLY ENRICHED URANIUM LATTICES
 REPORT NUMBER.... WAPD-117
 DATE PUBLISHED ... 54-11-00
 SITE/PROGRAM WESTINGHOUSE, BETTIS ATOMIC POWER LABORATORY - TRX CRITICAL ASSEMBLY

ABSTRACT

EXPERIMENTS INVOLVING CLEAN CRITICAL ASSEMBLIES OF SLIGHTLY ENRICHED FUEL RODS IN A WATER MODERATED LATTICE, OPERATED AT LOW POWER HAVE BEEN PERFORMED FOR SEVERAL WATER-TO-URANIUM RATIOS. THESE FUEL RODS ARE 0.600 INCH DIAMETER, 48 INCHES LONG, ENRICHED TO 1.3 PER CENT URANIUM-235 AND CLAD WITH ALUMINUM. THE REACTOR PROPERTIES MEASURED AS A FUNCTION OF WATER TO URANIUM RATIO INCLUDE THE NUMBER OF FUEL RODS REQUIRED FOR CRITICALITY AND FROM THIS THE GEOMETRICAL BUCKLING; MEASUREMENT OF THE MIGRATION AREA FROM A DIFFERENTIAL WATER WORTH VS WATER HEIGHT EXPERIMENT; THE TEMPERATURE COEFFICIENT OF REACTIVITY AS A FUNCTION OF TEMPERATURE IN THE RANGE 20C TO 60C. THE WATER-TO-URANIUM RATIOS INVESTIGATED ARE 3-TO-1, 2-TO-1, AND 1.5-TO-1.

2060 ID-NUMBER ID-NUMBER 2060

AUTHOR LANNING, D. D. / DONAHUE, D. J. / BENNETT, R. A.
 TITLE THE NUCLEAR PARAMETERS OF SOME LARGE PROCESS TUBE LATTICES FROM PCTR MEASUREMENTS
 REPORT NUMBER.... BNL-0489, 089-094
 CONFERENCE FRENCH-AMERICAN CONFERENCE ON GRAPHITE REACTORS, NOVEMBER 12 TO 15, 1957
 DATE PUBLISHED ... 57-11-12
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

MEASUREMENTS OF K(INF) HAVE BEEN MADE FOR THREE FUEL CONFIGURATIONS IN A 2.125 INCH O.D. PROCESS TUBE AS A FUNCTION OF THE GRAPHITE TO URANIUM ATOMIC RATIO. THESE MEASUREMENTS WERE MADE IN THE PCTR BY THE METHODS PREVIOUSLY REPORTED.

2061 ID-NUMBER ID-NUMBER 2061

AUTHOR CLAYTON, E. D.
 TITLE BUCKLING MEASUREMENTS WITH ENRICHED URANIUM IN GRAPHITE SYSTEMS
 REPORT NUMBER.... BNL-0489, 189-210
 CONFERENCE FRENCH-AMERICAN CONFERENCE ON GRAPHITE REACTORS, NOVEMBER 12 TO 15, 1957
 DATE PUBLISHED ... 57-11-12
 SITE/PROGRAM HANFORD - URANIUM(1%) - GRAPHITE LATTICES

ABSTRACT

THIS PAPER GIVES THE RESULTS OF A SERIES OF BUCKLING MEASUREMENTS WITH ENRICHED URANIUM IN GRAPHITE LATTICES. THE URANIUM ENRICHMENTS USED WERE 0.94%, 1.007%, 1.44%, AND HIGHLY ENRICHED (URANIUM GREATER THAN 90% BY WEIGHT URANIUM-235). THE BUCKLINGS WERE DETERMINED AS A FUNCTION OF THE LATTICE SPACING; THE EFFECT OF A WATER COOLANT CHANNEL ON THE BUCKLING WAS ALSO INVESTIGATED. THE EXPERIMENTS INCLUDE THE RESULTS FOR SEVERAL HOLLOW FUEL ELEMENTS. DATA ARE ALSO GIVEN ON NATURAL URANIUM BUCKLINGS WHICH CAN BE USED FOR COMPARISON WITH THE ENRICHED URANIUM CASES.

2062 ID-NUMBER ID-NUMBER 2062

AUTHOR ZIMMERMAN, E. L.
 TITLE A GRAPHITE MODERATED CRITICAL ASSEMBLY--CA-4
 REPORT NUMBER.... BNL-0489, 239-274
 CONFERENCE FRENCH-AMERICAN CONFERENCE ON GRAPHITE REACTORS, NOVEMBER 12 TO 15, 1957
 DATE PUBLISHED ... 57-11-12
 SITE/PROGRAM OAK RIDGE - URANIUM(93%) - GRAPHITE SYSTEMS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

A GRAPHITE MODERATED ENRICHED URANIUM CRITICAL ASSEMBLY WAS CONSTRUCTED TO PROVIDE AN EXPERIMENTAL CHECK FOR CERTAIN REACTOR CALCULATION METHODS AND TO EVALUATE A NUMBER OF EXPERIMENTAL PROCEDURES USED IN THE OAK RIDGE NATIONAL LABORATORY CRITICAL FACILITY. IN ORDER TO MINIMIZE UNCERTAINTIES IN SUBSEQUENT MEASUREMENTS AND CALCULATIONS, THE ASSEMBLY WAS KEPT AS SIMPLE AS POSSIBLE. THE ASSEMBLY APPROXIMATED A UNIFORMLY LOADED, UNPOISONED, BARE CUBE, CONTAINING RELATIVELY WELL-KNOWN REACTOR MATERIALS. THIS SIMPLE CRITICAL ASSEMBLY PROVED TO BE AN EXCELLENT TOOL FOR BASIC REACTOR PHYSICS STUDIES.

THE SIZE OF THE ASSEMBLY WAS 51.0 X 51.0 X 44.11 INCH, AND THE CRITICAL LOADING WAS 52.48 KG URANIUM-235. WITH THE CRITICAL ASSEMBLY AS A MODEL AND ASSUMING AN EXTRAPOLATION DISTANCE OF 2 CM, A BARE REACTOR, 32 GROUP CALCULATIONS GAVE A VALUE 0.9912 FOR THE EFFECTIVE MULTIPLICATIONS.

2063 ID-NUMBER ID-NUMBER 2063

AUTHOR BYERS, C. C.

TITLE GRAPHITE MODERATED, GRAPHITE REFLECTED CRITICAL ASSEMBLIES

REPORT NUMBER.... BNL-0489, 291-296

CONFERENCE FRENCH-AMERICAN CONFERENCE ON GRAPHITE REACTORS, NOVEMBER 12 TO 15, 1957

DATE PUBLISHED ... 57-11-12

SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE

ABSTRACT

GRAPHITE MODERATED, GRAPHITE REFLECTED CRITICAL ASSEMBLIES HAVE BEEN SET UP IN THE LASL HONEYCOMB REMOTELY CONTROLLED MACHINE. INFORMATION HAS BEEN OBTAINED ON THE CRITICAL MASSES OF SYSTEMS HAVING CARBON TO ORALLOY RATIOS OF 6650 AND 4366. A THIRD SYSTEM AT A SMALLER RATIO IS PLANNED. THE REACTIVITY CONTRIBUTION OF CHANNELS THROUGH THE CORE AND REFLECTOR WAS DETERMINED.

2064 ID-NUMBER ID-NUMBER 2064

AUTHOR NOAKS, J. W. / JOHNSON, W. R.

TITLE ARMY PACKAGE POWER REACTOR ZERO POWER EXPERIMENTS (ZPE-1)

REPORT NUMBER.... APAE-08

DATE PUBLISHED ... 57-02-08

SITE/PROGRAM ALCO PRODUCTS, INC. - ARMY PACKAGE POWER REACTOR

ABSTRACT

ALCO PRODUCTS CRITICALITY FACILITY LOCATED IN SCHENECTADY, N. Y. INITIATED OPERATIONS ON THE ARMY PACKAGE POWER REACTOR ZERO POWER EXPERIMENTS DURING THE FOURTH WEEK OF AUGUST, 1956.

THE INITIAL RESULTS OF THESE EXPERIMENTS WERE PUBLISHED IN AP MEMO NO. 6 "RESULTS AND ANALYSIS OF THE APPR-1 ZERO POWER EXPERIMENTS, PART I" HOWEVER, DUE TO THE PRESENCE OF SOME TECHNICAL DIFFICULTIES DURING THE INITIAL PHASES OF THE EXPERIMENT, IT SEEMED DESIRABLE TO REPEAT SOME RUNS. THE DATA HEREIN PRESENTED ARE CONSIDERED PRECISE, WITHIN THE ERRORS INDICATED, AND ARE A COMPLETE REPRESENTATION OF THOSE EXPERIMENTS UNDERTAKEN.

THE PRIMARY PURPOSE OF THIS REPORT IS THE PRESENTATION OF DATA IN A FORM SUITABLE FOR ANALYTICAL STUDIES.

2065 ID-NUMBER ID-NUMBER 2065

AUTHOR GALLAGHER, J. G. / GIESLER, H. W. / JOHNSON, W. R.

TITLE CRITICAL MASS CALCULATION FOR APPR-1 CRITICAL EXPERIMENT

REPORT NUMBER.... APAE-MEMO-001

DATE PUBLISHED ... 55-09-23

SITE/PROGRAM ALCO PRODUCTS, INC. - ARMY PACKAGE POWER REACTOR

ABSTRACT

IN ORDER TO CHECK PREVIOUS CALCULATIONS, AND TO PROVIDE A TOOL FOR FUTURE ANALYTICAL WORK ON APPR TYPE REACTORS, A CALCULATION TO PREDICT THE CRITICAL MASS OF THE APPR CRITICAL EXPERIMENT HAS BEEN PERFORMED. THE PARTICULAR CASES INVESTIGATED WERE FOR THE COLD, UNPOISONED CRITICAL ASSEMBLY, WITH AND WITHOUT THE STAINLESS STEEL END BOXES. THE INCLUSION OF THE END BOXES CHANGED THE AXIAL REFLECTOR FROM WATER TO 60% WATER AND 40% STAINLESS STEEL. AN INFINITE RADIAL REFLECTOR WAS ASSUMED AT ALL TIMES. THE CRITICAL MASS WAS FOUND TO BE 8.69 KG OF URANIUM-235 IN BOTH CASES.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2066 ID-NUMBER ID-NUMBER 2066

AUTHOR GIESLER, H. W.
 TITLE RESULTS AND ANALYSIS OF THE APPR-1 ZERO POWER EXPERIMENTS. PART 1
 REPORT NUMBER..... APAE-MEMO-061
 DATE PUBLISHED ... 56-11-07
 SITE/PROGRAM ALCO PRODUCTS, INC. - ARMY PACKAGE POWER REACTOR

ABSTRACT

THIS REPORT CONTAINS THE RESULTS OF THE INITIAL EXPERIMENTS PERFORMED ON THE APPR-1 CORE AT THE ALCO CRITICAL FACILITY, AN INTERPRETATION OF THE EXPERIMENTAL MEASUREMENTS, AND A PLAN OF OPERATION FOR THE APPR-1.

2067 ID-NUMBER ID-NUMBER 2067

AUTHOR PLASSMANN, E. A. / WOOD, D. P.
 TITLE CRITICALITY DATA ON METAL URANIUM-233 SPHERICAL SYSTEMS
 REPORT NUMBER..... BNL-0483, 73-74
 DATE PUBLISHED ... 57-01-09
 SITE/PROGRAM LOS ALAMOS - URANIUM-233 METAL SPHERES

ABSTRACT

DATA CONSISTING OF CRITICAL REFLECTOR THICKNESSES FOR 2.41-KG AND 10.0-KG URANIUM-233 METAL SPHERES ARE SUMMARIZED.

2068 ID-NUMBER ID-NUMBER 2068

AUTHOR HENRY, K. M. / JOHNSON, E. B. / MAIENSCHIN, F. C.
 TITLE PRELIMINARY CRITICAL TESTS USING AQUARIUM FUEL ELEMENTS IN THE BSR GRID
 REPORT NUMBER..... CF-55-5-189
 DATE PUBLISHED ... 55-05-31
 SITE/PROGRAM OAK RIDGE - AQUARIUM FUEL ELEMENTS

ABSTRACT

THE PRELIMINARY CRITICAL TESTS FOR THE AQUARIUM REACTOR WERE PERFORMED IN THE GRID OF THE BULK SHIELDING REACTOR (BSR) MAY 14, 1955. TWENTY OF THE FULL (170-G) AQUARIUM FUEL ELEMENTS WERE USED, TOGETHER WITH BSR EQUIPMENT, INSTRUMENTATION, ROD ELEMENTS AND PARTIAL ELEMENTS.

THE FIRST AQUARIUM LOADING WAS THE RESULT OF AN ATTEMPT TO FIND THE MINIMUM CRITICAL MASS. IT WILL BE NOTED THAT THIS LOADING WAS ESSENTIALLY A 5 X 5 FUEL ELEMENT ARRAY WITH THE TWO BACK CORNERS MISSING. THE TOTAL URANIUM-235 CONTENT WAS 3615 G AND THE EXCESS REACTIVITY WAS ABOUT 0.4%, AS INDICATED BY THE REGULATING ROD POSITION.

2069 ID-NUMBER ID-NUMBER 2069

AUTHOR BLY, F. T. / CONEYBEAR, J. F. / HAAKE, E. V. / HUNTER, J. A. / KROEGER, H. R. / MOONEYHAM, A. O. / PRESSEY, F. W. / THORNTON, G. / TOAL, R. L. / WEINBERG, D. I.
 TITLE NEPA CRITICAL EXPERIMENT FACILITY
 REPORT NUMBER..... NEPA-1769
 DATE PUBLISHED ... 51-04-51
 SITE/PROGRAM OAK RIDGE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THE NEPA PORTION OF THE JOINT NEPA-CARBIDE CRITICAL EXPERIMENT FACILITY IS DESCRIBED, AS WELL AS SOME OF ITS SUPPORTING FACILITIES. INFORMATION IS PRESENTED ON MECHANICAL EQUIPMENT, ELECTRICAL EQUIPMENT, INSTRUMENTATION, MATERIALS, AND BUILDING. DETAILED DIAGRAMS AND INSTRUCTIONS SUITABLE FOR OPERATING, MAINTAINING AND REPRODUCING THE EQUIPMENT IN USE ARE PROVIDED IN SEPARATE APPENDICES.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2070 ID-NUMBER ID-NUMBER 2070

AUTHOR WILLIAMS, D. V. P.
 TITLE PRELIMINARY RESULTS OF APPR CRITICAL EXPERIMENTS. PART I
 REPORT NUMBER..... ORNL-2021
 DATE PUBLISHED ... 55-11-25
 SITE/PROGRAM OAK RIDGE - ARMY PACKAGE POWER REACTOR

ABSTRACT

THIS MEMORANDUM IS THE FIRST IN A SERIES REPORTING PROGRESS IN THE PROGRAM OF CRITICAL EXPERIMENTS IN THE ORNL ARMY PACKAGE POWER REACTOR PROJECT. THE CRITICAL ASSEMBLY, DESIGNATED AS CA- 25, IS ANALOGOUS TO THE APPR DESIGN CORE AND CONSISTS OF 45 FUEL BOXES, IN A 7 X 7 ARRAY WITH THE CORNERS REMOVED, CONTAINED IN A LARGE WATER TANK. TWO SIDES OF EACH BOX ARE SLOTTED FOR THE INSERTION AND POSITIONING OF ANY DESIRED LOADING OF EIGHTEEN PLATES OF FUEL, STRUCTURAL MATERIAL, AND POISON. THE ARRAY IS SUBMERGED IN WATER TO PROVIDE A MODERATOR AND REFLECTOR.

2071 ID-NUMBER ID-NUMBER 2071

AUTHOR CALLIHAN, A. D.
 TITLE CRITICAL EXPERIMENTS AND NUCLEAR SAFETY AT OAK RIDGE NATIONAL LABORATORY
 REPORT NUMBER..... ORNL-2087
 DATE PUBLISHED ... 56-08-02
 SITE/PROGRAM OAK RIDGE - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

THIS PAPER CONSIDERS TWO SOMEWHAT SEPARATE ASPECTS OF POTENTIAL HAZARDS IN THE NUCLEAR REACTOR PROGRAM. THE FIRST SECTION DESCRIBES THE SAFETY FEATURES OF THE CRITICAL-EXPERIMENTS PROGRAM AT OAK RIDGE NATIONAL LABORATORY AND REVIEWS ITS OPERATIONAL EXPERIENCE. IN THESE EXPERIMENTS, REACTOR PROTOTYPES ARE STUDIED AND THE PROBLEMS OF FUEL PROCESSING ARE EXAMINED. THE SECOND SECTION OF THE PAPER PRESENTS SOME DESIGN BASES FOR FUEL PROCESSING EQUIPMENT AND DISCUSSES THE ADMINISTRATION OF NUCLEAR SAFETY AT THE LABORATORY.

2072 ID-NUMBER ID-NUMBER 2072

AUTHOR MARTENS, F. H.
 TITLE EXPERIMENTS ON ZERO POWER REACTOR (ZPR-1). PART III
 REPORT NUMBER..... TID-10020
 DATE PUBLISHED ... 54-03-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-1

ABSTRACT

THIS REPORT CONSTITUTES THE THIRD AND FINAL PART OF A SERIES OF REPORTS ON THE EXPERIMENTAL DATA TAKEN ON THE ZPR-1 REACTOR. THE TWO OTHER REPORTS, PART I - ANL-4684 AND PART II - ANL-4770, COVER THE PERIOD FROM THE STARTUP OF THE REACTOR ON OCTOBER 6, 1950, UNTIL THE TIME EXPERIMENTAL WORK WAS INTERRUPTED BY AN ACCIDENTAL RUNAWAY ON JUNE 2, 1952. REFERENCE TO THESE TWO REPORTS IS ESSENTIAL TO THE UNDERSTANDING OF THIS REPORT.

AT THE END OF THE PERIOD COVERED BY ANL-4770, THE REACTOR WAS SHUT DOWN FOR A THREE-MONTH PERIOD FOLLOWING THE ACCIDENTAL OVERPOWER TRANSIENT OF JUNE 2, 1952. DURING THIS TIME, THE REACTOR WAS REPAIRED, AND ADDITIONAL SAFEGUARDS WERE ADDED TO FURTHER INCREASE THE SAFETY OF THE REACTOR. SEVERAL WEEKS WERE USED IN OBTAINING DATA TO FURTHER THE UNDERSTANDING OF WHAT OCCURRED DURING THE TRANSIENT. THIS MATERIAL WAS INCLUDED IN THE REPORT COVERING THE ACCIDENT, ANL-4971.

THE PROGRAM OF RESEARCH FELL INTO THREE PARTS. THE FIRST WAS AN EXTENSIVE STUDY OF THE DIFFERENT CONTROL RODS AND THEIR EFFECT. SINGLE RODS WERE PLACED IN THE REACTOR, AND IN ALL CASES THE MINIMUM CRITICAL MASS WAS DETERMINED. MANY FLUX PLOTS SHOWING THE BEHAVIOR OF THE THERMAL FLUX WERE MADE.

THE SECOND PART CONSISTED OF BUILDING UP TO FULL SIZE AND EXPERIMENTING WITH THE FULL-SIZE CORE. A DETAILED FLUX DISTRIBUTION STUDY WAS MADE, AND THE VARIOUS RODS WERE CALIBRATED. AN EXPERIMENT TO DETERMINE THE SHUTDOWN REACTIVITY WAS PERFORMED. THE THIRD PART CONSISTED OF EXPERIMENTS PERFORMED WHILE THE WATER FORMING THE MODERATOR AND REFLECTOR WAS POISONED WITH DIFFERENT CONCENTRATIONS OF BORIC ACID.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2073 ID-NUMBER ID-NUMBER 2073

AUTHOR CALLIHAN, A. D. / SCOTT, D.
 TITLE PRELIMINARY CRITICAL ASSEMBLY FOR THE MOLTEN FLUORIDE REACTOR EXPERIMENT
 REPORT NUMBER..... ORNL-1634
 DATE PUBLISHED ... 53-11-18
 SITE/PROGRAM OAK RIDGE - MOLTEN FLUORIDE REACTOR (AIRCRAFT REACTOR EXPERIMENT)

ABSTRACT

A ZERO POWER MOCK-UP OF THE MOLTEN FLUORIDE REACTOR EXPERIMENT WAS CONSTRUCTED IN THE OAK RIDGE NATIONAL LABORATORY CRITICAL FACILITY. THE ASSEMBLY WAS BERYLLIUM OXIDE MODERATED AND REFLECTED AND USED A POWDER MIXTURE OF ZIRCONIUM, SODIUM, AND ENRICHED URANIUM, SIMULATING THE REACTOR FUEL, PACKED IN STAINLESS STEEL TUBES AS FUEL ELEMENTS. THE CLEAN CRITICAL MASS, WITHOUT THE REGULATING AND SAFETY RODS, WAS 5.8 KG OF URANIUM-235 TO BE COMPARED TO THE PREDICTED VALUE OF 5.5 KG.

2074 ID-NUMBER ID-NUMBER 2074

AUTHOR MC FARLAND, C. E. / VOORHIS, A. D.
 TITLE EXPERIMENTAL AND THEORETICAL STUDY OF CRITICAL SLABS. EFFECT OF DIFFERENT REFLECTOR ARRANGEMENTS AND COMPOSITIONS
 REPORT NUMBER..... WAPD-169
 DATE PUBLISHED ... 57-04-00
 SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - PWR CRITICAL EXPERIMENTS

ABSTRACT

DATA ARE PRESENTED FROM CRITICAL SLAB EXPERIMENTS WITH A THIN CORE OF ENRICHED URANIUM-235, LIGHT WATER, AND ZIRCONIUM WHICH WERE SURROUNDED BY REFLECTORS OF DIFFERENT COMPOSITIONS AND ARRANGEMENTS. THE REFLECTORS STUDIED WERE COMPOSED OF WATER, ZIRCONIUM-WATER, AND ALUMINUM-WATER. IN SOME EXPERIMENTS THE CORES WERE BISECTED BY WATER GAPS. EACH CRITICAL ASSEMBLY WAS ANALYZED BY ONE-DIMENSIONAL, GROUP DIFFUSION THEORY USING DIGITAL CODES. THE CALCULATED NEUTRON MULTIPLICATIONS FROM A FOUR-GROUP SCHEME PREDICT CRITICALITY IN MOST OF THE EXPERIMENTS WITHIN 1%, AND FROM A TWO-GROUP SCHEME WITHIN 3%. CALCULATED NEUTRON FLUX DISTRIBUTIONS ARE FITTED WITH EXPERIMENTAL TRAVERSES OF SUBCADMIUM AND EPICADMIUM ACTIVATION (OF MANGANESE). THE ACCURACY OF THE CALCULATIONS WITH REGARD TO INPUT DATA AND METHOD IS DISCUSSED.

2075 ID-NUMBER ID-NUMBER 2075

AUTHOR VOORHIS, A. D. / RYAN, T. M. / GOLDSMITH, M. / JONES, R. T.
 TITLE EXPERIMENTAL AND THEORETICAL STUDY OF CRITICAL SLABS. EFFECT OF ABSORBING MEMBRANES OF CADMIUM, GOLD, AND BORON
 REPORT NUMBER..... WAPD-170
 DATE PUBLISHED ... 57-04-00
 SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - PWR CRITICAL EXPERIMENTS

ABSTRACT

EXPERIMENTS ARE DESCRIBED IN WHICH A HIGHLY ENRICHED SLAB CORE WAS BISECTED BY ABSORBING MEMBRANES OF CADMIUM, GOLD, AND BORON-POLYETHYLENE. THE DATA INCLUDED CRITICAL CORE DIMENSIONS AND ACTIVATION TRAVERSES PERPENDICULAR TO EACH MEMBRANE. EACH ASSEMBLY WAS ANALYZED BY USE OF A ONE-DIMENSIONAL, GROUP DIFFUSION, DIGITAL CODE WHICH COMPUTED NEUTRON MULTIPLICATION AND FLUX DISTRIBUTION PERPENDICULAR TO THE MEMBRANE. IN EACH CALCULATION THE MEMBRANE WAS REPLACED BY AN EFFECTIVE DIFFUSION MEDIUM HAVING THE SAME THICKNESS. THIS PROCEDURE IS DESCRIBED. THE RESULTS INDICATED THAT OVER 90% OF THE REACTIVITY WORTH OF THE CADMIUM OR GOLD MEMBRANE WAS ACCOUNTED FOR IN THE CALCULATION. THE LOADING IN THE BORON-POLYETHYLENE MEMBRANE WAS SO SMALL THAT CALCULATING ITS REACTIVITY WORTH BY THE METHOD USED WAS DIFFICULT.

2076 ID-NUMBER ID-NUMBER 2076

AUTHOR BROWN, J. R. / HARRIS, D. R. / FRANTZ, F. S. / VOLPE, J. J. / ANDREWS, J. C. / NOORDHOFF, B. H.
 TITLE KINETIC AND BUCKLING MEASUREMENTS ON LATTICES OF SLIGHTLY ENRICHED URANIUM OR URANIUM DIOXIDE RODS IN LIGHT WATER
 REPORT NUMBER..... WAPD-176
 DATE PUBLISHED ... 58-01-00
 SITE/PROGRAM WESTINGHOUSE, BETTIS ATOMIC POWER LABORATORY - TRX CRITICAL ASSEMBLY

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

RESULTS OF MEASUREMENTS MADE IN THE TRX CRITICAL FACILITY ON LIGHT WATER-MODERATED LATTICES OF 1.3 AND 1.15 W/O ENRICHED URANIUM METAL FUEL RODS AND OF 1.3 W/O ENRICHED URANIUM DIOXIDE FUEL RODS ARE DESCRIBED. DIAMETERS OF 0.60 INCH AND 0.39 INCH FOR EACH FUEL HAVE BEEN USED AS WELL AS DENSITIES OF 7.5 AND 10.5 GM/CC FOR THE URANIUM DIOXIDE FUEL. SEVERAL WATER-TO-URANIUM RATIOS HAVE BEEN INVESTIGATED FOR EACH FUEL ROD TYPE. MEASUREMENTS HAVE BEEN MADE OF RADIAL AND AXIAL BUCKLING, REFLECTOR SAVINGS, AND TEMPERATURE COEFFICIENT OF REACTIVITY.

2077 ID-NUMBER ID-NUMBER 2077

AUTHOR GELBARD, E. M.

TITLE ANALYSIS OF DCTF CRITICALITY AND REACTIVITY DATA

REPORT NUMBER..... WAPD-P-695

DATE PUBLISHED ... 55-12-00

SITE/PROGRAM WESTINGHOUSE, BETTIS ATOMIC POWER LABORATORY - TRX CRITICAL ASSEMBLY

ABSTRACT

DCTF CRITICAL HEIGHTS HAVE BEEN MEASURED FOR SIX DIFFERENT CONCENTRATIONS, BOTH WITH AND WITHOUT A WATER REFLECTOR. IN ADDITION, REACTIVITIES PER INCH OF SOLUTION HEIGHT HAVE BEEN DETERMINED FOR THE SAME CONCENTRATIONS. THIS REPORT SUMMARIZES RESULTS OF A RECENT INVESTIGATION OF THE EXPERIMENTAL DATA, AN INVESTIGATION WHICH HAD TWO MAIN OBJECTIVES. FIRST, IT WAS HOPED THAT AVAILABLE INFORMATION WOULD SUFFICE TO DETERMINE LUCITE AND WATER REFLECTOR SAVINGS FOR THE GIVEN FUEL CONCENTRATIONS. SECOND, THE MOMENTS OF THE SLOWING DOWN DENSITY IN WATER WERE TO BE DEDUCED FROM THE CRITICAL HEIGHT AND REACTIVITY MEASUREMENTS, THROUGH ANALYSIS OF THE CRITICAL EQUATION. THE RESULTS DETAILED BELOW WERE INCONCLUSIVE, BUT SUGGESTIVE.

2078 ID-NUMBER ID-NUMBER 2078

AUTHOR LEVINE, S. H. / JOHNSON, P. G.

TITLE AN ALUMINUM-URANIUM CRITICAL ASSEMBLY IN CYLINDRICAL GEOMETRY

REPORT NUMBER..... WAPD-TM-0024

DATE PUBLISHED ... 56-11-00

SITE/PROGRAM WESTINGHOUSE - FLEXIBLE SURVEY ASSEMBLY CORE (HETEROGENEOUS URANIUM ALUMINUM WATER CORE)

ABSTRACT

THIS EXPERIMENT INVOLVES CONSTRUCTING AN ALUMINUM-URANIUM, HETEROGENEOUS, WATER-MODERATED CRITICAL ASSEMBLY HAVING A METAL-TO-WATER RATIO OF 1.39, IN ORDER TO MEASURE CRITICALITY AND REFLECTORS SAVINGS, AND TO INFER THE AGE OF THIS SYSTEM. CRITICALITY IS ATTAINED BY SLOWLY ADDING BUNDLES IN A CYLINDRICAL CONFIGURATION UNTIL THE CORE IS JUST CRITICAL WITH ALL CONTROL RODS COMPLETELY REMOVED FROM THE CORE. THE REFLECTOR SAVINGS IS MEASURED FROM THE FLUX PLOTS OF THE CADMIUM-COVERED MANGANESE WIRES.

2079 ID-NUMBER ID-NUMBER 2079

AUTHOR CALLIHAN, A. D. / CRONIN, D. F.

TITLE RING TAMPING

REPORT NUMBER..... Y-B23-22

DATE PUBLISHED ... 52-11-05

SITE/PROGRAM OAK RIDGE - URANIUM(5%)OXIDE - GLYCEROL

ABSTRACT

"RING TAMPING" HAS BEEN DEFINED AS THE CONDITION IN A POTENTIAL NUCLEAR CHAIN-REACTING SYSTEM WHEREBY TWO OR MORE VOLUMES OF FISSIONABLE MATERIAL ARE SURROUNDED BY, BUT NOT SEPARATED BY, A HYDROGENOUS NEUTRON-REFLECTING MEDIUM. IN THE DESIGN OF A SYSTEM WHICH WILL BE SAFE WHEN COMPLETELY INUNDATED IN WATER, RELIANCE MAY BE PLACED ON THE NEUTRON ABSORPTION BY THE HYDROGEN SEPARATING THE COMPONENTS. WERE THE WATER BETWEEN THE COMPONENTS OF AN OTHERWISE SAFE SYSTEM TO BE REMOVED, A MORE HAZARDOUS CONDITION MIGHT RESULT.

PRELIMINARY EXPERIMENTS INTENDED TO DETERMINE THE CHANGE IN REACTIVITY INCURRED BY REMOVAL OF REFLECTOR MATERIAL FROM BETWEEN THE TWO COMPONENTS ARE DESCRIBED HERE.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2080 ID-NUMBER ID-NUMBER 2080

AUTHOR DONAHUE, D. J. / LANNING, D. D. / BENNETT, R. A. / HEINEMAN, R. E.
 TITLE DETERMINATION OF K(INF) FROM CRITICAL EXPERIMENTS WITH THE PCTR
 REPORT NUMBER..... BNL-0489, 069-084
 CONFERENCE FRENCH-AMERICAN CONFERENCE ON GRAPHITE REACTORS, NOVEMBER 12 TO 15, 1957
 DATE PUBLISHED ... 57-11-12
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

THE PCTR IS A 7 FOOT CUBE OF GRAPHITE WITH A LARGE CAVITY, 2 X 2 X 3 FOOT LOCATED AT ITS CENTER. IT IS MADE CRITICAL BY ENRICHED URANIUM WHICH IS DISTRIBUTED ON THE BOUNDARY OF THE CENTRAL CAVITY. ONE END OF THE ASSEMBLY, 2 X 7 X 7 FOOT IS MOUNTED ON A MOVABLE CART AND CAN BE MOVED AWAY FROM THE REACTOR PROPER TO ALLOW ACCESS TO THE CENTRAL TEST REGION.

THE INFINITE MEDIUM, THERMAL NEUTRON MULTIPLICATION FACTOR OF A MULTIPLYING MATERIAL IS OBTAINED BY DETERMINING THE AMOUNT OF THERMAL ABSORBER WHICH, WHEN INSERTED WITH THE MULTIPLYING MATERIAL INTO THE CENTRAL REGION OF THE PCTR, WILL CHANGE NEITHER THE REACTIVITY OF THE ASSEMBLY NOR THE ENERGY DISTRIBUTION OF NEUTRONS IN IT. THE DESIGN OF THE REACTOR AND THE METHOD USED FOR DETERMINING THIS ABSORBER MASS ARE DISCUSSED, AND RESULTS FOR TWO GRAPHITE-NATURAL URANIUM LATTICES ARE PRESENTED.

2081 ID-NUMBER ID-NUMBER 2081

AUTHOR LANNING, D. D. / DONAHUE, D. J. / BENNETT, R. A.
 TITLE THE NUCLEAR PARAMETERS OF SOME GRAPHITE, NATURAL URANIUM LATTICES MEASURED IN THE PCTR
 REPORT NUMBER..... BNL-0489, 085-088
 CONFERENCE FRENCH-AMERICAN CONFERENCE ON GRAPHITE REACTORS, NOVEMBER 12 TO 15, 1957
 DATE PUBLISHED ... 57-11-12
 SITE/PROGRAM HANFORD - PCTR MEASUREMENTS OF K(INF)

ABSTRACT

THE PHYSICAL CONSTANTS TESTING REACTOR, PCTR, AND THE METHOD BY WHICH IT CAN BE USED TO OBTAIN THE NUCLEAR PROPERTIES OF A MULTIPLYING MATERIAL HAVE BEEN DESCRIBED IN DETAIL IN A PREVIOUS PAPER. IN ORDER TO GAIN FURTHER INSIGHT INTO THE OPERATION OF THIS REACTOR, AND TO INVESTIGATE THE NUCLEAR PROPERTIES OF A RANGE OF GRAPHITE MODERATED, AIR COOLED, NATURAL URANIUM FUELED SYSTEMS, THE INFINITE MEDIUM, THERMAL NEUTRON MULTIPLICATION FACTOR, AND THE THERMAL UTILIZATION, OF TEN SUCH LATTICES HAVE BEEN DETERMINED. THE RESULTS HAVE BEEN FURTHER ANALYZED TO OBTAIN A VALUE OF THE FAST NEUTRONS PRODUCED PER THERMAL CAPTURE IN NATURAL URANIUM. SOME COMPARISONS ARE MADE BETWEEN THE RESULTS OF THE PCTR MEASUREMENTS AND THOSE OBTAINED BY OTHER METHODS.

2082 ID-NUMBER ID-NUMBER 2082

AUTHOR KOECHLIN, J. C. / TANGUY, P. / ZALESKI, C. P.
 TITLE FRENCH RESULTS ON THE NATURAL URANIUM-GRAPHITE LATTICES
 REPORT NUMBER..... BNL-0489, 097-126
 CONFERENCE FRENCH-AMERICAN CONFERENCE ON GRAPHITE REACTORS, NOVEMBER 12 TO 15, 1957
 DATE PUBLISHED ... 57-11-12
 SITE/PROGRAM FRANCE - GRAPHITE LATTICES

ABSTRACT

THIS REPORT CONTAINS THREE COMMUNICATIONS PRESENTED AT THE BROOKHAVEN CONFERENCE WHICH SUMMARIZE SOME OF THE MOST IMPORTANT RESULTS OF THE EXPERIMENTS CARRIED OUT IN 1956 ON THE G.1 REACTOR, THE FIRST FRENCH GRAPHITE PILE. THESE EXPERIMENTS WERE PERFORMED AND THE RESULTS INTERPRETED BY THE SCIENTISTS AND TECHNICIANS OF THE REACTOR DEVELOPMENT DEPARTMENT AND THE INDUSTRIAL DIRECTION; THEY ARE DESCRIBED IN DETAIL IN CEA REPORT NO. 670 AGP.

2083 ID-NUMBER ID-NUMBER 2083

AUTHOR BROWN, W. W. / CAMPBELL, R. W. / GUDERJAHN, C. A. / LAUBENSTEIN, R. A.
 TITLE PHYSICS EXPERIMENTS PERFORMED FOR AND ON SODIUM GRAPHITE REACTORS
 REPORT NUMBER..... BNL-0489, 217-223
 CONFERENCE FRENCH-AMERICAN CONFERENCE ON GRAPHITE REACTORS, NOVEMBER 12 TO 15, 1957
 DATE PUBLISHED ... 57-11-12

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

SITE/PROGRAM: ATOMICS INTERNATIONAL - URANIUM(2%) METAL - GRAPHITE

ABSTRACT

THE PHYSICS EXPERIMENTS PERFORMED ON SODIUM GRAPHITE LATTICES INCLUDE BOTH EXPONENTIAL EXPERIMENTS AND MEASUREMENTS MADE ON THE SODIUM REACTOR EXPERIMENT. A SERIES OF EXPONENTIAL EXPERIMENTS WAS PERFORMED ON LATTICES WITH 4.6, AND 7-ROD FUEL CLUSTERS IN A GRAPHITE MODERATOR WHICH COULD BE ARRANGED TO PROVIDE ONE OF THREE DIFFERENT LATTICE SPACINGS. LATTICE BUCKLING AND INTRACELL FLUX DISTRIBUTION MEASUREMENTS WERE MADE. EXPERIMENTAL MEASUREMENTS IN THE SODIUM REACTOR EXPERIMENT HAVE NOT BEEN COMPLETED TO DATE. THE MEASUREMENTS WHICH HAVE BEEN MADE INCLUDE DETERMINATIONS OF THE CRITICAL MASS BOTH WITH AND WITHOUT SODIUM IN THE REACTOR CORE AND DETERMINATION OF NEUTRON FLUX DISTRIBUTIONS, SAFETY ROD EFFECTIVENESS, TEMPERATURE COEFFICIENT, AND THE REACTIVITY VALUE OF ADDITIONAL FUEL ELEMENTS BEYOND THE CRITICAL LOADING.

2084 ID-NUMBER ID-NUMBER 2084

AUTHOR: KIRSCHBAUM, A. J.

TITLE: STUDIES OF ENRICHED URANIUM GRAPHITE REACTOR SYSTEMS

REPORT NUMBER.....: BNL-0489, 275-290

CONFERENCE: FRENCH-AMERICAN CONFERENCE ON GRAPHITE REACTORS, NOVEMBER 12 TO 15, 1957

DATE PUBLISHED ...: 57-11-12

SITE/PROGRAM: LIVERMORE - URANIUM(93%) - GRAPHITE SYSTEMS

ABSTRACT

THIS PAPER PRESENTS THE RESULTS TO DATE OF STUDIES OF ESSENTIALLY HOMOGENEOUS ENRICHED URANIUM (93.5% URANIUM-235) GRAPHITE SYSTEMS. CRITICAL CONFIGURATIONS FOR BARE AND GRAPHITE OR BERYLLIUM REFLECTED CORES WILL BE GIVEN FOR CARBON TO URANIUM ATOMIC RATIOS OF 600 TO 1, 1200 TO 1, AND 2400 TO 1. THE RESULTS OF EXPERIMENTS TO DETERMINE THE SYSTEMATIC ERRORS WILL BE GIVEN. THIS ALLOWS REDUCTION OF THE CRITICAL SIZE DATA TO IDEALIZED GEOMETRIES FOR COMPARISON WITH NEUTRONIC CALCULATIONS.

BY USE OF A PULSED NEUTRON SOURCE, DATA ON THE PROMPT NEUTRON POPULATION RELAXATION TIME AS A FUNCTION OF BUCKLING HAVE BEEN OBTAINED. THE EXPERIMENTAL TECHNIQUE AND RESULTANT DATA WILL BE DISCUSSED.

A COMPARISON OF THE CRITICAL BUCKLING AND TIME BEHAVIOR DATA WITH A SIMPLE MODIFIED FERMI AGE THEORY WILL BE MADE. THIS WILL INCLUDE DISCUSSION OF THE PROMPT NEUTRON LIFETIME EFFECTIVENESS OF THE CONTROL AND SAFETY ROD SYSTEM, THE BULK NEUTRONIC PROPERTIES OF THE GRAPHITE, AND SELF SHIELDING EFFECTS OF THE URANIUM.

2085 ID-NUMBER ID-NUMBER 2085

AUTHOR: HANSEN, G. E. / HOOGERP, J. C. / ORNDOFF, J. D. / PAXTON, H. C.

TITLE: CRITICAL ASSEMBLIES OF GRAPHITE AND ENRICHED URANIUM WITH BERYLLIUM REFLECTORS

REPORT NUMBER.....: BNL-0489, 297-302

CONFERENCE: FRENCH-AMERICAN CONFERENCE ON GRAPHITE REACTORS, NOVEMBER 12 TO 15, 1957

DATE PUBLISHED ...: 57-11-12

SITE/PROGRAM: LOS ALAMOS - URANIUM(93%) METAL - GRAPHITE

ABSTRACT

COLLECTED IN THIS REPORT ARE DATA ON PROPERTIES OF THREE SETS OF CYLINDRICAL BERYLLIUM REFLECTED, GRAPHITE MODERATED CRITICAL ASSEMBLIES. THE FIRST SET WAS PRIMARILY TO ESTABLISH CHARACTERISTICS AS FUNCTIONS OF CARBON TO ORALLOY ATOMIC RATIO OF CORE WITH NEARLY CONSTANT REFLECTOR THICKNESS. FISSION DISTRIBUTIONS WERE DETERMINED.

THE SECOND SET CONSISTED OF THREE ASSEMBLIES WITH FIXED CORE TO DETERMINE THE EFFECT OF REDISTRIBUTING REFLECTOR FROM THE ENDS TO THE CYLINDRICAL WALL. THIS SERIES WAS DONE TO PROVIDE THE LOS ALAMOS SCIENTIFIC LABORATORY'S THEORETICAL DIVISION CHECKS FOR A TWO-DIMENSIONAL DIFFUSION CODE. FLUX DISTRIBUTIONS IN THE UNIFORMLY REFLECTED ASSEMBLY WERE MAPPED EXTENSIVELY WITH BARE AND CADMIUM SHIELDED FOILS OF ORALLOY, GOLD, AND INDIUM.

THE THIRD SET WAS TO ESTABLISH THE MINIMUM VOLUME CORE AT CARBON TO ORALLOY RATIO ABOUT 350 THAT COULD BE MADE CRITICAL WITH AVAILABLE BERYLLIUM.

EXPERIMENTAL CRITICAL DATA CONVERTED TO EQUIVALENT SPHERICAL SYSTEMS ARE COMPARED WITH RESULTS OF S-4 CALCULATIONS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2086 ID-NUMBER ID-NUMBER 2086

AUTHOR BYERS, C. C. / KOELLING, J. J. / HANSEN, G. E. / SMITH, D. R. / DYER, H. R.
 TITLE CRITICAL MEASUREMENTS OF A WATER-REFLECTED ENRICHED URANIUM SPHERE
 REPORT NUMBER.... TANSO, 27, 412-413
 DATE PUBLISHED ... 77-11-00
 SITE/PROGRAM LOS ALAMOS - URANIUM(93%) METAL SPHERES

ABSTRACT

EXPERIMENTAL DETERMINATION OF THE CRITICAL STATE OF A FULLY REFLECTED 97.67% ENRICHED URANIUM METAL SPHERE HAS BEEN MADE TO PROVIDE A BENCHMARK VALUE WITH WHICH MACHINE CALCULATIONS MAY BE COMPARED. THE SPHERE MASS AND DENSITY ARE 22159.92 GRAM AND 18.794 +/- 0.010 GRAM/CC, RESPECTIVELY.

2087 ID-NUMBER ID-NUMBER 2087

AUTHOR CLARK, H. K.
 TITLE CRITICAL AND SAFE MASSES AND DIMENSIONS OF LATTICES OF URANIUM AND URANIUM DIOXIDE RODS IN WATER
 REPORT NUMBER.... DR-1014
 DATE PUBLISHED ... 66-02-00
 SITE/PROGRAM SAVANNAH RIVER - GENERAL DESCRIPTIONS, INFORMATION, AND SUMMARIES

ABSTRACT

A SURVEY IS GIVEN OF AVAILABLE CRITICAL AND EXPONENTIAL DATA OBTAINED WITH WATER-REFLECTED LATTICES OF SLIGHTLY ENRICHED URANIUM AND URANIUM OXIDE RODS. CALCULATIONS ARE MADE FOR THESE LATTICES BY AN ASYMPTOTIC MULTIGROUP BUCKLING CODE AND BY A TWO-GROUP DIFFUSION THEORY CODE EMPLOYING PARAMETERS GENERATED IN THE FIRST CODE. COMPARISON BETWEEN CALCULATIONS AND EXPERIMENTS IS MADE IN TERMS OF k_{eff} , WHICH IS THE RATIO OF THE CALCULATED k TO THAT CALCULATED FROM THE EXPERIMENTAL DIMENSIONS AND FLUX TRAVERSES AND FROM THE CALCULATED MIGRATION AREAS AND EXTRAPOLATION DISTANCES. FOR SOME OF THE DATA, COMPARISONS ARE ALSO MADE BETWEEN THE PRESENT METHOD OF CALCULATION AND A MORE HIGHLY SOPHISTICATED METHOD.

2088 ID-NUMBER ID-NUMBER 2088

AUTHOR HUMMEL, H. H. / COHN, C. E. / FISCHER, G. J. / KATO, W. Y. / MARTENS, F. H. / MENEGHETTI, D. / TOPPEL, B. J.
 TITLE EXPERIMENTAL AND THEORETICAL STUDIES OF THE COUPLED FAST-THERMAL SYSTEM ZPR-5
 REPORT NUMBER.... GENEVA-2, 12, 166-181
 CONFERENCE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SWITZERLAND, 1-13 SEPTEMBER 1958
 DATE PUBLISHED ... 58-09-00
 SITE/PROGRAM ARGONNE NATIONAL LABORATORY - ZPR-5

ABSTRACT

THE COUPLED FAST-THERMAL CRITICAL FACILITY ZPR-5 WAS CONSTRUCTED AT THE ARGONNE NATIONAL LABORATORY PRIMARILY TO PERFORM FAST REACTOR PHYSICS MEASUREMENTS NOT POSSIBLE WITH THE FAST EXPONENTIAL EXPERIMENT. THESE INCLUDED REACTIVITY (INCLUDING CRITICAL MASS) MEASUREMENTS, ACTIVATION MEASUREMENTS, AND SPECTRUM STUDIES FOR TYPICAL DILUTE BREEDER CORE COMPOSITIONS. BECAUSE OF THE GROWING INTEREST IN MIXED FAST-THERMAL SYSTEMS, STUDIES OF THE CHARACTERISTICS OF ZPR-5 AS SUCH A SYSTEM HAVE FORMED PART OF THE PROGRAM. THESE STUDIES INCLUDED MEASUREMENT OF FLUX AND POWER DISTRIBUTIONS, MEASUREMENT OF DISTRIBUTION OF REACTIVITY AND DETERMINATION OF PROMPT NEUTRON LIFETIME.

2089 ID-NUMBER ID-NUMBER 2089

AUTHOR FOX, T. A.
 TITLE MOVABLE-MOLYBDENUM-REFLECTOR REACTIVITY EXPERIMENTS FOR CONTROL STUDIES OF COMPACT SPACE POWER REACTOR CONCEPTS
 REPORT NUMBER.... NASA-TM-X-2922
 DATE PUBLISHED ... 73-10-00
 SITE/PROGRAM NASA, LEWIS RESEARCH CENTER - URANYL(92%)FLUORIDE - WATER

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

AN EXPERIMENTAL REFLECTOR REACTIVITY STUDY WAS MADE WITH A COMPACT CYLINDRICAL REACTOR USING AN URANYL FLUORIDE - WATER FUEL SOLUTION. THE REACTOR WAS AXIALLY UNREFLECTED AND RADially REFLECTED WITH SEGMENTS OF MOLYBDENUM. THE REFLECTOR SEGMENTS WERE DISPLACED INCREMENTALLY IN BOTH THE AXIAL AND RADIAL DIMENSIONS, AND THE SHUTDOWN OF EACH CONFIGURATION WAS MEASURED BY USING THE PULSED-NEUTRON SOURCE TECHNIQUE. THE REACTIVITY EFFECTS FOR AXIAL AND RADIAL DISPLACEMENT OF REFLECTOR SEGMENTS ARE TABULATED SEPARATELY AND COMPARED. THE EXPERIMENTS PROVIDE DATA FOR CONTROL-SYSTEM STUDIES OF COMPACT-SPACE-POWER-REACTOR CONCEPTS. (AUTH)

2090 ID-NUMBER ID-NUMBER 2090

AUTHOR FOX, T. A. / MUELLER, R. A. / FIENO, D.
 TITLE PULSED-NEUTRON-SOURCE STUDIES WITH THE NASA ZERO POWER REACTOR II
 REPORT NUMBER..... NASA-TN-D-5956
 DATE PUBLISHED ... 70-08-00
 SITE/PROGRAM NASA, LEWIS RESEARCH CENTER - URANYL(92%)FLUORIDE - WATER

ABSTRACT

AN EXPERIMENTAL AND ANALYTICAL STUDY OF THE PULSED-SOURCE TECHNIQUE FOR MEASURING SHUTDOWN REACTIVITIES WAS MADE USING THE ZERO POWER REACTOR II (ZPR-2) OVER A WIDE RANGE OF FUEL SOLUTION CONCENTRATIONS FOR CONFIGURATIONS VARYING FROM DELAYED CRITICAL TO HIGHLY SUBCRITICAL. THE FUEL IS AN AQUEOUS SOLUTION OF ENRICHED URANYL FLUORIDE. CALCULATED FUNDAMENTAL PROMPT-MODEL DECAY CONSTANTS OBTAINED USING ONE-DIMENSIONAL MULTIGROUP TRANSPORT THEORY ARE COMPARED TO EXPERIMENTAL VALUES. ALSO, CALCULATED VALUES FOR THE SUBCRITICAL REACTIVITY ARE COMPARED WITH VALUES DERIVED FROM EXPERIMENTS USING AN INHOUR TECHNIQUE. THE TECHNIQUE OF SIMMONS AND KING, AND THE THREE WELL-KNOWN AREA-RATIO TECHNIQUES OF GARELIS AND RUSSELL, GOZANI, AND SJOSTRAND. (AUTH).

2091 ID-NUMBER ID-NUMBER 2091

AUTHOR FOX, T. A. / MUELLER, R. A. / FORD, C. H.
 TITLE CRITICAL MASS STUDIES WITH THE NASA ZERO POWER REACTOR II. II-
 HETEROGENEOUS ARRAYS OF CYLINDRICAL VOIDS
 REPORT NUMBER..... NASA-TN-D-3555
 DATE PUBLISHED ... 66-08-00
 SITE/PROGRAM NASA, LEWIS RESEARCH CENTER - URANYL(92%)FLUORIDE - WATER

ABSTRACT

THE NASA ZERO POWER REACTOR II (ZPR-2) HAS BEEN USED TO DETERMINE EXPERIMENTALLY SEVERAL CRITICAL CYLINDRICAL CONFIGURATIONS OF AQUEOUS FUEL SOLUTIONS THAT CONTAIN HETEROGENEOUS ARRAYS OF VOIDS. THESE VOIDS ARE CYLINDRICAL, ARE SYMMETRICALLY ARRANGED PARALLEL TO THE AXIS OF THE REACTOR, AND EXTEND THE HEIGHT OF THE CORE. THE STUDY COVERED A WIDE RANGE OF HIGHLY ENRICHED AQUEOUS URANYL FLUORIDE FUEL CONCENTRATIONS. THE SPECIFIC REACTOR VOID CONFIGURATIONS CONSISTED OF SYMMETRICAL ARRAYS OF 1, 7, 19, 31 AND 37 TUBES APPROXIMATELY 7.6 CM IN DIAMETER ARRANGED IN HEXAGONAL GEOMETRY WITH PITCHES OF 9.652 OR 10.922 CM. IN ADDITION TO THE CRITICAL MASS AND GEOMETRY, DATA ARE PRESENTED ON THE THERMAL NEUTRON FLUX DISTRIBUTIONS IN THE CENTRAL RADIAL PLANE, AND ON THE VARIATION OF VOID REACTIVITY IMPORTANCE WITH RADIAL POSITION. THESE DATA EXPLAIN QUALITATIVELY SOME OF THE REACTIVITY EFFECTS ASSOCIATED WITH THE DIFFERENT VOID SPACINGS.

2092 ID-NUMBER ID-NUMBER 2092

AUTHOR FIENO, D. / FOX, T. A. / MUELLER, R. A. / FORD, C. H.
 TITLE ANALYSIS AND EXPERIMENTS WITH A PULSED NEUTRON SOURCE FOR AN UNREFLECTED
 SOLUTION REACTOR UP TO 50 DOLLARS SHUTDOWN
 REPORT NUMBER..... NASA-TN-D-5487
 DATE PUBLISHED ... 69-10-00
 SITE/PROGRAM NASA, LEWIS RESEARCH CENTER - URANYL(92%)FLUORIDE - WATER

ABSTRACT

PULSED-SOURCE EXPERIMENTS HAVE BEEN PERFORMED FOR AN UNREFLECTED, CYLINDRICAL SOLUTION REACTOR FOR HEIGHTS VARYING FROM DELAYED CRITICAL TO HIGHLY SUBCRITICAL SYSTEMS. THE FUEL SOLUTION CONSISTS OF ENRICHED (93.2% URANIUM-235) AS URANYL FLUORIDE DISSOLVED IN WATER. FOR THESE EXPERIMENTS A HYDROGEN TO URANIUM-235 ATOM RATIO OF 975 IS USED, THUS GIVING HIGHLY THERMAL REACTOR SPECTRA. MULTIGROUP-TRANSPORT-THEORY-CALCULATED VALUES OF THE FUNDAMENTAL PROMPT-MODE DECAY CONSTANT ARE COMPARED WITH EXPERIMENTAL VALUES. ALSO, CALCULATED VALUES FOR THE SUBCRITICAL REACTIVITY ARE COMPARED WITH VALUES OBTAINED FROM THE EXPERIMENTS BY USING THE INHOUR METHOD, THE METHOD OF SIMMONS AND KING, AND THE THREE WELL-KNOWN "AREA-RATIO" METHODS -THOSE OF GARELIS AND RUSSELL, SJOSTRAND, AND GOZANI.(AUTH)

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2093 ID-NUMBER ID-NUMBER 2093

AUTHOR GILLEY, L. W. / CRONIN, D. F. / FOX, J. K. / THOMAS, J. T.

TITLE CRITICAL ARRAYS OF NEUTRON-INTERACTING UNITS

REPORT NUMBER..... ORNL-4193, 159-167

DATE PUBLISHED ... 61-10-00

SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

A SERIES OF EXPERIMENTS USING AS MANY AS 100 SUBCRITICAL VESSELS OF URANIUM-235-ENRICHED URANYL NITRATE AQUEOUS SOLUTION HAS BEEN PERFORMED. IN ONE GROUP OF EXPERIMENTS NEITHER REFLECTOR ABOUT THE ARRAYS NOR MODERATOR BETWEEN THE UNITS WAS PRESENT. (THE TERMS "MODERATOR" AND "REFLECTOR" WHEN USED IN THIS TEXT REFER TO THE ADDITION OF HYDROGENOUS MATERIAL BETWEEN THE UNITS OR ABOUT THE ARRAY.) IN ANOTHER SET THE THICKNESS OF THE MODERATOR AND PARTIAL REFLECTOR WAS VARIED TO EXHIBIT ITS MAXIMUM EFFECT. ADDITIONAL EXPERIMENTS SIMULATED VARIOUS CONDITIONS OF INTEREST TO NUCLEAR SAFETY. A BRIEF DESCRIPTION OF THE MATERIALS USED IS PRESENTED, AND THE RESULTS APPEAR IN BOTH TABULAR AND GRAPHICAL FORM.

2094 ID-NUMBER ID-NUMBER 2094

AUTHOR BIERMAN, S. R. / CLAYTON, E. D. / DURST, B. M.

TITLE CRITICAL SEPARATION BETWEEN SUBCRITICAL CLUSTERS OF 2.35 WT% URANIUM-235 ENRICHED URANIUM DIOXIDE RODS IN WATER WITH FIXED NEUTRON POISONS

REPORT NUMBER..... PNL-2438

DATE PUBLISHED ... 77-10-00

SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER

ABSTRACT

A RESEARCH PROGRAM, FUNDED BY THE U. S. NUCLEAR REGULATORY COMMISSION, TO PROVIDE EXPERIMENTAL CRITICALITY DATA ON SYSTEMS SIMULATING CONDITIONS ASSOCIATED WITH FUEL ELEMENT SHIPPING PACKAGES AND FUEL STORAGE POOLS WAS BEGUN IN 1976 AT THE BATTELLE OPERATED CRITICAL MASS LABORATORY. THE OBJECTIVE OF THE PROGRAM IS TO PROVIDE EXPERIMENTAL DATA FOR VALIDATING CALCULATIONAL TECHNIQUES AND NUCLEAR DATA USED IN CRITICALITY ASSESSMENTS OF LWR TYPE FUEL ELEMENT SHIPPING PACKAGES AND SIMILAR TYPE SYSTEMS. CONSEQUENTLY THE EXPERIMENTS ARE DESIGNED TO PERMIT EASY AND ACCURATE DEFINITION ON MONTE CARLO COMPUTER CODES CURRENTLY USED IN THESE CRITICALITY ASSESSEMENTS.

BASICALLY THE EXPERIMENTS ARE CONCERNED WITH THE CRITICAL SEPARATION BETWEEN WATER FLOODED SUBCRITICAL CLUSTERS OF FUEL RODS IN THE PRESENCE OF VARIOUS FIXED NEUTRON POISONS. THE EXPERIMENTS ARE CARRIED OUT IN A 1.8M X 3M X 2.1M DEEP TANK PROVIDED WITH FEATURES SPECIFICALLY DESIGNED AND BUILT FOR THESE EXPERIMENTS. THE INITIAL SERIES OF EXPERIMENTS IN THIS PROGRAM ARE COVERED IN THIS REPORT AND INVOLVE ALUMINUM CLAD 2.35 WT% URANIUM-235 ENRICHED URANIUM DIOXIDE RODS ABOUT 12MM IN DIAMETER BY 914MM IN LENGTH. THE CRITICAL SEPARATION BETWEEN THREE SUBCRITICAL CLUSTERS OF THESE RODS ALIGNED IN A ROW WAS DETERMINED WITH AND WITHOUT THE FOLLOWING NEUTRON ABSORBER MATERIALS (NEUTRON POISONS) LOCATED BETWEEN THE CLUSTERS:

304L STEEL WITH 0, 1.1, AND 1.6 WT% BORON.

BORAL.

COPPER WITH 0 AND 1 WT% CADMIUM.

CADMIUM.

ALUMINUM.

ZIRCALOY-4.

THE NEUTRON POISONS WERE IN THE FORM OF PLATES SLIGHTLY LARGER THAN THE LENGTH AND WIDTH OF THE OPPOSING FACES OF THE FUEL CLUSTERS:

2095 ID-NUMBER ID-NUMBER 2095

AUTHOR ROTHE, R. E. / OH, I.

TITLE BENCHMARK CRITICAL EXPERIMENTS ON HIGH-ENRICHED URANYL NITRATE SOLUTION SYSTEMS

REPORT NUMBER..... RFP-2710

DATE PUBLISHED ... 78-04-00

SITE/PROGRAM ROCKY FLATS - URANYL NITRATE - PLEXIGLASS

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

SEVENTY-SIX BENCHMARK EXPERIMENTS ARE REPORTED, GIVING THE CRITICAL HEIGHT OF URANYL NITRATE SOLUTION SYSTEMS. BOTH MATERIAL AND GEOMETRY PROPERTIES WERE WELL DETERMINED TO REDUCE GREATLY ANY CONTRIBUTION TO A THEORETICAL/EXPERIMENTAL DISCREPANCY ATTRIBUTABLE TO THE EXPERIMENT. THE PROGRAM USED URANYL NITRATE SOLUTION WITH THE URANIUM ENRICHED TO 93.17% URANIUM-235 AND A CONCENTRATION RANGE FROM 54.89 GRAMS URANIUM/LITER TO 369.96 GRAMS URANIUM/LITER. UNREFLECTED EXPERIMENTS ARE REPORTED, AS MEASUREMENTS WITHIN THICK-WALLED CUBICAL REFLECTOR SHELLS COMPOSED OF CONCRETE AND METHYL METHACRYLATE PLASTIC. EXPERIMENTS INVOLVING A SINGLE TANK AND ARRAYS OF CYLINDERS WERE PERFORMED. SINGLE TANK DIAMETERS RANGED FROM 27.88 CM TO 50.69 CM, AND ARRAYS OF UP TO SIXTEEN CYLINDERS HAD CONTAINERS OF 16.12 CM OR 21.12 CM DIAMETER. CONTAINERS COMPOSED OF ALUMINUM OR STAINLESS STEEL WERE STUDIED. FOR ALL THESE PARAMETERS, THE CRITICAL HEIGHTS RANGED FROM 17.13 CM TO 110.20 CM.

2096 ID-NUMBER ID-NUMBER 2096

AUTHOR FOX, J. K. / THOMAS, J. T.
 TITLE CRITICAL EXPERIMENTS WITH MIXTURES OF AQUEOUS URANIUM-235-ENRICHED URANYL NITRATE SOLUTIONS AND BOROSILICATE GLASS RINGS
 REPORT NUMBER..... ORNL-3360, 35-36
 DATE PUBLISHED ... 62-09-00
 SITE/PROGRAM OAK RIDGE - URANYL(93%)NITRATE - WATER - BOROSILICATE GLASS

ABSTRACT

SEVERAL CRITICAL EXPERIMENTS WERE PERFORMED WITH LARGE-CAPACITY CYLINDRICAL TANKS CONTAINING FISSIONABLE MATERIAL, AS AQUEOUS URANYL NITRATE SOLUTIONS, AND BOROSILICATE GLASS RASCHIG RINGS. THE EXPERIMENTS ARE PART OF A SERIES DESIGNED TO FURNISH INFORMATION ON THE CRITICAL PARAMETERS OF SUCH SYSTEMS FOR NUCLEAR SAFETY APPLICATIONS.

2097 ID-NUMBER ID-NUMBER 2097

AUTHOR LOCKEY, D. J. / PEARSON, H. / POPE, A. L. / WELLS, C. M.
 TITLE EXPONENTIAL EXPERIMENTS WITH NATURAL AND SLIGHTLY ENRICHED URANIUM, GRAPHITE MODERATED SYSTEMS
 REPORT NUMBER..... AERE-R/R-2597
 DATE PUBLISHED ... 56-09-00
 SITE/PROGRAM UNITED KINGDOM, HARWELL - EXPONENTIAL EXPERIMENTS FOR PIPPA-MK I (GRAPHITE - URANIUM)

ABSTRACT

AN ACCOUNT IS GIVEN OF GRAPHITE EXPONENTIAL EXPERIMENTS WHICH EXTEND THE RANGE COVERED PREVIOUSLY. AN IMPROVED METHOD OF ANALYSIS IS EMPLOYED. THE RESULTS ARE COMPARED WITH THE LATTICE CALCULATIONS RECOMMENDED FOR PIPPA TYPE REACTORS AND PROPOSALS MADE FOR FURTHER WORK.

2098 ID-NUMBER ID-NUMBER 2098

AUTHOR DAVEY, W. G. / SMITH, K. R. E.
 TITLE EXPONENTIAL EXPERIMENTS WITH ENRICHED URANIUM--NATURAL WATER SYSTEMS
 REPORT NUMBER..... AERE-RP/R-1788
 DATE PUBLISHED ... 55-10-00
 SITE/PROGRAM UNITED KINGDOM, HARWELL - SLIGHTLY ENRICHED URANIUM IN WATER

ABSTRACT

ANALYSES OF THE DATA REQUIRED FOR AN EVALUATION OF THE REACTOR PHYSICS ASPECTS OF NATURAL- WATER MODERATED REACTORS SHOWED THAT FOR ROD TYPE TYPE FUEL ELEMENTS EXPERIMENTS WERE NEEDED IN WHICH THE FOLLOWING FUEL ELEMENTS EXPERIMENTS WERE NEEDED IN WHICH THE FOLLOWING PARAMETERS WERE VARIED:

- (1) URANIUM ENRICHMENT.
- (2) ROD DIAMETER.
- (3) VOLUME OF MODERATOR TO VOLUME OF URANIUM RATIO.
- (4) SHEATHING MATERIAL.
- (5) SHEATH THICKNESS.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

(6) MODERATOR DENSITY.

(7) TEMPERATURE OF THE ASSEMBLY.

ACCORDINGLY AN EXPERIMENTAL PROGRAMME WHICH COVERED THIS RANGE OF PARAMETERS WAS ARRANGED. APART FROM THE TEMPERATURE VARIATION THIS RANGE HAS BEEN COVERED IN THE EXPONENTIAL EXPERIMENTS OUTLINED.

THE NATURAL URANIUM EXPERIMENTS HAVE BEEN REPORTED PREVIOUSLY AND A DISCUSSION OF THE CHOICE OF EXPERIMENTS IS GIVEN.

IN THIS REPORT AN ACCOUNT OF THE TECHNIQUE, RESULTS AND PRELIMINARY CONCLUSIONS TO BE DRAWN FROM THE ENRICHED URANIUM EXPERIMENTS IS GIVEN.

2099 ID-NUMBER ID-NUMBER 2099

AUTHOR CROCKER, V. S. / DAVEY, W. G. / SMITH, K. R. E.

TITLE APPROACH TO CRITICAL EXPERIMENTS WITH SLIGHTLY ENRICHED URANIUM IN NATURAL WATER

REPORT NUMBER..... AERE-RP/R-1810

DATE PUBLISHED ... 57-07-00

SITE/PROGRAM UNITED KINGDOM, HARWELL - SLIGHTLY ENRICHED URANIUM IN WATER

ABSTRACT

AN EXPERIMENTAL STUDY OF NATURAL URANIUM - NATURAL WATER EXPONENTIAL ASSEMBLIES WAS COMMENCED IN 1953. LATER, URANIUM BECAME AVAILABLE HAVING A URANIUM-235 CONTENT GREATER THAN THAT OF NATURAL URANIUM BY A FACTOR 1.3 OR 1.6 (SO CALLED 1.3 CO AND 1.6 CO ENRICHED URANIUM).

FROM THE STANDPOINT OF ACCURACY, AN EXPONENTIAL EXPERIMENTAL ASSEMBLY SHOULD BE AS LARGE AS POSSIBLE CONSISTENT WITH THE CRITERION THAT THE DECAY OF NEUTRON FLUX AWAY FROM THE SOURCE SHOULD CONTAIN ONLY EXPONENTIAL TERMS (FOR EASE OF ANALYSIS). IT CAN BE SHOWN THAT SUCH AN EXPONENTIAL ASSEMBLY WOULD JUST BECOME CRITICAL IF ITS WIDTHS REMAINED FIXED AND ITS HEIGHT INCREASED WITHOUT LIMIT. THE SIZE OF ASSEMBLY NORMALLY USED (3 INCHES X 3 INCHES X 2.5 FEET) WAS IN SOME CASES LARGER THAN THE CALCULATED CRITICAL SIZE, SO "APPROACH TO CRITICALITY" EXPERIMENTS WERE INITIATED HAVING TWO MAIN AIMS:

(1) TO ENSURE THE SAFETY OF CONSTRUCTING THE EXPONENTIAL ASSEMBLIES.

(2) TO DETERMINE THE CRITICAL SIZE AND ESTIMATE THE LATTICE LAPLACIAN, FROM WHICH THE "EXPONENTIAL SIZE" COULD BE DEDUCED.

IT WAS FURTHER HOPED THAT "APPROACH" EXPERIMENTS MIGHT PROVE VERY USEFUL IN THE EXAMINATION OF SUB-CRITICAL ASSEMBLIES, ULTIMATELY PERHAPS REPLACING TO A LARGE EXTENT THE RELATIVELY LABORIOUS "EXPONENTIAL" EXPERIMENTS.

SOME MEASUREMENTS WERE MADE ON THE EFFECT OF SHUT-OFF RODS, AND AN ATTEMPT WAS ALSO MADE TO MEASURE THE TEMPERATURE COEFFICIENTS OF REACTIVITY OF THE 1.6 CO ASSEMBLIES. THESE PROVIDED A GUIDE TO THE CORRECT VALUES AND A SUPPLEMENT TO ANY EXPONENTIAL EXPERIMENTS AT ELEVATED TEMPERATURES. THIS REPORT GIVES THE GEOMETRICAL DETAILS OF THE EXPERIMENTS PERFORMED, ESTIMATED LAPLACIANS, AND A COMPARISON WITH THE EXPONENTIAL EXPERIMENTAL RESULTS.

2100 ID-NUMBER ID-NUMBER 2100

AUTHOR OKAZAKI, A. / ALLEN, D. F. / HONE, D. W.

TITLE LATTICE EXPERIMENTS FOR CLUSTERS OF NINETEEN 1.31 CM DIAMETER URANIUM METAL RODS IN HEAVY WATER

REPORT NUMBER..... CRRP-648

DATE PUBLISHED ... 59-01-00

SITE/PROGRAM CANADA, CHALK RIVER NUCLEAR LABORATORIES - HEAVY WATER LATTICES

ABSTRACT

IN THE DESIGN OF POWER REACTORS THE ENGINEERING REQUIREMENTS OF HIGH HEAT TRANSFER RATES LEAD TO COMPLEX FUEL ASSEMBLIES WITH A LARGE SURFACE-TO-MASS RATIO. THE EXACT CALCULATIONS OF THE PROPERTIES OF LATTICES MADE UP OF THESE ASSEMBLIES IS DIFFICULT AND SIMPLE MODELS OR RECIPES ARE USED. TO TEST THE VALIDITY OF THESE SIMPLE MODELS MEASUREMENTS OF THE PROPERTIES OF VARIOUS LATTICES MUST BE MADE. THE PRESENT INVESTIGATION IS A CONTINUATION OF THE STUDY OF NATURAL URANIUM- HEAVY WATER SYSTEMS WHICH HAS BEEN CARRIED OUT IN THE ZEEP REACTOR.

AN ASSEMBLY OR CLUSTER OF NINETEEN URANIUM METAL RODS WAS USED IN THESE EXPERIMENTS. THIS ARRANGEMENT WAS SIMILAR TO ONE OF THE PROPOSED FUEL RODS FOR THE NPD REACTOR. HOWEVER THE PRESENT NPD DESIGN CALLS FOR THE USE OF URANIUM OXIDE AS FUEL. THE NATURAL URANIUM METAL FUEL WAS IN THE FORM OF CYLINDRICAL SLUGS 1.31 CM. IN DIAMETER. THE SLUGS WERE 15 CM. LONG AND FITTED LOOSELY IN ALUMINUM TUBES 1.59 CM. O.D. WITH 0.10 CM. WALL THICKNESS. THE DENSITY OF THE URANIUM WAS 18.93 G/CM³. EACH ROD WAS MADE UP OF 14 SLUGS GIVING A TOTAL LENGTH OF 210 CM. OF URANIUM. NINETEEN SUCH RODS ARRANGED IN A HEXAGONAL ARRAY MADE UP A SINGLE CLUSTER.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2101 ID-NUMBER ID-NUMBER 2101

AUTHOR HINES, K. C.
 TITLE U.K./CANADA CONFERENCE. NUCLEAR DATA SESSION: FIVE PLUTONIUM-239, URANIUM-235, URANIUM-233 -- WATER ASSEMBLIES (ZETR)
 REPORT NUMBER..... UK/C/5/1
 DATE PUBLISHED ... 56-00-00
 SITE/PROGRAM UNITED KINGDOM, HARWELL - URANYL(46%)FLUORIDE IN WATER - CALCULATIONS

ABSTRACT

PRELIMINARY RESULTS OF TWO-GROUP CALCULATIONS ON THE ZETR CRITICAL ASSEMBLIES ARE PRESENTED IN THIS PAPER. THE METHOD OF APPROXIMATE SEPARATION OF THE VARIABLES HAS BEEN USED THROUGHOUT. ASSURING BEST KNOWN VALUES FOR THE NUCLEAR CROSS-SECTIONS AN ATTEMPT HAS BEEN MADE TO FIT THE EXPERIMENTAL CRITICAL HEIGHTS BY VARYING THE SQUARE OF THE SLOWING DOWN LENGTH IN WATER. FOR ALL THREE ISOTOPES IT HAS BEEN FOUND THAT REASONABLE AGREEMENT WITH EXPERIMENTAL RESULTS CAN BE OBTAINED BY A CHOICE OF 25 FOR THE SLOWING DOWN LENGTH IN WATER. AS THE CONCENTRATION OF THE FISSIONABLE MATERIAL DECREASES THIS AGREEMENT BECOMES MUCH LESS SATISFACTORY. IT IS SHOWN THAT THE CALCULATIONS ARE MUCH MORE RELIABLE FOR THE CONCENTRATED SOLUTIONS THAN FOR THE DILUTE SOLUTIONS.

2102 ID-NUMBER ID-NUMBER 2102

AUTHOR HORTON, C. C.
 TITLE URANIUM-235-WATER ASSEMBLIES FOR LIDO
 REPORT NUMBER..... UK/C/5/5
 DATE PUBLISHED ... 56-00-00
 SITE/PROGRAM UNITED KINGDOM, HARWELL - LIDO REACTOR - URANIUM(46%)- ALUMINUM - WATER

ABSTRACT

THE EXPERIMENTS DESCRIBED IN THIS PAPER WERE PERFORMED DURING JULY AND AUGUST 1956 AS A PRELIMINARY CHECK ON THE CRITICALITY OF THE LIDO REACTOR, AND ARE REPORTED HERE BRIEFLY PENDING PUBLICATION. THE FUEL ELEMENTS IN THIS REACTOR SYSTEM ARE OF THE CONVENTIONAL "SANDWICH" TYPE USING 20% URANIUM, 80% ALUMINUM ALLOY PLATES FABRICATED INTO AN ELEMENT BY DIP-BRAZING BRAZING TECHNIQUES. THE ELEMENTS ARE SUPPORTED IN A 4 INCH THICK ALUMINUM LATTICE PLATE BY INSERTING NOZZLES AT THEIR LOWER END INTO HOLES IN THE LATTICE PLATE IN THE WATER TANK, AND ARE MANIPULATED BY A HANDLING TOOL WHICH ENGAGES IN A LIFTING FEATURE AT THE TOP OF THE ELEMENT. EACH FUEL PLATE CONTAINS 10 GMS OF URANIUM-235 IN THE FORM OF 46% WT. URANIUM-235 URANIUM; THE STANDARD FUEL ELEMENT CONTAINS 13 SUCH PLATES. SIMILAR ELEMENTS CONTAINING 8, 4, 2 OR 1 PLATES ARE ALSO AVAILABLE FOR FINE REACTIVITY ADJUSTMENTS. THE CONTROL RODS FOR THE REACTOR DROP INTO FOUR SPECIAL ELEMENTS FILLED WITH GUIDE TUBES AT THE TOP AND CONTAINING 2 PLATES (20 GM URANIUM-235) EACH. DETAILS OF THE CONSTRUCTION OF THE ELEMENTS ARE GIVEN.

2103 ID-NUMBER ID-NUMBER 2103

AUTHOR CRITOPH, E. / OKAZAKI, A. / HONE, D. W. / TUNNICLIFFE, P. R. / DE MILLE, G. R. / HANNA, G. C.
 TITLE MULTIPLE METAL ROD ASSEMBLIES IN ZEEP
 REPORT NUMBER..... UK/C/5/103
 DATE PUBLISHED ... 56-10-22
 SITE/PROGRAM CANADA, CHALK RIVER NUCLEAR LABORATORIES - HEAVY WATER LATTICES

ABSTRACT

AT PRESENT LATTICE EXPERIMENTS ARE BEING DONE IN ZEEP WITH 19-ELEMENT, URANIUM METAL RODS. THE GEOMETRICAL DETAILS OF THESE RODS ARE SHOWN.

AT THE TIME OF WRITING THREE HEXAGONAL LATTICES COMPOSED OF THESE RODS HAVE BEEN ASSEMBLED IN ZEEP. THESE WERE LATTICES WITH HEXAGONAL SPACINGS OF 8.66, 10.00 AND 11.50 INCHES.

2104 ID-NUMBER ID-NUMBER 2104

AUTHOR OKAZAKI, A. / HONE, D. W.
 TITLE LATTICE EXPERIMENTS FOR CLUSTERS OF NINETEEN 1.31 CM. DIAMETER URANIUM METAL RODS IN HEAVY WATER
 REPORT NUMBER..... UK/C/6/120
 DATE PUBLISHED ... 57-09-27
 SITE/PROGRAM CANADA, CHALK RIVER NUCLEAR LABORATORIES - HEAVY WATER LATTICES

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

ABSTRACT

IN THE DESIGN OF POWER REACTORS THE ENGINEERING REQUIREMENTS OF HIGH HEAT TRANSFER RATES LEAD TO COMPLEX FUEL ASSEMBLIES WITH A LARGE SURFACE-TO-MASS RATIO. THE EXACT CALCULATION OF THE PROPERTIES OF LATTICES MADE UP OF THESE ASSEMBLIES IS DIFFICULT AND SIMPLE MODELS OR RECIPES ARE USED. TO TEST THE VALIDITY OF THESE SIMPLE MODELS MEASUREMENTS OF THE PROPERTIES OF VARIOUS LATTICES MUST BE MADE. THE PRESENT INVESTIGATION IS A CONTINUATION OF THE STUDY OF NATURAL URANIUM- HEAVY WATER SYSTEMS WHICH HAS BEEN CARRIED OUT IN THE ZEEP REACTOR.

THE ASSEMBLY WHICH WAS STUDIED IS SIMILAR IN GEOMETRY TO THAT PROPOSED FOR THE NPD REACTOR IN WHICH EACH ASSEMBLY OR CLUSTER IS MADE UP OF NINETEEN SMALL RODS.

THE NATURAL URANIUM METAL FUEL WAS IN THE FORM OF CYLINDRICAL SLUGS 1.31 CM. IN DIAMETER. THE SLUGS WERE 15 CM. LONG AND FITTED LOOSELY IN ALUMINUM TUBES 1.59 CM. O.D. WITH 0.10 CM. WALL THICKNESS. EACH ROD WAS MADE UP OF 14 SLUGS GIVING A TOTAL LENGTH OF 210 CM. OF URANIUM. NINETEEN SUCH RODS ARRANGED IN A HEXAGONAL ARRAY MADE UP A SINGLE CLUSTER.

2107 ID-NUMBER ID-NUMBER 2107

AUTHOR VISNER, S. / WOOD, P. M.

TITLE LOW-POWER CRITICALITY EXPERIMENTS ON THE HOMOGENEOUS REACTOR EXPERIMENT (HRE-1)

REPORT NUMBER.... ORNL-1858

DATE PUBLISHED ... 57-04-03

SITE/PROGRAM OAK RIDGE - URANYL(92%)SALTS - WATER

ABSTRACT

THE LOW POWER CRITICALITY BEHAVIOR OF THE HRE HAS BEEN EXPERIMENTALLY INVESTIGATED AND IN GENERAL, THE THEORETICAL PREDICTIONS WERE CONFIRMED. THE HRE, WHICH IS FUELED WITH AN AQUEOUS SOLUTION OF HIGHLY ENRICHED URANYL SULFATE IN AN 18-INCH DIAMETER SPHERICAL CORE AND REFLECTED BY HEAVY WATER, WAS THE FIRST PROTOTYPE OF A CIRCULATING AQUEOUS HOMOGENEOUS POWER REACTOR AND WAS INTENDED TO DEMONSTRATE STABLE OPERATION AT HIGH POWER DENSITIES. CRITICALITY WAS HERE ACHIEVED FOR THE FIRST TIME IN A REACTOR THROUGH WHICH A FLUID CIRCULATED WITH THE ATTENDANT LOSS OF DELAYED NEUTRONS IN THE EXTERNAL CIRCUIT. IT WAS DEMONSTRATED THAT EXCEPT FOR THE LOSS AND RECOVERY OF REACTIVITY ON STARTING AND STOPPING THE CIRCULATING PUMP, THE LOW POWER BEHAVIOR OF THE HRE WAS QUALITATIVELY NO DIFFERENT THAN IN A STATIC HOMOGENEOUS SYSTEM.

2108 ID-NUMBER ID-NUMBER 2108

AUTHOR HARTLEY, W. H.

TITLE SLAB EXPERIMENTS. II. URANIUM METAL REFLECTOR

REPORT NUMBER.... WAPD-PWR-PH-112

DATE PUBLISHED ... 56-05-00

SITE/PROGRAM WESTINGHOUSE, ATOMIC POWER DIVISION - PWR CRITICAL EXPERIMENTS

ABSTRACT

AN INTERMEDIATE STEP TOWARD CONSTRUCTION OF A FULL-SCALE MOCK-UP OF THE PWR CORE IS THE INVESTIGATION OF THE PROPERTIES OF A SLAB CORE. EXPERIMENTAL STUDIES OF A SLAB CORE CONSISTING OF A HIGHLY ENRICHED SEED FLANKED BY NATURAL URANIUM REFLECTOR HAVE BEEN MADE WITH THE PWR-FA FACILITY. THIS REPORT GIVES THE RESULTS OF THOSE INVESTIGATIONS.

2109 ID-NUMBER ID-NUMBER 2109

AUTHOR DURST, B. M. / BIERMAN, S. R. / CLAYTON, E. D.

TITLE HANDBOOK OF CRITICAL EXPERIMENTS BENCHMARKS

REPORT NUMBER.... PNL-2700

DATE PUBLISHED ... 78-03-00

SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

DATA FROM CRITICAL EXPERIMENTS HAVE BEEN COLLECTED TOGETHER FOR USE AS BENCHMARKS IN EVALUATING TECHNIQUES AND NUCLEAR DATA. THESE BENCHMARKS HAVE BEEN SELECTED FROM THE NUMEROUS EXPERIMENTS PERFORMED ON HOMOGENEOUS SYSTEMS. NO ATTEMPT HAS BEEN MADE TO REPRODUCE ALL OF THE DATA THAT EXISTS. THE PRIMARY OBJECTIVE IN THE COLLECTION OF THESE DATA IS TO PRESENT REPRESENTATIVE EXPERIMENTAL DATA IN A CONCISE, STANDARDIZED FORMAT THAT CAN EASILY BE TRANSLATED INTO COMPUTER CODE INPUT.

THE SELECTED BENCHMARKS COVER THE FOLLOWING KINDS OF SYSTEMS:

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

- (1) UNREFLECTED SPHERES OF PLUTONIUM METAL CONTAINING 4.5 AND 20 WT% PLUTONIUM-240.
- (2) UNREFLECTED SPHERICAL STEEL VESSEL FILLED WITH PLUTONIUM NITRATE SOLUTION.
- (3) SPHERICAL STEEL VESSELS FILLED WITH PLUTONIUM NITRATE SOLUTION OF LOW PLUTONIUM-240 CONTENT AND REFLECTED BY: (A) FULL WATER WITH AND WITHOUT A CADMIUM INTERFACE (B) DIFFERENT THICKNESSES OF CONCRETE SOME WITH AND WITHOUT A CADMIUM INTERFACE (C) ADDITIONAL STEEL AND FULL WATER (D) DIFFERENT THICKNESSES OF PARAFFIN.
- (4) WATER REFLECTED STEEL CYLINDRICAL VESSELS CONTAINING PLUTONIUM NITRATE SOLUTION HAVING 8.4, 13.5, AND 42.9 WT% PLUTONIUM-240 IN THE PLUTONIUM.
- (5) UNREFLECTED AND REFLECTED ANNULAR STEEL CYLINDRICAL VESSELS CONTAINING PLUTONIUM NITRATE SOLUTION.
- (6) UNREFLECTED AND REFLECTED STEEL SLAB VESSELS CONTAINING PLUTONIUM NITRATE SOLUTION.
- (7) UNREFLECTED AND REFLECTED PLUTONIUM DIOXIDE SOLIDS COVERING AN HYDROGEN/PLUTONIUM ATOMIC RATIO RANGE FROM 0 TO 50.
- (8) METAL PLUTONIUM SPHERE REFLECTED BY NATURAL URANIUM.

2110 ID-NUMBER ID-NUMBER 2110

AUTHOR JENQUIN, U. P. / BIERMAN, S. R.
 TITLE BENCHMARK EXPERIMENTS TO TEST PLUTONIUM AND STAINLESS STEEL CROSS SECTIONS
 REPORT NUMBER..... PNL-2273
 DATE PUBLISHED ... 78-06-00
 SITE/PROGRAM GENERAL DESCRIPTIONS OF LABORATORIES OR COMPILATIONS OF EXPERIMENTS

ABSTRACT

THE NUCLEAR REGULATORY COMMISSION (NRC) COMMISSIONED BATTELLE, PACIFIC NORTHWEST LABORATORY (PNL) TO ASCERTAIN THE ACCURACY OF THE NEUTRON CROSS SECTIONS FOR THE ISOTOPES OF PLUTONIUM AND THE CONSTITUENTS OF STAINLESS STEEL AND DETERMINE IF IMPROVEMENTS CAN BE MADE IN APPLICATION TO CRITICALITY SAFETY ANALYSIS. NRC'S PARTICULAR AREA OF INTEREST IS IN THE TRANSPORTATION OF LIGHT-WATER REACTOR SPENT FUEL ASSEMBLIES.

THE PROJECT WAS DIVIDED INTO TWO TASKS. THE FIRST TASK WAS TO DEFINE A SET OF INTEGRAL EXPERIMENTAL MEASUREMENTS (BENCHMARKS). THE SECOND TASK IS TO USE THESE BENCHMARKS IN NEUTRONICS CALCULATIONS SUCH THAT THE ACCURACY OF ENDF/B-IV PLUTONIUM AND STAINLESS STEEL CROSS SECTIONS CAN BE ASSESSED. THE SECOND TASK SHOULD HELP TO IDENTIFY DEFICIENCIES IN THE NEUTRON CROSS SECTIONS.

THE RESULTS OF THE FIRST TASK ARE GIVEN IN THIS REPORT. A SET OF INTEGRAL EXPERIMENTS MOST PERTINENT TO TESTING THE CROSS SECTIONS HAS BEEN IDENTIFIED AND THE CODE INPUT DATA FOR CALCULATING EACH HAS BEEN DEVELOPED. THE SECOND TASK WILL BE COMPLETED AT A LATER DATE.

2111 ID-NUMBER ID-NUMBER 2111

AUTHOR OH, I. / PECORA, D. / ROTHE, R. E.
 TITLE REFERENCE CRITICAL EXPERIMENTS (PROGRESS REPORT FOR PERIOD JANUARY 1, 1978, THROUGH MARCH 31, 1978)
 REPORT NUMBER..... RFP-2795
 DATE PUBLISHED ... 78-06-00
 SITE/PROGRAM ROCKY FLATS - OXIDE EXPERIMENTS

ABSTRACT

THIS IS THE TENTH IN THE SERIES OF QUARTERLY REPORTS DESCRIBING CRITICAL EXPERIMENTS BEING PERFORMED AT ROCKY FLATS FOR THE U. S. NUCLEAR REGULATORY COMMISSION (NRC). FIVE SPECIAL CANS OF OXIDE, USED TO FILL THE REGIONS AROUND THE DRIVER SUPPORT AND SOURCE REMOVAL SLOTS, HAVE BEEN PACKED AND ADJUSTED TO AN HYDROGEN/URANIUM RATIO OF 0.75 BY INJECTING MEASURED QUANTITIES OF WATER. HANDSTACKING OF THE METAL AND AND SOLUTION URANIUM DRIVERS HAS BEEN COMPLETED. TWO PAIRS OF SOLUTION DRIVER CANS WERE FABRICATED OF TYPE 304 STAINLESS STEEL AND THEIR DIMENSIONS MEASURED.

HANDSTACKING OF THE LOW-ENRICHED OXIDE CANS AT AN HYDROGEN/URANIUM RATIO OF 0.75 WAS PERFORMED ON THE HORIZONTAL SPLIT TABLE IN THE CONCRETE REFLECTOR. THE FIRST TABLE CLOSURE OF THE CONCRETE- REFLECTED OXIDE EXPERIMENT HAD THE SOLUTION DRIVER CANS IN THE ARRAY, BUT THEY CONTAINED NO SOLUTION. THE RECIPROCAL MULTIPLICATION WAS MEASURED AS A FUNCTION OF THE TABLE SEPARATION, AND A VALUE OF 0.55 WITH THE TABLE COMPLETELY CLOSED WAS ACHIEVED.

LLL BIBLIOGRAPHY OF CRITICAL EXPERIMENTS

2112 ID-NUMBER ID-NUMBER 2112

AUTHOR BIERMAN, S. R. / DURST, B. M. / CLAYTON, E. D.
 TITLE CRITICAL SEPARATION BETWEEN SUBCRITICAL CLUSTERS OF 4.29 WT% URANIUM-235
 ENRICHED URANIUM DIOXIDE RODS IN WATER WITH FIXED NEUTRON POISONS
 REPORT NUMBER..... NUREG/CR-0073
 DATE PUBLISHED ... 78-05-00
 SITE/PROGRAM HANFORD - SLIGHTLY ENRICHED URANIUM RODS IN WATER WITH FIXED POISONS

ABSTRACT

MEASUREMENT DATA ARE PRESENTED FROM A SERIES OF CRITICALITY EXPERIMENTS ON SYSTEMS SIMULATING FUEL ELEMENT SHIPPING CONTAINERS AND FUEL STORAGE BASINS. THE CONDITIONS INVESTIGATED INVOLVE CLUSTERS OF 4.29 WT% URANIUM-235 ENRICHED URANIUM DIOXIDE FUEL RODS IMMERSED IN WATER. THE NUMBER OF RODS REQUIRED FOR CRITICALITY IN A SQUARE LATTICE SPACING (25.4 MM) NEAR OPTIMUM NEUTRON MODERATION AND THE CRITICAL SEPARATION BETWEEN THREE SUBCRITICAL CLUSTERS ALIGNED IN A ROW WAS DETERMINED. THE EFFECT THAT THE FOLLOWING FIXED NEUTRON ABSORBERS HAD ON THIS CRITICAL SEPARATION WAS ALSO MEASURED:

304L STEEL WITH 0, 1.1, AND 1.6 WT% BORON.

BORAL.

COPPER WITH 0 AND 1 WT% CADMIUM.

CADMIUM.

ALUMINUM.

ZIRCALOY-4.

2113 ID-NUMBER ID-NUMBER 2113

AUTHOR ULLO, J. J. / HARDY, J.
 TITLE ANALYSIS OF HOMOGENEOUS URANIUM-233 AND URANIUM-235 CRITICAL ASSEMBLIES
 WITH ENDF/B-IV DATA
 REPORT NUMBER..... WAPD-TM-1299
 DATE PUBLISHED ... 77-10-00
 SITE/PROGRAM GENERAL COMPILATIONS OF CALCULATIONS OF EXPERIMENTS

ABSTRACT

THIRTY-TWO URANIUM-233 AND URANIUM-235 HOMOGENEOUS AQUEOUS CRITICAL EXPERIMENTS WERE ANALYZED WITH ENDF/B-IV DATA. CALCULATED EIGENVALUES FOR BOTH FUEL TYPES INCREASED BY NEARLY 2% OVER THE RANGE OF HYDROGEN/URANIUM ATOMIC RATIO COVERED (FROM 2106 TO 27.1). THIS IS ATTRIBUTED TO AN UNDERPREDICTION OF FAST LEAKAGE, WITH SOME CONTRIBUTION FROM THE FISSION AND CAPTURE RESONANCE INTEGRALS OF ENDF/B-IV URANIUM-235. EIGENVALUE SENSITIVITIES TO SEVERAL NUCLEAR DATA CHANGES WERE EXAMINED.

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ABSTRACT

A BIBLIOGRAPHY ON REACTOR PHYSICS IS PRESENTED. THE ABSTRACTS COVER THE PERIOD FROM 1956 TO 1 MARCH 1967. THESE ABSTRACTS ARE GROUPED AS FOLLOWS: CRITICAL EXPERIMENTS, REASONABLY HOMOGENEOUS; CRITICAL EXPERIMENTS, LATTICES; NEUTRON GROUP AVERAGED CROSS SECTIONS; REACTIVITY MEASUREMENTS FOR COMPONENT MATERIALS; AND DOPPLER EFFECTS ON REACTIVITY. THE ABSTRACTS ARE ARRANGED CHRONOLOGICALLY, ACCORDING TO GROUP. (MLS).