ATTACHMENT 2 TO P-92162

REVISION TO
THE FORT ST. VRAIN
PROPOSED DECOMMISSIONING PLAN

DATED APRIL 17, 1992

DIRECTIONS FOR ENTERING CHANGES TO THE FORT ST. VRAIN PROPOSED DECOMMISSIONING PLAN

As discussed in the cover letter, this attachment provides a revision to the Proposed Decommissioning Plan and is based on PSC's commitment to update the PDP to incorporate PSC responses to NRC Requests for Additional Information.

Changes from the original Proposed Decommissioning Plan (submitted on November 5, 1990, in PSC letter P-90318 and as revised in P-91217 on July 1, 1991) have been identified in the following pages with side revision marks to facilitate ease of review.

The reviewer is requested to either:

(1) replace the pages in their copy of the Fort St. Vrain Proposed Decommissioning Plan with the attached revision (preferred), or

(2) file this letter (with attachment) in total with the original copy of the Proposed Decommissioning Plan.

The cover graphic, index tabs, Appendix I and Appendix III are the only items to be retained from the previous revision of the PDP. Final replacement should be consistent with the List of Effective Pages provided immediately following this page. The List of Effective Pages should be placed in the Proposed Decommissioning Plan immediately following the Cover Graphic page and preceding the Table of Contents.

LIST OF EFFECTIVE PAGES

3.5	3.5-1 through 3.5-8	4/17/92
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	Table 5-1	4/17/92
6	6-1 through 6-4	4/17/92
7	7-1 through 7-14	4/17/92
8	8-1 through 8-4	4/17/92
9	(Deleted)	
10	(Deleted)	
Appendix I	I-1 through I-13	Original (11/5/90)
Appendix II	1 through 40 (EE-DEC-0010, Rev D.)	4/17/92
	Appendix B (34 pages)	4/17/92
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PROPOSED DECOMMISSIONING PLAN
FOR
FORT ST. VRAIN NUCLEAR GENERATING STATION

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COMMONLY USED ACRONYMS

AEC	Atomic Energy Commission
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
AOO	Anticipated Operational Occurrences
ASTM	American Society of Testing and Materials
ATC	Auxiliary Transfer Cask
BNL	Battelle Northwest Laboratories
BOC	Beginning of (fuel) Cycle
BOP	Balance of Plant
CDOH	Colorado Department of Health
CEBAF	Continuous Electron Beam Accelerator Facility
CFR	Code of Federal Regulations
Ci	Curie
CPIU	Consumer Price Index for all Urban Consumers
CPM	Counts per minute
CPUC	Colorado Public Utilities Commission
CRD	Control Rod Drive
CRDOA	Control Rod Drive and Orifice Assembly
CSF	Core Support Floor
D/D	Decontamination and Dismantlement
DAC	Derived Air Concentration
DAD	Digital Alarming Dosimeter
DAW	Dry Active Waste
DBE	Design Basis Earthquake
DECON	Immediate Decontamination/Dismantlement Decommissioning Option
DOE	Department of Energy
DOP	Dioctylphthalate (Testing)
DOT	Department of Transportation
DPM	Disintegrations per minute
DTS	Decommissioning Technical Specifications
EAB	Exclusion Area Boundary
EAL	Emergency Action Level
ECP	Executive Command Post
EFPD	Effective Full Power Days
EOC	End of (fuel) Cycle
EOF	Emergency Operations Facility

EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
EPZ	Emergency Planning Zone
ERF	Emergency Response Facility
ESW	Equipment Storage Wells
FCP	Forward Command Post (EOF)
FHM	Fuel Handling Machine
FNAL	Fermi National Atomic Laboratory
FSV	Fort St. Vrain
FSW	Fuel Storage Wells
GA	General Atomics
GET	General Employee Training
GM	Geiger-Mueller
GTCC	Greater Than Class 'C' (Radioactive) Waste
HEPA	High Efficiency Particulate Air (Filter)
HIC	High Integrity Container
HLRW	High Level Radioactive Waste
HLWR	High Level Waste Repository
HPGe	Hyper-Pure Germanium
HSF	Hot Service Facility
HTGR	High Temperature Gas-Cooled Reactor
HVAC	Heating, Ventilation and Air Conditioning
IDO	Idaho Operations Office
INEL	Idaho National Engineering Laboratories
INPO	Institute of Nuclear Power Operations
IPEEE	Individual Plant Examination of External Events
IPP	Independent Power Producer
ISFSI	Independent Spent Fuel Storage Installation
KI	Potassium Iodide (tablets)
LANL	Los Alamos National Laboratory
LLD	Lower Limit of Detection
LLRW	Low-Level Radioactive Waste
LSA	Low Specific Activity
MCRB	Metal Clad (Reflector) Block
MDA	Minimum Detectable Activity
MicroR	1E(-6) Rem
MVDS	Modular Vault Dry Storage (System)
NAVLAP	National Voluntary Laboratory Accreditation Program
NDE	Nondestructive Examination

NFS	Nuclear Fuel Services
NFSC	Nuclear Facility Safety Committee
NIOSH	National Institute of Occupational Safety and Health
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
OCC	Office of Consumer Counsel
ORE	Occupational Radiation Exposure
OSHA	Occupational Safety and Health Administration
PCC	Personnel Control Center
pCi	Pico Curie (1 E-12 Curies)
PCP	Process Control Program
PCRV	Prestressed Concrete Reactor Vessel
PDP	Proposed Decommissioning Plan
PORC	Plant Operations Review Committee
PURPA	Public Utility Regulatory Policies Act
PSC	Public Service Company of Colorado
QA	Quality Assurance
QC	Quality Control
R/B	Release to Birth Rate
RCA	Radiologically Controlled Area
RCD	Region Constraint Device
RCRA	Resource Conservation and Recovery Act
REM	Roentgen Equivalent Man (Radiation Measure)
REMP	Radiological Environmental Monitoring Program
RIV	Reactor Isolation Valve
RMC	Rocky Mountain Compact Board
S/G	Steam Generator
SAFSTOR	Delayed Decontamination/Dismantlement Decommissioning Option
SAR	Safety Analysis Report
SCP	Site Characterization Program
SEOC	State Emergency Operations Center
SFSC	Spent Fuel Shipping Cask
SRD	Self Reading Dosimeter
TEDE	Total Effective Dose Equivalent
TLD	Thermoluminescent Dosimeter
TRU	Transuranic Waste
TS	Technical Specifications
TSCA	Toxic Substances Control Act

UFSAR	Updated FSAR
UMTRAP	Uranium Mill Tailings Remedial Actions Project
WBS	Work Breakdown Structure
WITS	Waste Inventory Tracking System
WSEG	Westinghouse Scientific Ecology Group

COMMONLY REFERENCED ISOTOPES AND ELEMENTS

Boron	B
Calcium	Ca-41, Ca-45
Carbon	C-14
Cesium	Cs-134, Cs-137
Cobalt	Co-60
Dysprosium	Dy
Europium	Eu-152, Eu-154
Fluorine	F
Germanium	Ge
Helium	He
Iodine	I-129, I-131
Iron	Fe-55, Fe-59
Krypton	Kr-90
Lithium	Li-6, Li-7
Manganese	Mn-54
Nickel	Ni-63, Ni-59
Niobium	Nb-94
Silver	Ag-110m
Strontium	Sr-90
Tellurium	Te-127m
Tritium	H-3
Xenon	Xe-137

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SECTION 1
SUMMARY OF PLAN

1.1 DESCRIPTION OF DECOMMISSIONING PLAN AND DECOMMISSIONING ALTERNATIVE

1.1.1 Introduction

By letter to the Nuclear Regulatory Commission (NRC) dated December 5, 1988 (Ref. 1), Public Service Company of Colorado (PSC) notified the NRC that "based on economic considerations associated with the ongoing operating costs of Fort St. Vrain, PSC has determined that it will be necessary to terminate Fort St. Vrain operations early." At that time, PSC began decommissioning planning to support premature decommissioning, resulting in submittal of the Preliminary Decommissioning Plan to the NRC on June 30, 1989. (Ref. 2)

This Proposed Decommissioning Plan is submitted by PSC in accordance with the requirement of 10 CFR 50.82(a), which requires submittal of the Proposed Decommissioning Plan "within two years following permanent cessation of operations." PSC previously provided a target date of October 31, 1990, for submittal of the Proposed Decommissioning Plan.

The Proposed Decommissioning Plan represents a departure from PSC's Preliminary Decommissioning Plan (Ref. 2) in that, after consideration of financial risks, regulatory environment, and uncertainty of other issues, PSC has selected the DECON alternative for immediate dismantlement and decommissioning of Fort St. Vrain.

Through a competitive bid process, PSC has selected a team headed by the Westinghouse Electric Corporation to carry out the decommissioning of Fort St. Vrain on a fixed price basis. Coincident with decommissioning, the Fort St. Vrain plant may be converted to a fossil-fueled facility (See Section 5.5).

1.1.2 Background

Fort St. Vrain was shutdown on August 18, 1989. On August 29, 1989, the PSC Board of Directors reviewed and confirmed the Executive Management decision that Fort St. Vrain would not be restarted, and that PSC would pursue the decommissioning of Fort St. Vrain.

The decision to permanently shut down and decommission Fort St. Vrain was based on related technical and financial considerations. Problems were identified with the control rod drive assemblies and the steam generator steam ring headers that presented significant technical obstacles which could be overcome, but at significant cost in dollars and time to PSC. Additionally, due to the uniqueness of the one-of-a-kind High Temperature Gas-Cooled Reactor (HTGR) fuel cycle, the cost to purchase new fuel was prohibitive. This, in conjunction with low plant availability and correspondingly high operating costs, made continued operation of Fort St. Vrain imprudent.

Coupled with these technical and fuel cycle considerations, Fort St. Vrain had previously been removed from the rate base as a result of a 1986 Settlement Agreement between PSC, the Colorado Public Utilities Commission (CPUC), the Office of Consumer Counsel (OCC) and other parties. With the exception of limited funds to be collected for decommissioning, the removal of Fort St. Vrain from the regulatory rate base left PSC shareholders responsible for further operating and decommissioning costs of Fort St. Vrain.

1.1.3 Contents of the Proposed Decommissioning Plan

The Proposed Decommissioning Plan has been prepared to be responsive to the requirements of 10 CFR 50.82(b) and the guidance of Draft Regulatory Guide DG-1005 "Standard Format and Content for Decommissioning Plans for Nuclear Reactors" (Ref. 3). The following is a brief summary of the sections contained within this plan.

Section	Description
1	"Summary of Plan" provides a brief description of the proposed plan and background information related to the decision to decommission Fort St. Vrain. Information is provided to describe the major activities involved in the dismantlement and decommissioning of Fort St. Vrain, and the projected project schedule. The cost to decommission Fort St. Vrain is identified, as well as status of the availability of funding. Details are provided in Section 1.4 on implementation and administration of the proposed plan. Section 1.5 describes the controls which will be effective during the transition period prior to approval of the Proposed Decommissioning Plan.
2	"Choice of Decommissioning Alternative and Description of Activities" identifies the selected decommissioning alternative. Section

2.2 provides a description of Fort St. Vrain and identifies major site factors, and identifies contaminated or activated structures and components which will be removed during decommissioning. The major decommissioning activities and schedule are provided in Section 2.3. Organizational structures are provided for the PSC organization (Section 2.4) and the selected contractor (the Westinghouse team, Section 2.6). Decommissioning training requirements are identified in Section 2.5.

3 "Protection of Occupational and Public Health and Safety" describes the "as-is" radiological status of the Fort St. Vrain facility (Section 3.1). The decommissioning radiation protection organization and exposure estimates are described in Section 3.2, and proposed methods of managing radioactive waste, including offsite transportation and disposal, are discussed in Section 3.3. The analysis of postulated bounding decommissioning accidents is provided in Section 3.4.

4 "Final Radiation Survey Plan" provides the purpose, criteria, and methodology that will be used to formulate the final radiation survey plan, including instrumentation, documentation and quality assurance requirements, and eventual site closure.

5 "Decommissioning Fixed Price Contract and Funding Plan" provides a description of the decommissioning fixed price contract, major assumptions and es used to derive the decommissioning cost, and status of decor ioning funding. Provisions are also identified for updating both t' decommissioning cost and the funding plan.

6 "Decommissioning Technical and Environmental Specifications" provides the methodology and philosophy that was used to develop the decommissioning technical specifications.

7 "Decommissioning Quality Assurance Plan" provides the QA plan which will be effective during decommissioning.

8 "Decommissioning Access Control Plan" identifies those access control requirements to be administered during the decommissioning process once all spent fuel has been removed from the Protected Area. This access control plan will replace the existing physical

security plan during the decommissioning period.

Appendix I, "Westinghouse Team Scope of Work", provides a detailed description of the proposed Westinghouse team decommissioning and dismantlement activities. Appendix II, "Fort St. Vrain Activation Analysis", provides the results of the analysis to identify activation levels and isotopes for Fort St. Vrain components.

1.2 MAJOR TASKS, SCHEDULES AND ACTIVITIES

1.2.1 Description of Major Activities

The major dismantlement and decontamination activities to be performed during decommissioning are described in detail in Section 2.3. The decommissioning project is divided into three major work areas:

1. Decontamination and dismantlement of the PCRV.
2. Decontamination and dismantlement of the contaminated balance of plant (BOP) systems.
3. Site cleanup and final site radiation survey.

Site cleanup is described in Section 2.3 and the final site radiation survey is described in Section 4.

1.2.2 Final Release Criteria

The release of the site, facilities and materials will be based on proper application of release criteria for surface contamination, soil/water concentrations and exposure rates. Final site release criteria are fully identified in Section 4.2 of this plan.

1.2.3 Decontamination and Dismantlement of the PCRV

The major decommissioning task is the dismantlement and decontamination of the radioactive portions of the Prestressed Concrete Reactor Vessel (PCRV). Section 2.3 provides a comprehensive description of the steps necessary to dismantle and decontaminate the PCRV. PCRV dismantlement activities will begin only after all irradiated fuel has been removed from the Reactor Building.

PSC and the Westinghouse team have evaluated technical options available for dismantling radioactive portions of the PCRV, and a decision has been made that the best technical approach is to flood the PCRV with water, and perform the majority of dismantlement activities submerged. This will allow the most direct access to highly radioactive portions of the PCRV, while affording the maximum shielding benefit.

1.2.4 Decontamination and Dismantlement of Contaminated Balance of Plant Systems

For the purposes of this Proposed Decommissioning Plan, balance of plant systems refer to those contaminated or potentially contaminated plant systems outside the PCRV. Decontamination and dismantlement of contaminated or potentially contaminated balance of plant systems will be performed by one of the following approaches: (1) decontamination in place, (2) removal and decontamination, or (3) removal and disposal as radioactive waste. Systems which are contaminated or potentially contaminated above releasable limits requiring decontamination and dismantlement are described in Section 2.3.

1.2.5 Schedule for Decommissioning Activities

The schedule for decommissioning activities is provided in Section 2.3.5 and Figure 2.3-15. The following is a brief description of the two phases of the Fort St. Vrain Decommissioning Project:

Phase I	Decommissioning Planning Phase consists of initial site characterization, preparation of work scope planning, work specifications and procedures, and equipment and material staging. There will be NO physical decommissioning activities performed as part of this planning phase, although some component removal and disposal activities may occur prior to commencement of Phase II (described below) as described in Section 1.5 of this plan.
Phase II	Decontamination and Dismantlement Phase, with an estimated duration of 39 months. Actual dismantlement, decontamination, and physical decommissioning activities will occur as part of this phase. The actual physical decommissioning activities are scheduled to commence after:(1) NRC approval of the Proposed Decommissioning Plan, and (2) removal of all irradiated fuel from the Reactor Building.

It is important to note that Phase I and Phase II activities are not conducted in series. These two phases have considerable overlap. Further detailed descriptions of the work scope to be performed in each project phase are provided in Appendix I of this plan.

Some component removal activities will b. conducted prior to commencement of the Decontamination and Dismantlement Phase, as described in Section 1.5. Decommissioning of Fort St. Vrain, including site cleanup and final site radiation survey, is expected to be completed by October 1995.

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1.3 FIXED PRICE AND AVAILABILITY OF FUNDS

1.3.1 Decommissioning Cost

Through the competitive bid process described in Section 5.2, PSC selected, from among four qualified bidders, a project team of Westinghouse and MK-Ferguson as its decommissioning contractor.

The competitive bid submitted by the Westinghouse team, together with an estimate of PSC decommissioning costs, resulted in an initial decommissioning cost of $137,129,000 based on future value dollars escalated to the year of expenditure, and based on the start of physical decommissioning activities in January 1992. Of this amount, the Westinghouse team's firm fixed price is $100,460,000. PSC's costs, as overall project manager and licensing coordinator, were estimated to be $36,669,000. Assumptions used as the basis for these costs are identified in Section 5.2.1. The proposed Westinghouse team Scope of Work is provided in Appendix I. A detailed cost estimate responsive to the requirements of 10 CFR 50.82(b)(4) was prepared to support the costs and was submitted to the NRC on June 6, 1991 (Ref. 4).

Due to delays experienced with the defueling of Fort St. Vrain, the start of physical decommissioning activities has been delayed from January 1992 until August 1992. This delay, and recognition of the possibility of sizeable increases in low level radioactive waste disposal costs, has resulted in the need for adjustments to the Decommissioning Cost Estimate provided to the NRC in Reference 4. The revised total cost for decommissioning is estimated to be $157,472,700 in future value dollars, escalated to the date of expenditure. Section 5.2.3 of this plan provides further detail and supporting basis for these cost increases, as well as other adjustments to the Decommissioning Cost Estimate determined to be necessary.

1.3.2 Decommissioning Funding Plan

As of September 30, 1991, the Fort St. Vrain decommissioning trust fund balance was approximately $28.0 million. There are no remaining funds to be collected from PSC customers under terms of the 1986 Settlement Agreement. Section 5 describes the Decommissioning Funding Plan and revised Decommissioning Cost Estimate. The Letter of Credit, Standby Trust Agreement, and associated letters of commitment to execute these documents are provided in Appendix III.

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1.4 REGULATORY BASIS FOR ADMINISTRATION OF THE PROPOSED DECOMMISSIONING PLAN

This Proposed Decommissioning Plan has been prepared and submitted to be responsive to the requirements of 10 CFR 50.82 and the guidance of Draft Regulatory Guide DG-1005, "Standard Format and Content for Decommissioning Plans for Nuclear Reactors" (Ref. 3). The Proposed Decommissioning Plan is intended to govern the entire Fort St. Vrain decommissioning effort, and is to be maintained current as described in this section, if and when the need for plan changes occur. This plan is to be a key component of the licensing basis of Fort St. Vrain during decommissioning as described below.

The following documents shall constitute the decommissioning licensing basis of Fort St. Vrain, effective following the removal of all irradiated fuel from the Fort St. Vrain Reactor Building and receipt of NRC approval to commence decommissioning:

1. This NRC-approved Proposed Decommissioning Plan including:
   a. Applicable NRC decommissioning regulations as identified in this plan, and
   b. NRC regulatory guidance applicable to the decommissioning of Fort St. Vrain as identified in this plan.
2. The NRC-approved Fort St. Vrain 10 CFR 50 license and the Decommissioning Technical Specifications.
3. Licensing basis correspondence between the NRC and PSC related to the decommissioning of Fort St. Vrain.

This Proposed Decommissioning Plan, following its approval by the NRC and the removal of all irradiated fuel from the Fort St. Vrain Reactor Building, shall supersede and replace the Fort St. Vrain Updated Final Safety Analysis Report (UFSAR, Ref. 5). Following the completion of defueling, the final revision of the Fort St. Vrain UFSAR then in effect shall be retained as an historical document only, and all of the operational descriptions and commitments therein shall be superseded in their entirety by this Proposed Decommissioning Plan. Essential safety features and functions which will be relied upon during decommissioning are described and included in this plan.

For the purposes of the Fort St. Vrain plant decommissioning, the provisions of 10 CFR 50.59 and 10 CFR 50.71(e) shall apply to and be implemented by this Proposed Decommissioning Plan and the Decommissioning Technical Specifications. Any

Proposed Decommissioning Plan change or activity which involves an unreviewed safety question as defined in 10 CFR 50.59 or requires a change to the Decommissioning Technical Specifications shall require approval by the NRC prior to implementation.

Any Proposed Decommissioning Plan changes or activities that do not involve an unreviewed safety question and do not require a Decommissioning Technical Specification change, as determined by performing a 10 CFR 50.59 safety evaluation, may be implemented by PSC without prior NRC approval. An annual report shall be submitted to the NRC per the provisions of 10 CFR 50.59 describing all Proposed Decommissioning Plan changes made under the provisions of 10 CFR 50.59 and the results of the associated 10 CFR 50.59 safety evaluations.

Likewise, Proposed Decommissioning Plan updates shall be submitted to the NRC at least annually per the provisions of 10 CFR 50.71(e). This annual Proposed Decommissioning Plan update shall be current as of six months prior to the submittal date.

The following plans, which require NRC approval for decommissioning and constitute a part of this Proposed Decommissioning Plan, shall be administered under the applicable provisions of the regulations as described in the following Proposed Decommissioning Plan (PDP) sections:

PLAN DESCRIPTION	APPLICABLE REQUIREMENTS PDP SECTION
Quality Assurance Plan(1)	10 CFR 50.54(a), 10 CFR 50 Appendix B, and 10 CFR 71 Subpart H as described in PDP Section 7
Access Control Plan(1)	PDP Section 8
Final Radiation Survey Plan (1)	10 CFR 50.82(b)(3) as described in PDP Section 4
Decommissioning Funding Plan (2)	10 CFR 50.82(b)(4) as described in PDP Section 5

Notes:

(1) Plans which are included in this Proposed Decommissioning Plan for NRC review and approval.

(2) Plans submitted to the NRC for approval separate from this Proposed Decommissioning Plan.

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1.5 DECOMMISSIONING CONTROLS DURING THE TRANSITION PERIOD PRIOR TO APPROVAL OF THE PROPOSED DECOMMISSIONING PLAN

1.5.1 Introduction

This section describes the decommissioning controls that will apply to plant closure activities during the transition to the Decommissioning Technical Specifications (DTS) and the Proposed Decommissioning Plan (PDP) controls.

The decommissioning of Fort St. Vrain (FSV) involves many planning and preparatory activities that will be performed prior to approval of the PDP. The requirements and controls that govern these plant closure activities are contained largely in the operational Technical Specifications (TS) and in 10 CFR 50.59.

The Fort St. Vrain 10 CFR 50 license includes controls in the TS which are an appendix to the license. The Administrative Controls in the TS will remain generally unchanged until the DTS (see Section 6.1) are approved and implemented. Pending NRC approval, the DTS may be implemented concurrent with the PDP approval or it may occur at a later time. Decommissioning activities, therefore, may have to be initiated under the then current TS controls.

Decommissioning shall be considered to begin with the first physical activity to remove contaminated equipment from Fort St. Vrain, after all irradiated fuel has been removed from the Reactor Building and after NRC approval of the PDP. Activities performed prior to NRC approval of the PDP are considered plant closure activities, in preparation for decommissioning.

In Reference 6, the NRC stated that a licensee must: (1) comply with the requirements of its operating license and the regulations applicable to whatever mode or condition the plant might be in at a given time; and (2) refrain from taking any actions that would materially and demonstrably affect the methods or options available for decommissioning, or that would substantially increase the costs of decommissioning, prior to NRC approval of a decommissioning plan.

Fort St. Vrain is permanently shut down, cooled down and depressurized, and has received a Possession Only License (Ref. 7). Under these plant conditions, PSC considers that performing plant closure activities is within existing licensee authority provided they do not require a change to the Fort St. Vrain Technical

Specifications or 10 CFR 50 license, do not involve an unreviewed safety question as defined in 10 CFR 50.59, do not limit the choice of reasonable decommissioning alternatives (i.e.,SAFSTOR, DECON, or ENTOMB), and do not substantially increase the costs of FSV decommissioning. PSC will not consider resumed operation as an option during the review of contemplated component removal and disposal activities (e.g., region constraint devices and helium circulators). Other plant closure activities that are not within existing licensee authority will be submitted for NRC approval, prior to their accomplishment. PSC considers these actions to be fully in compliance with applicable regulations and license requirements.

1.5.2 Component Removal Activities

Prior to the initiation of actual decommissioning activities, PSC may complete the removal of numerous components from the PCRV, including the helium circulators, control rod drive and orifice assemblies (CRDOAs), metal clad reflector blocks (MCRBs) and the region constraint devices (RCDs). These activities are performed as plant closure activities, outside the scope of the Proposed Decommissioning Plan. Some of these components may be removed prior to the completion of defueling, if the components have no required nor useful function during any planned or postulated defueling or shutdown conditions. In addition, several component removal activities may be performed in the interest of technology transfer with the Department of Energy (DOE), including removal of a steam generator ring header and bimetallic weld sample(s), and removal of high temperature helium purification system components.

Other plant closure activities beyond the scope of the Proposed Decommissioning Plan are evaluated against the following criteria:

1. If the activity requires a change to the Fort St. Vrain Technical Specifications or involves an unreviewed safety question, as determined by a safety evaluation performed in accordance with the provisions of 10 CFR 50.59, prior NRC approval must be obtained.
2. If the activity has an adverse environmental impact, in that it disturbs environs not previously disturbed during plant construction or operation, prior NRC approval must be obtained.
3. If the activity precludes any of the allowable decommissioning alternatives (SAFSTOR, DECON, or ENTOMB), prior NRC approval

must be obtained.

4. If the activity involves any significant increase in the total radiation exposure required for decommissioning, to the extent that a revision to the Proposed Decommissioning Plan is required, prior NRC approval must be obtained.

1.5.3 Transition to Decommissioning Controls

After all nuclear fuel has been removed from the Reactor Building, the controls on plant closure activities will not be needed to ensure the safety of the core, but they will be needed to minimize radiological exposure to workers and the public, and to protect against an unplanned release of radioactivity to the environs. Fort St. Vrain will maintain its 10 CFR 50 license, and regulations such as 10 CFR 50.59 will still apply.

The transition to decommissioning controls will be relatively smooth because many of the existing requirements will continue to apply, although various details may differ considerably. Facility modifications that involve a change to the PDP will be reviewed pursuant to 10 CFR 50.59. The DTS will include Administrative Controls, such as organizational requirements, a safety review committee, procedural requirements, record keeping requirements, and reporting requirements.

Upon NRC approval of the PDP, decommissioning controls will be phased-in in a controlled manner, as follows:

1. Surveillances and preventive maintenance activities for equipment no longer required to be operable will be suspended.
2. New decommissioning design controls may be implemented which will incorporate revised requirements for 10 CFR 50.59 evaluations and configuration management.
3. Procedures that are no longer needed will be deleted or placed in a category which requires no additional maintenance of the procedure.
4. Procedures that relate to radioactive effluent controls will be retained until the DTS are issued. At that time, they will be revised as necessary to reflect the requirements of the Off Site Dose Calculation Manual and the Process Control Program.
5. After approval of the DTS, implementing procedures will be revised accordingly.

1.5.4 Mobilization Activities

In preparation for the actual start of decommissioning activities, it may be desirable to install certain equipment items such as material handling and water purification equipment prior to formal approval of the PDP.

These mobilization activities may be performed while there is still nuclear fuel being removed from the Reactor Building, provided each activity is evaluated for its impact on the defueling operation. Also, any physical modifications to an existing Fort St. Vrain system (e.g., piping connections, power connections) will be treated in accordance with the then current Fort St. Vrain Quality Assurance Plan.

1.6 REFERENCES FOR SECTION 1

1. PSC Letter, R.O. Williams (PSC) to J. Calvo (NRC), dated December 5, 1988; Subject: "Early Termination of Fort St. Vrain Operations", (P-88422).

2. PSC Letter, A.C. Crawford (PSC) to NRC, dated June 30, 1989; Subject: "Fort St. Vrain Preliminary Decommissioning Plan", (P-89228).

3. NRC Regulatory Guide DG-1005 "Standard Format and Content for Decommissioning Plans for Nuclear Reactors" (Draft For Comment), September, 1989.

4. PSC Letter, Crawford to Weiss, dated June 6, 1991; Subject: "Fort St. Vrain Decommissioning Cost Estimate", (P-91118).

5. Fort St. Vrain Updated Final Safety Analysis Report, Rev. 9, dated July 22, 1991.

6. NRC Memorandum and Order, CLI-90-08, dated October 17, 1990.

7. NRC letter, Erickson to Crawford, dated May 21, 1991; Subject: "Amendment No. 82 to FSV Techni l Specifications", (G-91106).

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SECTION 2

CHOICE OF DECOMMISSIONING ALTERNATIVE AND DESCRIPTION OF ACTIVITIES

2.1 DECOMMISSIONING ALTERNATIVE

PSC has officially notified the NRC of its selection of the DECON option for decommissioning Fort St. Vrain in Reference 1. PSC's objective is the immediate dismantlement and decommissioning (DECON) of the Fort St. Vrain Nuclear Generating Station to release all site areas for unrestricted use. To accomplish this objective, the following activities will be accomplished:

1. Remove the PCRV internal radioactive components remaining after completion of defueling.
2. Decontaminate and/or dismantle those portions of the PCRV structure and radioactive balance-of-plant systems which exceed limits for unrestricted release of residual radioactive materials.
3. Ship all radioactive waste offsite for disposal.
4. Perform a final site radiation survey to confirm that all site areas can be released for unrestricted use.
5. Terminate the 10 CFR 50 license.

Fort St. Vrain will be decontaminated to levels which meet the criteria of USAEC Regulatory Guide 1.86 "Termination of Operating Licenses for Nuclear Reactors" (Ref. 2) and NRC interim guidance identified in Section 4.2.

It is expected that PSC will operate and maintain Fort St. Vrain under the 10 CFR 50 Possession Only License issued in Reference 3 during decontamination and dismantlement activities. Once decontamination and dismantlement activities are completed and a final site survey has been performed to confirm site release for unrestricted use, PSC will apply to the NRC to terminate the 10 CFR 50 license.

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2.2 FACILITY DESCRIPTION

2.2.1 General Description

Fort St. Vrain is a High Temperature Gas-Cooled Reactor (HTGR) owned and operated by PSC. Fort St. Vrain's location is approximately 35 miles north of Denver and three and one-half miles northwest of the town of Platteville in Weld County, Colorado.

The site consists of 2798 acres owned by PSC. During the plant operation, approximately one mile square within the site area was designated as the exclusion area, and the licensee maintained complete control over this area. The completed facility is shown in Figure 2.2-1. The basic installation consists of a Reactor Building, a Turbine Building, cooling towers, and an electrical switchyard.

2.2.1.1 Reactor Building

The Reactor Building (Figures 2.2-2 and 2.2-3) houses the prestressed concrete reactor vessel (PCRV), fuel handling area, fuel storage wells (FSWs), fuel shipment preparation facilities, decontamination and radioactive liquid and gas waste processing equipment, and most reactor plant process and service systems. The building is able to withstand wind loadings developed by a 100 mph wind or a tornado of 202 mph total horizontal wind velocity without exceeding yield stresses.

The Reactor Building ventilation exhaust filter system is designed to filter the Reactor Building atmosphere prior to release to the vent stack during both normal and most accident conditions during decommissioning. The Reactor Building is maintained in a subatmospheric condition to ensure that all air leakage will be inward and to minimize unfiltered fission product release from the building. The ventilation system was designed to maintain a subatmospheric condition approximately 1/4-inch water gauge negative. In actual practice, the Reactor Building pressure is normally 0.15 to 0.20 inches water gauge negative, depending on building activities and ventilation system configuration.

The Reactor Building overpressure protection system consists of 94 louvered panels, 4-feet by 8½-feet, each of which provides 12.02 ft^2 of free flow area for a total of 1130 ft^2 of free flow area when fully opened. The louvers are opened by spring pressure and closed (or held closed) by air pressure acting through a pneumatic cylinder. Subatmospheric conditions can be maintained with several louver banks open. The overpressure protection system louvers may be opened on a controlled basis for various reasons (e.g., to provide extra ventilation cooling during hot weather). The louvers must be closed whenever Reactor Building integrity is required.

The PCRV and nuclear steam supply system (NSSS) are located in the west portion of the Reactor Building. The east portion of the Reactor Building houses auxiliary and support systems and facilities such as the FSWs, the hot service facility (HSF), the equipment storage wells (ESWs), storage and laydown areas for various pieces of equipment, radioactive gas and liquid waste storage facilities, and the loading ports for the spent fuel shipping casks (SFSC). The basement area of the Reactor Building contains the building sump/keyway. The volume of the sump/keyway is approximately 44,600 cubic feet.

The Fort St. Vrain Reactor Building is presently designed to withstand the Design Basis Earthquake (DBE) of 0.10 g horizontal ground acceleration at the site without unsafe damage or failure to function. During decommissioning, the Reactor Building will continue to be required to perform its confinement function following a seismic event.

The decommissioning of Fort St. Vrain will not involve any major modifications to the Fort St. Vrain Reactor Building without verification of the seismic qualification. Other than the Reactor Building, no additional seismic analysis of individual decommissioning tasks and removal activities will be required.

The Reactor Building overhead crane is located inside the Reactor Building, over the refueling floor. The Reactor Building crane is the means by which heavy lifting operations and maintenance are performed on the refueling floor of the Reactor Building. The design of the overhead crane conforms to Class "D" crane type specified in the Electric Overhead Crane Institute (EOCI) Specification No. 61 and the AISC Specification "Designs, Fabrication, and Erection of Structural Steel for Buildings" adopted November 30, 1961. All structural steel is ASTM A-36 or better. The crane capacity has been upgraded from 160 tons to a revised capacity of 170 tons. The crane trolley main hook has a capacity of 50 tons and the auxiliary crane hook has a capacity of 17.5 tons.

In order to meet the requirements of the EOCI and AISC specifications, the building girders and crane rails are designed for 125% of the rated load, and the crane bridge girders are designed for an impact loading of not less than 10% of the lifting forces required for 125% of the rated load. The hoisting cable at the main hoist consists of 12 parts of 1-3/8 inch diameter, 6-strand, 37-wire improved plow steel crane rope with a rating of 14.8 tons per part, for a total capacity of 177 tons. The breaking strength of the hoisting cable arrangement is 775 tons.

2.2.1.2 Turbine Building

The Turbine Building (Figures 2.2-2 and 2.2-3) houses the turbine generator with condensing, feedwater, and other auxiliary systems. Included in the Turbine Building is an auxiliary bay area housing the reactor plant ventilation equipment, the controlled personnel access to the Reactor Building, and an area housing the control room and miscellaneous electrical services. The Turbine Building also houses a service and office area which provides space for miscellaneous shops, auxiliary steam system components, and administrative offices.

2.2.1.3 Fuel Storage Building

The Fort St. Vrain Fuel Storage Building is a single level concrete structure located east of the Reactor Building (see Figure 2.2-4). The building is constructed of prestressed concrete panels and twin tees, and is designed to withstand a 202 mph tornado wind and can withstand the design basis tornado missile. This building will be used for decommissioning support.

2.2.2 Prestressed Concrete Reactor Vessel (PCRV) and Internal Components

The PCRV (Figures 2.2-5 and 2.2-6), which contains the NSSS, is a reinforced concrete structure prestressed with steel tendons. Following defueling, the PCRV will contain the majority of the remaining radioactive materials in the Reactor Building.

The Fort St. Vrain systems associated with the PCRV are as follows:

System 11	PCRV and Internal Components
System 12	Control Rod Drive and Orifice Assembly
System 17& System 18	Reactor Reflector and Defueling Elements
System 21	Helium Circulators
System 22	Steam Generators
System 23	Helium Purification System

These systems make up the primary reactor vessel and internal core components located within the PCRV. These systems and components are discussed further in this section and in Section 2.3.

Portions of the PCRV concrete and rebar are expected to remain activated due to direct irradiation from the reactor core. Highly radioactive components will remain inside the PCRV until removed during PCRV decontamination and dismantlement.

Physically, the 15-1/2 foot thick heads and the 9 foot thick concrete walls are constructed around a 3/4-inch thick low-carbon steel liner which forms the internal cavity. The liner is anchored to the concrete at frequent intervals. A core support floor (CSF) is provided within the PCRV in the form of a reinforced 5 foot thick concrete disk with a 3/4-inch carbon steel outer liner, supported by 12 steel core support floor columns from the bottom of the PCRV cavity.

Longitudinal, circumferential and top and bottom crosshead prestressing tendons (448 total) are located in conduits embedded in the PCRV concrete. Tendons are positioned both circumferentially and vertically along the PCRV side walls. There are also tendons across the top and bottom heads in a criss-cross arrangement.

The reactor core arrangement within the PCRV is shown in Figure 2.2-7. The top layer of the core arrangement consisted of hexagonal shaped metal clad reflector blocks (MCRBs) with openings for 37 control rod pairs. The MCRBs provided an inlet plenum for the reactor coolant to the active core. Region constraint devices (RCDs) were located on top of the MCRBs and mechanically interlocked the top layer (not shown on Figure 2.2-7). Hexagonal top reflector elements with coolant channels are located directly below the MCRBs and above the active core region.

The active core was divided into 37 regions and consisted of 1482 fuel elements. Individual fuel elements were hexagonal in cross section and aligned with the coolant channels from the reflector elements and MCRBs. During reactor defueling, the fuel elements are being replaced with defueling elements of identical shape and size. Hexagonal reflector elements are also located to the sides of and below the active core region. Many of the bottom reflector elements contain boronated graphite in Hastelloy cans.

Radially outside of and immediately adjacent to the top, side and bottom hexagonal reflector elements are the large irregular-shaped side reflector blocks. Between the side reflector blocks an core barrel are the boronated side reflector spacer blocks that contain boronated st pins and were used for shielding.

The core barrel is a steel cylinder approximately 27 feet 4 inches inside diameter and 29 feet high. The core barrel has 12 upper outer keys and 12 lower outer keys which center the core barrel to the PCRV liner. The lower three feet of the inside surface of the core barrel is insulated. In addition, there are seven thermocouple penetrations located about four feet above the bottom of the core barrel that are between the PCRV liner and the core barrel.

Immediately outboard of the core barrel is a helium interspace area. Outboard of this interspace area is an outer metal insulation cover plate, Kaowool (thermal) insulation, an inner metal insulation cover, another layer of Kaowool, and then the PCRV carbon steel liner. See Figure 2.2-8 for a general arrangement of the thermal barriers.

Below the core region containing the defueling elements, the CSF will bear the weight of the defueling elements and reflectors through the core support posts and the core support blocks. The CSF also is the bottom termination point of the core barrel and has 12 penetrations for the 12 steam generator modules. The CSF is supported from the bottom head of the PCRV with 12 core support floor columns (See Figure 2.2-9). The CSF is a complex component that includes the following features:

1. The CSF is a 29-foot in diameter, 5-foot thick concrete disk, clad with 3/4-inch plate steel, weighing approximately 270 tons.
2. There are 12 conical penetrations which discharged the hot helium gas from the reactor to the steam generators via 12 inlet ducts.
3. The CSF is supported by 12 steel columns that are located near the CSF periphery that are welded to the cladding plate.
4. Within each of the 12 CSF support columns is an array of cooling tubes and instrumentation tubes.
5. All surfaces of the CSF are insulated.
6. There is a monorail spider consisting of twelve heavy structural steel beams in a radial arrangement on the bottom side of the CSF, that were used to position the steam generators during construction.

The lower plenum is below the CSF and houses the steam generator modules (12), circulator diffusers (4), circulators (4) the CSF support columns (12) and the lower floor. A number of instrument and equipment penetrations and wells exist in the PCRV heads and sidewalls.

2.2.3 Balance of Plant Contaminated Components

The systems identified below are considered to be the potentially contaminated balance of plant systems outside of the PCRV at Fort St. Vrain. Decontamination and dismantlement of these BOP systems are discussed in Section 2.3.4:

System 13	Fuel Handling Equipment
System 14	Fuel Storage Facility
System 16	Auxiliary Equipment
System 21	Helium Circulator Auxiliaries
System 23	Helium Purification Auxiliaries
System 24	Helium Storage System
System 46	Reactor Plant Cooling Water System
System 47	Purification Cooling Water System
System 61	Decontamination System
System 62	Radioactive Liquid Waste System
System 63	Radioactive Gas Waste System
System 72	Reactor Building Drain System
System 73	Reactor Building Ventilation System
System 93	Instrumentation and Controls

System 15, fuel and reflector shipping equipment, consists primarily of the shipping casks, truck-trailers, spent fuel container, and cask lifting apparatus and is not a part of the decommissioning project. These equipment items will be retained under their separate 10 CFR 71 license or will be disposed of at some time in the future.

A brief summary of the major components in each of the above balance of plant contaminated systems is as follows:

2.2.3.1 System 13 - Fuel Handling Equipment

The fuel handling equipment that remains contaminated includes the fuel handling machine (FHM, Figure 2.2-10), five reactor isolation valves (Figure 2.2-11) and two refueling sleeves (Figure 2.2-12).

2.2.3.2 System 14 - Fuel Storage Facility

The fuel storage facility (See Figure 2.2-13) consists of nine fuel storage wells constructed of carbon steel liners suspended in concrete pits.

2.2.3.3 System 16 - Auxiliary Equipment

The auxiliary equipment consists of the Auxiliary Transfer Cask (ATC, Figure 2.2-12), ten ESWs (Figure 2.2-14), the HSF (Figure 2.2-15), and three shielding adapters (Figure 2.2-16). Figure 2.2-16 shows a general layout at the location of the various fuel handling and storage system components, and associated auxiliary equipment on the refueling floor.

The ATC is most commonly used to transfer the control rod drive assemblies, refueling sleeves and the shield plugs. The ten ESWs are carbon steel structures embedded in concrete used to store the control rod drive assemblies and the refueling sleeves.

The HSF, constructed of concrete and steel shielding plates, consists of two work areas used for inspection, repair, maintenance, testing and decontamination work. The HSF was designed to allow the decontamination, service and repair of various items of contaminated and activated equipment. The HSF was designed to allow service operations to be performed either indirectly with manipulator equipment or manually after decontamination. Provisions are made for partial shielding of portions of an assembly while work is proceeding on an exposed portion. The shielding design of the facility conforms to applicable regulations and is adequate for activated or contaminated equipment. In addition, facility design allows the control and disposal of airborne, waterborne, and solid contamination resulting from operation in the HSF. Adequate monitoring for radiation and airborne contamination is available.

The HSF is the shielded general assembly, decontamination and maintenance area, and provides a cell with walls constructed of 3000 psi concrete with steel embedments to provide the necessary shielding. The walls, floor, and ceiling are coated with an epoxy coating to facilitate decontamination.

The HSF consists of two areas, one capable of staging relatively short items and the other for longer items such as the FHM internal mast. Both areas are serviced by two remotely operated manipulators for disassembly and handling of components.

The "longer" area is serviced by a movable platform that straddles the longer component supported at preselected vertical locations by means of retractable support pins. At the bottom of the service platform well, provisions have been made for a water pool to act as shielding for possible storage of highly radioactive items if this should ever be needed.

Ventilation is provided by a fresh air inlet located below the service floor elevation and a portable HEPA filter and blower located near the top of the access with ducting to the Reactor Building ventilation exhaust. The filter assembly is removable by either manipulator. Packaging of highly radioactive solid waste is normally performed in the HSF.

The structural design of the HSF is such that no significant release of radioactive material will occur. All radioactive materials will be adequately contained under all normal and abnormal conditions to protect the health and safety of the public. Adequate shielding and ventilation controls are also provided to protect operating personnel.

2.2.3.4 System 21 - Helium Circulator Auxiliaries

The auxiliary equipment for System 21 was used to provide a supply of high pressure water for the helium circulator bearing lubrication and a supply of purified buffer helium to prevent in-leakage of bearing water into the primary coolant. The major equipment items include buffer helium recirculators, heat exchangers, filters, pumps, helium dryers, chemical injection components, containment tanks, and compressors (See Figure 2.2-17).

2.2.3.5 System 23 - Helium Purification Auxiliaries

The System 23 auxiliary equipment was used to assist in purification of the helium used as the primary reactor coolant. The major equipment items include filters, heat exchangers, compressors, and dryers (See Figure 2.2-18).

2.2.3.6 System 24 - Helium Storage System

The primary purpose of the helium storage system was to provide for both storage and transfer of helium from the reactor vessel and the storage tanks. In addition, the helium storage system was used in testing the control rod reserve shutdown system and for various FHM purging operations. The primary equipment items include a helium transfer compressor, storage tanks, surge tank, oil adsorber, and high pressure helium supply tanks (See Figure 2.2-19).

2.2.3.7 System 46 - Reactor Plant Cooling Water System

The reactor plant cooling water system (Figure 2.2-20) provided cooling water for process heat removal from all auxiliary equipment in the reactor plant. Three loops were provided that formed the PCRV circuit (liner cooling tubes), the PCRV auxiliary circuit (closed loop for various systems/components) and the service water circuit (open loop for various systems/components). The major equipment items include surge tanks, pumps, demineralizers, filters, heat exchangers, chemical injection (tank and pump) and recondenser chiller.

2.2.3.8 System 47 - Purification Cooling Water System

The purification cooling water system (two loops) provided cooling water to the helium purification system heat exchangers. The major components are pumps, expansion tanks, exchangers and associated piping (See Figure 2.2-21).

2.2.3.9 System 61 - Decontamination System

The major equipment items include a water heater, a drying air heater, a filter, pumps,a solution tank and a chemical injection system (See Figure 2.2-22). Certain System 61 piping and manual valves may be used during decommissioning.

2.2.3.10 System 62 - Radioactive Liquid Waste System

The Radioactive Liquid Waste System is designed to collect and permit sampling, analysis and monitoring of all aqueous wastes discharged from the reactor plant. Radioactive liquid effluents will be diluted by the cooling tower blowdown flow prior to release to the surrounding surface waters. The rate of liquid waste release, along with the blowdown flow, will be controlled to assure that the concentration following dilution does not exceed 10 CFR 20 limits, that resultant doses do not exceed 10 CFR 50 Appendix I limits, and that the concentration of tritium in downstream surface waters does not exceed EPA Safe Drinking Water Standards in 40 CFR 141.

The maximum liquid waste transfer pump capacity is 10 gpm and the minimum allowed blowdown flow setting is 1100 gpm. Assuming a maximum liquid waste release rate and a minimum blowdown flow setting, a dilution factor of 100 is assured.

All radioactive liquids released are discharged via the cooling tower blowdown line to dilute the waste prior to release from the site. Two redundant activity monitors are provided in the radioactive liquid waste discharge line, arranged in one-out-of-two logic. Upon detection of high concentrations of gross gamma activity, these activity monitors will automatically alarm, shutdown the Liquid Waste Transfer Pumps, shutdown the Reactor Building sump pumps, and shut the block valves in the liquid waste discharge line. A flow switch in the cooling tower blowdown line is also provided to automatically alarm, shutdown the Liquid Waste Transfer pumps, shutdown the Reactor Building sump pumps, and shut the block valves in the liquid waste discharge line on low cooling tower blowdown flow. The liquid waste release rate, low blowdown flow setting, and high activity monitors are adjusted in accordance with the ODCM prior to the release. Failure of the selected flow switch will be annunciated in the appropriate control board and will allow normal closure of the liquid waste discharge block valves by the plant operators. If the blowdown flow measuring devices or radiation monitors become inoperable, liquid effluent releases may continue as described in the ODCM. Flow rates can be estimated using Parshall Flume numbers in the liquid discharge pathways.

As shown in Figure 2.2-23, the radioactive liquid waste system includes a 1000 gallon stainless steel lined liquid waste sump which collects aqueous wastes. The sump is equipped with two vertical pumps. Two liquid waste filters are provided in the sump pump discharge line. Two 3000 gallon liquid waste receiver tanks, two demineralizers and a 3000 gallon liquid waste monitor tank are provided. Two liquid waste transfer pumps are provided for disposition of the liquids collected in the waste receiver or monitor tanks.

The liquid waste filters and liquid waste demineralizers are the only equipment items in the radioactive liquid waste system that are expected to accumulate significant quantities of activity. The radioactive liquid waste demineralizers consist of steel pressure tanks that contain the demineralizer resin in cartridges. Each tank contains one cartridge loaded with mixed bed resin. Replacement is accomplished by releasing the latch and opening the tank head, attaching a hoist to the cartridge lifting lug, and lifting the cartridge out of the tank. The cartridge can then be lowered into a suitable shipping container. Since replacement will take place before excessive activity levels are built up in a demineralizer, there are no particular radiological problems involved with replacing the cartridge.

Liquids whose activity is expected to be low will be collected in the liquid waste sump. From the sump, the liquids can be pumped by a sump pump through one of the two filters to one of the two liquid waste receivers, or sampled and released directly to the common radioactive liquid effluent discharge line. Flow is switched from one filter to the other whenever pressure drop or radiation level indicates the filter is loaded. When a convenient amount of liquid is collected in a receiver, the incoming fluid will be diverted to the second tank, and the first tank will be isolated. The receivers are connected to the transfer pump manifold to allow the tank contents to be recirculated and thoroughly mixed to ensure representative samples. Prior to release, the contents of the receiver will be sampled and analyzed to determine the dilution factor required to assure that the concentration in the cooling tower blowdown flow will not exceed the values specified in the ODCM. Once the liquid waste release rate, blowdown flow and activity monitors have been set, the liquid waste effluent will be pumped by one of the liquid waste transfer pumps to the cooling tower blowdown line for release to the environment. If the gross concentration of radioactivity in the undiluted effluent exceeds ODCM limits, the liquids will be further treated prior to release to the environment.

When one of the two liquid waste receivers reaches a level at which it is desired to discharge the contents, the operator recirculates the contents of the tank for a period of not less than one hour to mix the liquid. Samples are taken from a sample point located at the discharge of the liquid waste transfer pumps. If required, the contents of the liquid waste receiver are pumped from the receiver to the monitor tank through the decontamination system filters and a liquid waste demineralizer to reduce the activity concentration. At a preset level in the liquid waste receiver, the transfer pump will be automatically tripped. The operator then sets up the system to recirculate the liquid waste monitor tank, and a sample is taken and analyzed. Allowable release rates are then determined to ensure that the radioactive liquid waste, when diluted with cooling tower blowdown flow, can be released in accordance with the limits specified in the ODCM.

As shown on Figure 2.2-23, a three-way ball valve is installed at the connection between the Reactor Building sump discharge line and the radioactive liquid waste discharge line. This ensures that a simultaneous liquid release from more than one system is prevented. The Reactor Building sump effluent is continuously monitored and the release automatically terminated on high activity or low circulating water blowdown flow. A bypass line is installed around the oil separator in the liquid waste system discharge line. This allows the oil separator to be bypassed during a radioactive liquid waste discharge.

The liquid level in the liquid waste sump is regulated by a level control which starts the sump pump on high level and stops it on low level. Each liquid waste receiver has a level indicator and a high level alarm. Level switches stop the sump pump when a predetermined level is reached in the tank being filled. Switching from a full receiver to the other receiver (less than full) automatically clears the alarm and allows the sump pump to restart. Two activity monitors are provided in the liquid waste discharge line to the cooling tower blowdown line. A low flow switch is provided in the cooling tower blowdown line to detect flow inadequate to effectively dilute the radioactive liquid waste. Upon detection of inadequate blowdown flow, the liquid waste release will automatically be terminated.

2.2.3.11 System 63 - Radioactive Gas Waste System

The radioactive gas waste system collects and monitors potentially radioactive gases discharged from the plant. Gases with activity below 10 CFR 20, 10 CFR 50 and ODCM limits (taking into account atmospheric dilution) are released directly to the reactor plant exhaust filters in the ventilation system for disposal via the reactor plant vent. Gases that are too radioactive for direct release are stored temporarily in surge tanks. Gases that are probably radioactive are transferred directly to the surge tanks. Gas collected in the surge tanks is analyzed to determine isotopic concentrations. With this information, a release rate of the stored gas is established in conformance with the ODCM, and the gas is vented from the tanks at a controlled rate through the reactor plant exhaust filters.

A flow diagram of the gas waste system is shown in Figure 2.2-24. Gas enters the system by means of two inlet headers, a low activity inlet header for gases that are usually of sufficiently low activity levels and flow rates that they can be released directly to the reactor plant exhaust system for disposal, and a high activity inlet header for gases that may be too radioactive for direct release.

Gas that enter the system via the low activity inlet header flows through one of the gas waste filters (one standby). Each filter consists of a prefilter and an "absolute" filter to remove particulate matter. The gas waste filters are designed for 5 psig and full vacuum. These filters are provided with differential pressure indicators and alarms. When either the filter pressure drop or activity becomes excessive, the standby filter is placed in service and the spent filter is replaced.

After leaving the filters, the gas is monitored for activity. If the activity concentration is within the preset limits, the gas is routed directly to the reactor plant exhaust filters for disposal via the gas waste exhaust blowers. If the activity concentration exceeds the preset limits, two interlocked valves are automatically repositioned to divert the gas to the gas waste vacuum tank. Diversion of the gas in this manner activates an alarm in the control room.

The effluent from the gas waste system is released to the plant ventilation system and undergoes monitoring by two redundant particulate monitors arranged in a one-out-of-two logic.

Two gas waste exhaust blowers (one standby) are provided to maintain the low activity inlet header at a slight vacuum and to discharge low activity gas to the reactor plant exhaust filters for disposal. If the operating blower should fail, the resulting rise in header pressure will automatically start the standby blower, while an alarm alerts the plant operator to the trouble.

Gases that enter the system via the high activity inlet header are normally too radioactive for unidentified or undecayed release and are piped directly to the vacuum tank. These gas wastes will potentially be of such high activity as to make release on an unidentified basis impractical. The gas waste system is therefore arranged to permit identification of the radioisotopes present, and thus allow disposal at the maximum permissible rate on an identified basis.

The gas waste vacuum tank collects gas known to be radioactive. This gas is then compressed by one of the gas waste compressors and is stored in the gas waste surge tanks. The gas waste vacuum tank is a 500 ft^3 tank designed for 15 psig and full vacuum, and is provided with an ASME Code safety valve set at 10 psig. A liquid drain tank is provided to accumulate any liquids collected in the vacuum tank for batch transfer to the liquid waste sump in the radioactive liquid waste system. The liquid drain tank is a 10 ft^3 tank, designed for 15 psig and full vacuum. The gas waste surge tanks are 700 ft^3 tanks designed for 500 psig.

The gas waste compressors normally maintain the operating pressures in the gas waste vacuum tank and the liquid drain tank between 8 and 10 psia. The standby compressor is automatically started if the tank pressure should rise to 12 psia, due either to a failure of the operating compressor or to a gas flow in excess of the compressor capacity (50 acfm). The compressors continue to operate until the gas waste vacuum tank pressure is reduced to 8 psia, at which time the compressors are automatically stopped.

Two gas waste compressors (one standby) are provided. These are three stage reciprocating compressors, enclosed in tanks to collect leakage. The compressor tank vapor spaces are vented to the gas waste vacuum tank. For control of leakage through the piston rod seals, the compressors are equipped with two sealed housings. The inner housing is vented to the compressor suction. The outer housing is maintained at a positive pressure with service air backed up by nitrogen from portable nitrogen cylinders. This arrangement is designed so that any leakage will be air or nitrogen into the compressor, rather than process gas leaking out. Water is used to cool the compressors and the inter and after-coolers.

Compressed and cooled gas from the gas waste compressors is collected in one of the gas waste surge tanks. When the tank pressure reaches a predetermined value, the other tank is manually placed in service and the full tank is isolated by a block valve. A gas sample from the full tank is then obtained, and an analysis performed to determine the radioisotopes present and concentrations, and an allowable release rate. The flow controller in the tank vent line is set at this rate, the tank outlet block valve is opened, and the tank is vented directly to the Reactor Building ventilation exhaust. The Reactor Building ventilation exhaust monitors will alarm for any excessive release of activity and terminate gas waste surge tank venting automatically. In addition, the interlocked valves mentioned previously then automatically divert the discharge from the outlet of the gas waste filters to the gas waste vacuum tank.

The gas waste compressors and the various tanks in the system are protected against overpressure by pressure relief devices, which relieve to the reactor plant exhaust filters. Filter overpressure is prevented in the gas waster filters by pressure controllers located upstream of the filters. The gas waste compressors are equipped with conventional safety valves at the discharge of each stage. These valves relieve to the compressor containment tanks which are, in turn, equalized in pressure with the gas waste vacuum tank. The compressor containment tanks are also equipped with conventional safety valves which discharge to the reactor plant exhaust filters. These valves protect against inadvertent closure of the pressure equalization lines to the gas waste vacuum tanks. The gas waste surge tanks are each provided with a rupture disk upstream of and in series with a relief valve which discharges to the exhaust blower discharge line. The space between the rupture disk and the relief valve is vented to the gas waste vacuum tank to prevent pressure buildup in this space due to minute leaks. Tank overpressure will blow out the rupture disk, open the relief valve, and safely discharge a portion of the tank contents to the ventilation system exhaust filters. When the pressure surge has been dissipated, the relief valve will close, preventing release of the entire tank contents.

Activity of gases normally leaving the system is monitored at the outlet of the gas waste filters. Alarms are provided to alert the operator if concentrations approach discharge limits. Trip settings are based on the rated flow capacity (80 cfm) of one of the gas waste exhaust blowers. If the gas flow rate through the filters should exceed this rate, the permissible activity release rate could be exceeded. For this reason, a high-flow alarm (set at a maximum of 110 scfm) is provided to alert the operator should blower discharge flow exceed normal. A flow recorder is provided in the blower discharge line.

2.2.3.12 System 72 - Reactor Building Drain System

The Reactor Building drain system collects the liquid effluent from various equipment and piping drains for appropriate disposal. The major equipment items include drain tanks, sump, pumps, piping and filters (See Figure 2.2-25).

2.2.3.13 System 73 - Reactor Building Ventilation System

The reactor plant ventilation system provides filtered and heated or cooled air to the Reactor Building for the removal of airborne radioactivity, for personnel comfort, for removal of heat from equipment, piping, and motors, and for control of ambient temperature. The ventilation exhaust filter system is designed to filter the Reactor Building atmosphere prior to release to the ventilation stack during both normal and most accident conditions during decommissioning. The system filters the exhaust air to remove radioactive particulates and discharges the air to the atmosphere through the reactor plant vent extending 10 feet above roof level. The process flow diagram is shown in Figure 2.2-26.

Air handling unit 1A or 1B provides recirculated and outside ventilation air to the Reactor Building, the quantity of outside air being adjusted to allow for building inleakage so as to maintain a negative building pressure and exhaust flow from the Reactor Building. The system is sized to provide a sufficient rate of air change for personnel comfort considering void space and expected occupancy of each area. In most cases, the ventilation air rate is predicated on the heat removal capability, but in all cases there is a sufficient quantity of outdoor air passing through each area to permit the required occupancy in potentially contaminated areas.

Ventilation air to the refueling floor consists of a mixture of outside air. This air is cooled or heated to maintain the desired temperature. The ventilation air in this zone is sufficient to dissipate the heat from external effects, lighting loads and equipment loads. This air, plus leakage from the Reactor Building overpressure relief louvers, is mixed in the refueling floor area, and a portion is routed through the grating in the refueling floor surrounding the PCRV. The balance of the total supply plus leakage is routed back to the supply air handling unit inlet. Perimeter finned tube heat exchangers supplement the heating capacity of ventilation air to offset heat losses from the overpressure relief louvers.

Ventilation air supplied to the area beneath the PCRV is cooled by air handling units located therein. Air through the air handling unit is a mixture of recirculated air and air drawn from outside of the PCRV support ring. A portion of the ventilation air supplied to this zone is exhausted directly to the reactor plant exhaust filters. Pressures in all areas of the Reactor Building are maintained subatmospheric to ensure that any air leakage will be inward, when relied upon to mitigate the consequences of potential accidents, as described in Section 3.4.

<u>Reactor Plant Ventilation Air Supply</u>

All reactor plant ventilation air (except for a fraction of the building leakage) is supplied by one of two air handlers which consist of dampers, 85% efficiency filters, fan, and heating and cooling coils. Temperature of the ventilation air is regulated by controlling the hot or chilled water supply to the heating coils. In the event of a shutdown for repair of the operating air handler, the standby unit is started up, thus assuring 100% ventilation.

Flow of air to each ventilated area is set by manual adjustment of dampers in each main supply duct. Branch supply ducts also equipped with dampers distribute the air throughout each ventilated area as required. Pressure levels for each area are maintained by throttling the supply air to areas maintained at a negative pressure and by throttling the exhaust air from the access control area which is maintained at a positive pressure.

<u>Reactor Plant Exhaust</u>

The ventilation exhaust filter system consists of three trains, one of which is normally in continuous operation. The design flow rate for each train is 19,000 cfm. One train is sufficient to maintain the Reactor Building subatmospheric and thereby minimize unfiltered fission product release from the building. The reactor plant exhaust provides for filtration and high velocity exhaust of any radioactivity inadvertently or accidently released into the Reactor Building. Exhaust air from all locations in the Reactor Building is collected and filtered prior to discharge to the atmosphere via the reactor plant vent extending 10 feet above the roof level (about 180 feet above grade). This ensures sufficient atmospheric dilution to limit activity concentrations at the site boundary to acceptable levels. Air is supplied to the exhaust filters as described previously. Main exhaust ducts from certain areas contain backflow preventers to prevent reverse flow of contaminated air between the various locations in the event of accidental pressure buildup in the refueling floor and the PCRV area.

The exhaust air is subjected to high-efficiency filtration at all times for removal of particulate matter. The particulate filters have a specified and tested capability for removal of 99.9% of particulates that are 0.3 microns and greater in size. The exhaust air is monitored for particulate and gaseous radioactivity in the reactor plant vent (i.e., the common exhaust duct) as it is discharged up the vent to the atmosphere. Radiation alarms from the reactor plant vent monitors are installed in the control room. Gases released from the radioactive gas waste system are routed through the exhaust filters before being discharged to the atmosphere.

In the event that pressure in the PCRV area exceeds atmospheric pressure, the standby exhaust train (exhaust filter and exhaust fan) can be manually started, unless the train is unavailable due to maintenance or repair. Normal operation of the ventilation system controls will throttle fresh air supply to the air handler in order to maintain a negative pressure.

Ventilation System Components

1. Air Handling Units. The two reactor plant air handling units 1A and 1B, which supply a combination of recirculated and outside air to all locations, are each designed to cool 27,200 cfm of air from 99°F (dry bulb), 65°F (wet bulb) to 57°F (dry bulb), 51.5°F (wet bulb).

2. PCRV Ventilation Air Handling Units. The two PCRV ventilation air handling units 1C and 1D are each designed to cool 21,200 cfm of recirculated air from 105°F (db) and 70.5°F (wb) to 57°F (db) and 55.5°F (wb).

3. PCRV Pipe Cavity Ventilation Air Handling Units. The four PCRV pipe cavity ventilation air handling units 1A, 1B, 1C, and 1D are each designed

to cool 18,765 cfm of recirculated air from 105°F (db) and 70.5°F (wb) to 60°F (db) and 54.5°F (wb).

4. PCRV Pipe Cavity Chilled Water Heat Exchangers. The two pipe cavity chilled water heat exchangers 1A and 1B are each designed to cool 50,000 cfm of recirculated air from 105°F (db) and 70.5°F (wb) to 57°F (db) and 55.5°F (wb).

5. Exhaust Filters. The reactor plant exhaust filters consist of three units. Exhaust air entering the reactor plant exhaust filters will pass in sequence through a moisture separator and a high efficiency particulate air (HEPA) filter. The HEPA filters conform to the requirements of the following documents:

(1) MilSpec MIL-F-51068 (D)
(2) Underwriters Laboratories Standard UL-568-1977
(3) USNRC Regulatory Guide 1.140
(4) USNRC Regulatory Guide 1.52, Rev. 2
(5) ANSI N509 (1976)

Each of the HEPA filter elements in each filter unit, manufactured from fiberglass conforming to MilSpec MIL-F-51079, is designed for a flow rate of 1200 cfm, with a maximum initial (clean) pressure drop of 1 inch (water gage). Each filter unit is rated at 19,000 cfm to handle the output of its associated reactor plant exhaust fan. The design specification requires that the maximum penetration is 0.03% when tested with thermally-generated mono-dispersed dioctylphthalate (DOP) smoke having a light-scattering geometric mean droplet diameter of 0.3 microns.

6. Exhaust Fans. The three reactor plant exhaust fans are of the circuit-driven, two-stage, vaneaxial type and are located on the outlet of the reactor plant exhaust filters. Each fan is rated at 19,000 cfm at a total pressure of 12 inches H_2O and is driven by a 60 hp motor.

7. Reactor Building Radioactivity Monitors. The Reactor Building exhaust air is monitored for particulate radioactivity in the reactor plant vent (i.e., the common exhaust duct) as it is discharged to the atmosphere.

2.2.3.14 System 93 - Instrumentation and Control

The portions of the instrumentation and control system that are of interest originate at the PCRV penetrations. These are thermocouple penetrations, process and moisture instrumentation, helium circulator instrumentation, and helium vent piping.

Ventilation Exhaust Monitors

The general design bases for the Reactor Building ventilation exhaust monitoring system are the activity release and radiation exposure limits set by Federal and State regulatory agencies for the protection of personnel and property inside and outside the plant boundaries. The system consists of two particulate monitors, arranged in a one-out-of-two logic.

Ventilation System Air Flow

Ventilation system flow is measured at the outlet of the system. Above-normal flow rates are alarmed to ensure that allowable activity release rates are not exceeded.

Area Radiation Monitors

The area radiation monitors include two monitors, one on the refueling floor and one in the Reactor Building truck bay. These monitors serve as accident monitors to detect unplanned radiation levels in the Reactor Building. The monitors are not relied upon in any accident analysis, but are provided to detect abnormal conditions that could indicate unplanned or accidental radiation levels. Alarm setpoints are specified in the Decommissioning Technical Specifications.

2.2.4 Site Characteristics

2.2.4.1 Demography

The population density in the rural areas surrounding the site is relatively low. The nearest resident is located approximately ½-mile north of the Reactor Building, with the nearest town of Platteville located approximately 3½ miles southeast. This is well outside the proposed EPZ of 100 meters from the Reactor Building. Platteville's population is 1515 based on preliminary 1990 census figures. The nearest population centers with a population over 25,000 are Greeley (60,399), Longmont (51,288), and Loveland (37,173), all based on preliminary 1990 census figures.

2.2.4.2 Geography and Land Use

The site is located in Weld County, Colorado. The area surrounding the site is shown in Figure 2.2-27 with reference circles of 10, 20 and 30 miles radii. The site is located in the South Platte River Valley, approximately thirty-five miles north of Denver. It is located in an agricultural area with gently rolling hills. Grade elevation at the plant is 4,790 feet. The foothills of the Rocky Mountains start to rise about twenty miles west of the site, and the Continental Divide is prominently identified by Longs Peak, located forty miles directly west of the site.

The South Platte River and St. Vrain Creek both pass through portions of the site. These two streams, which join near the northern tip of the site, are not large enough to be used for water transportation.

The general area and land use surrounding the site is predominantly agricultural. The major farm products include grain, feed corn, sugar beets, vegetables, beef cattle, sheep and turkeys. There is also a limited amount of dairy farming in the area.

The industrial facilities in the immediate area are primarily located in the town of Platteville. There are 14 oil/gas wells within a one mile radius of the Reactor Building on Company property.

2.2.4.3 Geology and Seismology

The geologic structure of the general area in which the site is located is shown in Figure 2.2-28. The area lies on the east flank of the Colorado Front Range which is a complexly faulted anticlinal arch on which are superimposed numerous smaller folds and faults. The rocks of the core of the anticlinal arch are Precambrian crystallines, including gneiss, schists, and quartzites which have been intruded by granitic rocks that range in age from Precambrian to Tertiary. On the east flank of the arch are Paleozoic and Mesozoic sedimentary rocks.

The regional structure of this part of Colorado is characterized by sedimentary rocks dipping eastward into the Denver Basin. Along the mountain front the regional structural pattern is interrupted by relatively small, en echelon anticlines that plunge to the southeast. In addition to the fold axes, two groups of faults have been recognized. The most notable occurs along the mountain front and includes a series of faults extending in a generally northwest-southeast direction from the Precambrian into the Paleozoic-Mesozoic sediments. The second group of faults has been recognized primarily in coal mines, located generally east of Boulder. These faults have a northeast-southwest orientation. Both groups of faults are relatively high angle faults.

The faults and the minor folds are related to the uplift of the Front Range which began in Late Cretaceous and continued into the Tertiary. The original field examination and photo interpretation of the area surrounding the site location failed to indicate any evidence of recent movement along any of the known faults. There is no known evidence of any recent seismic activity in the immediate area to have caused any subsequent movement.

The subsoils at the site are St. Vrain-Platte River alluvial sands and gravel overlying Pierre shale bedrock. Generally, 3 to 8 feet of loose to very loose clean sands (with occasional silty and clay lenses) are underlain by 30 to 35 feet of medium dense, fine alluvial sands. These sands are underlain with 4 to 11 feet of medium dense to dense, slightly clay, sandy gravel. Continuing under the gravel, hard to very hard interlayered sandstone and claystone bedrock is found at depth 46 to 51 feet. Free water was found at a depth of about 23 feet. Estimated contours of the surface of the bedrock and the free water level are shown in Figures 2.2-29 and 2.2-30. The shallow loose sands are capable of supporting only low foundation pressures, the medium dense sand will support moderate foundation pressures, and the bedrock will support high foundation pressures.

2.2.4.4 Hydrology

The site location is between the South Platte River and St. Vrain Creek about two miles south of the confluence of these two streams. Surface water rights are owned in four ditches which traverse portions of the site area. In addition, nineteen shallow wells are located on the site area.

Flow of ground water on the site is toward the alluvial deposits of both the South Platte River and St. Vrain Creek. The contours of the water table indicate that the flow of ground water is predominately toward the South Platte River Valley (Figure 2.2-30). Much of the ground water comes from the South Platte River and St. Vrain Creek, such that the water table changes with the flow rate (elevation) in the two streams. Total precipitation, mostly in the form of rain, in the South Platte Valley is small and contributes relatively little to the ground water.

2.2.4.4.1 Plant Water Supply

When the plant was operating, cooling water for the plant was supplied by the main cooling tower and the service water tower. Make-up water for the main cooling tower was obtained from water diverted from the South Platte River and St. Vrain Creek, and supplemented by water from a system of six shallow wells. Make-up water for the service water tower is supplied by the domestic water system, with back-up from the shallow well system. Potable water and water for closed systems in the plant, such as the secondary coolant system, is supplied by the domestic water line, which is connected to a main of the local water district. The local water district is the Central Weld County Water District, whose source of supply is Colorado Big Thompson Project water from Carter Lake, which is located about twenty miles west of the site. The arrangement of the various water supply systems is shown in Figure 2.2-31.

2.2.4.4.2 Plant Effluent

The same liquid effluent release path will be used during decommissioning as was used during normal plant operations. As shown in Figure 2.2-31, diluted liquid effluent will normally be released from the Fort St. Vrain protected area to the Goosequill Ditch. From the concrete lined Goosequill Ditch, liquid effluent flows into the Jay Thomas Ditch, where additional dilution may occur, and then on to a 25 acre farm pond that contains about 32 million gallons of water. Water flows approximately 8700 feet from the plant to the farm pond.

Dilution water will be taken from the surrounding rivers (South Platte River or St. Vrain Creek) and released via the cooling tower blowdown line, where it is mixed with radioactive liquid effluent. Availability of 2000 gpm for the dilution water flow is assured throughout decommissioning, as this is less than the 4100 gpm circulating water makeup flow (which is 35% of the surface water rights owned by PSC) that was available during normal plant operations.

Miscellaneous turbine plant drains such as floor drains, the Turbine Building sump, and yard drains, are normally directed to the South Platte River via the continuation of the Goosequill ditch to the farm pond. A diversion box is provided in the Turbine Building drain line so that effluent can normally be directed into the Goosequill ditch. Under abnormal conditions which prevent discharge via the Goosequill ditch, effluent is alternatively directed to the St. Vrain Creek via a slough. The reactor plant drains flow to a diversion box from which the flow can be directed to the South Platte River via the continuation of the Goosequill ditch or to the St. Vrain Creek via a slough.

Three lined evaporation ponds (total surface area of 3.6 acres) are present and were utilized to receive chemically treated effluent (primarily produced by periodic regeneration of plant demineralizers) while the plant was operating. Two ponds are located a few hundred feet northeast of the plant building. The other pond is located south of the switchyard.

Use of surface water downstream from the site is limited almost entirely to irrigation. A diagram of the major tributaries and irrigation ditches on the South Platte River between the gaging stations at Henderson and Kersey is shown on Figure 2.2-32. The plant site is located just upstream of the junction with the St. Vrain Creek, adjacent to the Jay Thomas Ditch.

Analyses for the reactor site were conducted on the amount of diversion and stream flows of the nearby water ways. From these original analyses, it was concluded that effluent from the plant would be carried primarily by the South Platte River except during the irrigation season with allowance for reservoir storage. Effluent in irrigation water would enter ground water in the alluvium and would eventually be transported back into the strata bed of the South Platte River. There have been no significant changes in the waterway flows or diversions to require new analyses.

The sources of public water supplies within thirty miles of the site are given in Table 2.2-1. There are two towns downstream within this radius that presently obtain part or all of their water from wells in the alluvium of the South Platte River: Gilcrest and LaSalle. It has been common practice for farmers to obtain domestic water from shallow wells in the alluvium. Many of those who formerly used shallow wells as their source of domestic water now obtain water from the Central Weld County Water District. This same district is the source of domestic water for the plant.

2.2.4.5 Meteorology

2.2.4.5.1 General Climate

The general climate around the Fort St. Vrain reactor site is typical of the Colorado eastern-slope plains region. In this semi-arid region the precipitation averages 10 to 15 inches a year, mostly from thunderstorms in late spring and summer. The annual free water surface evaporation rate is about 45 inches per year (Ref. 4).

The wind records show no dominant direction, although winds out of the north by northeast segment do occur with the greatest frequency. The winds are generally light (10 mph), with higher velocities occurring during various atmospheric disturbances.

The weather is generally mild. Most seasons are characterized by low humidity and sunny days, with occasional, short-lived storms bringing precipitation into the area. Relative humidity averages about 40 percent during the day and 65 percent at night. Thermal radiation losses resulting from lack of cloud cover provide considerable variation in temperature from night to day. Although snowfall may be significant, the snow cover is usually melted in a few days.

2.2.4.5.2 Severe Weather

Tabulated below are temperature and precipitation records for three cities within 20 miles of Fort St. Vrain (see Figure 2.2-27). The recording periods were 1973-1988 (Brighton), 1931-1988 (Longmont), and 1967-1988 (Greeley).

	Brighton	Longmont	Greeley
Max. Temp. (degrees F)	101	106	103
Min. Temp. (degrees F)	-23	-36	-25
Max. Precip. - Day (in.)	2.73	4.04	3.20
Max Snowfall - Month (in.)	22.1	32.1	37.3

Based on information extracted from archived weather data collected from Fort St. Vrain's 60 meter meteorological tower for the period 1986 through 1989, the following weather extremes were observed:

Maximum Temperature	104 degrees F
Minimum Temperature	-26 degrees F
Maximum Wind Velocity	48 mph at wind direction 6.5 degrees (NNE)

Seasonally, winds tend to be strongest in the late winter and spring, the season with high chinook frequency, and again in the summer, when thunderstorms occur frequently. Strong winds, especially under chinook conditions, have been observed on various occasions in eastern Colorado. The chinook winds are strongest immediately to the east of the mountain ridge and diminish rapidly over the plains with increasing distance from the mountains.

The measurement records at the site from July 1986 to December 1989 reveal a prevalence of northerly and southerly winds caused by the shallow depression of the St. Vrain Creek and the South Platte River and by the proximity of the Rocky Mountains. The meteorological data for this period for the wind speed and duration and frequency of distribution is contained in Tables 2.2-2 and 2.2-3, respectively.

Northeastern Colorado has moderate thunderstorm activity. The region near Fort St. Vrain averages 50 days/year in which thunder and lightning occur. The majority of these thunderstorms are present from late spring through the summer.

The Fort St. Vrain site is located in a region that typically experiences five tornadoes per year per 10,000 square miles. The peak tornado activity occurs in the month of June. According to the National Weather Service, 117 tornadoes occurred in Weld County during the period 1950-1987.

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TABLE 2.2-1
PUBLIC WATER SUPPLIES WITHIN THIRTY MILES OF FORT ST. VRAIN

DIST. MILES	MUNICIPALITY	POP. SERVED	TYPE OF SUPPLY	SOURCE OF SUPPLY
	DOWNSTREAM IN THE PLATTE RIVER VALLEY			
5-10	Gilcrest	382	Wells	Alluvium of South Platte River
10-15	LaSalle	1,300	Wells	Alluvium of South Platte River
10-20	Greeley	39,000	Surface	Cache la Poudre River; Colorado-Big Thompson Project; Nunn and Deadman Creeks
	OTHER MUNICIPALITIES			
3-4	Platteville	950	Wells	Alluvium
5-10	Mead	900	Surface	Big Thompson River and St. Vrain Creek
10-15	Johnstown	1,200	Surface	Big Thompson River
10-15	Fort Lupton	4,000	Wells	Alluvium of South Platte River
10-15	Frederick	1,500	Surface	Boulder Creek
10-15	Longmont	50,000	Surface	North and South St. Vrain Creek
10-20	Loveland	30,000	Surface	Big Thompson River
10-15	Berthoud	3,200	Surface	Big Thompson River
15-20	Hudson	540	Wells	Alluvium
15-20	Brighton	13,000	Wells	Alluvium of South Platte River
15-20	Erie	1,375	Surface	South Boulder Creek
15-20	Windsor	1,500	Surface	Greeley
20-25	Eaton	1,500	Wells	Alluvium
20-25	Keenesburg	475	Wells	Laramie and Fox Hills formations
20-25	Broomfield	20,000	Wells	Fox Hills sandstone
20-25	Lafayette	10,000	Surface	South Boulder Creek, Woneka Reservoir
20-25	Louisville	6,000	Surface	South Boulder Creek
20-25	Lyons	1,340	Surface	North St. Vrain Creek
20-25	Timnath	150	Surface	Greeley
20-30	Fort Collins	80,000	Surface	Cache la Poudre River
25-30	South Adams Water and Sanitary Dist. (Commerce City)	25,000	Wells	Alluvium of South Platte River
25-30	Lochbuie	1,000	Wells	Alluvium of South Platte River
25-30	North Huron Water Dist (near Broomfield)	80	Wells	Fox Hills sandstone
25-30	Northwest Utilities Company	15,000	Wells	Arapahoe and Fox Hills formations; alluvium of South Platte River
25-30	Federal Heights	8,000	Wells	Arapahoe and Fox Hills formations
25-30	Westminster	60,000	Surface	Clear Creek Wells Arapahoe and Fox Hills formations
25-30	Boulder	96,000	Surface	North Boulder Creek
25-30	Jamestown	230	Ground	Alluvium

TABLE 2.2-2
HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1986-1989
STABILITY CLASS: All Classes

Wind Speed (mph) at 10m Level

WIND DIRECTION	1-3	4 - 7	8 - 12	13 - 18	19 - 24	>24	TOTAL
N	545.13	579.12	355.24	272.14	76.43	21.50	1849.56
NNE	738.41	729.08	420.54	217.72	72.83	25.22	2202.80
NE	803.04	964.27	353.48	101.27	19.11	3.53	2244.70
ENE	820.38	1051.09	303.93	38.20	4.26	1.26	2219.12
E	597.95	845.41	227.74	27.21	2.77	0.76	1701.84
ESE	570.52	748.32	256.38	41.60	4.52	1.51	1622.85
SE	526.77	584.33	231.54	61.27	6.04	2.77	1412.72
SSE	637.06	666.42	265.01	68.02	23.41	9.85	1669.77
S	872.38	805.30	228.23	56.06	19.41	7.31	1988.69
SSW	1072.95	937.43	120.03	23.18	2.92	2.36	2158.87
SW	1204.10	1537.78	157.65	24.11	5.54	2.27	2931.45
WSW	867.01	1113.02	166.28	62.69	11.57	6.03	2226.60
W	369.11	263.26	75.50	50.46	26.98	10.84	796.15
WNW	205.06	169.15	84.86	90.29	29.78	20.91	600.05
NW	278.20	299.73	160.76	87.95	29.96	8.83	865.43
NNW	388.84	380.16	221.87	129.06	36.58	4.28	1160.79
VARIABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	10496.91	11673.87	3629.04	1351.23	371.11	129.23	27651.39

Periods of calm (hours): 1241.77
Hours of missing data: 1728.56

TABLE 2.2-3
FREQUENCY OF DISTRIBUTION
FOR EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1986-1989
STABILITY CLASS: All Classes

Wind Speed (mph) at 10m Level

WIND DIRECTION	1 - 3	4 - 7	8 - 12	13 - 18	19 - 24	>24	TOTAL
N	0.020	0.021	0.013	0.010	0.003	0.001	0.067
NNE	0.027	0.026	0.015	0.008	0.003	0.001	0.080
NE	0.029	0.035	0.013	0.004	0.001	0.000	0.081
ENE	0.030	0.038	0.011	0.001	0.000	0.000	0.080
E	0.022	0.031	0.008	0.001	0.000	0.000	0.062
ESE	0.021	0.027	0.009	0.002	0.000	0.000	0.059
SE	0.019	0.021	0.008	0.002	0.000	0.000	0.051
SSE	0.023	0.024	0.010	0.002	0.001	0.000	0.060
S	0.032	0.029	0.008	0.002	0.001	0.000	0.072
SSW	0.039	0.034	0.004	0.001	0.000	0.000	0.078
SW	0.044	0.056	0.006	0.001	0.000	0.000	0.106
WSW	0.031	0.040	0.006	0.002	0.000	0.000	0.081
W	0.013	0.010	0.003	0.002	0.001	0.000	0.029
WNW	0.007	0.006	0.003	0.003	0.003	0.001	0.022
NW	0.010	0.011	0.006	0.003	0.001	0.000	0.031
NNW	0.014	0.014	0.008	0.005	0.001	0.000	0.042
VARIABLE	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.380	0.422	0.131	0.049	0.013	0.005	1.000

Periods of calm fraction: 0.045
Fraction of missing data: 0.063

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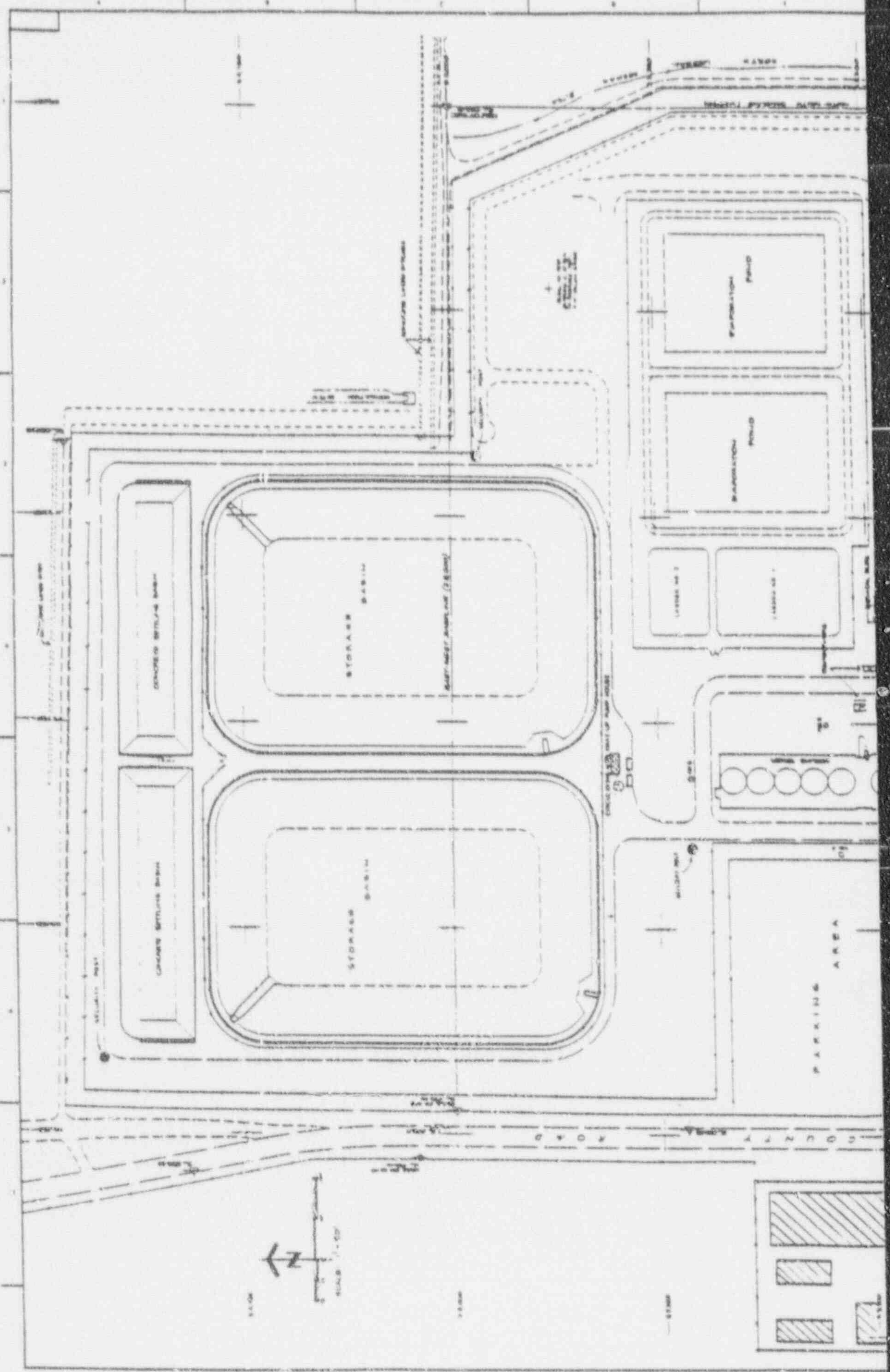


STORAGE BASIN
STORAGE BASIN
CONCRETE SETTLING BASIN
CONCRETE SETTLING BASIN
EVAPORATION POND
EVAPORATION POND
PARKING AREA
COUNTY ROAD
N

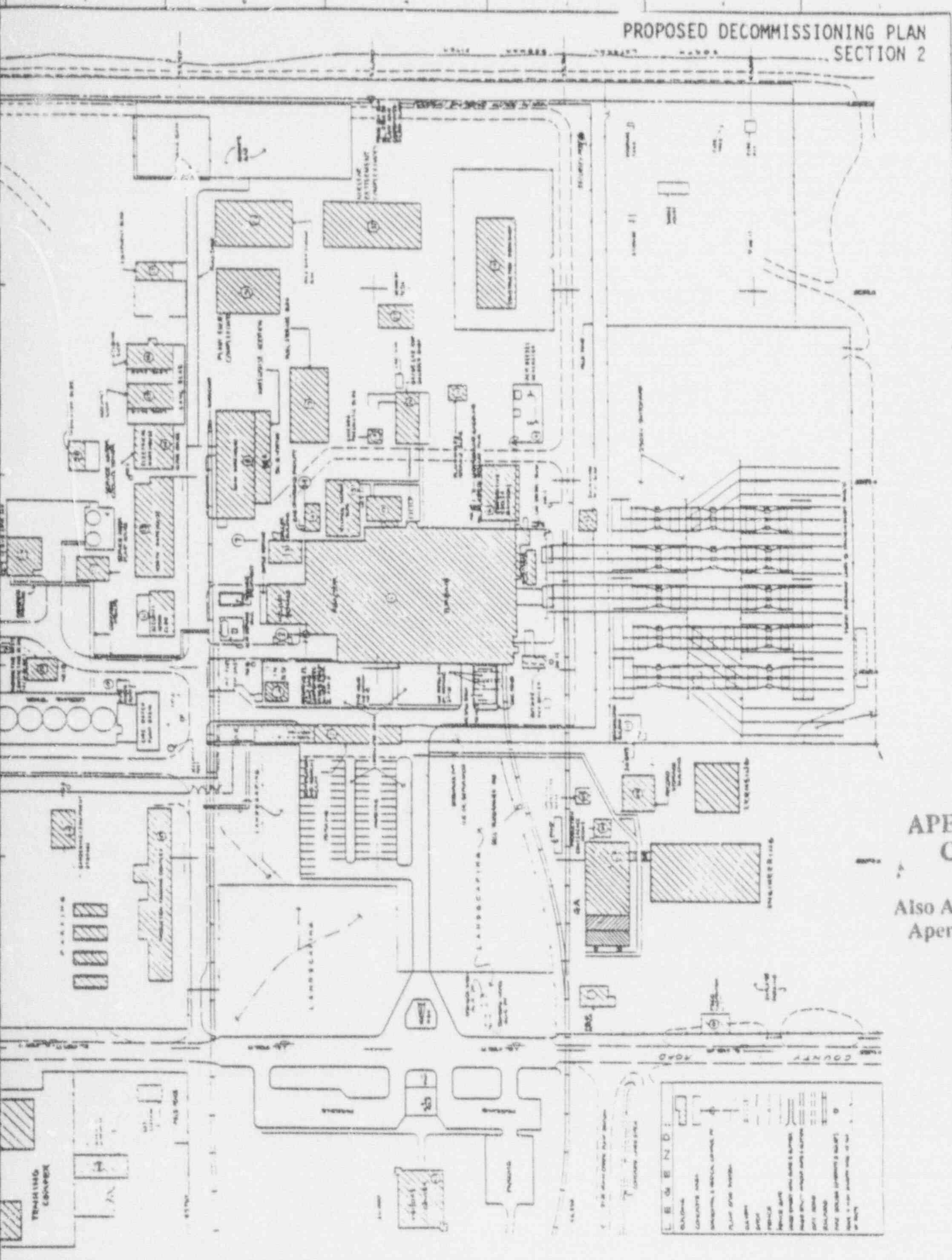


Figure 2.2-1 Fort St. Vrain
Plot Plan

9204280079-01

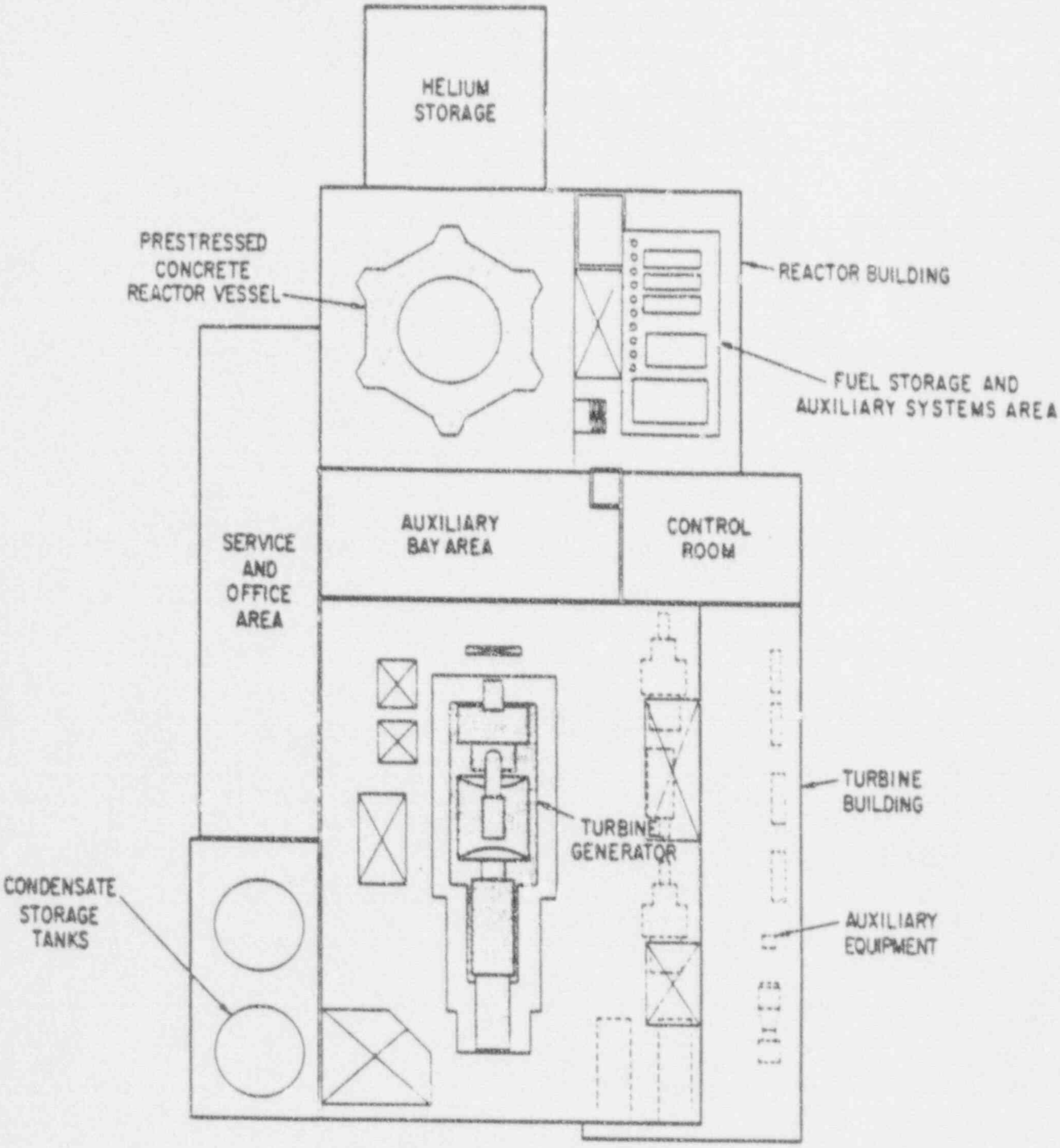


Figure 2.2-2 Reactor and Turbine Building - Plan View

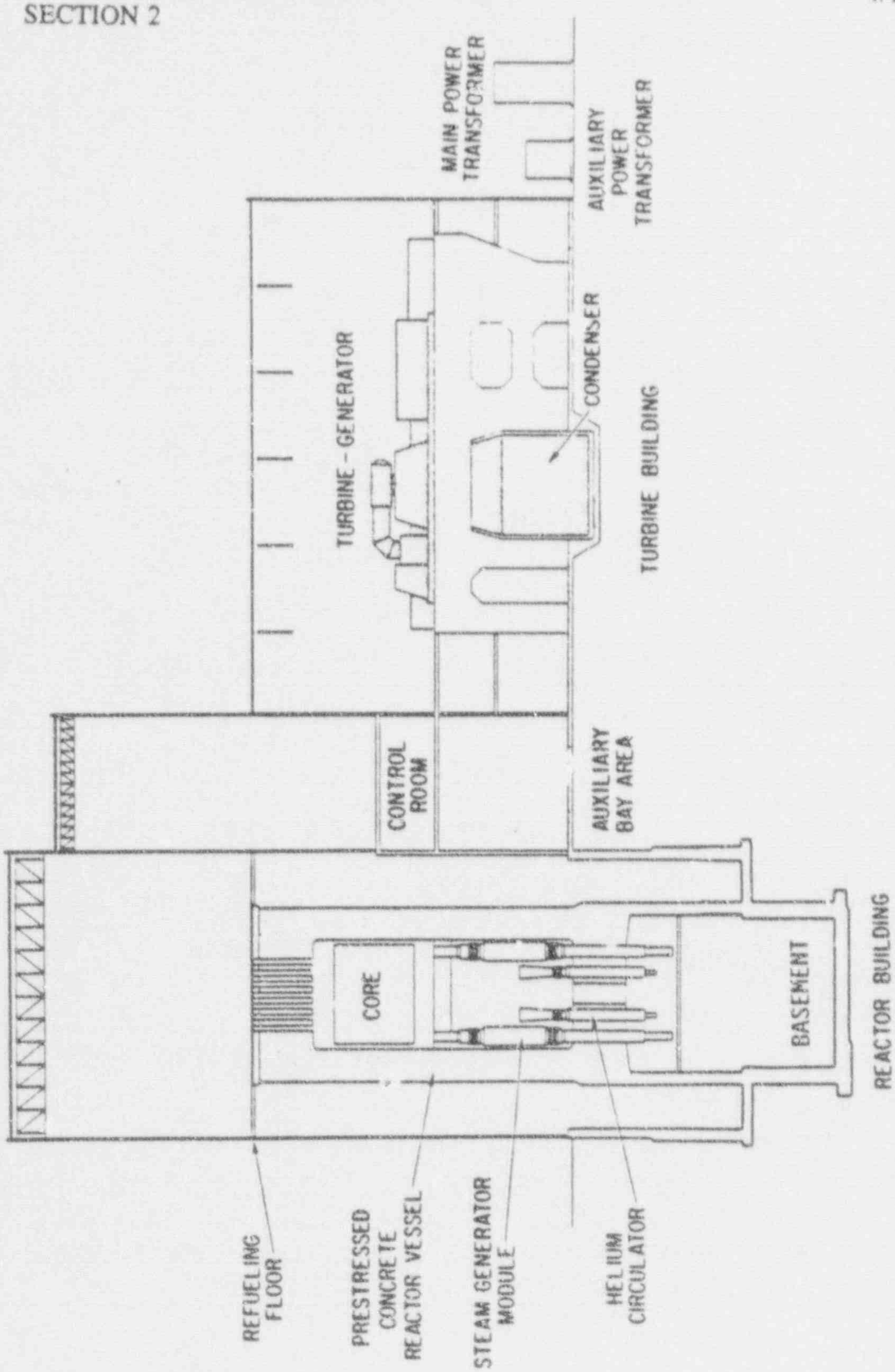


Figure 2.2-3 Reactor and Turbine Buildings - Elevation View

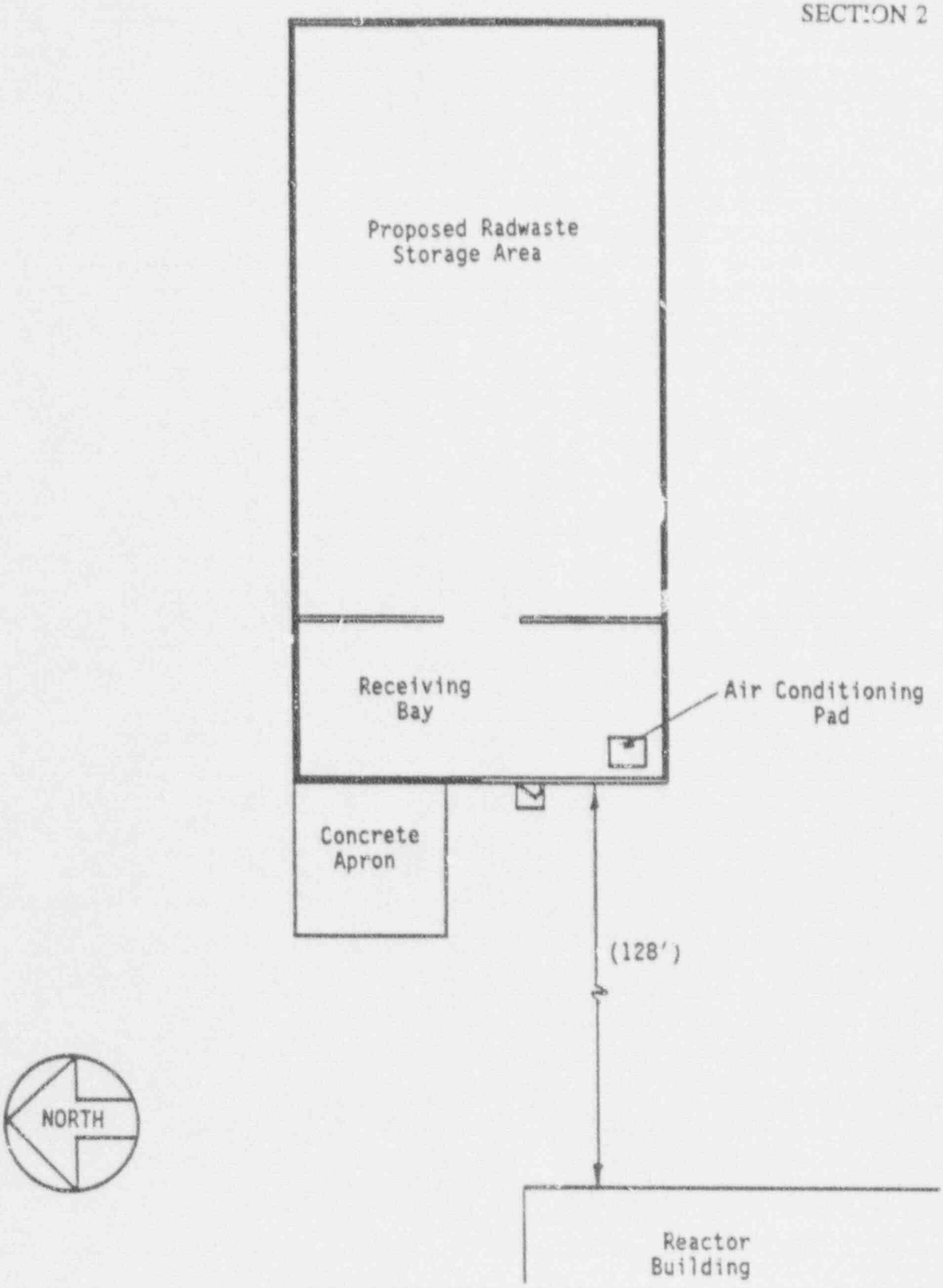


Figure 2.2-4 Fuel Storage Building

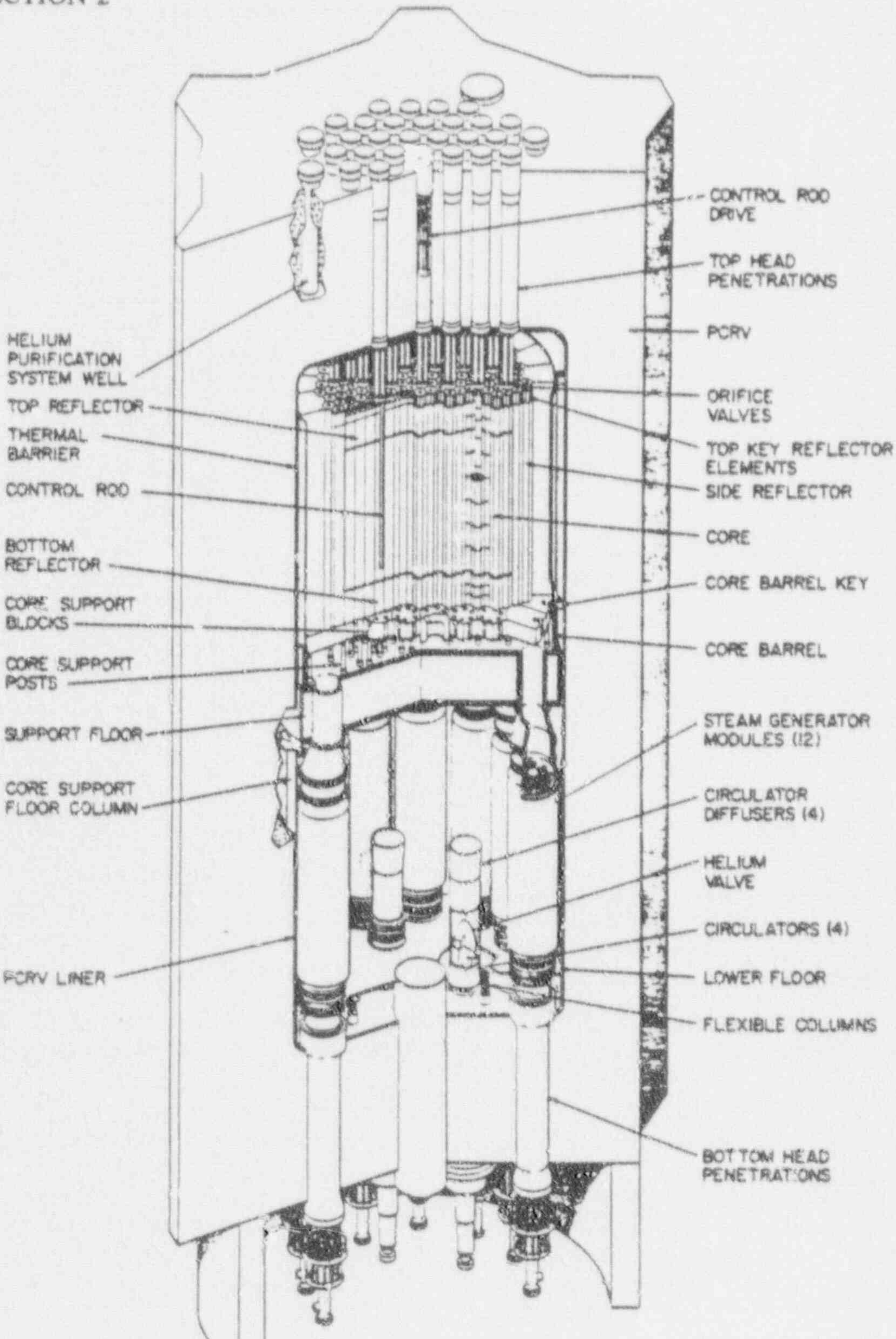


Figure 2.2-5 Prestressed Concrete Reactor Vessel (PCRV)

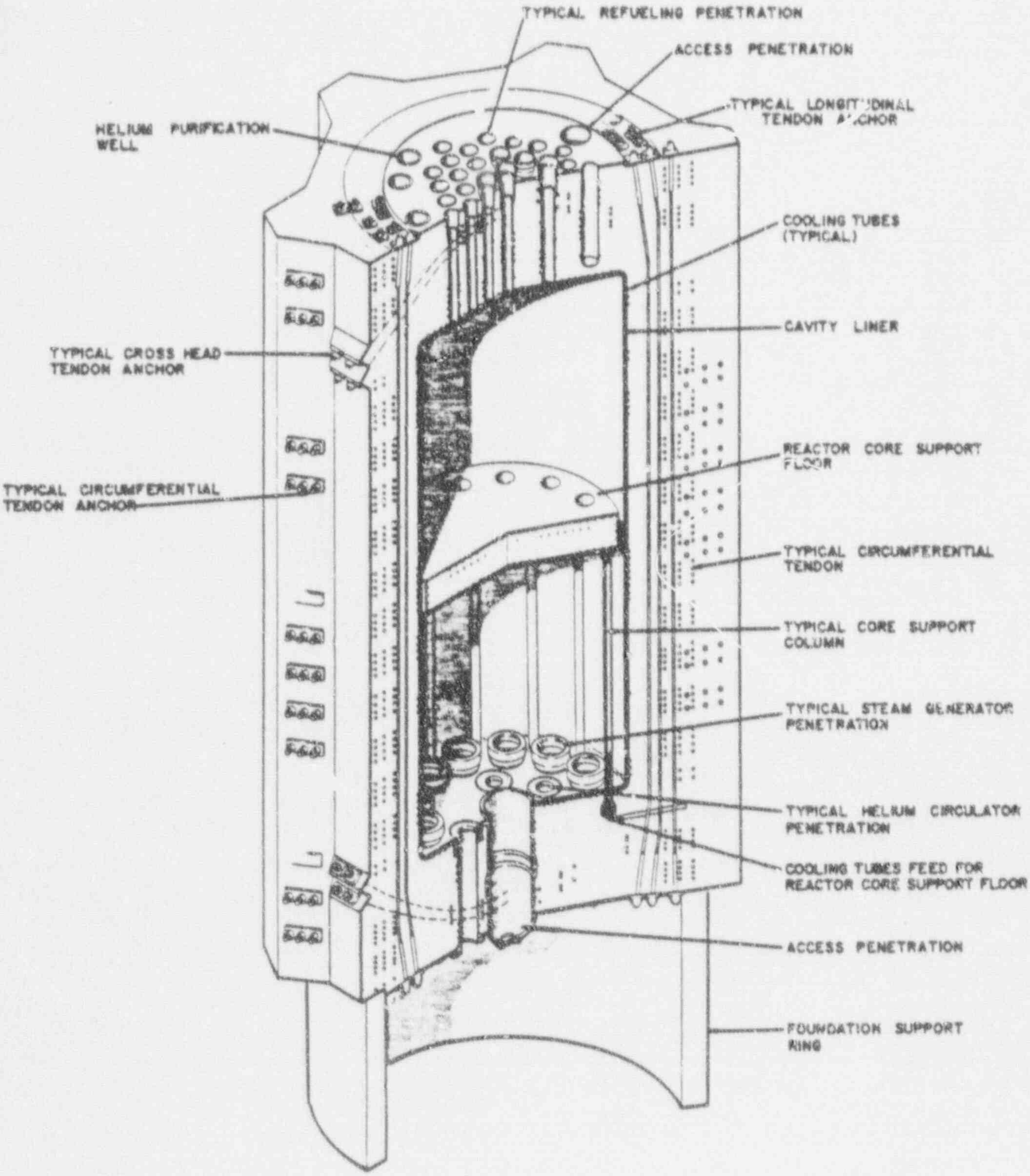


Figure 2.2-6 PCRV General Configuration

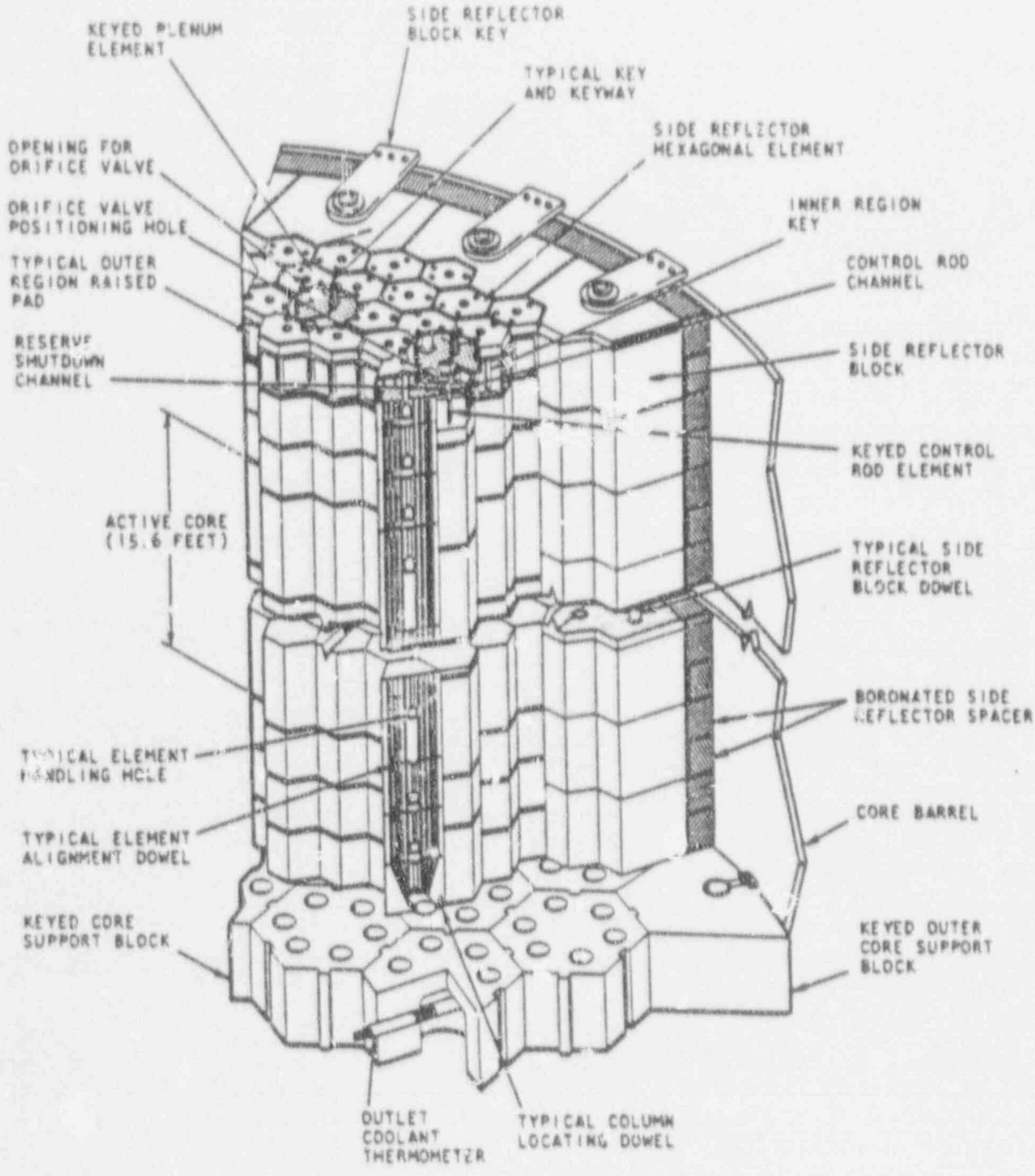
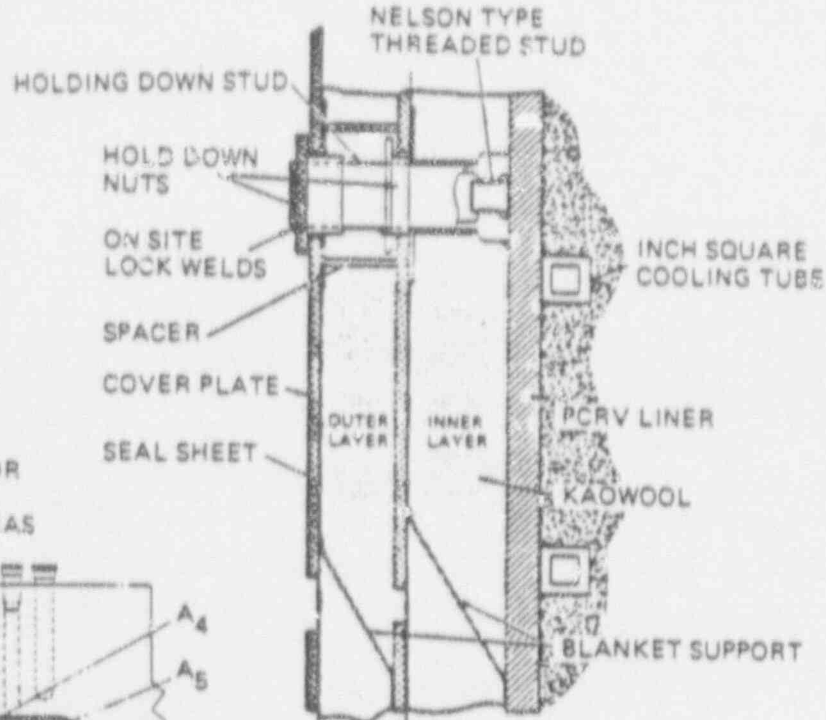
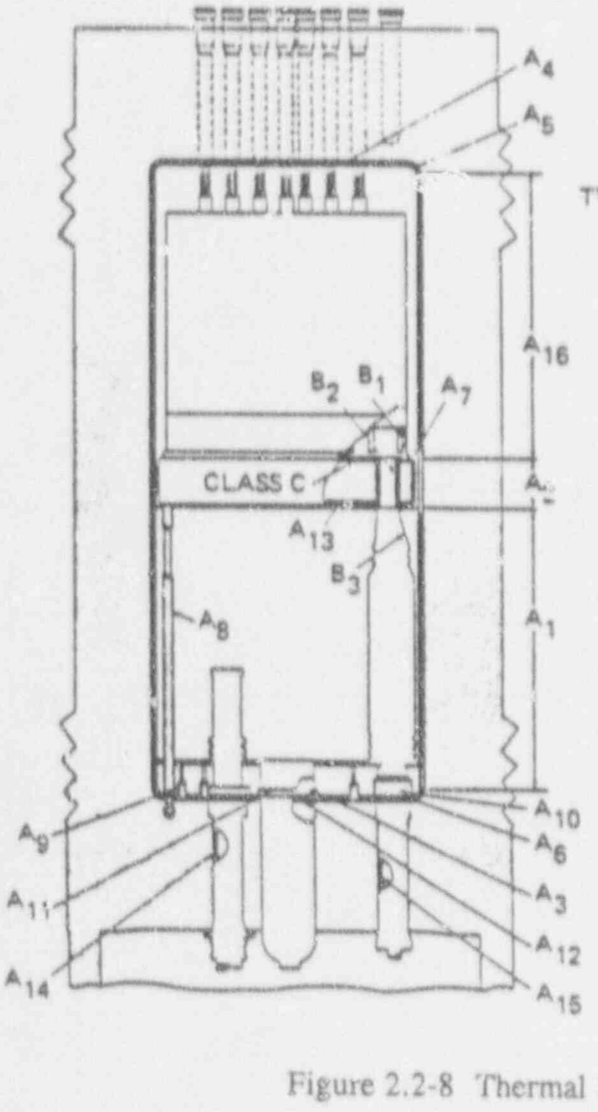


Figure 2.2-7 Core Arrangement - Elevation Section



TYPICAL SECTION THRU INSULATION IN AREA A_1

CROSS SECTION REACTOR SHOWING LOCATION OF THERMAL BARRIER AREAS



AREA	OVERALL THICKNESS TO TOP OF COVER PLATE	INSULATION MATERIAL THICKNESS AS INSTALLED	
		INNER	OUTER
CLASS A			
A_1	4-5/16 IN.	2-1/4 IN.	1-3/4 IN
A_2	3-13/12 IN.	2-1/4 IN.	1 IN
A_3	3-9/32 IN	3 IN.	NONE
A_4	4-9/16 IN	2-1/4 IN.	1-3/4 IN
$A_{5\&6}$	≥ 4-9/16 IN.	≥ 2-1/4 IN.	≥ 1-3/4 IN
A_7	3-6/16 IN	1-3/4 IN.	1 IN
$A_{8\&9}$	1-8/32 IN.	1 IN.	NONE
A_{10}	2-9/32 IN.	2 IN.	NONE
A_{11}	3-9/32 IN.	3 IN.	NONE
A_{12}	3-9/32 IN.	3 IN.	NONE
A_{13}	4-9/16 IN.	2-1/4 IN	1-3/4 IN
A_{14}	1-8/32 IN.	1 IN.	NONE
A_{15}	2 IN.	METALLIC	INSULATION
A_{16}	3-13/16 IN	2-1/4 IN	1 IN
CLASS B			
B_1	3-1/2 IN	2-1/4 IN	NONE
B_2	3 IN.	1-1/8 IN	1-1/8 IN
B_3	2-1/4 IN	1-3/4 IN	NONE
CLASS C			
C	12 IN	2-3/4 IN	9 IN

Figure 2.2-8 Thermal Barrier Arrangement

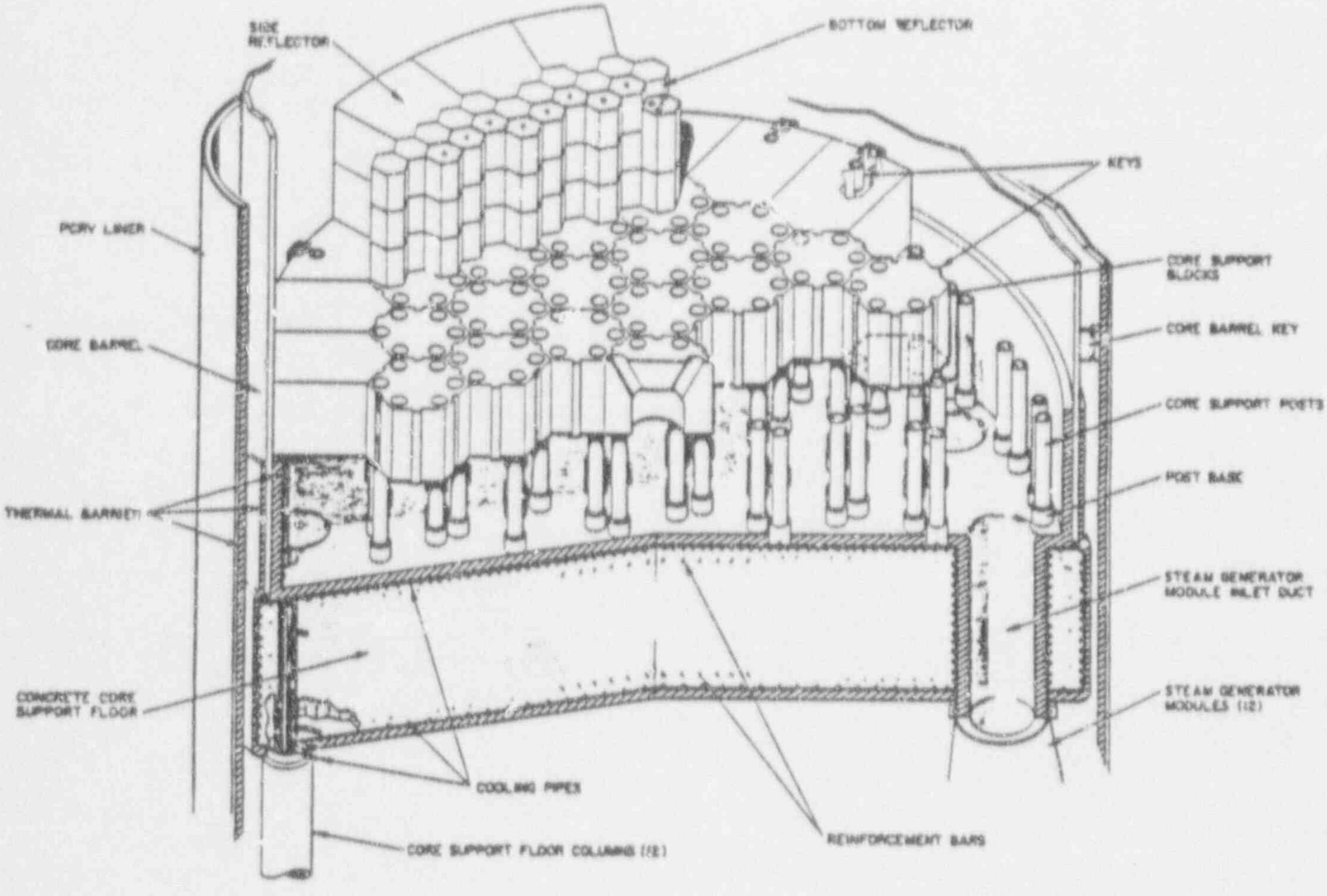
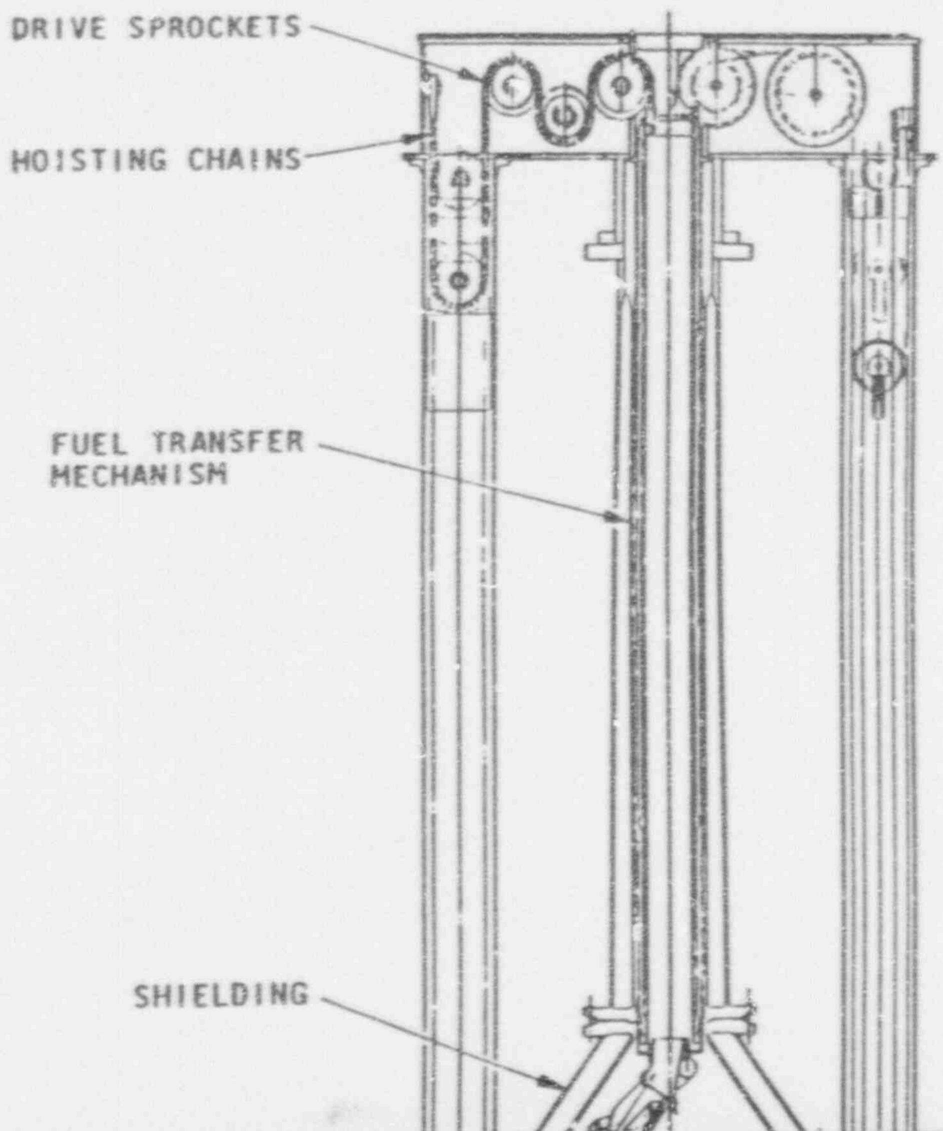


Figure 2.2-9 Core Support Arrangement


DRIVE SPROCKETS
HOISTING CHAINS
FUEL TRANSFER
MECHANISM
SHIELDING

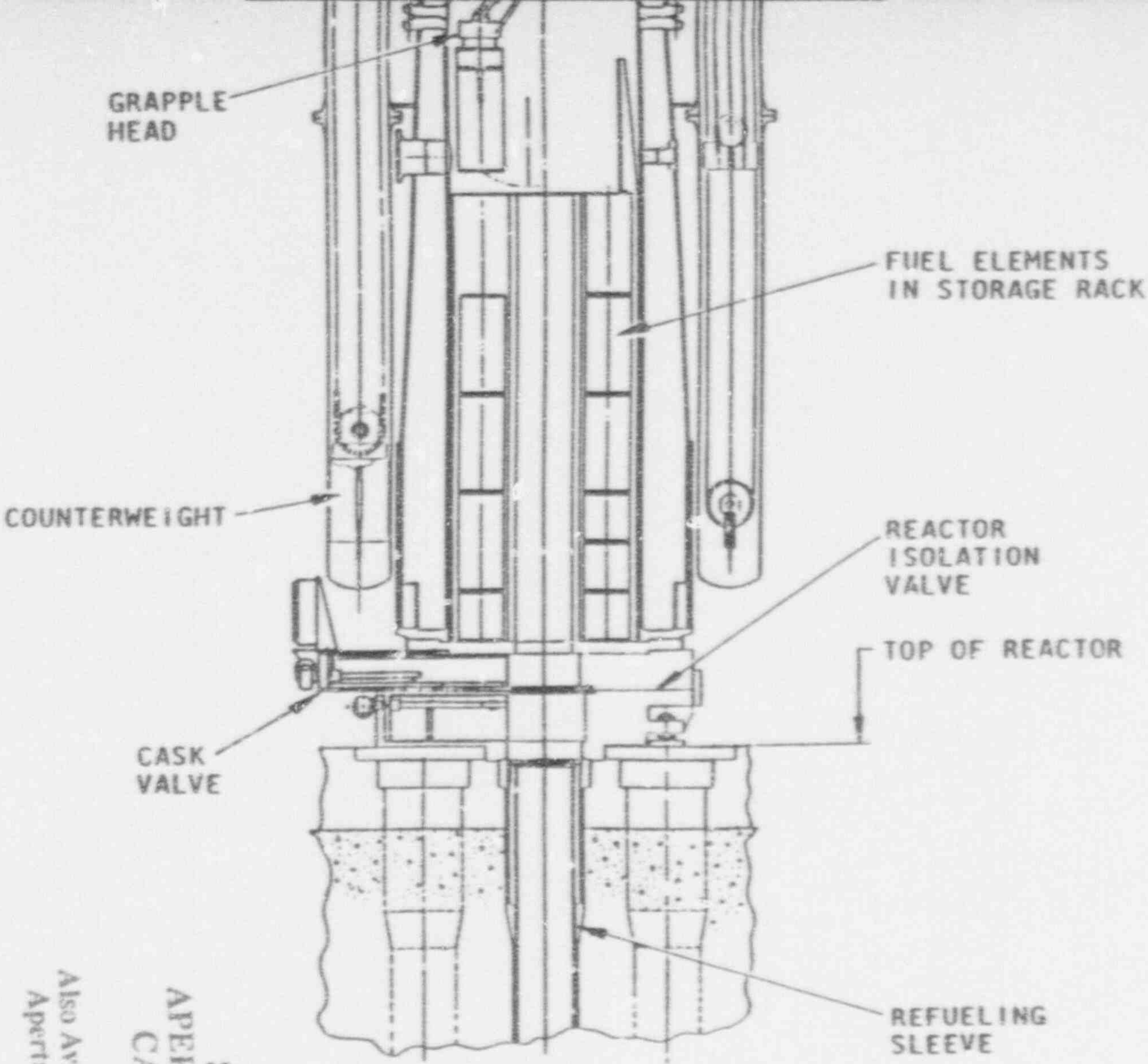


Figure 2.2-10 Fuel Handling
Machine

SI
APERTURE
CARD

Also Available On
Aperture Card

9204280079-02

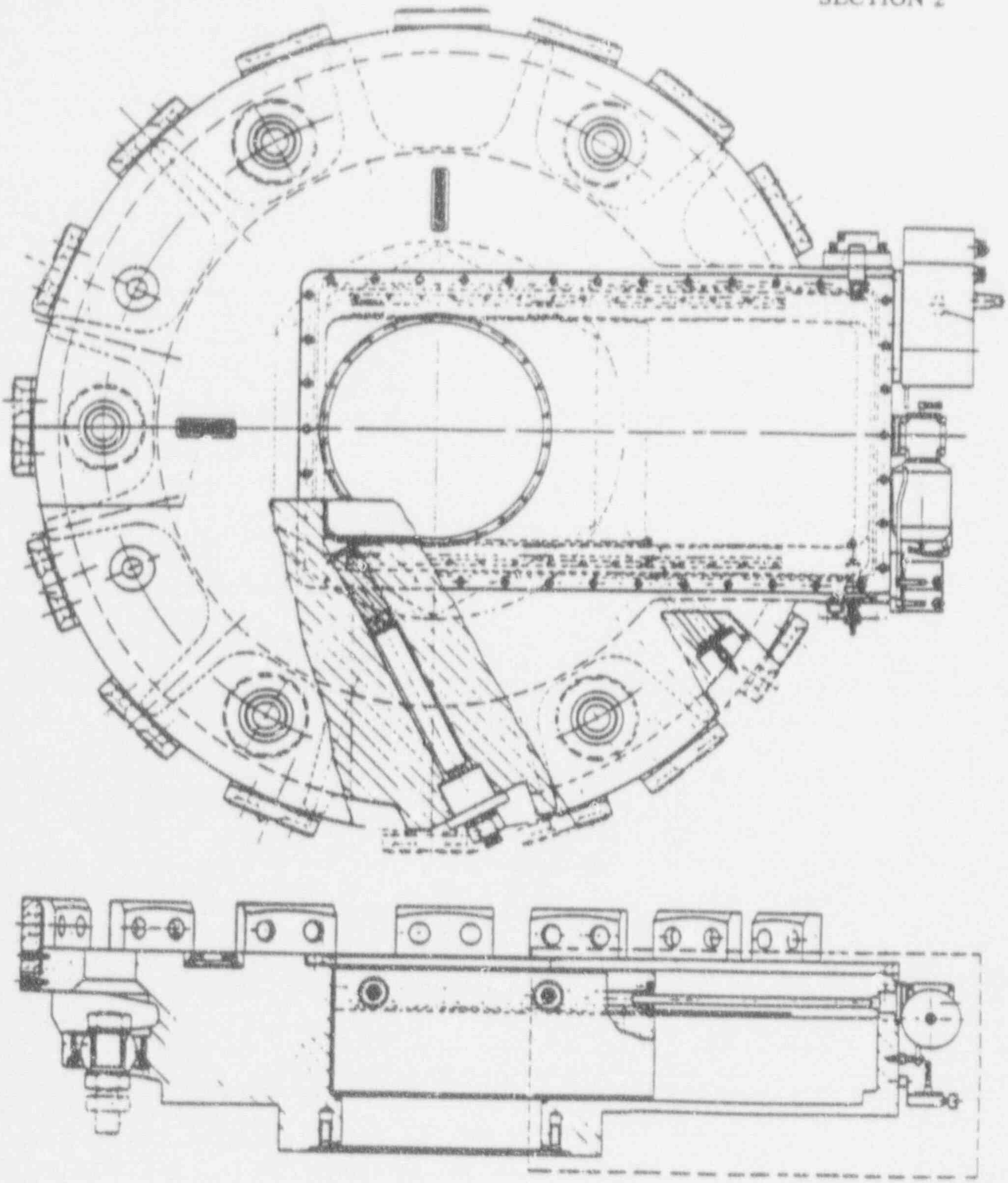
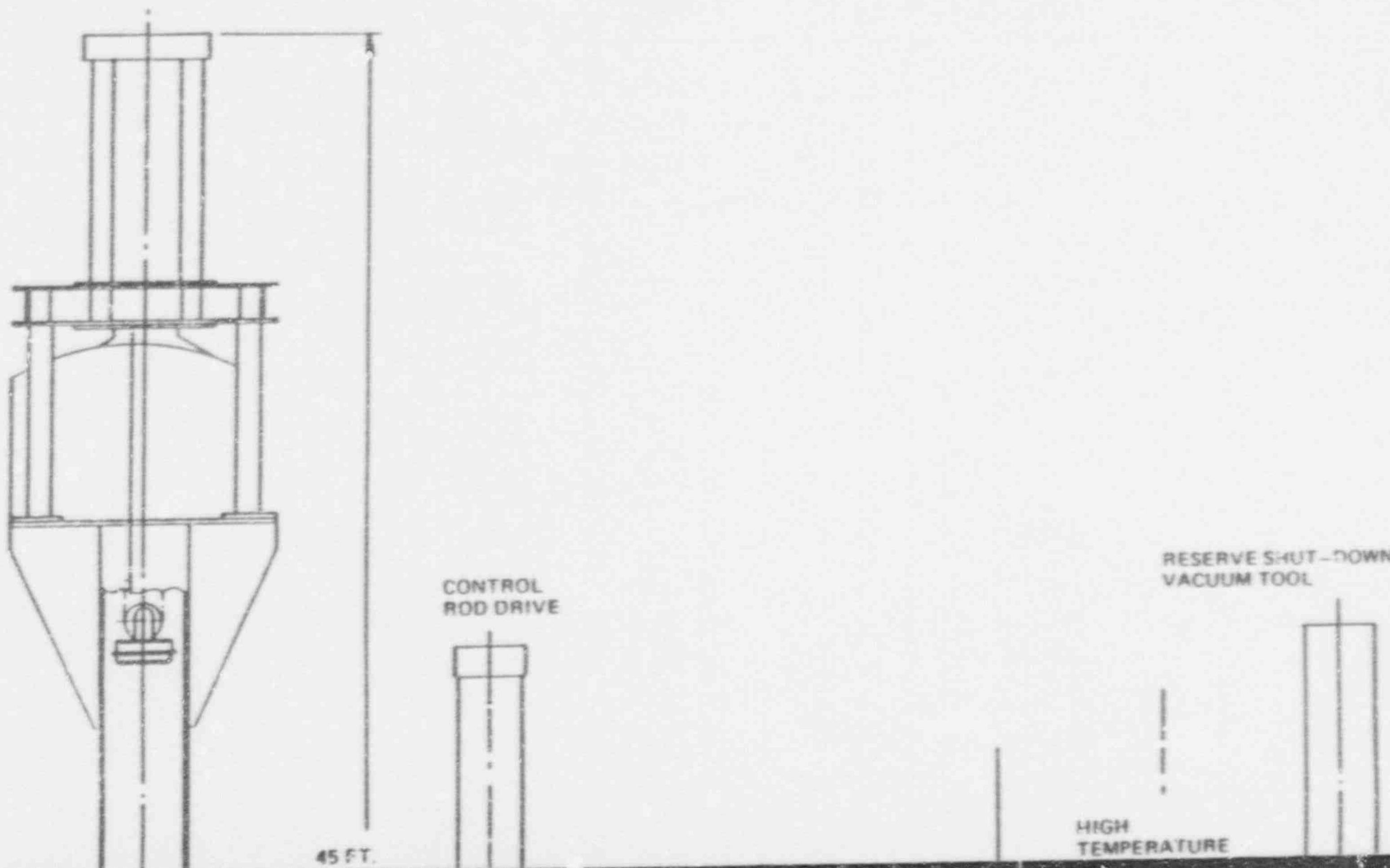


Figure 2.2-11 Reactor Isolation Valve

INTENTIONALLY LEFT BLANK


45 FT.
CONTROL
ROD DRIVE
HIGH
TEMPERATURE
RESERVE SHUT-DOWN
VACUUM TOOL

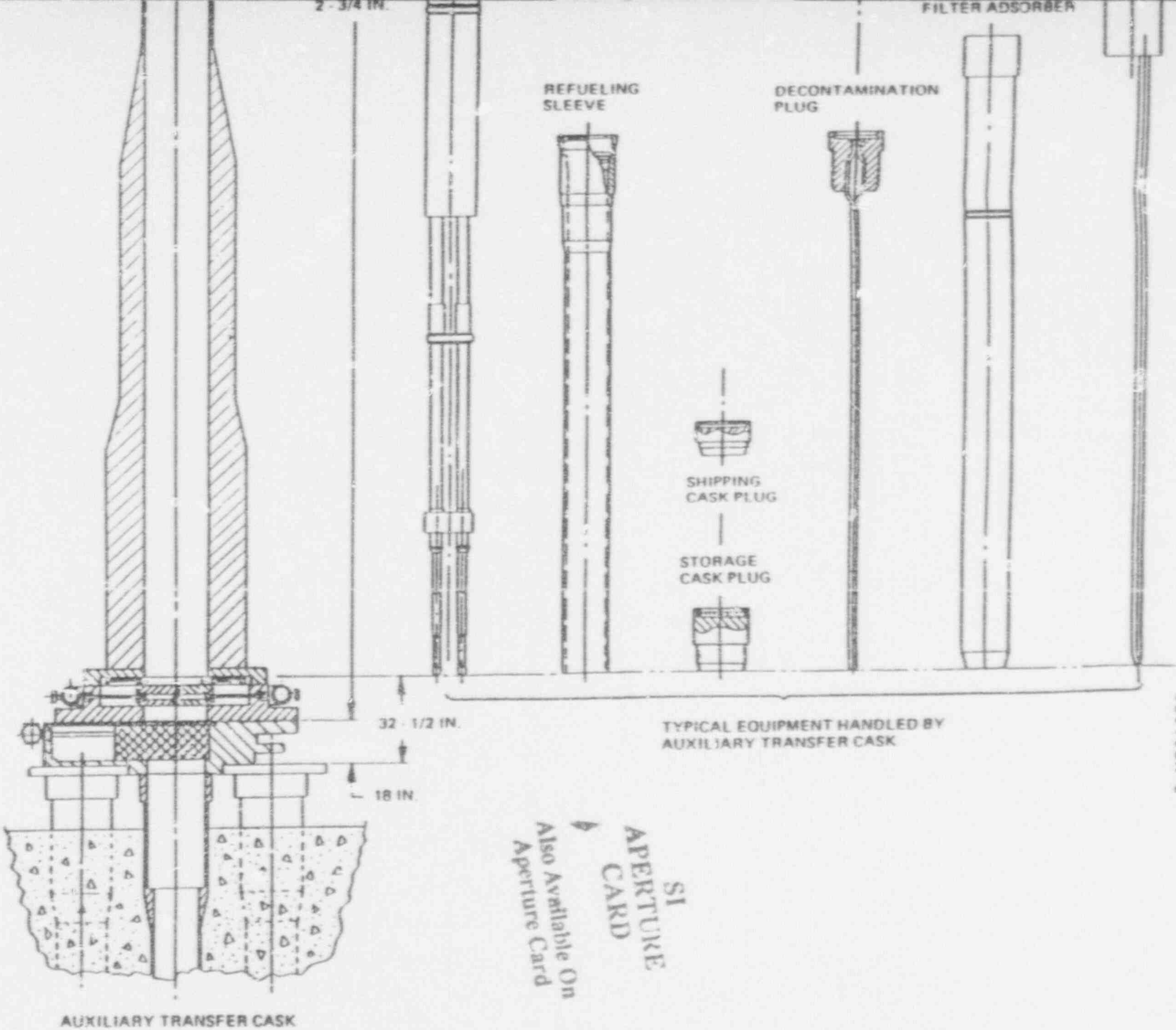


Figure 2.2-12 Auxiliary Transfer Cask and Associated Auxiliary Equipment

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APERTURE
CARD

Also Available On
Aperture Card

9204280079-03

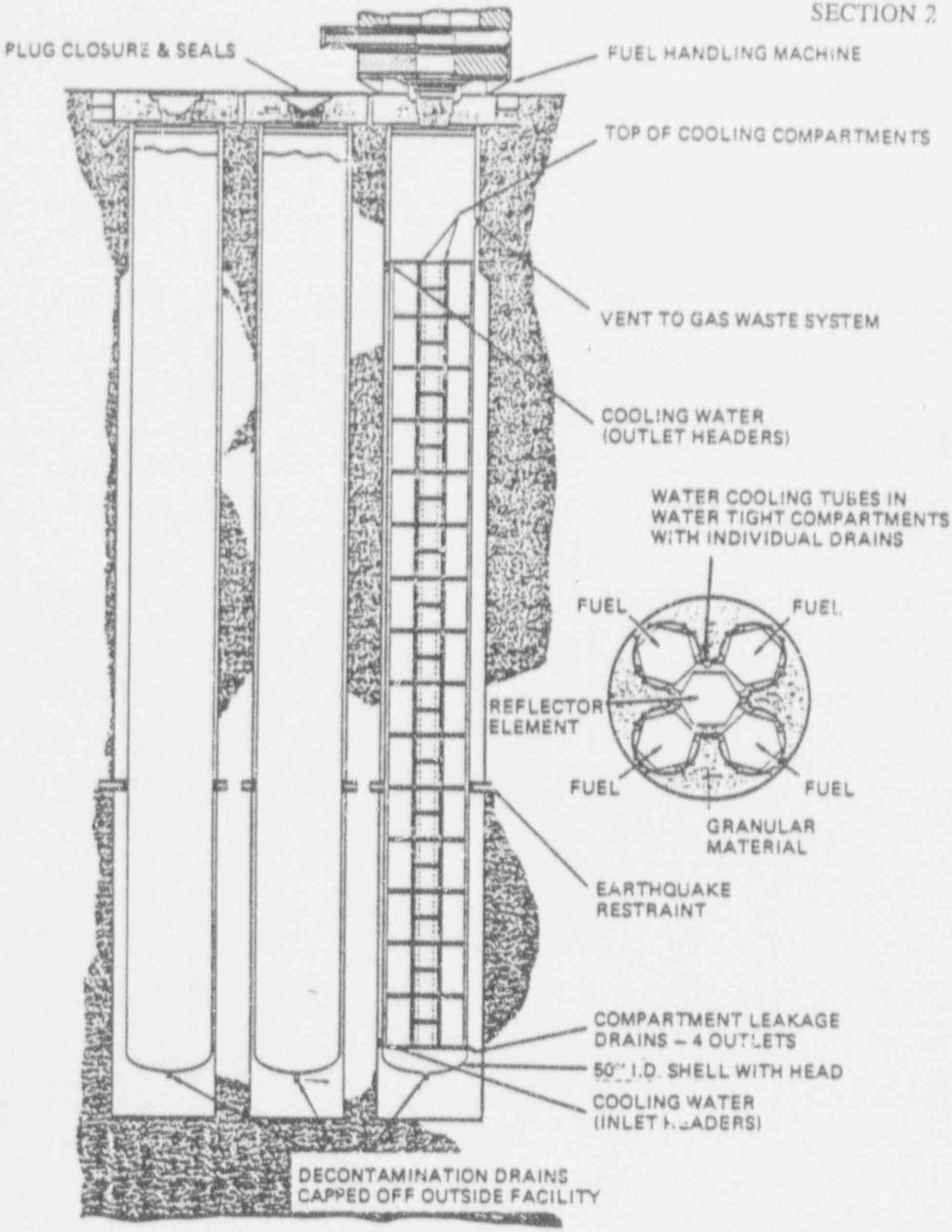


Figure 2.2-13 Fuel Storage Wells

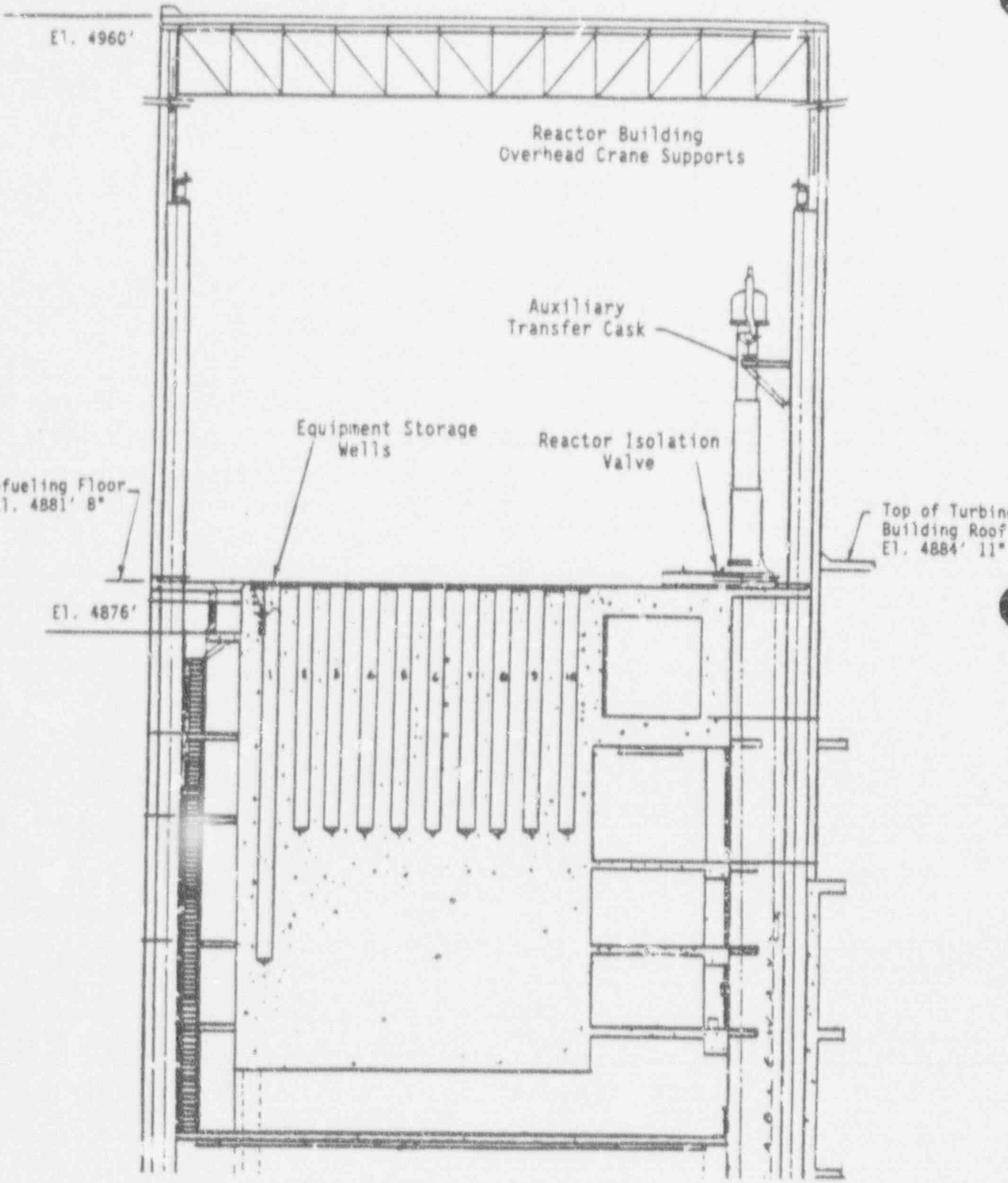


Figure 2.2-14 Reactor Plant Arrangement
Equipment Storage Wells

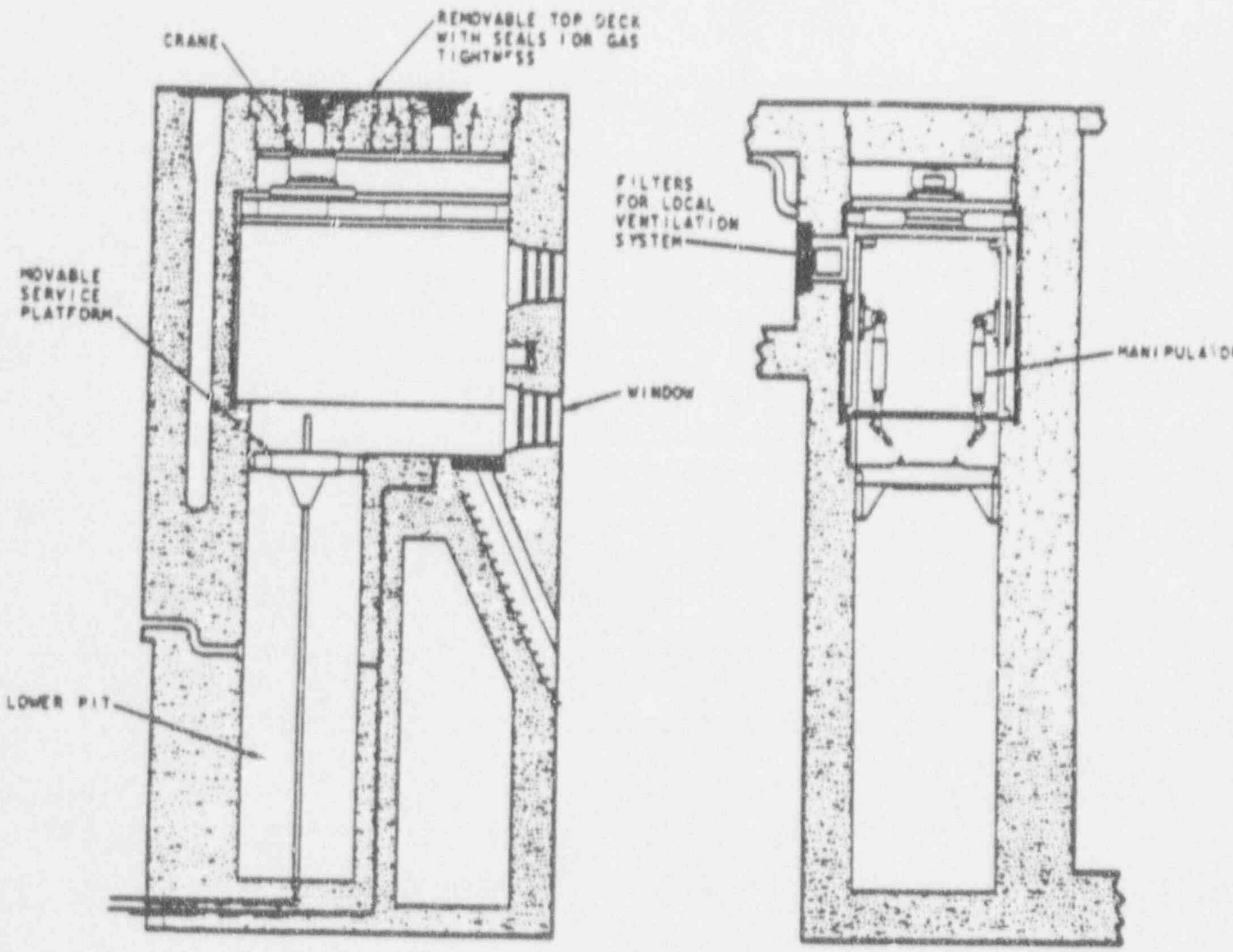


Figure 2.2-15 Hot Service Facility

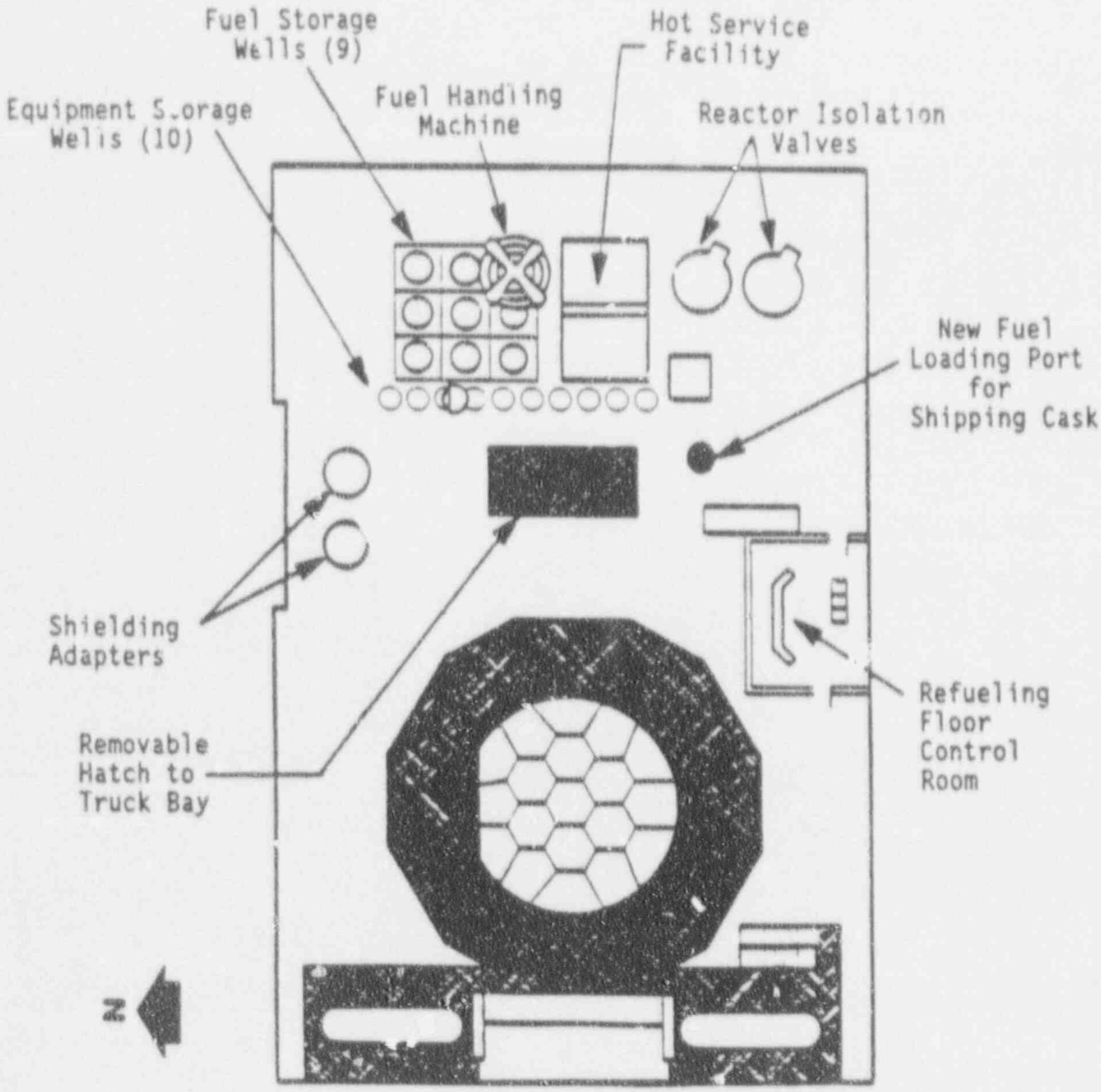
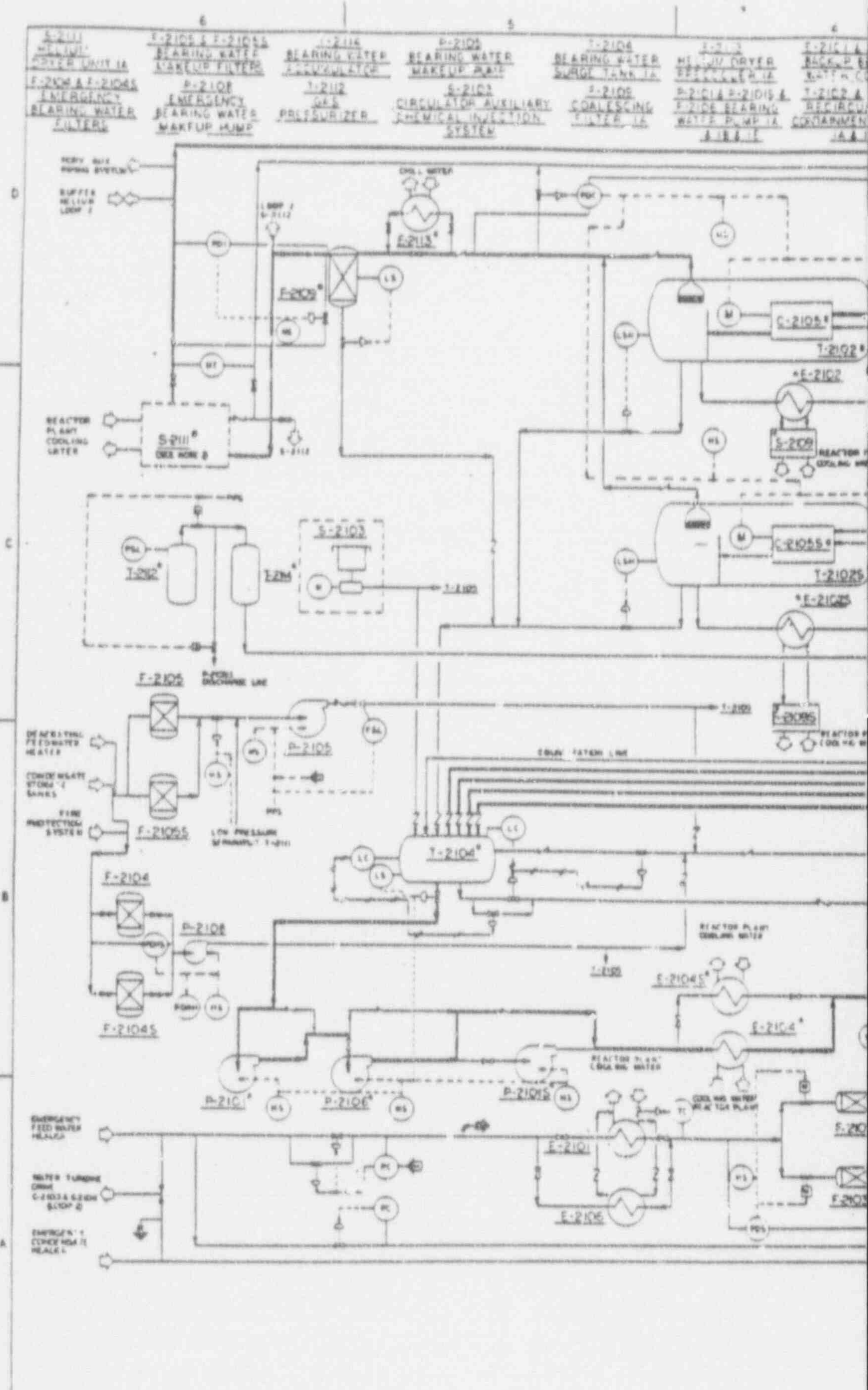


Figure 2.2-16 Reactor Plant Arrangement
Refueling Floor Layout



P-2105
BEARING WATER
MAKEUP PUMP
S-2103
CIRCULATOR AUXILIARY
CHEMICAL INJECTION
SYSTEM
T-2104
BEARING WATER
SURGE TANK 1A
F-2106
COALESCING
FILTER 1A
P-2108
EMERGENCY
BEARING WATER
MAKEUP PUMP
T-2112
GAS
PRESSURIZER
F-2105
F-2105S
F-2104
F-2104S
P-2105
P-2108
T-2104
S-2103
S-2111
E-2113
T-2112
T-2114
E-2102
E-2102S
C-2105
C-2105S
T-2102
T-2102S
S-2109
P-2101
P-2106
P-2101S
E-2104
E-2104S
E-2101
E-2106
REACTOR PLANT COOLING WATER
EMERGENCY FEED WATER HEADER

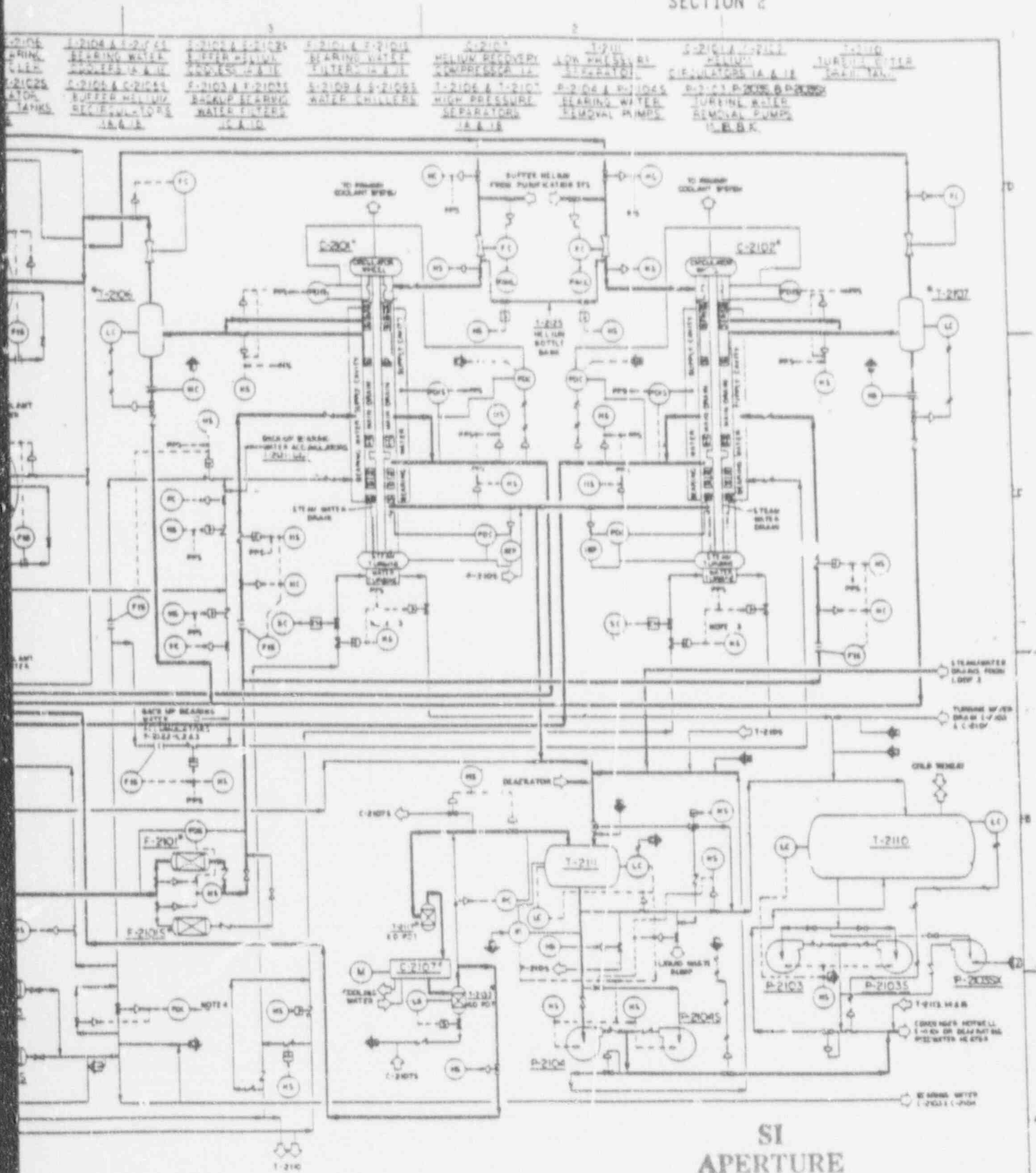
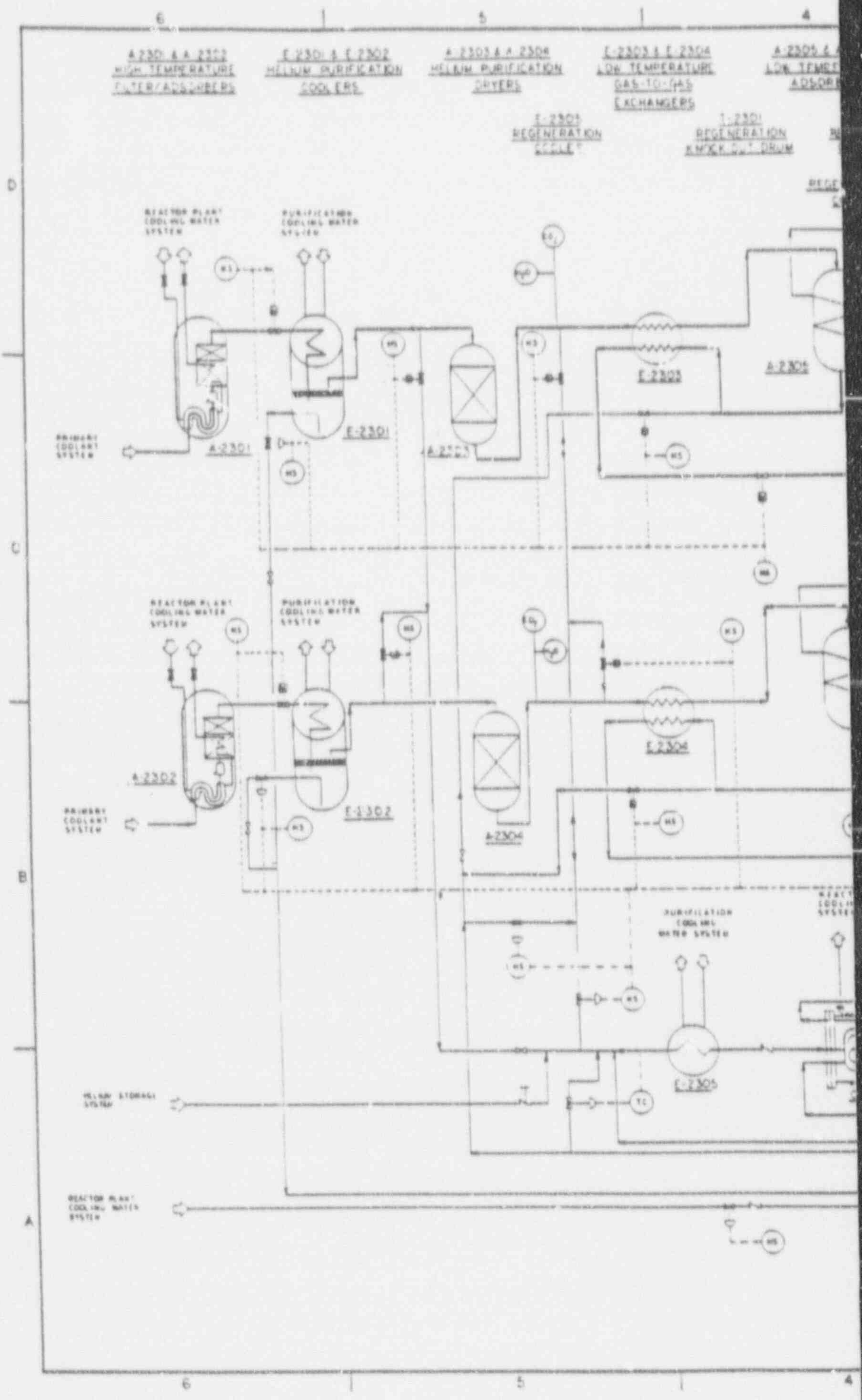


Figure 2.2-17 Helium Circulator Auxiliary Equipment (System 21)

9204280079-04


A-2301 & A-2302
HIGH TEMPERATURE
FILTER/ADSORBERS
E-2301 & E-2302
HELIUM PURIFICATION
COOLERS
A-2303 & A-2304
HELIUM PURIFICATION
DRYERS
E-2303 & E-2304
LOW TEMPERATURE
GAS-TO-GAS
EXCHANGERS
E-2305
REGENERATION
COOLER
T-2301
REGENERATION
KNOCK OUT DRUM
REACTOR PLANT
COOLING WATER
SYSTEM
PURIFICATION
COOLING WATER
SYSTEM
PRIMARY
COOLANT
SYSTEM
A-2301
E-2301
A-2303
E-2303
A-2305
A-2302
E-2302
A-2304
E-2304
E-2305
HELIUM STORAGE
SYSTEM
PURIFICATION
COOLING
WATER SYSTEM

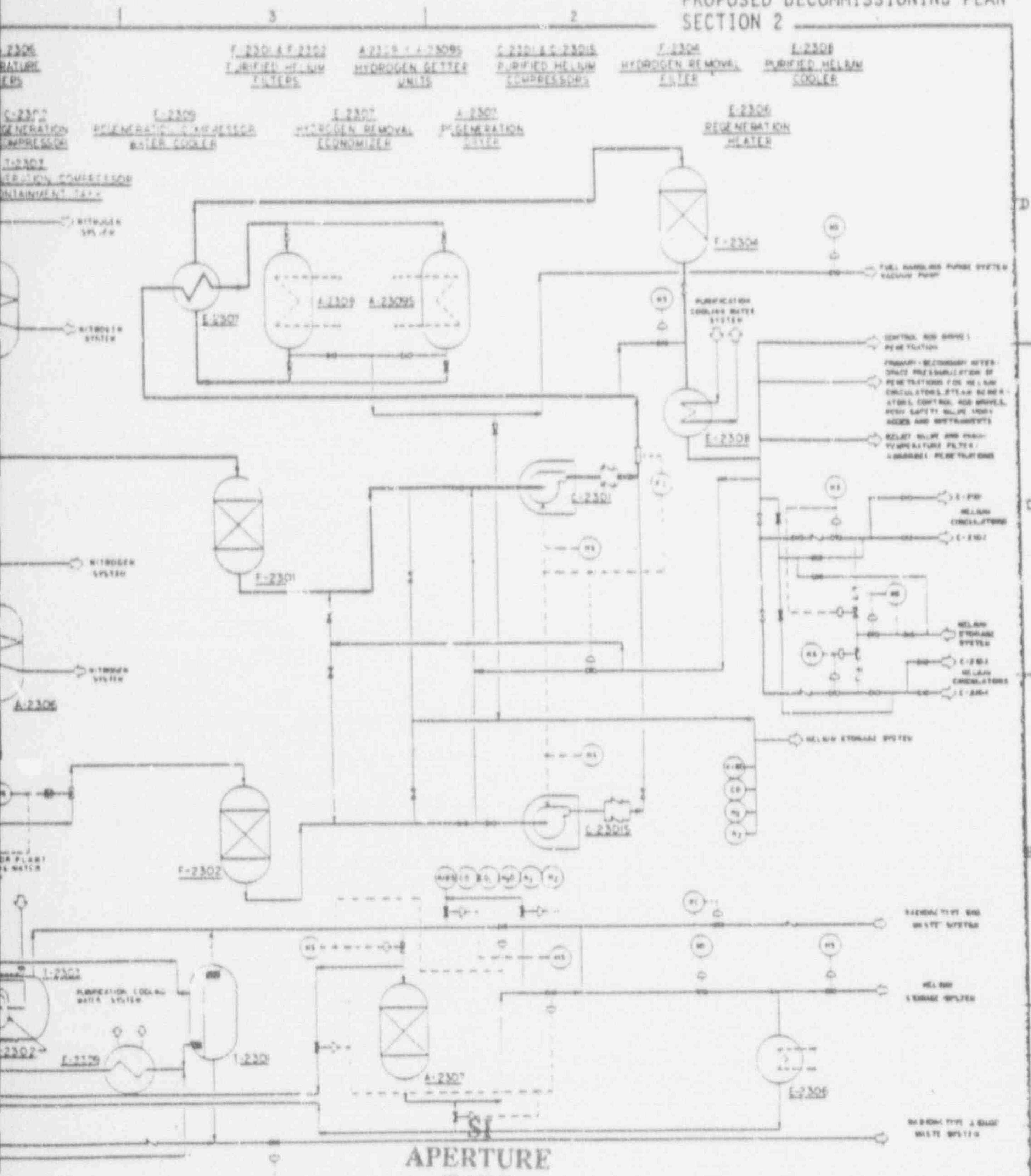
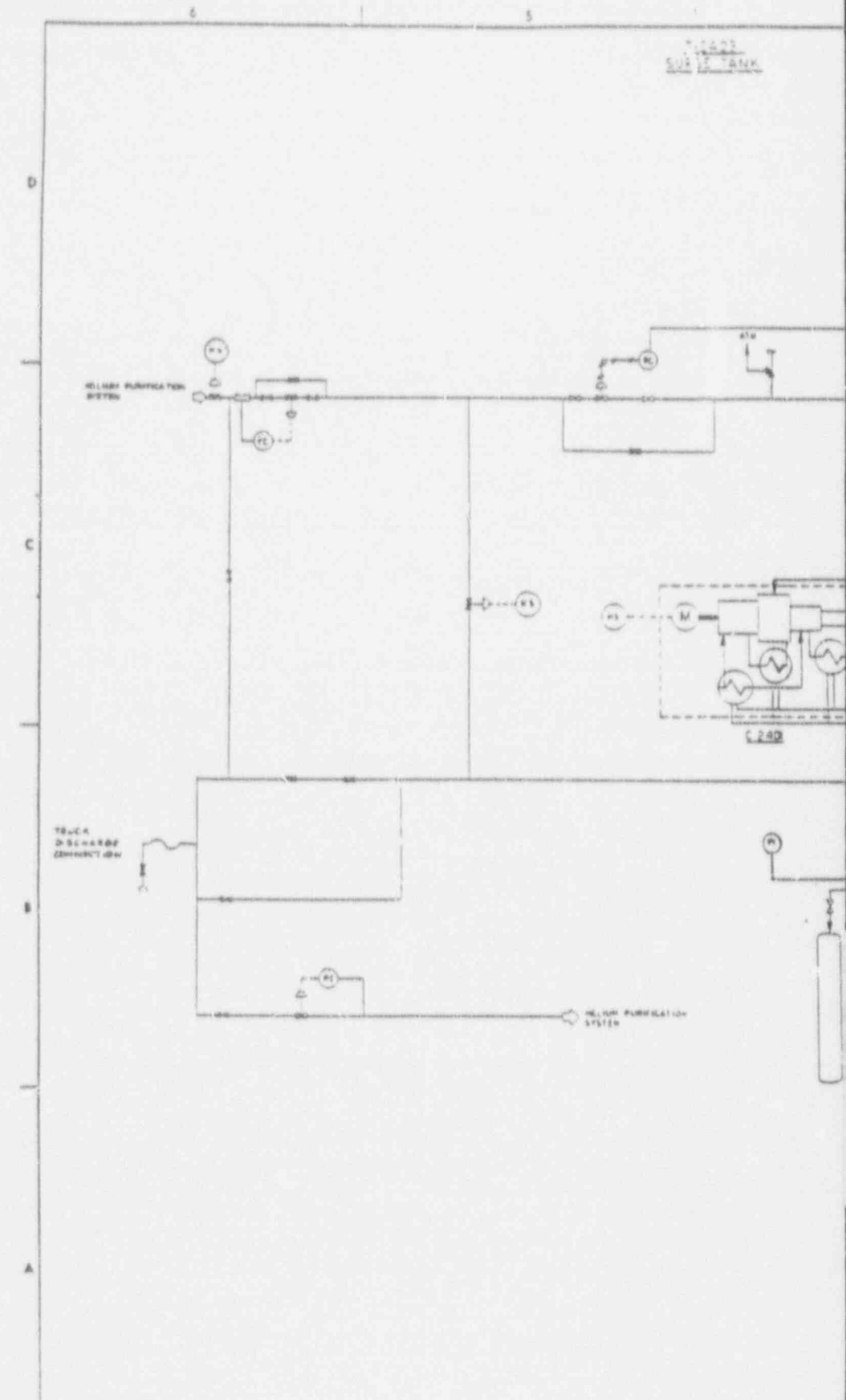


Figure 2.2-18 Helium Purification
System Auxiliaries
(System 23)


SURGE TANK
HELIUM PURIFICATION SYSTEM
TRUCK DISCHARGE CONNECTION
HELIUM PURIFICATION SYSTEM

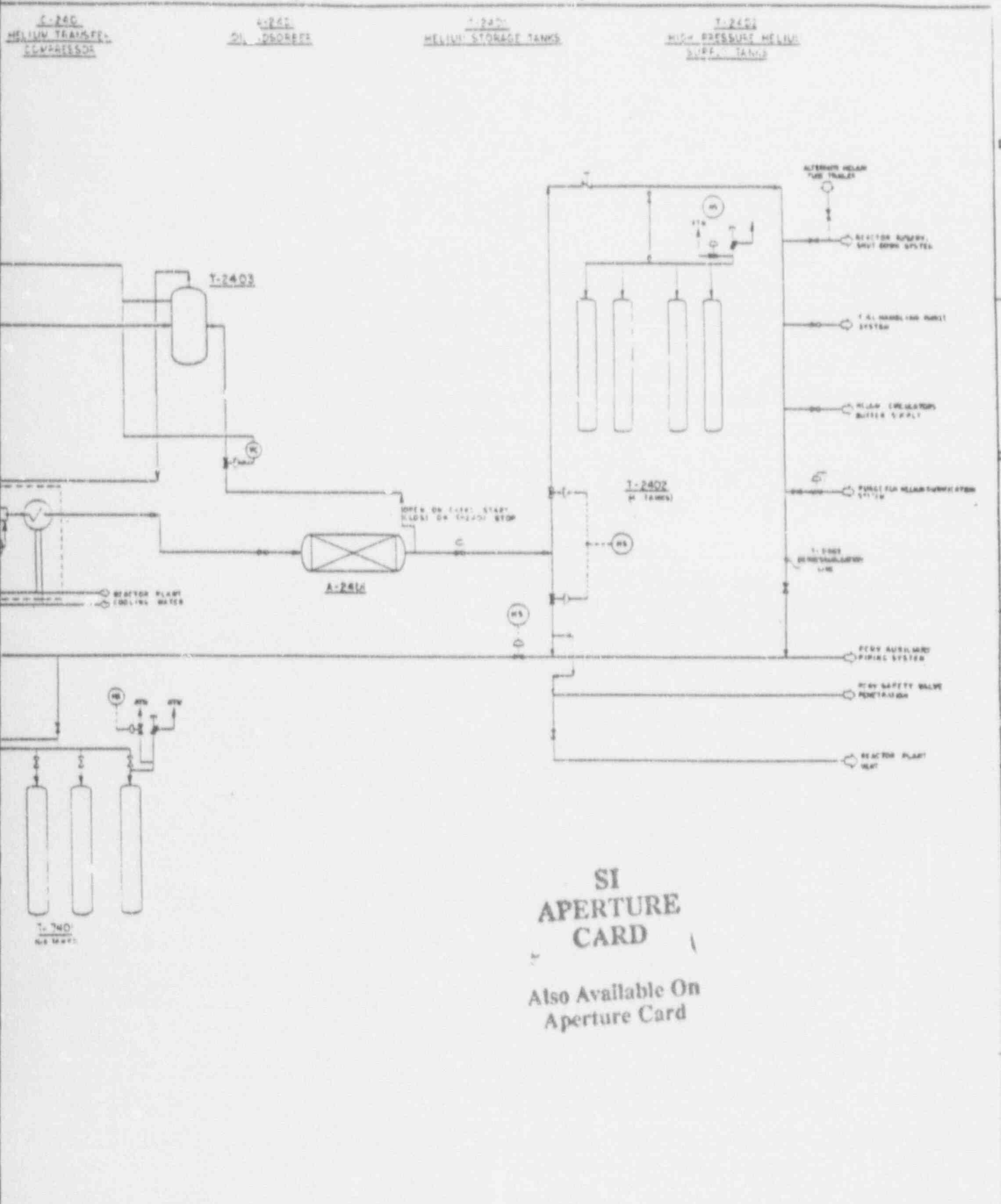
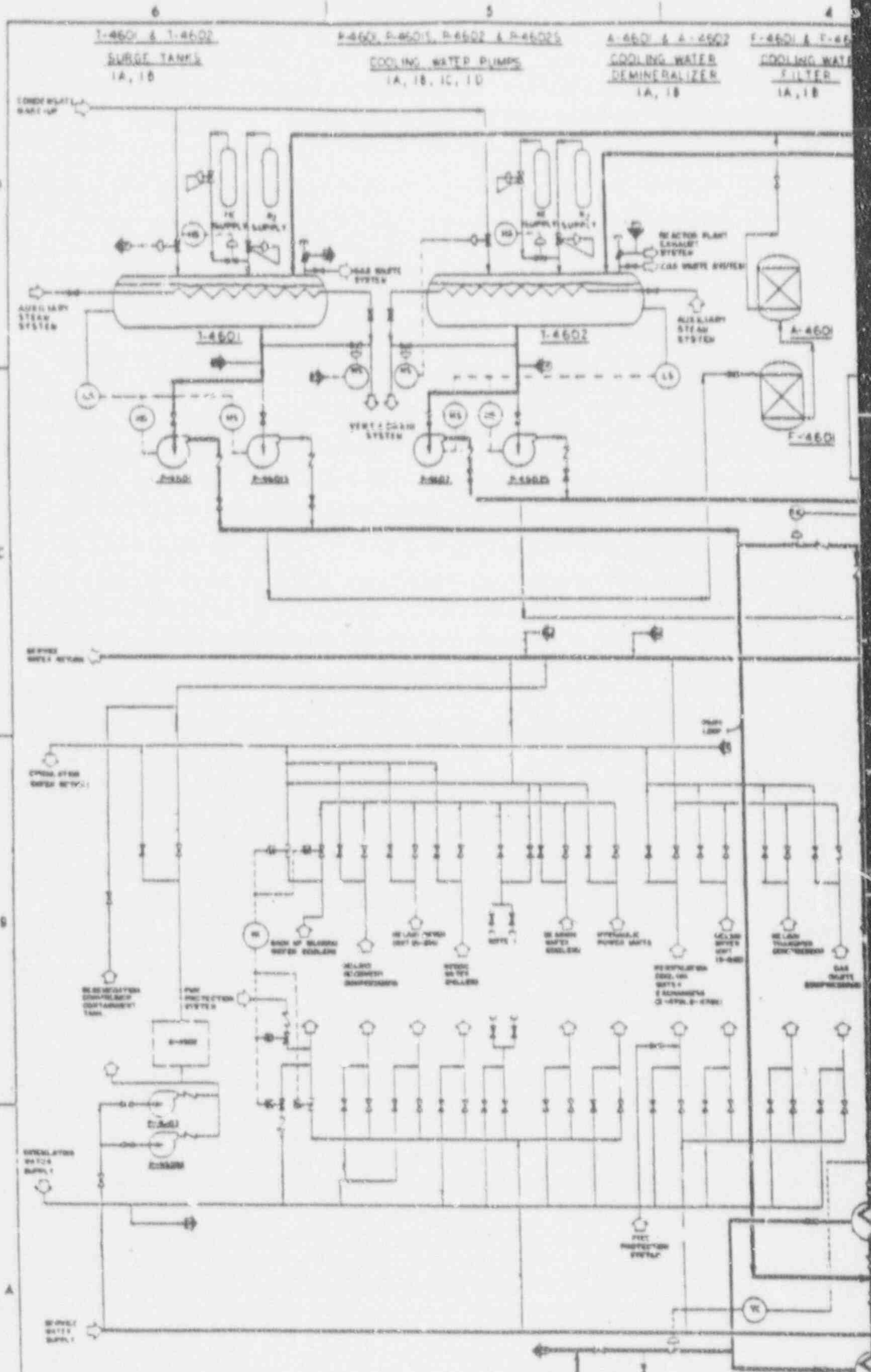


Figure 2.2-19 Helium Storage
System (System 24)

9204280079-06


T-4601 & T-4602
SURGE TANKS
1A, 1B
P-4601, P-4601S, P-4602 & P-4602S
COOLING WATER PUMPS
1A, 1B, 1C, 1D
A-4601 & A-4602
COOLING WATER
DEMINERALIZER
1A, 1B
COOLING WATE
FILTER
1A, 1B
T-4601
T-4602
A-4601
F-4601
AUXILIARY STEAM SYSTEM
VENT & DRAIN SYSTEM

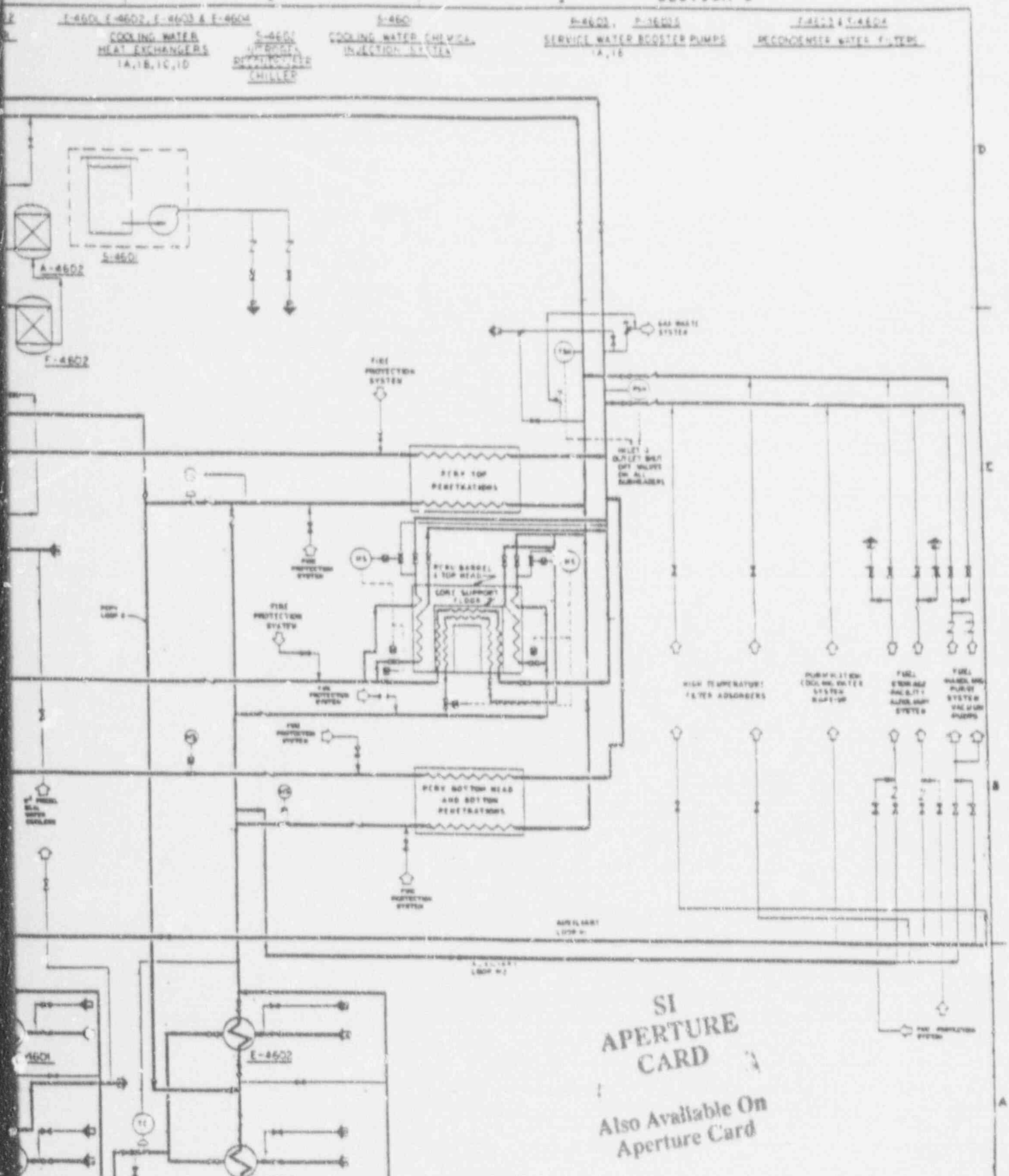
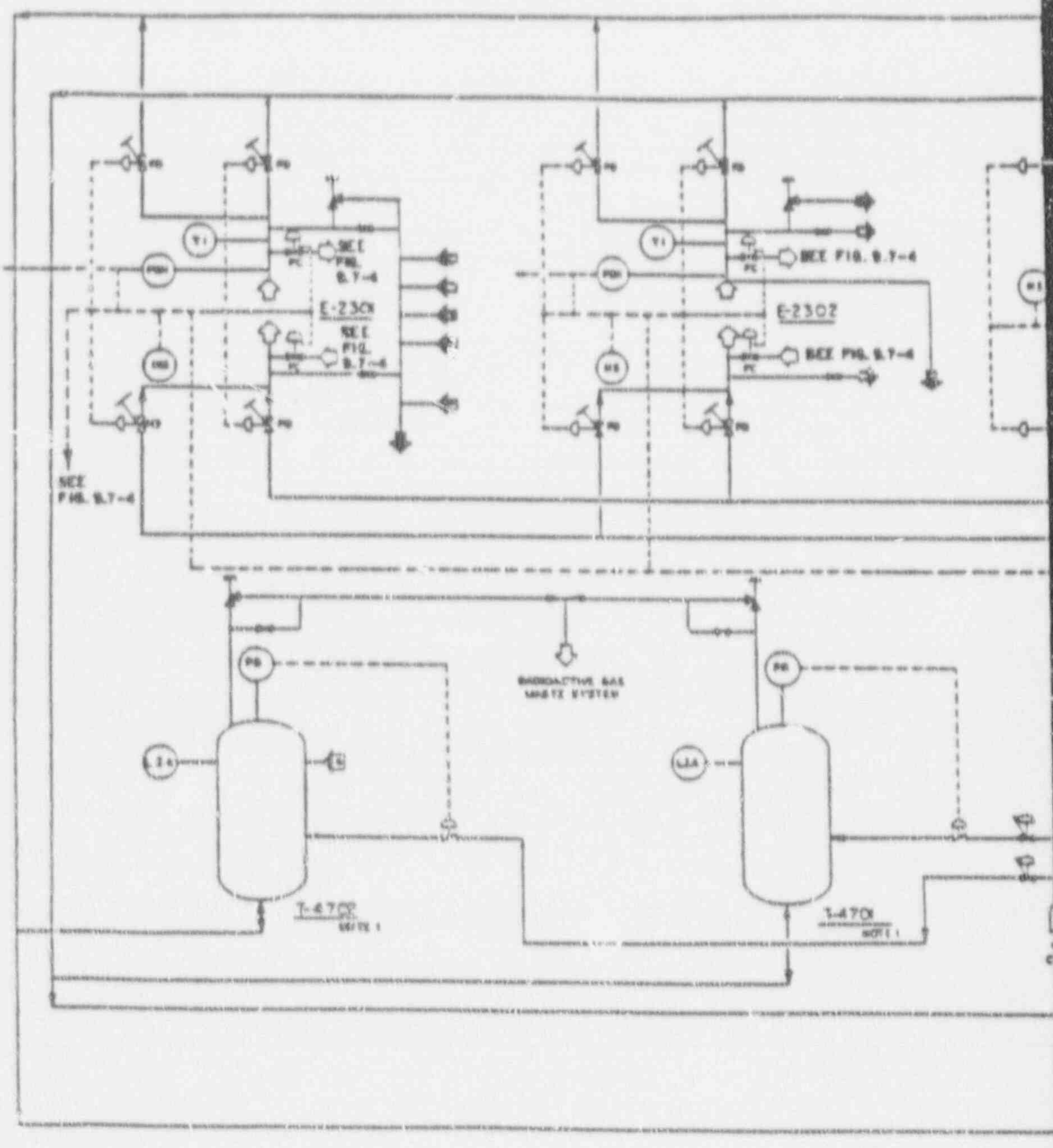
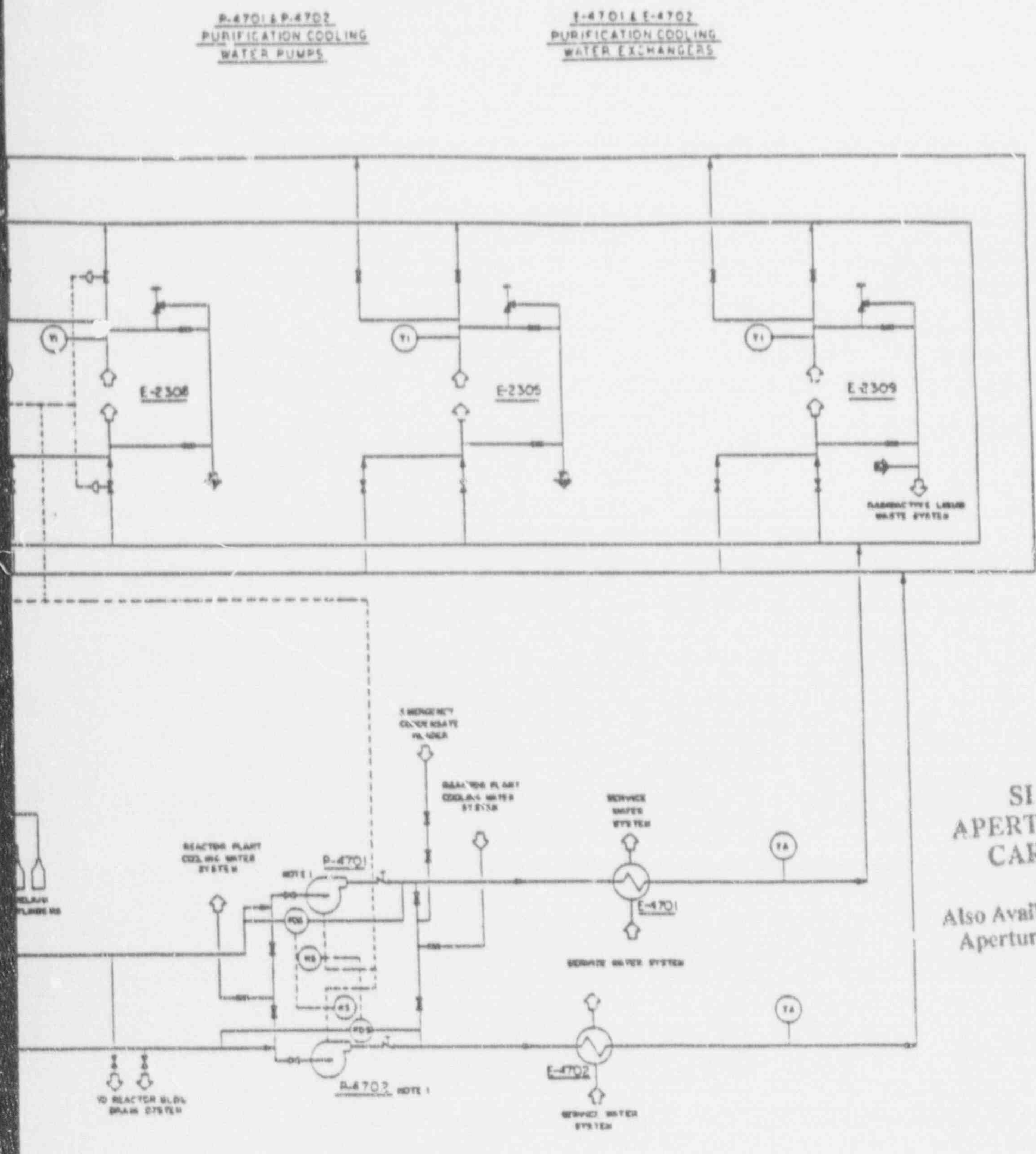


Figure 2.2-20 Reactor Plant
Cooling Water System
(System 46)

9204280079-07

T-4701 & T-4702
PURIFICATION COOLING WATER
EXPANSION TANKS





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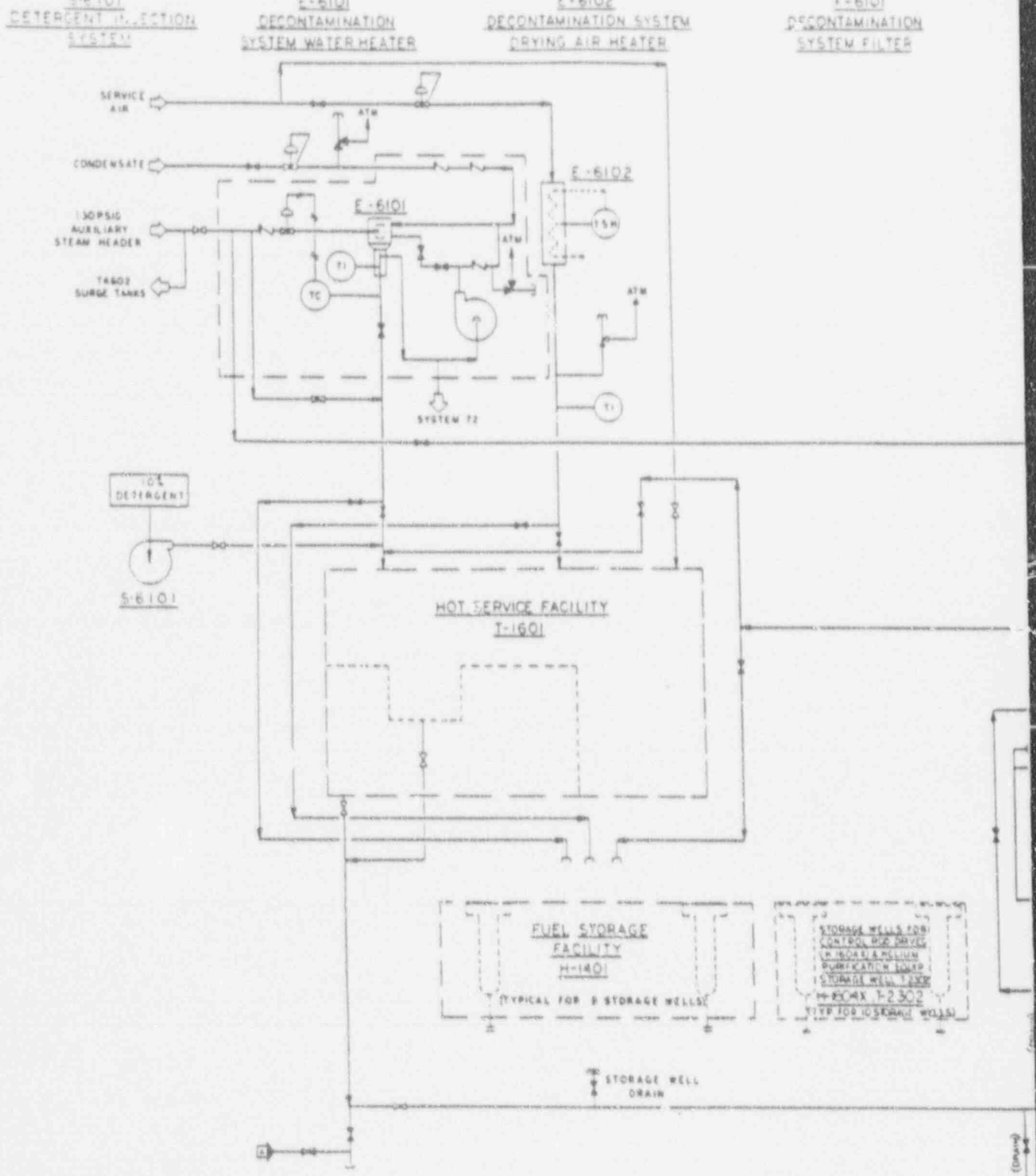
Aperture Card

Figure 2.2-21 Purification Cooling
Water System
(System 47)

9204280079-08



S-6101
DETERGENT INJECTION SYSTEM
E-6101
DECONTAMINATION SYSTEM WATER HEATER
E-6102
DECONTAMINATION SYSTEM DRYING AIR HEATER
F-6101
DECONTAMINATION SYSTEM FILTER
SERVICE AIR
ATM
CONDENSATE
E-6102
E-6101
TSH
130 PSIG AUXILIARY STEAM HEADER
T-6602 SURGE TANKS
TI
TC
SYSTEM 72
10% DETERGENT
S-6101
HOT SERVICE FACILITY
T-1601
FUEL STORAGE FACILITY
H-1401
(TYPICAL FOR 2 STORAGE WELLS)
STORAGE WELL DRAIN

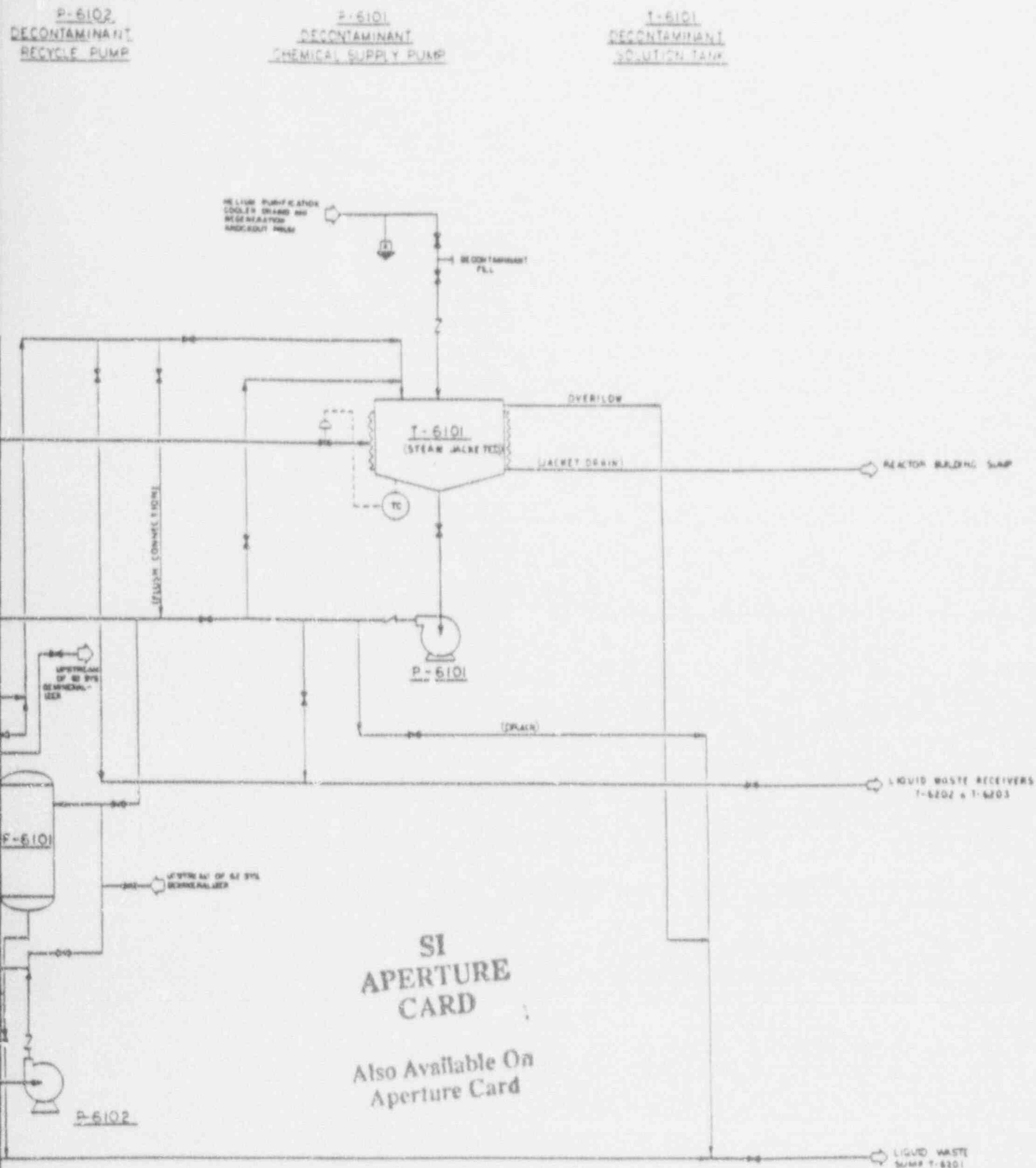
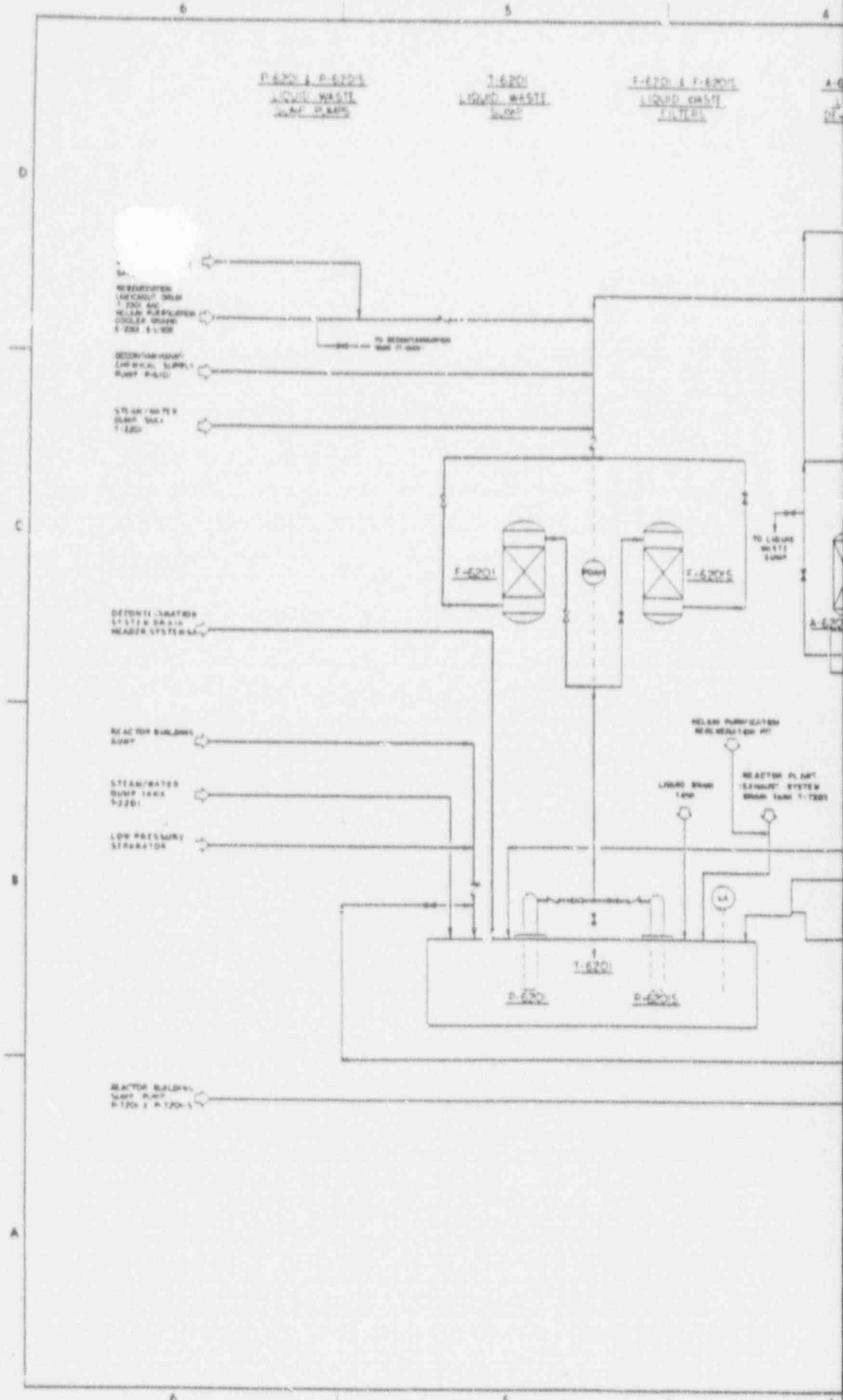
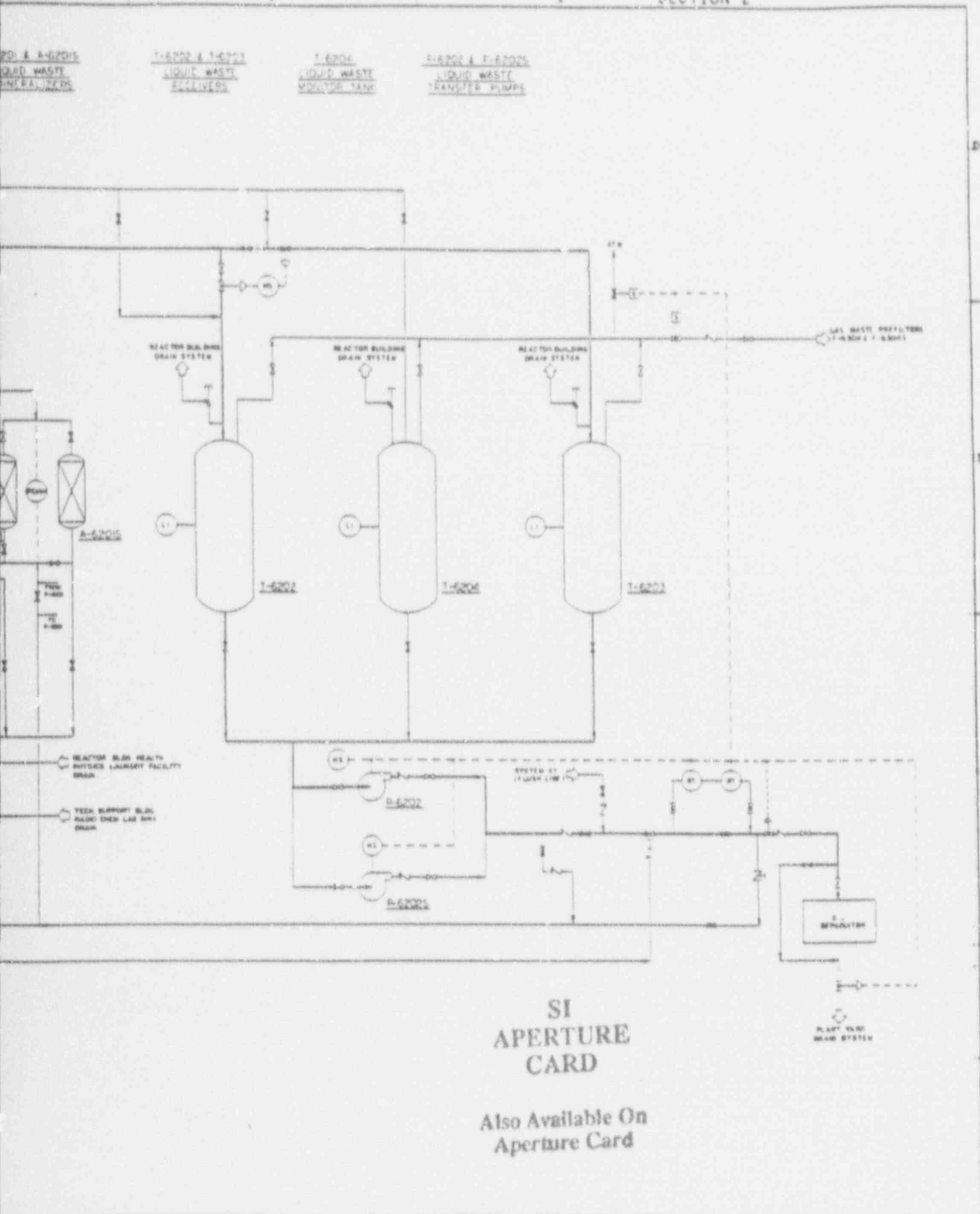


Figure 2.2-22 Decontamination
System (System 61)



P-6201 & P-6201-S
LIQUID WASTE
SUMP PUMPS
T-6201
LIQUID WASTE
SUMP
F-6201 & F-6201-S
LIQUID WASTE
FILTERS
F-6201
T-6201
P-6201

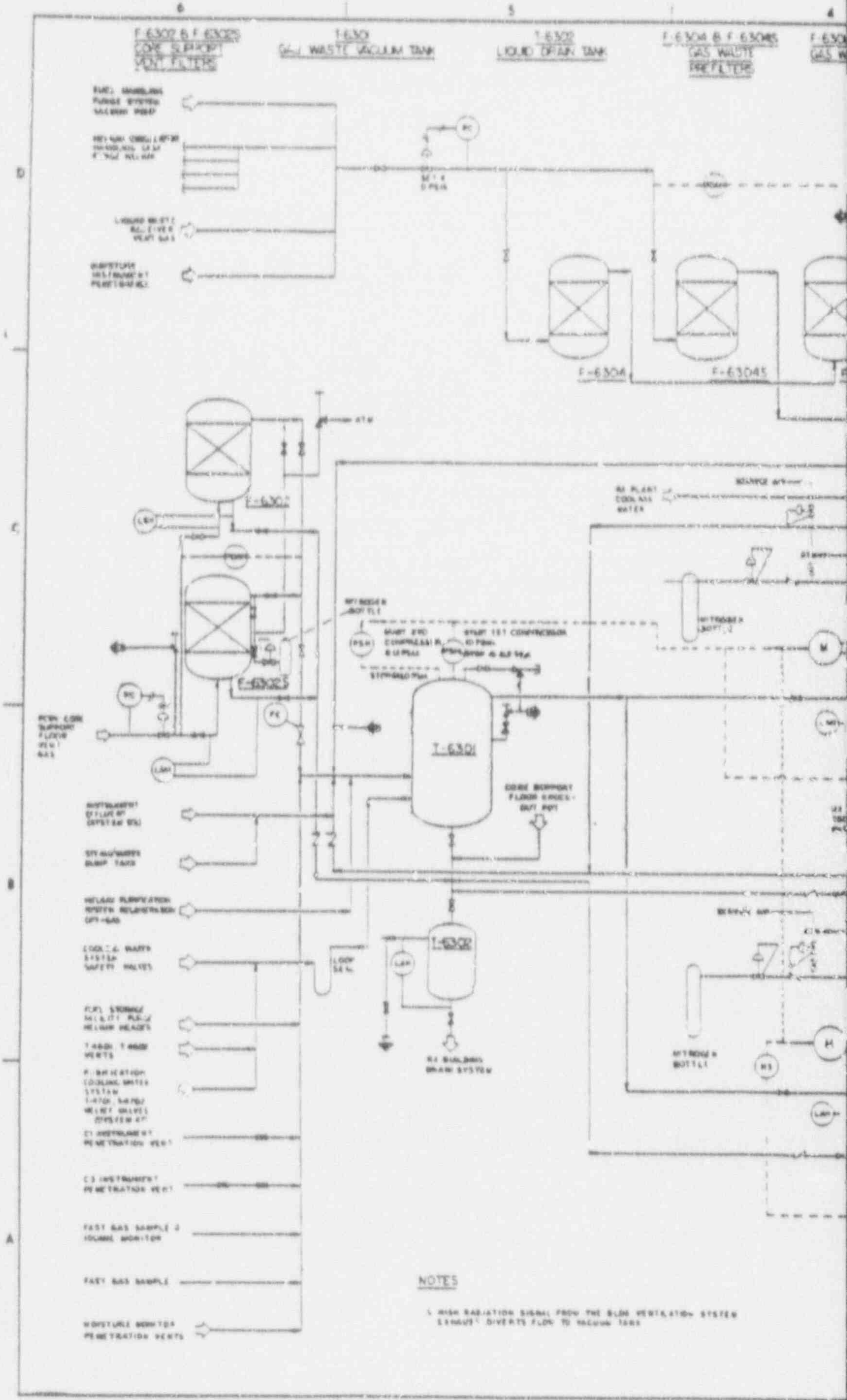


SI
APERTURE
CARD

Also Available On
Aperture Card

Figure 2.2-23 Radioactive Liquid
Waste System
(System 62)

9204280079-10



F-6302 & F-6302S CORE SUPPORT VENT FILTERS
T-6301 GAS WASTE VACUUM TANK
T-6302 LIQUID DRAIN TANK
F-6304 & F-6304S GAS WASTE PREFILTERS
F-6304
F-6304S
F-6302
F-6302S
T-6301
T-6302
NOTES

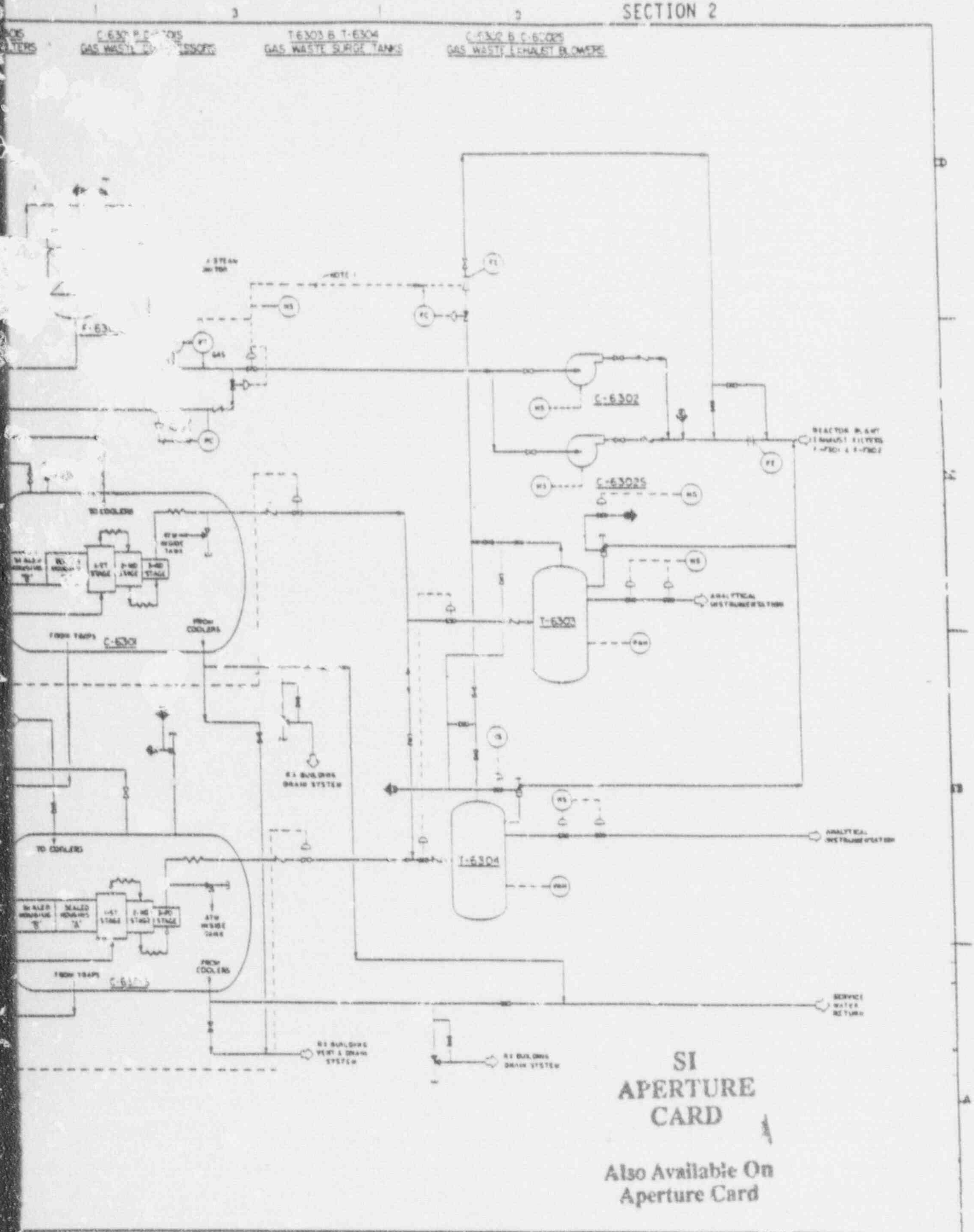
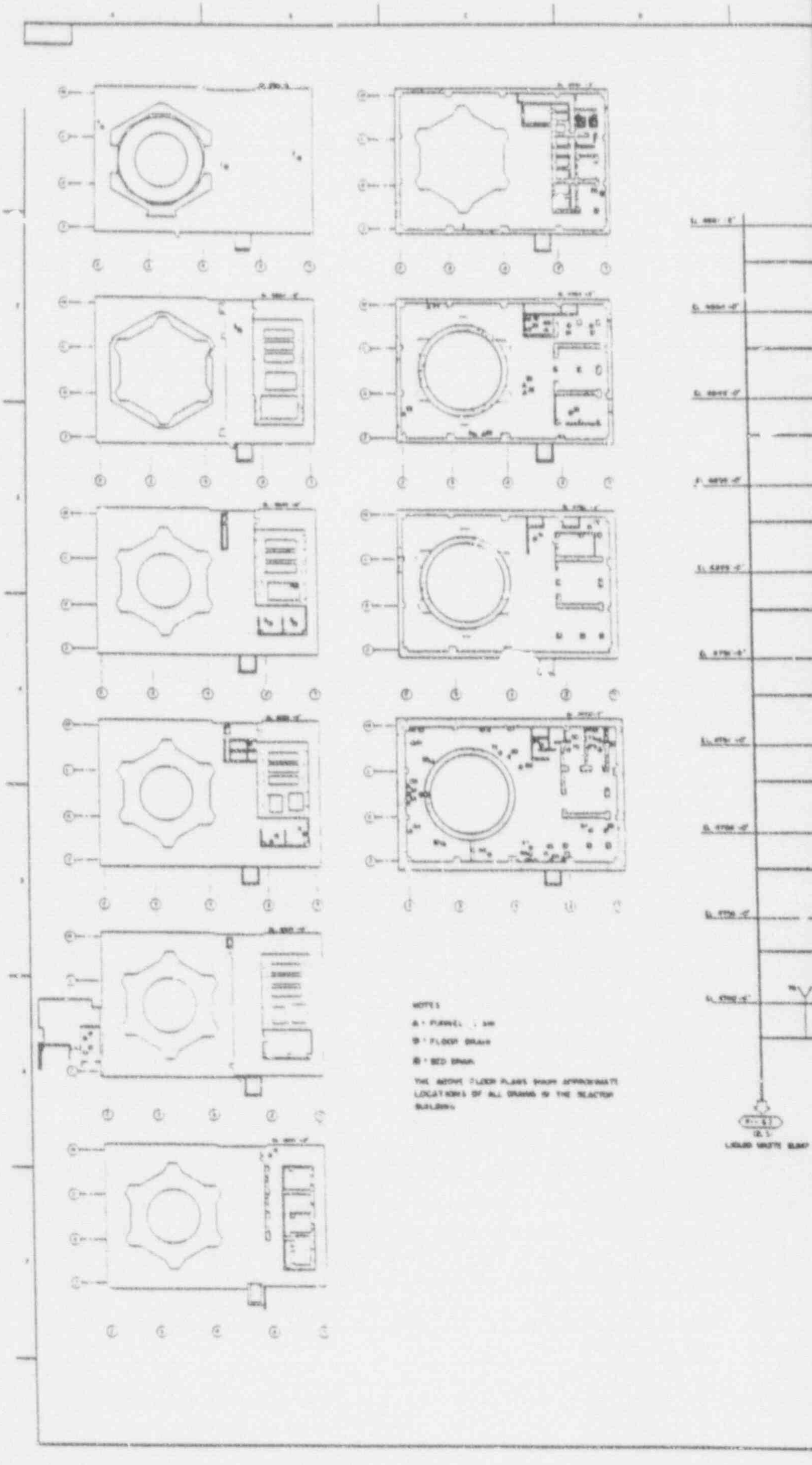


Figure 2.2-24 Radioactive Gas Waste System (System 63)


NOTES
FLOOR DRAIN
THE ABOVE FLOOR PLANS SHOW APPROXIMATE LOCATIONS OF ALL DRAINS IN THE REACTOR BUILDING
LIQUID WASTE SUMP

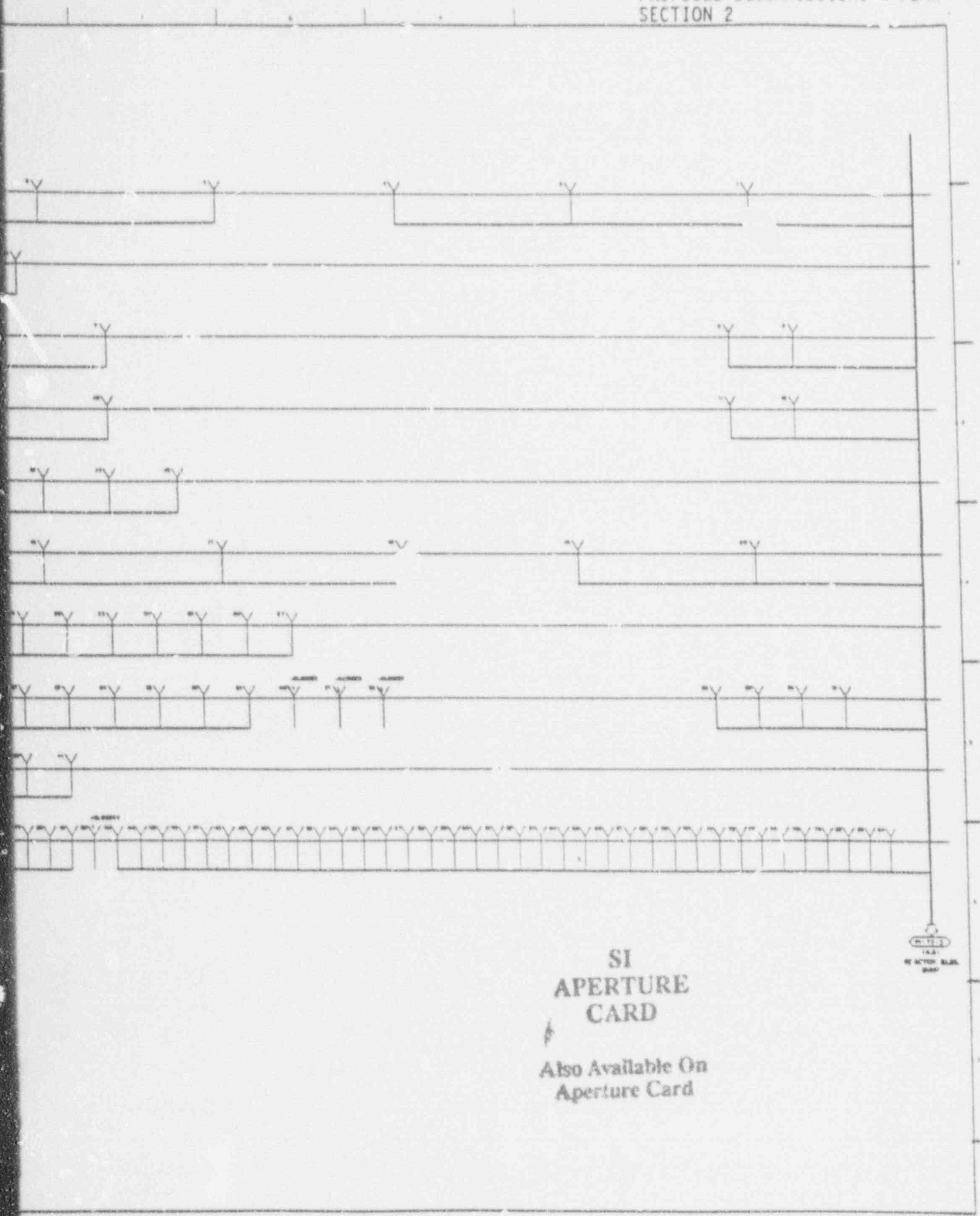
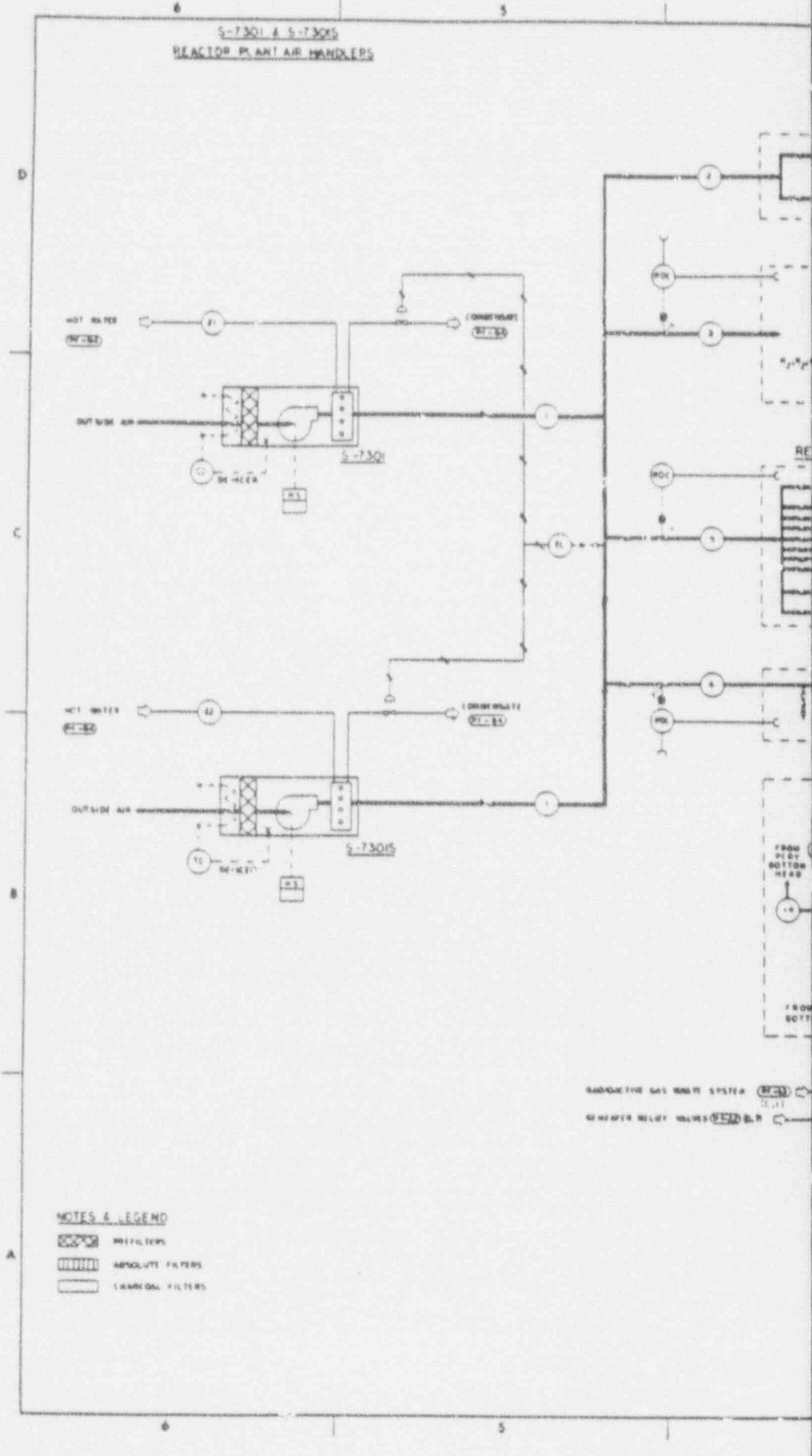


Figure 2.2-25 Reactor Building
Drain System
(System 72)

9204280079-12


S-7301 & S-7301S
REACTOR PLANT AIR HANDLERS
HOT WATER
CONDENSATE
OUTSIDE AIR
S-7301
S-7301S
NOTES & LEGEND
PREFILTERS
ABSOLUTE FILTERS
CHARCOAL FILTERS

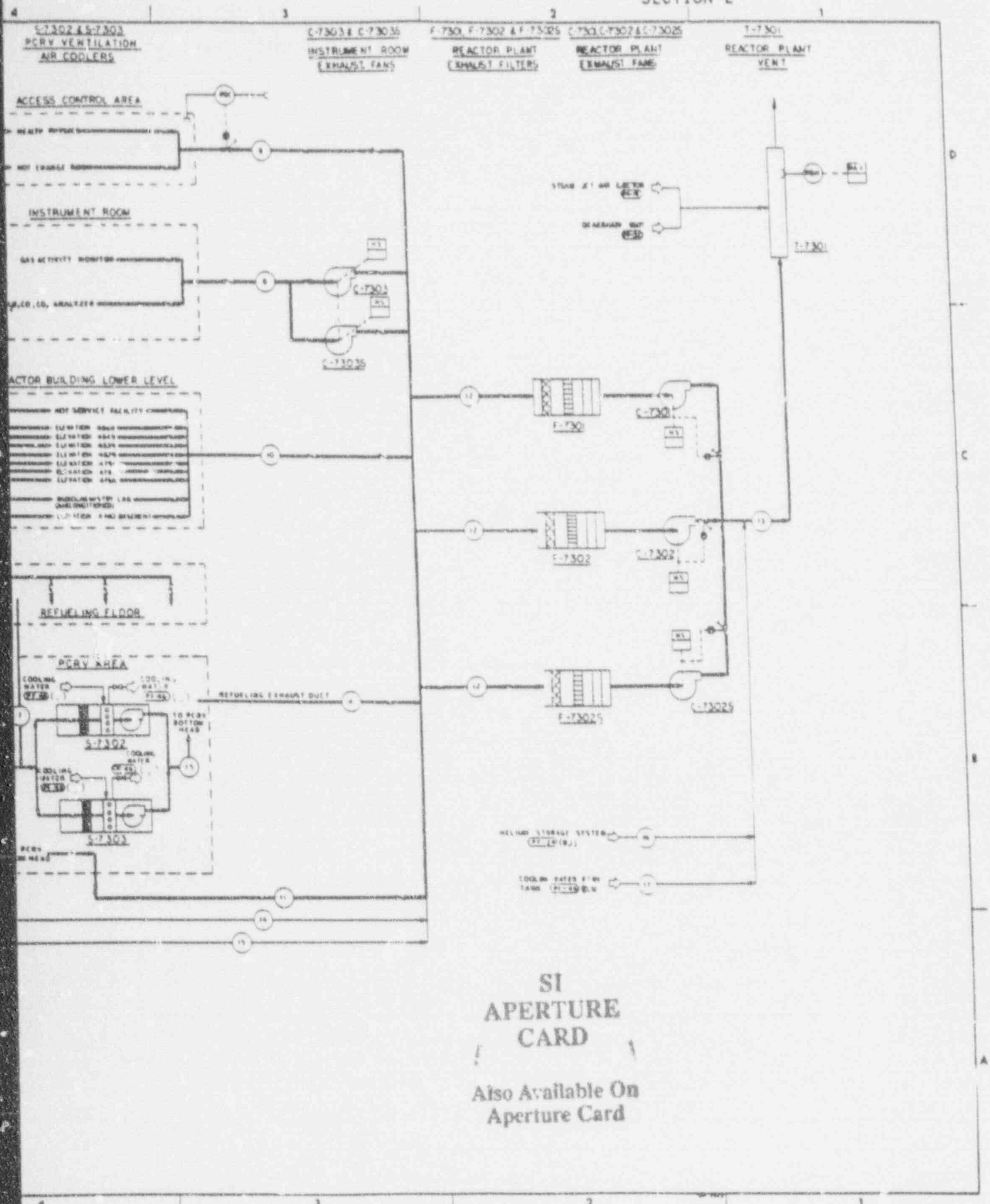


Figure 2.2-26 Reactor Building
Ventilation System
(System 73)

9204280079-13

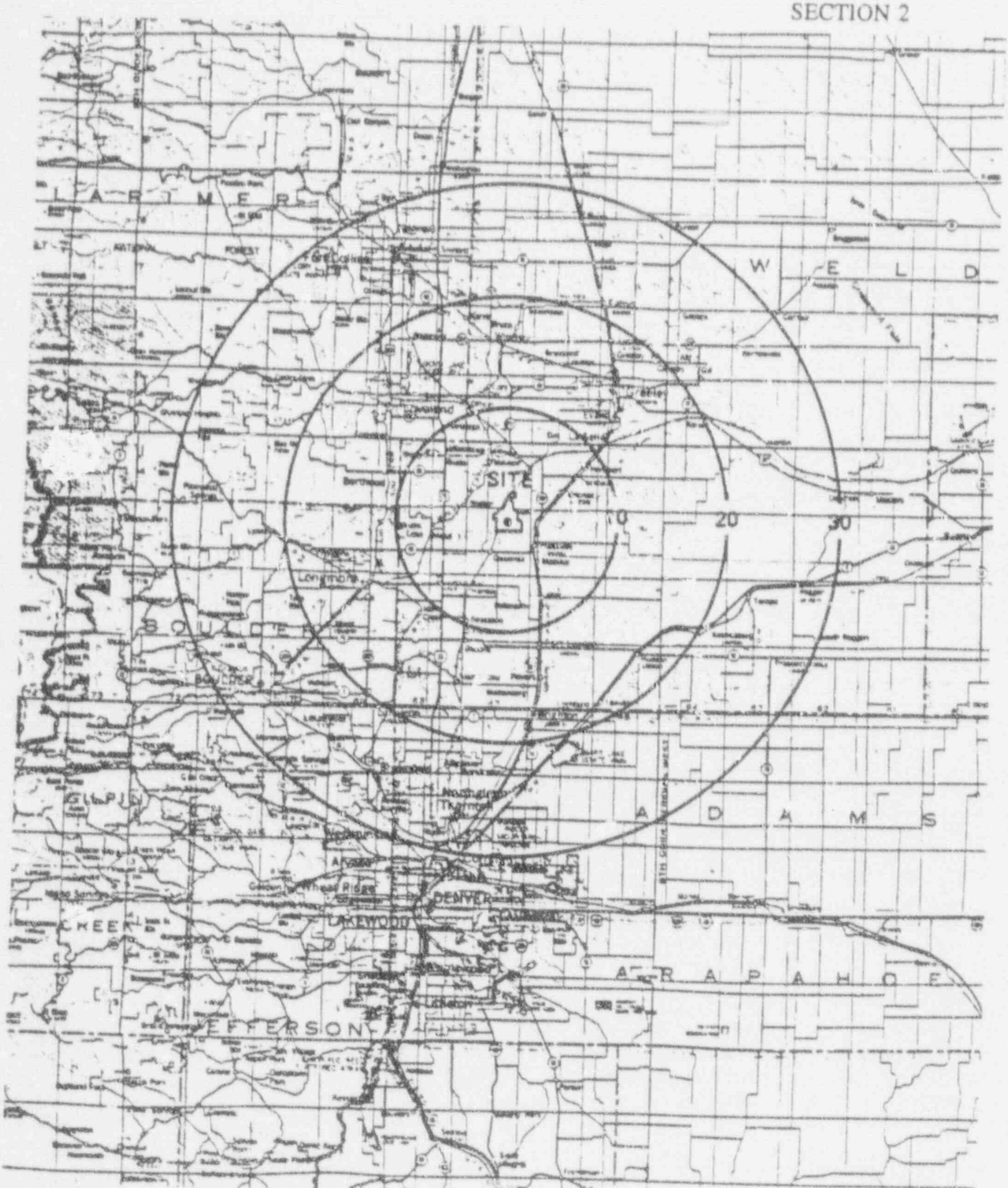


Figure 2.2-27 Area Within Thirty Miles of Fort St. Vrain

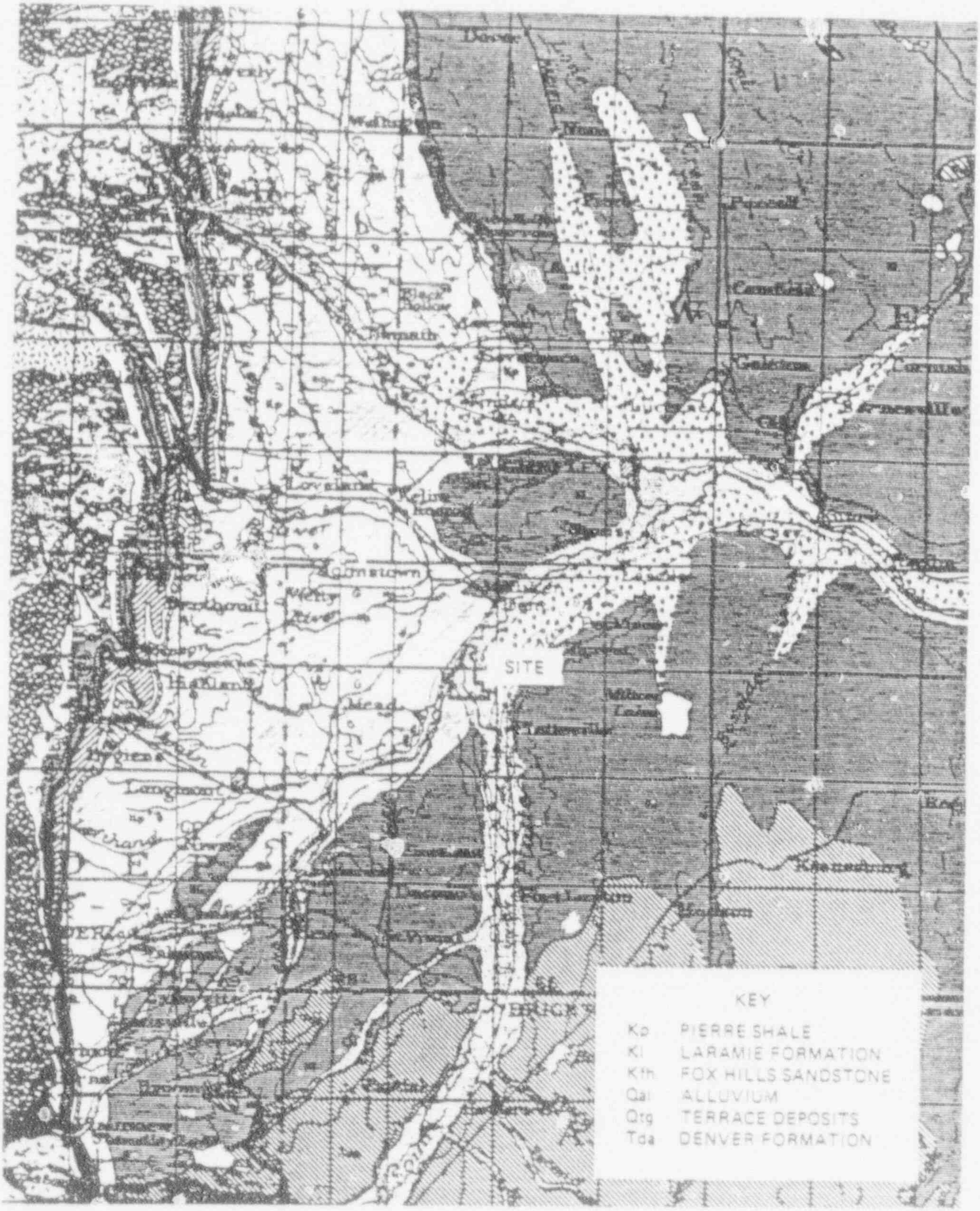


Figure 2.2-28 Subsurface Geology Surrounding the Site

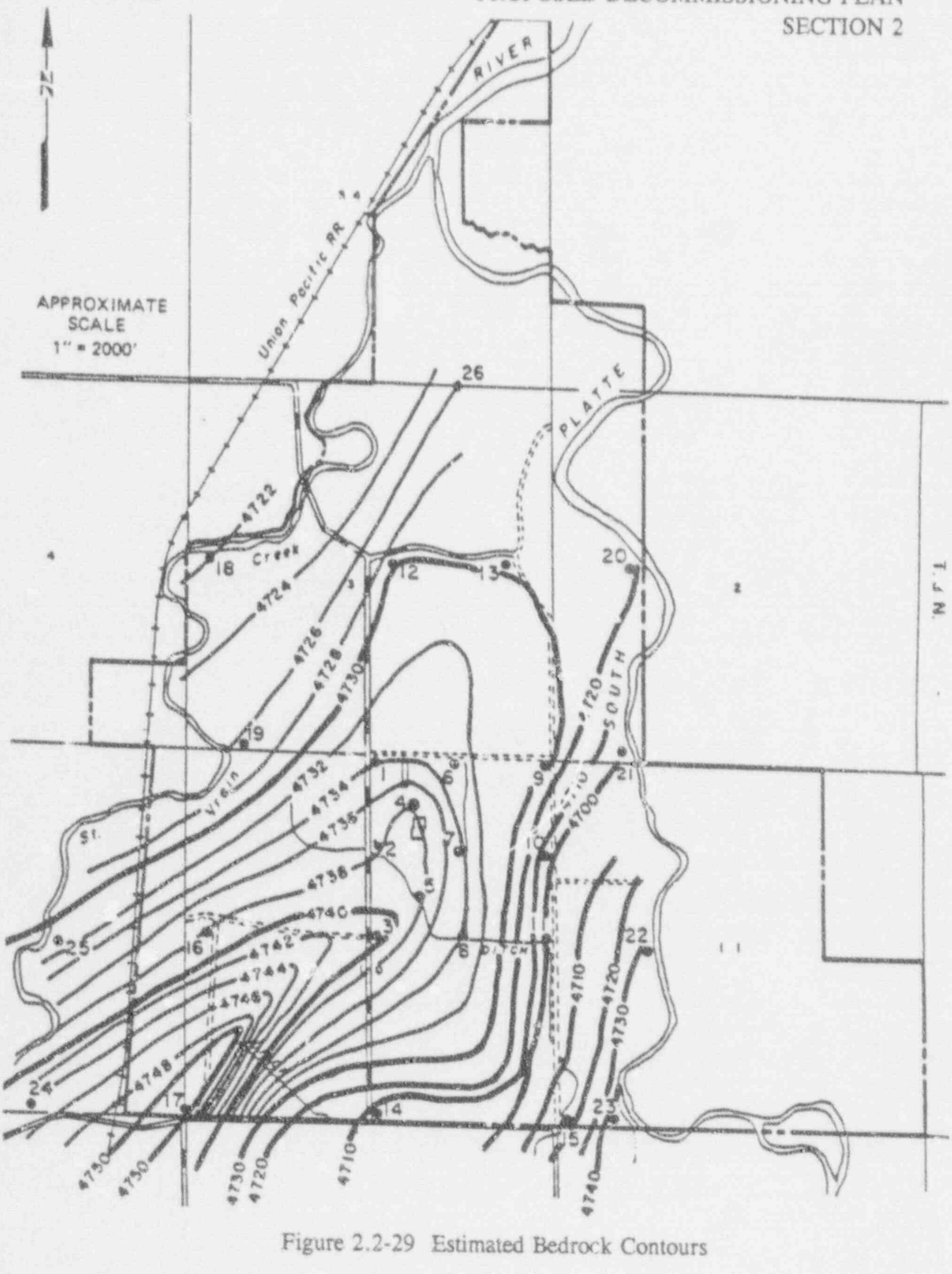


Figure 2.2-29 Estimated Bedrock Contours

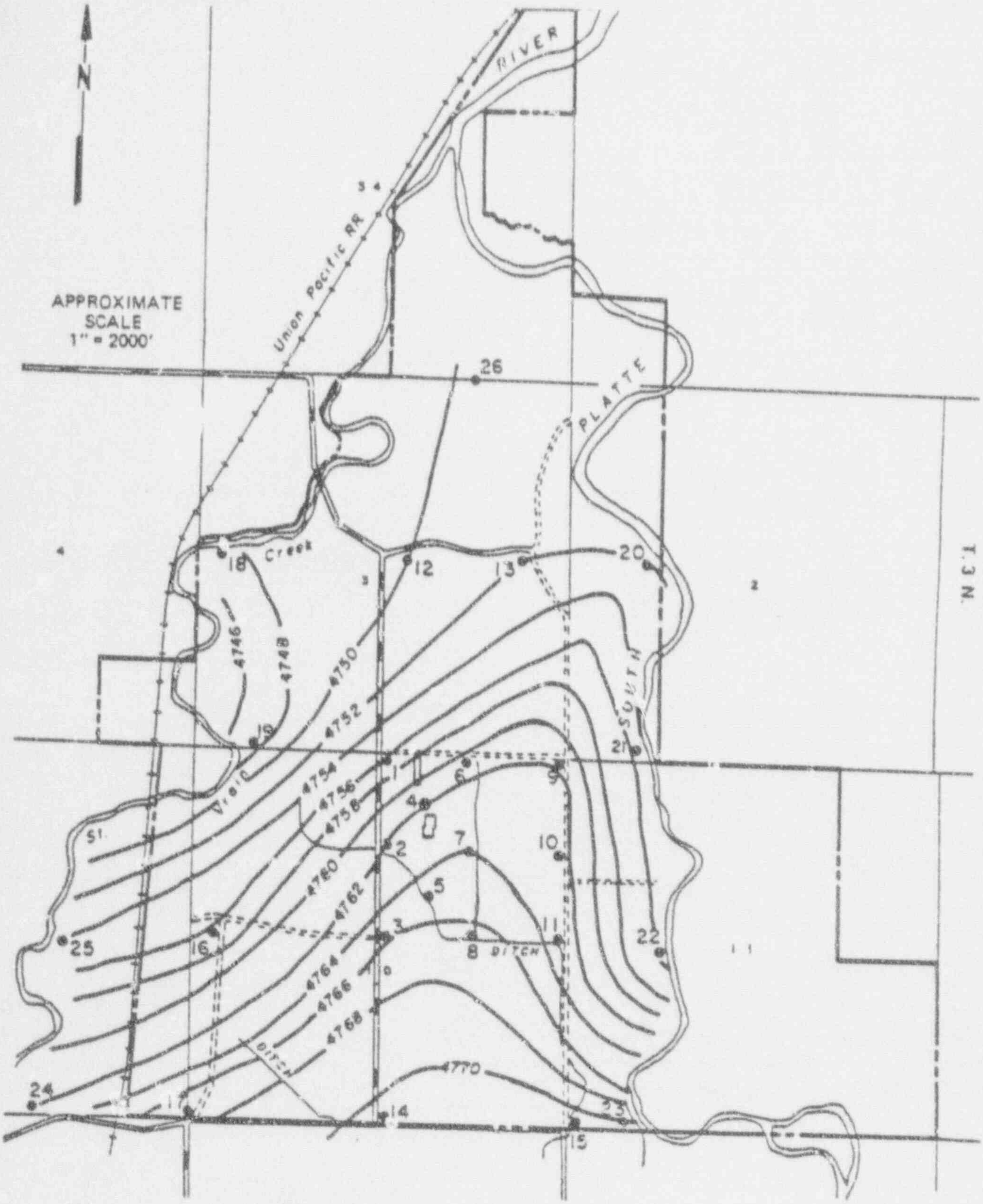


Figure 2.2-30 Estimated Water Table Contours

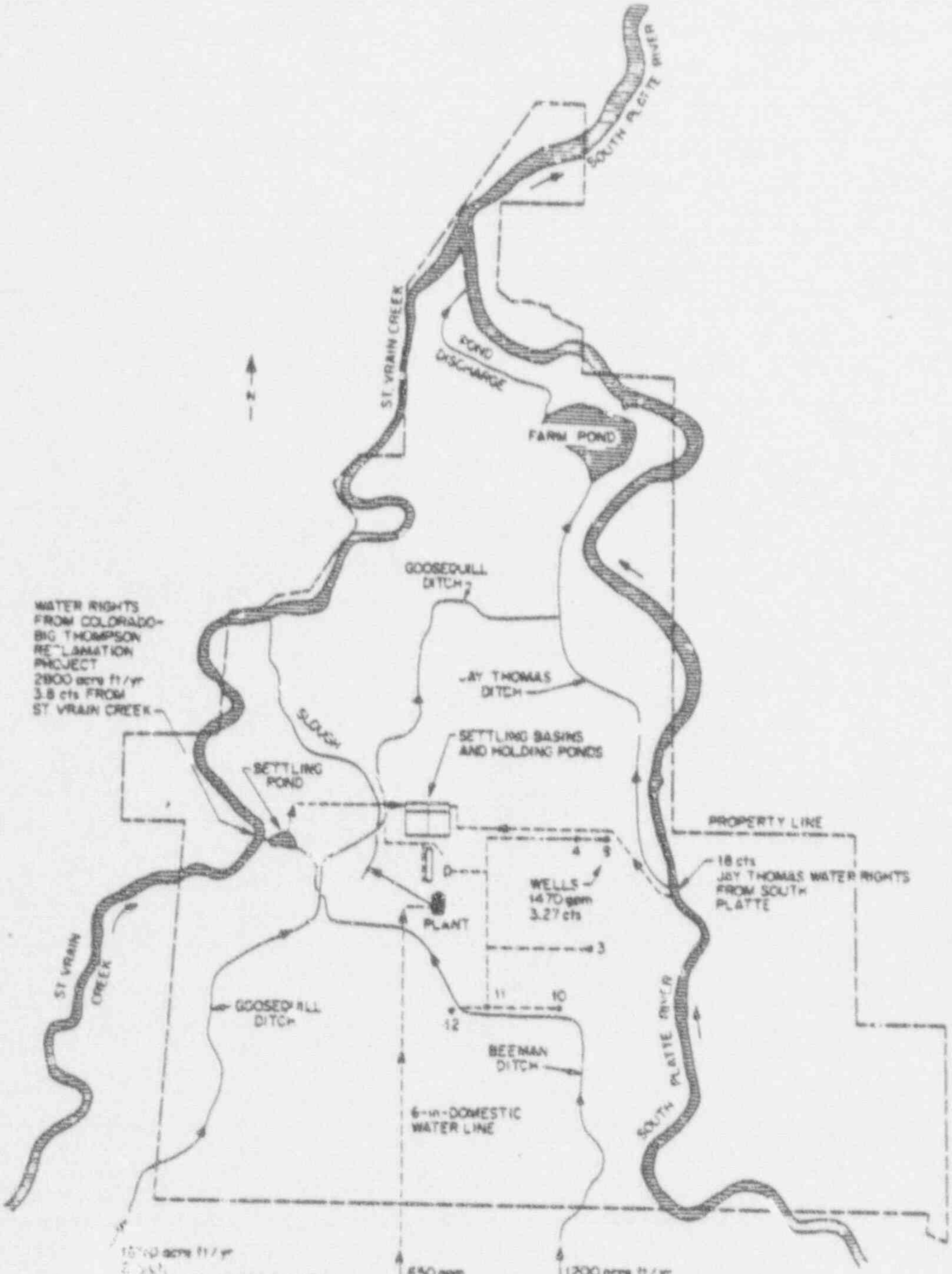


Figure 2.2-31 Irrigation Ditches Around Fort St. Vrain

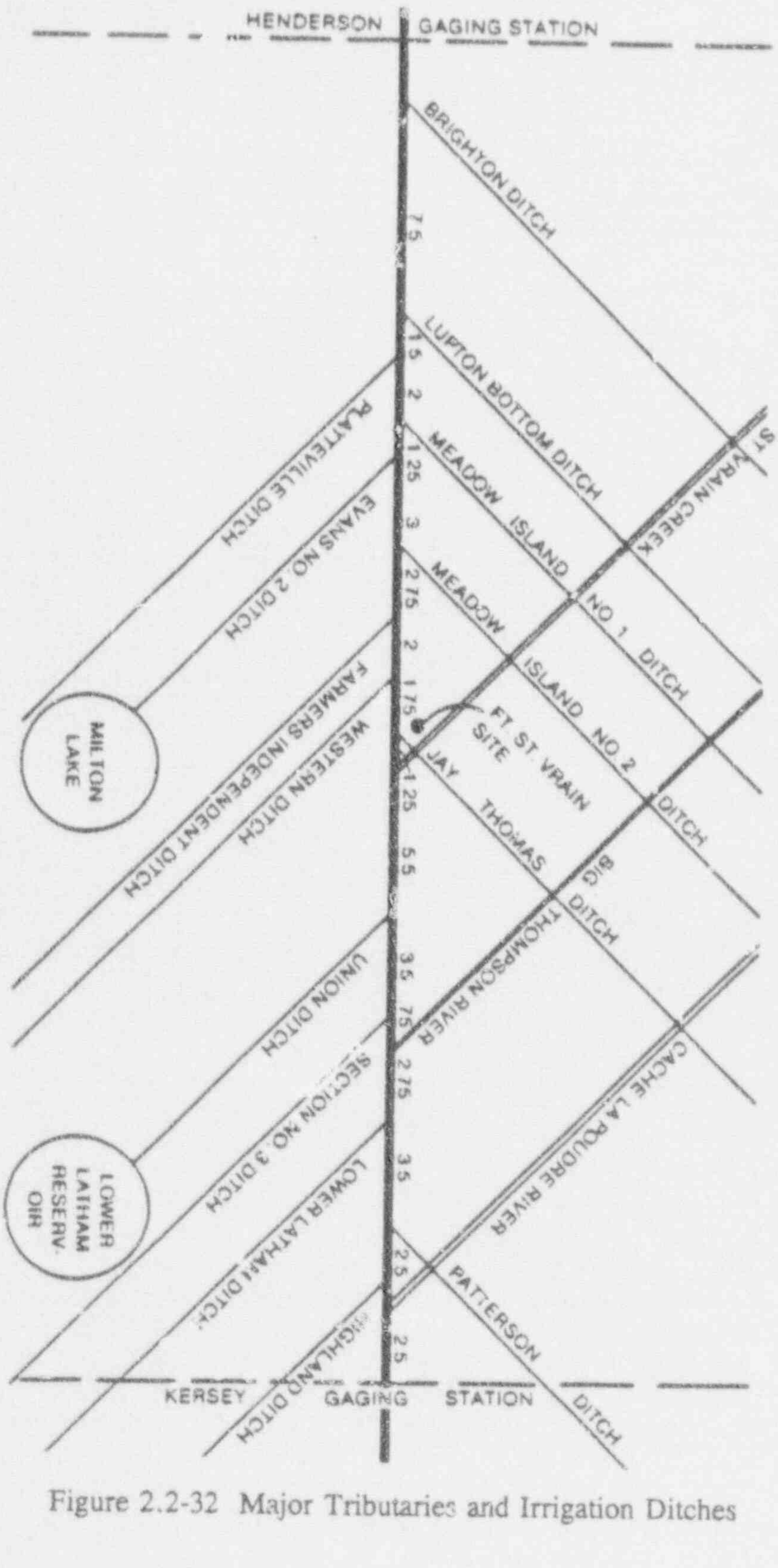


Figure 2.2-32 Major Tributaries and Irrigation Ditches

2.3 DECOMMISSIONING ACTIVITIES AND PLANNING

2.3.1 Introduction

Decommissioning of Fort St. Vrain includes the dismantlement, decontamination and disposal of radioactively contaminated or potentially contaminated material and components within the PCRV, and in contaminated or potentially contaminated balance of plant systems, and on the remaining site, followed by the final radiation survey. Some of the activities described in this section will be performed prior to approval of the Proposed Decommissioning Plan, and are considered plant closure activities in preparation for decommissioning. Section 2.2 provided a description of the facility and site characteristics. The activated and contaminated portions of Fort St. Vrain which will be decontaminated, dismantled and removed during the decommissioning process are identified in Sections 2.2, 2.3 and 3.1. The specific tasks to be performed to accomplish this goal are discussed in this section. Although personnel conducting the dismantling activities will be exposed to radiation above background levels, the dismantling and decontamination activities have been developed to limit exposure to and control radioactive material in order to maintain occupational doses As Low As Reasonably Achievable (ALARA). Exposure estimates to accomplish the individual tasks and overall project are also provided

To accomplish the decommissioning of Fort St. Vrain, substantial portions of the existing plant will be dismantled and removed. However, Reactor and Turbine Building components and structures which are not radioactive above releasable limits will remain.

The decommissioning project is divided into three major work areas:

1. Decontamination and dismantlement of the PCRV.
2. Decontamination and dismantlement of the contaminated or potentially contaminated balance of plant systems.
3. Site cleanup and final site radiation survey.

Site cleanup involves pre- and post-decommissioning surveys of the site, and the radiological decontamination necessary to meet the regulatory guidelines to allow release for unrestricted use. These activities are discussed in detail in Section 4 and are not addressed in this section.

PCRV Decontamination and Dismantlement Activities

The following are the major activities involved in dismantling and removing the radioactive portions of the PCRV. These activities will be discussed in further detail in the following Section 2.3.3:

1. Initial PCRV Preparation
2. Removal of the Helium Circulators
3. Steam Generator Disassembly
   a. Initial Preparation
   b. Removal of Steam Generator Secondary Assembly
4. Removal of Activated Components using the ATC and FHM
5. Detensioning and Removal of Pretensioned Tendons
6. Flooding of the PCRV
7. PCRV Top Head Concrete and Liner Removal
8. Dismantling PCRV Core Components
9. Removing the Core Barrel
10. Removal of the Core Support Floor
11. Disassembling the PCRV Lower Plenum
12. Final Dismantling, Decontamination, and Cleanup Activities

A technical evaluation is provided in Section 2.3.2 which provides the basis for the technical approach selected to decontaminate and dismantle the PCRV. A brief description is also provided to identify various techniques which were considered for removal of the PCRV activated concrete.

Balance of Plant System Decontamination and Dismantlement Activities

The balance of plant systems that are contaminated or potentially contaminated above releasable limits and will require decontamination or dismantlement are identified in Section 2.2.3. Work activities associated with these systems are discussed in paragraph 2.3.4 of this section.

2.3.2 Technical Approach Selection

2.3.2.1 Options Considered for Removal of the PCRV

Key elements of the decommissioning plan include the techniques to be used to remove the internal components from the PCRV and to remove the activated concrete from the PCRV structure. This technical approach is based on filling the PCRV with water for shielding while internal components are being removed and using diamond-wire cutting to remove the activated concrete from the PCRV structure. These methods provide the decommissioning project with the optimum schedule, cost, ALARA, risk, and safety considerations for decommissioning the PCRV. A detailed description of the PCRV disassembly techniques and the basis for selecting them are described below.

Two basic methods to disassemble the PCRV were considered: (1) in-air (dry) disassembly, and (2) filling the PCRV with water to provide shielding. Two possible methods of in-air dismantlement were also evaluated, considering factors of ALARA, safety, risks, schedule and cost. The two in-air methods evaluated were fully remote disassembly through the refueling penetrations in the top head, and partially remote disassembly from a massive shielded work platform with the top head removed. The following paragraphs provide an evaluation of each method, discussion of advantages and disadvantages, and a determination of its acceptability.

2.3.2.1.1 Fully Remote, In-Air Disassembly:

The fully remote, in-air approach to the PCRV disassembly relied upon the extensive use of complex remote tooling and resultant limited view of dismantlement operations, which would produce less than predictable results. Although use of remote operations would potentially result in the best ALARA and safety records, all activities would be performed with highly specialized robots. Therefore, the risk of failure or project delays would be greater due to potential breakdowns or delays, lack of reliable backup techniques, and lack of adequate contingency plans. Design, fabrication and testing of specialized robotics would also have to occur in a relatively short period of time, which could cause unnecessary delays in the project schedule. Additionally, removal of the CSF would be extremely difficult, since it is too massive (270 tons) for practical remote removal.

2.3.2.1.2 Partially Remote, In-Air Disassembly

Partially remote in-air disassembly of the PCRV relied upon a massive shielded work platform that would be required to protect workers from radiation exposure during disassembly. Access ports would be required in this platform through which hand-held, pole-type tools could be inserted to perform the disassembly when the platform is properly indexed over the work location. Using this approach, radiation exposure would be increased because of the extended stay times resulting from restricted tool access. Removal of the top head and the top of the PCRV liner for installation of the work platform would be difficult because of high radiation levels and would probably require remote operations.

2.3.2.1.3 Flooding the PCRV:

The final approach evaluated was to flood the PCRV cavity with water. This selected approach will provide optimum shielding and contamination control and will allow the PCRV disassembly to be completed with optimum balance of schedule, cost, ALARA exposure and minimum risks. Additionally, there is an inherent added measure of safety due to the passive nature of the water for shielding and contamination control. Dismantling operations are greatly simplified by "line of sight" manipulations as a result of direct viewing of the entire cavity.

2.3.2.1.4 Conclusion

The evaluation of the two "dry" (in-air) approaches against the "wet" approach for PCRV disassembly favors filling the PCRV with water for shielding during disassembly. Additionally, it is noted that the "dry" techniques are not completely dry, since large volumes of water are required for any abrasive process used to cut the activated concrete inside the PCRV. Therefore, water would be introduced into the PCRV in each of the "dry" dismantlement options considered.

2.3.2.2 Techniques Considered for Removal of PCRV Activated Concrete

Diamond wire cutting and abrasive water-jet cutting were evaluated for removing activated concrete from the PCRV walls. Diamond wire cutting was chosen as the method for cutting most of the concrete into sections because this proven technology lends itself well to the PCRV concrete removal activities.

Abrasive water-jet cutting was determined to be feasible for much of the concrete cutting but has been minimized to limit the production of contaminated abrasive waste and because of related ALARA considerations. The abrasive water-jet is presently being considered for one application, cutting of the CSF.

The following techniques were also evaluated and were determined to be less desirable for the following reasons: (1) Expanding grout and explosives could be used to break apart the PCRV concrete, but were less desirable because of the heavy reinforcement of the concrete and the presence of the PCRV liner on the face of the concrete; (2) Thermal techniques were evaluated but were less desirable due to tool positioning difficulties, which could cause cost and schedule concerns; (3) Mechanical impact was evaluated but was less desirable due to structural considerations (with the exception of removal of portions of the lowest concrete in the top head).

2.3.3 PCRV Dismantlement and Decontamination

2.3.3.1 Overview of PCRV Dismantlement Activities

The major decommissioning task is the dismantlement and decontamination of the radioactive portions of the PCRV. A description of the PCRV is provided in Section 2.2 and illustrated on Figure 2.2-6. It should be noted that the steps identified in the following paragraphs represent preliminary planning and may change during the detailed engineering and work development that will occur during the planning phase.

This section provides a description of the expected steps necessary to dismantle and decontaminate the PCRV. Initial dismantlement of the PCRV will include removal of selected PCRV internal components and removal of portions of the steam generators. The selected internal PCRV components will be removed from the upper portion of the PCRV using the Fuel Handling Machine (FHM) and Auxiliary Transfer Cask (ATC). These components may include the 37 control rod metal clad reflector blocks (MCRBs), all but six of the 276 non-control rod hexagonal MCRBs, and certain helium purification components. Simultaneously, the non-contaminated portion of the steam generators (also called the steam generator secondary assemblies) will be removed from the lower portion of the PCRV to provide access for detachment of the contaminated steam generator primary assemblies (See Figure 2.2-6).

To facilitate the removal of the remaining reactor core components, the reactor cavity will be flooded with water. As discussed in Section 2.3.2, flooding the PCRV will provide shielding for the workers associated with PCRV dismantlement activities. After the steam generator secondary assemblies are removed from the bottom of the PCRV, the PCRV bottom head and side wall penetrations will be sealed, the PCRV Shield Water System will be connected, and the PCRV will be flooded.

To gain entry to the PCRV cavity, a plug of concrete will be removed from the top of the PCRV. Selected PCRV prestressing tendons (See Figure 2.2-6) will be either (1) detensioned and removed, or (2) detensioned and left in-place. The top head plug will be cut into sections of appropriate size such that the weight and dimensions will allow them to be handled with the Reactor Building crane and permit them to be moved out of the building. After the majority of the concrete has been removed from the PCRV top head, the 3/4-inch steel PCRV liner plate will be cut and removed with the remaining concrete, together with the top head liner insulation. A detailed discussion of this activity is provided in Section 2.3.3.7.

Once access is gained to the PCRV cavity, a work platform will be installed at the approximate elevation of the top of the PCRV where the liner and concrete have been removed. Working from this platform workers will remove core components, including the remaining MCRBs, defueling elements, hexagonal reflector blocks, large side reflector blocks, side spacer blocks, core support blocks and core support posts. This activity is described in Section 2.3.3.8.

Once the core internals have been removed, the core barrel (a large carbon steel cylinder) will be removed by cutting it into pieces sized to fit in radwaste containers. (See Section 2.3.3.9)

Following removal of the core barrel, the PCRV water level will be lowered and the CSF insulation removed, in preparation for removal of the CSF. The CSF is a 29-foot diameter, 5-foot thick disk of reinforced concrete within a 3/4-inch steel casing weighing approximately 270 tons. The CSF will be detached from the twelve CSF columns and the twelve steam generator inlet ducts and lifted with a hydraulic jacking system to the PCRV top head region. The jacking system will then lower the CSF onto supports on the ledge in the cavity where the PCRV top head was removed. Once supported, the CSF will be sectioned into segments small enough for handling by the Reactor Building crane. This activity is discussed in Section 2.3.3.10.

Once the CSF is removed, the PCRV lower plenum is exposed and the helium circulator diffusers and steam generator primary modules can be removed. These activities are discussed in Section 2.3.3.11.

The removal of the steam generator primary assemblies completes the removal of the major PCRV radioactive components. Remaining radioactive components include the activated "beltline concrete" around the reactor core region, the PCRV liner, liner insulation and insulation cover plates, and the PCRV lower floor with its supports. The activated beltline concrete is the PCRV region that was adjacent to the reactor core. It is estimated that this activated region is defined by a cylinder with an 18 to 24 inch wall thickness and a height of 40 feet. This section of PCRV sidewall will be removed by cutting and removing vertical segments. The activated liner plate, insulation and cover plates will be removed with the concrete. These activities are discussed in Section 2.3.3.12.

In the lower portion of the PCRV cavity (below the CSF), the insulation and insulation cover plates will be removed from the PCRV liner. The lower floor and all support members, insulation and other components will be removed, and the exposed PCRV liner will be surveyed and decontaminated as appropriate. These activities are also discussed in Section 2.3.3.12.

2.3.3.2 Initial PCRV Preparation

Initial tasks to be completed in preparation for dismantling the PCRV will include acquiring tooling, setting up training mockups, installation of the PCRV Shield Water System, and craft personnel training in accordance with Section 2.6.

Preparation activities include any modifications or revisions to existing facilities and equipment and installation of new facilities and equipment that would be necessary for their use in supporting the decommissioning operations. No major facility modifications are required that will affect the safety of the facility.

Preliminary plans involve enlarging the refueling deck equipment hatch and truck bay door to allow passage of larger items. Plans also include re-reeving of the Reactor Building crane to provide additional vertical travel which will allow the 170-ton main hook to travel from the refueling floor to ground level. This re-reeved configuration is consistent with the crane configuration used during original plant construction and is necessary to provide the lifting capacity to lift the PCRV top head concrete block sections and other heavy lifts when components are removed from within the PCRV.

The need for extensive waste handling facilities in addition to those already present has been minimized by proper sequencing of the dismantlement activities and by proper management of the radioactive waste program, as described in Section 3.3. Off-site facilities will be utilized when necessary and practical for waste processing and final packaging. Proper task planning and sequencing will aid in minimizing accumulation of radioactive waste onsite.

A self-contained mobile laundry facility to clean all contaminated protective clothing will be utilized. The PCRV Shield Water System, installed to maintain water purity in the flooded PCRV, will be discussed in Section 2.3.3.6.

Following helium circulator machine assembly removal, as identified in Section 1.5.2 (See Figure 2.3-1), the diffuser shutoff valve assemblies will be disconnected from the PCRV penetrations and the penetrations will then be sealed by installing a closure fixture designed to withstand pressure when the PCRV is flooded with water.

2.3.3.3 Steam Generator Disassembly

2.3.3.3.1 Initial Steam Generator Disassembly

Each of the twelve steam generators consists of a primary assembly and a secondary assembly (Figure 2.3-2). The primary assembly is located within the PCRV lower plenum and the secondary assembly is located beneath the primary assembly inside a PCRV bottom head steam generator penetration. The primary assembly is contaminated and the secondary assembly is not expected to be contaminated. However, in order to remove the primary assembly, the secondary assembly must first be removed from beneath the PCRV.

The removal of the insulation from the steam generator secondary side piping will be limited to the sections of feedwater, main steam, hot reheat, and cold reheat piping that need to be severed for the steam generator secondary side removal. Prior to removal, the insulation will be tested for asbestos content. If asbestos is present, appropriate controls will be implemented for removal of the insulation. Following the removal of the insulation, the main steam, feedwater, hot reheat and cold reheat piping will be cut which will allow the secondary side of the twelve (12) steam generators to be removed.

2.3.3.3.2 Removal of Steam Generator Secondary Assembly

Removal of the steam generator secondary assemblies (See Figure 2.3-2) will be accomplished in the reverse of the original construction installation sequence. The steam generator secondary assemblies are expected to be free of contamination.

The Marmon clamp (See Figure 2.3-2) will be removed from the lower end of the steam generator secondary assembly. This will allow withdrawal of the hot reheat piping from the steam generators. Because of the length of the hot reheat pipe, it will be severed into several sections as it is being withdrawn from the steam generators.

The cold reheat pipe will then be severed by remote operations at the threaded connection below the primary closure dome. Severing this connection remotely will make it unnecessary to send an individual inside the cold reheat pipe, as was done during installation. After the top of the cold reheat pipe has been cut, the lower reheat nozzle assembly will be cut free of the steam generator secondary assembly at an elevation below the feedwater ring header. This will allow the withdrawal of the cold reheat pipe from the steam generator for disposal.

After the cold reheat piping has been removed, the 40 feedwater, instrument, and steam tubes will be cut remotely below the primary closure dome. The steam generator secondary assembly will then be rigged for lowering. The secondary closure weld will be cut and the steam generator secondary assembly will be lowered out of the PCRV penetration liner. The Rucker machine, which is a large turntable designed to handle heavy loads under the PCRV, will be used to handle the steam generator secondary assemblies in the reverse order of the installation operations.

In order to detach the primary assembly from the penetration liner, the final step will be to remove the 36 nuts that attach the primary module to the penetration liner flange. The steam generator primary assembly is stabilized by the steam generator shroud connection to the lower floor and the helium duct connection to the CSF.

After each of the twelve steam generator primary assemblies is detached from its respective penetration, it will then be removed through the top of the PCRV after the CSF is removed. This is discussed further in Section 2.3.3.11.

When cutting operations have been completed, the interior of the penetration liner may be sprayed with a strippable coating to ease future decontamination operations. A new secondary closure plate will be welded in place to seal the penetration liner in preparation for flooding the PCRV.

In parallel with the removal of the steam generator secondary assemblies, the PCRV lower plenum (See Figure 2.3-3) will be entered through the PCRV bottom head access penetration after removal of the shield plug. A radiological survey of this area will be performed to determine radiation levels and major contributors in this area. Still photographs and video recordings will also be made to assist in mockup design and training for eventual dismantlement of the PCRV lower plenum.

2.3.3.4 Removal of Activated Components Using the ATC and FHM

Selected activated components will be removed from the PCRV using the ATC and the FHM. Use of this equipment will provide shielding while transferring highly radioactive components from the PCRV to shipping casks with minimal personnel exposure. The 37 control rod MCRBs and all but six of the 276 non-control rod hexagonal MCRBs will be removed from the PCRV by the FHM. Removal of the highly radioactive components with the FHM is the preferred method to maintain personnel exposure ALARA. However, use of the FHM for this purpose is dependent on its operability, and its availability has not been relied upon as the basis for removal of these components. Removal of certain components in the helium purification wells and penetrations, and placement of the refueling sleeve, will be performed by the ATC.

As identified in Section 1.5.2, the RCDs, CRDOAs, and high temperature helium purification equipment may have been previously removed.

2.3.3.5 Detensioning and Removal of Pretensioned Tendons

2.3.3.5.1 Tendon Removal

Concurrent with operations discussed in Sections 2.3.3.2 through 2.3.3.4 is the detensioning of selected tendons in the PCRV. The PCRV has a total of 448 prestressing tendons made up of vertical, circumferential, and top and bottom cross head tendons (See Figure 2.2-6). The following identifies the number of tendons planned to be detensioned and the number of tendons planned to be both detensioned and removed for each of the various tendon types. The exact tendons affected could change somewhat based on conditions encountered during decommissioning.

Type of Tendon	Number of Tendons	Number to Be Detensioned	No. of Tendons To Be Removed
Vertical	90	90	90
Circumferential	310	70	24
Top Cross Head	24	24	24
Bottom Cross Head	24	0	0
TOTALS:	448	184	138

Temporary scaffolding will be erected to facilitate tendon removal. Tendons will be detensioned by cutting or grinding individual tendon wire buttonheads.

2.3.3.5.2 Vessel Integrity

The modified PCRV structure was evaluated for the loadings produced by the dead weight of the PCRV structure and components, the lifting operations of the CSF, and a design basis seismic event. The structural evaluation considered the detensioning and removal of all 24 top cross head tendons, all 90 vertical tendons, and all circumferential tendons from group 9 through group 19. In addition, it was conservatively assumed that all circumferential tendons (inner, middle and outer) were detensioned even though it is planned to only detension the inner and middle tendons in the top head and the inner tendons in the belt line region.

To evaluate this modified structure, a simplified free-body lumped mass model fixed at the basement floor of the PCRV structure was developed for analysis with the STAAD-III/ISDS (Ref. 5) computer code. Inputs to the analysis included NRC Regulatory Guide 1.60 "Design Response Spectra for Seismic Design of Nuclear Power Plants" (Ref. 6) design response spectra normalized to the Fort St. Vrain specific "double design earthquake" (referred to as the Design Basis Earthquake (DBE)) ground motions with NRC Regulatory Guide 1.61 "Damping Values for Seismic Design of Nuclear Power Plants" (Ref. 7) damping values. Specifically, the FSV Operating Basis Earthquake (OBE) ground motions of 0.05g horizontal and 0.033g vertical accelerations and DBE ground motions of 0.10g horizontal and 0.067g vertical accelerations were used in the analysis. In addition, the concrete has a compressive strength of f'c = 6000 psi and the reinforcing steel was conservatively assumed to be Grade 40 steel with a F_y = 40,000 psi, although it is Grade 60 or better. The damping values are 2% horizontal and vertical for the OBE, and 2% vertical and 5% horizontal for the DBE.

The modified structure was conservatively evaluated for the loadings produced by the dead weight of the PCRV structure (assuming the PCRV is flooded with water), PCRV internal components, the lifting operations of the CSF, and OBE and DBE events. The resulting forces and moments in each of the individual cross sections of the PCRV were used to develop concrete compressive and reinforcing steel tensile stresses. In the development of the concrete and reinforcing steel stresses, all vertical, cross-head and circumferential pre-stressing tendons were considered detensioned.

The resulting concrete compressive and reinforcing steel tensile stresses are provided below:

CROSS SECTION	LOADING	CONCRETE COMPRESSIVE STRESS (psi)	REINFORCING STEEL TENSILE STRESS (psi)
Top Head	DW	16.7	0.0
	Lift	7.7	0.0
	OBE Seismic[1]	22.0	10.2
	DBE Seismic[1]	25.1	23.7
Belt Line Region	DW	134.6	0.0
	Lift	6.1	0.0
	OBE Seismic[1]	298.9	814.8
	DBE Seismic[1]	381.5	1,268.0

[1] - Includes the effects of Dead Weight (DW).

To determine the margins of safety, the worst case load combinations of dead weight, lift loads, and OBE and DBE seismic events were considered using the following equations, consistent with the "Building Code Requirements for Reinforced Concrete" (Ref. 8):

Equation-1: $U_1 = 0.75\,(1.4\text{ DW} + 1.7\text{ Lift} + 1.87\text{ OBE Seismic})$
Equation-2: $U_2 = 0.75\,(1.4\text{ DW} + 1.7\text{ Lift} + 1.4\text{ DBE Seismic})$

The total combined concrete compressive stress was compared to the "Limit Condition 2" compressive stress allowable of 0.85 f'c or 5100 psi as outlined by Section E.1.2.6.2 of the FSV FSAR. The reinforcing steel allowable tensile stress was considered to be 90% of the yield stress of Grade 40 steel, or 36,000 psi. The margins of safety, where margin equals (allowable stress)/(combined actual stress), are summarized below:

SECTION	CONCRETE		REINFORCING STEEL	
	EQ-1	EQ-2	EQ-1	EQ-2
Top Head	87.6	95.0	2517	1447
Belt Line Region	8.97	9.28	31.5	27.0

In summary, the structural evaluation has determined that the resulting concrete compressive and reinforcing steel tensile stresses are well within allowable limits. Furthermore, adequate margin of safety exists for all loading conditions specified. The potential for cracking of concrete in the modified top head and beltline regions has been reviewed and, considering the relatively low tensile stress in a conservative number of reinforcing bars, cracking due to tension in the concrete is not expected.

2.3.3.6 Flooding of the PCRV

2.3.3.6.1 Preparation for Flooding the PCRV

Once operations described in Sections 2.3.3.2 through 2.3.3.4 have been completed, activities may proceed to install the PCRV Shield Water System and flood the PCRV. A network of PCRV liner cooling tubes (System 46) and the tendon tubes within the PCRV concrete wall creates a potential pathway for water leakage and the spread of contamination during the cutting of the PCRV concrete. To block these potential leak paths and prevent the spread of contamination, the liner cooling tubes and selected tendon tubes will be sealed with grout or other suitable sealing methods.

Before flooding the vessel, all PCRV penetrations that are below the PCRV waterline and have had their instrumentation removed (including instrument penetration internal components and other items such as the thermocouples routed through the core support blocks) will be sealed. These penetrations will be sealed by either one or a combination of the following: cutting and capping just outside the PCRV or by installation of bolted and gasketted blind flanges. Where welding is utilized, the welds will be non-destructively tested per applicable codes. A PCRV low point penetration will be sealed with a specially designed cover plate before the PCRV is flooded. This closure will provide suction and fill connections for the PCRV Shield Water System described below. The welded connection will be non-destructively tested. After verifying that the steam generator and helium circulator penetrations are sealed, the PCRV Shield Water System will be installed.

2.3.3.6.2 Expected Conditions Within the Flooded PCRV

1. Radionuclides: The radionuclides of concern that will be encountered during dismantlement operations inside the PCRV have been previously identified in the activation analysis provided as Appendix II and are summarized in Table 3.1-2. A fraction of each of these radionuclides is expected to leach into the water from the graphite when the PCRV is flooded.

The principal radionuclides of concern are tritium, Co-60, Fe-55 and Cs-137. Of these, Co-60 will provide the majority of the whole body exposure to occupational workers as a result of dismantlement operations. These radionuclides will appear in particulate and ionic form, and the PCRV Shield Water System will be designed to remove the principal radionuclides.

Although not a major contributor to whole body exposures, the other major radionuclide of concern is tritium. Since the tritium cannot be removed by processing through filters or demineralizers, it will be processed and released using liquid effluent discharge operations in accordance with 10 CFR 20 limits. The maximum tritium concentration shall not exceed the limit specified in the Decommissioning Technical Specifications.

2. Particulates: During PCRV dismantlement evolutions, debris will be generated from handling graphite blocks, concrete cutting operations, insulation, and dross from underwater cutting operations. Relatively large particles of debris (½ to 1-inch in diameter) are expected to be generated from the various cutting methods to be employed during PCRV dismantlement operations, including diamond wire cutting (PCRV top head), oxy-acetylene cutting, thermitic rod cutting, and underwater plasma arc cutting. This debris will settle downward in the PCRV water and will be removed by the PCRV Shield Water System. Suitable provisions will be included in the system design to collect this debris and prevent it from damaging system components.

Some graphite dust is expected to become waterborne after the PCRV is flooded. The need to filter this graphite has been incorporated into the design and filter sizing of the PCRV Shield Water System. The possibility of breakdown of the Kaowool insulation (described in Section 2.2.2 and Figure 2.2-8), attached to the PCRV liner immediately outboard of the core barrel, has also been considered. However, based on information from the manufacturer, this insulation is not expected to break down when immersed in water and therefore will not be a factor in the design of the system filtration trains.

2.3.3.6.3 PCRV Shield Water System - Design Considerations

The primary function of the system is to provide water shielding to minimize personnel exposure during dismantlement operations internal to the PCRV. The system will also be designed to provide a means to meet 10 CFR 20 discharge limits for the radionuclides identified above and ensure compliance with 10 CFR 50

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

1

IMAGE EVALUATION
TEST TARGET (MT-3)

150mm

6″

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

Appendix I guidance for radioactive liquid waste discharges to unrestricted areas. Specifically, the system design will provide:

(1) an acceptable method to reduce tritium inventory by liquid effluent discharge operations.
(2) an acceptable radioactive liquid waste processing path to reduce the concentrations of fission and activation products for discharge to unrestricted areas, as well as control radionuclide concentrations in the PCRV water inventory to maintain occupational exposures in the work area ALARA.

In addition to these regulatory criteria, the system will also be designed to meet the following non-regulatory considerations:

(1) maintain acceptable water clarity to conduct underwater dismantlement operations.
(2) minimize corrosion and biological fouling by suitable chemistry control.
(3) provide a means of initial fill of the PCRV, as well as the ability for makeup with demineralized water to compensate for system losses due to effluent discharges.

The recommendations of Regulatory Guide 1.143 "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants" (Ref. 9) will be used in system design.

This system will be designed to maintain occupational radiation exposures within 10 CFR 20 regulatory limits and as low as is reasonably achievable (ALARA). The recommendations of Regulatory Guide 8.8 "Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be ALARA" (Ref. 10) will also be incorporated (to the degree applicable) into system design.

2.3.3.6.4 PCRV Shield Water System - General Design Information

The PCRV Shield Water System is shown in Figures 2.3-4. The system will consist of two parallel trains of equipment, each sized for 500 gpm (or 50%) of the total flow. This total design flow rate (1000 gpm) will provide a turnover rate of approximately five PCRV volumes per day. Based on discussions with personnel involved in the TMI cleanup, this rate is considered adequate. The system will be designed to allow a complete train or individual components to be removed from service for preventive or corrective maintenance. Provisions will be included for the addition of another complete train if required. The trains are cross-connected to permit the pumps and filters to be used interchangeably between the two trains.

Maximum flexibility will be designed into the system to minimize the impact of individual component failure on system availability. Sufficient valves, bypasses and interconnecting piping will be utilized to allow continued system operation during scheduled maintenance or in the event of a component failure. Remote-indicating radiation detectors will be used to monitor dose rates on components in high radiation areas, such as at strainers, filters and demineralizers.

A. Filtration Trains:

The purpose of the system filtration trains will be to maintain PCRV water clarity by removing suspended solids and particulate matter, and to reduce concentrations of suspended radioactive particulates. In order to maintain optimum water clarity, suction of the PCRV Water Shield System will be taken from the bottom of the PCRV and clarified water will be returned to the top of the vessel. The system will have two filtration trains consisting of the following components:

1. Clarifying Pump Suction Strainer: A strainer will be installed in the suction line of each clarifying pump to prevent equipment damage due to large particulate debris. The strainers will be duplex type, and provisions for shielding and radiation monitoring of these filters will be included in the design.

2. Clarifying Pump: Each train will have one clarifying pump. The pumps will be horizontal, centrifugal process pumps. Each pump will have a capacity of 500 gpm through the associated train of equipment and will return the clarified water to the PCRV.

3. Filter Trains: Each filter train will consist of two filters, with the filters mounted in a series arrangement. Bypasses will be provided to allow each filter to be operated individually or in series with other filters. Five micron filters will be used to remove the graphite particulate expected while the PCRV is flooded. The series arrangement for filters will be specified to remove 98% of all particles larger than 5-micron at a maximum differential pressure of 15 psid. Provisions will be included for shielding and radiation monitoring.

B. Demineralizer Train:

The system will also be equipped with a sidestream demineralizer train. The purpose of the demineralizer train will be to reduce concentrations of dissolved radionuclides (specifically Co-60, Fe-55 and Cs-137) to levels that will allow discharge to unrestricted areas, as well as reduce concentrations in the PCRV to minimize radiation exposure to occupationally exposed personnel. The demineralizer train will consist of the following components:

1. Demineralizers: Two demineralizers capable of removing the principal radionuclides of concern (Co^{++}, Fe^{++}, Cs^{+}) will be provided in parallel. The demineralizer train will be sized for a minimum of 10% of the total process flow (100 gpm) and will remove dissolved radionuclides from the PCRV water inventory. The demineralizer will be enclosed in a shielded housing and will include provisions for remote radiation monitoring. One demineralizer is planned to be in service at all times.

2. Resin Fines Filter: One cage-type filter will be provided to prevent the loss of resin fines from the demineralizer and possible discharge into the PCRV. This filter will be designed for a minimum capacity of 100 gpm and to retain 98% of all particles greater than 5 micron at 15 psid.

3. Demineralizer Pumps: A demineralizer pump will be provided to take suction from the demineralizer surge tank and provide the necessary flow through the demineralizers. After exiting the demineralizers and the resin fines filters, the demineralizer booster pump will return the processed water to the top of the PCRV or to the radioactive liquid waste effluent release path when effluent discharge operations are in progress.

4. Demineralizer Surge Tank: A demineralizer surge tank will be provided to isolate the low pressure demineralizer sidestream from the higher pressure clarification filtration trains.

C. Chemical Addition Train:

The system will also include a chemical addition train. The purpose of the chemical addition train will be to minimize corrosion by suitable chemistry control within the PCRV system and to minimize biological fouling. The chemical addition train will consist of the following additional components:

1. Chemical Addition Tanks: Two 100-gallon chemical addition tanks will be included, one for sodium hydroxide and the other for hydrogen peroxide. The tanks will be used to add chemicals to the system for the maintenance of proper chemistry and to control biological fouling.

2. Chemical Addition Pumps: Two chemical addition pumps will be included. One pump will be provided for injection of sodium hydroxide into the system to maintain chemistry control and pH balance, and the other pump will be provided for injection of hydrogen peroxide to control biological fouling.

D. Skimmer System:

Consistent with experience gained conducting underwater operations at TMI, a skimmer subsystem has been included in the system design to maintain adequate surface visibility and to reduce surface contamination. The skimmer subsystem will include a duplex strainer, a skimmer pump, a filter and a floating strainer. By changing the valve positions, this system can also be aligned to provide underwater vacuuming capability.

E. System Controls:

The system incorporates remote manual controls on a central control panel located in a non-congested area on the refueling floor. All major operations of the system, including flow adjustments and valve positioning, will be performed from the panel. Pumps will be controlled both locally and remotely from the central control panel. Alarms for either high differential pressure or high radiation will notify the operator of the need to replace the filters or the demineralizer resins. PCRV water level indication and PCRV high/low water level alarms will be included in the design to facilitate system operation and control.

F. Other General Design Information:

The strainers, filters, and demineralizers will be shielded to reduce radiation fields in the immediate vicinity of these components during operation. The system will have an isolation valve at the outlet from the PCRV to the suction of the PCRV Shield Water System to allow isolation of the water in the PCRV if a problem should develop in the system. There will also be other valves to allow isolation of portions of the system for maintenance or repair. A connection will also be provided for an additional train, if necessary.

The major components of the system will be prefabricated on skids with drip pans to contain potential leakage and will be installed in low occupancy areas of the Reactor Building to minimize personnel exposure. Skids that include system filter and strainers will also be shielded. The operating controls and chemical addition skids will be located at the Refueling Floor area. The skids will be interconnected with other skids as well as with the suction piping from the bottom of the PCRV and the return piping to the top of the PCRV. The PCRV Shield Water System will be connected to the existing Fort St. Vrain Radioactive Liquid Waste System (System 62) to permit the use of the existing effluent discharge paths and radioactivity monitoring and controls.

2.3.3.6.5 <u>PCRV Shield Water System - Operation</u>

A. <u>Initial Fill of the PCRV</u>

After system installation and check out, the first operation of the system will be during the initial fill of the PCRV. As opposed to normal system operation, the initial fill will be from the bottom of the PCRV via the suction piping. The initial fill will be accomplished prior to the final cutting and removal of the PCRV top head concrete, and prior to gaining access into the PCRV internal cavity. Demineralized water for the initial PCRV fill (estimated to require approximately 325,000 gallons) will be from the existing secondary water treatment system, which is described in a following section.

As the PCRV is being filled, the displaced air and gas will be passed through a portable HEPA filter system attached to a refueling penetration in the PCRV head. Using temporary ventilation ducting, the displaced air from the HEPA filter will then be routed to the installed Radioactive Gas Waste System (System 63) for sampling, and then to the existing Reactor Building Ventilation Exhaust System (System 73) if concentrations permit direct discharge. All gaseous discharges will be in compliance with the Fort St. Vrain Offsite Dose Calculation Manual (ODCM) (Ref. 11). The PCRV will be inspected for leaks after the initial fill process is begun. The fill operation is expected to take several days.

The Decommissioning Technical Specifications require that the PCRV water be sampled and analyzed daily for tritium concentration during the initial fill of the

PCRV. Sample frequency may be reduced to weekly after the tritium concentration has decreased to less than 0.1 μCi/cc. Limits have been established in the Decommissioning Technical Specifications to assure that tritium activity concentrations in the PCRV Shield Water System will not exceed those postulated in the decommissioning accident analyses.

B. Normal System Operation

Once the PCRV has been filled, the PCRV Shield Water System lineup will be restored to take a suction from the bottom of the PCRV, with the return flow to the top of the PCRV. The system will be operated to establish and maintain water clarity, water chemistry and to minimize waterborne concentrations of radionuclides. The demineralizer will be placed into service as required. Filters and demineralizers will be monitored for differential pressure and radiation levels to determine when replacement is required. It is expected that approximately 60 days will be available to operate the system to establish water clarity and reduce radionuclide concentrations before the PCRV top head is removed.

1. System Recirculation to the PCRV:

The normal operational mode of the system will be with both trains processing PCRV water at a total flow rate of approximately 1000 gpm. Both clarifying pumps will take suction from the bottom of the PCRV (total flow rate - 1000 gpm) and will process the water through two parallel trains of filters. During system operation, water flows from the flooded PCRV through duplex strainers to the suction of the clarifying pumps. From the pumps, the water is processed through the filters before returning to the PCRV. A minimum side stream flow of 10% of the water flow rate will be processed through the demineralizers for removal of radionuclides, namely Co-60, Fe-55 and Cs-137. The filter trains will be set up in a series arrangement depending on the turbidity conditions in the PCRV. During initial operation, 50-micron elements will be loaded into both filter housings in each train. As water clarity improves, filter elements and filter alignment will be changed as needed to support ongoing operating conditions. The clarified water will be returned to the top of the PCRV through a sparger arrangement which will minimize surface disturbance.

2. System Processing Via The Demineralizer:

A minimum sidestream flow of approximately 10% of the total flow (100 gpm) will be taken from the return line downstream of the filtration units and processed through demineralizers. The flow will be adjusted as required to maintain acceptable radiation levels on the work platform to minimize personnel exposure. Effluent from the demineralizer train can also be routed back to the system return lines for recirculation to the PCRV or, after sampling, routed to the effluent discharge connections as described in the following paragraph. Suitable provisions will also be provided for additional demineralizer capacity as required.

3. Discharge Via Radioactive Liquid Waste System (System 62):

All liquid waste from the Fort St. Vrain decommissioning will be routed through the existing radioactive liquid waste system (System 62) discharge line that was utilized during normal plant operations. Further details of this system are provided in Figure 2.2-23 and Section 2.2.3.10. Discharges will also be performed in compliance with the NPDES permit in effect at that time.

4. Sampling Operations:

Initially, releases will be batch mode releases. Prior to liquid effluent discharge operations, representative samples obtained from the PCRV Shield Water System will be analyzed for principal radionuclides to ensure that the concentrations of radionuclides discharged to the environment do not exceed the values specified in 10 CFR 20. Samples will also be taken to verify maintenance of suitable water chemistry. Sample locations will be included (see Figure 2.3-4) at the suction line from the PCRV, at the outlet of the filter trains, and at the outlet of the demineralizers.

5. Chemistry Control:

In order to minimize corrosion from the carbon steel components within the PCRV, it will be necessary to maintain the pH balance of the PCRV water to a control band of between 9.0 and 10.0 by the addition of suitable caustic. Additionally, to control biological fouling, it will be necessary to maintain a hydrogen peroxide concentration. A system will be provided for this purpose consisting of two 100-gallon tanks and two chemical addition pumps. The system will initially be used to add chemical during the initial fill of the PCRV. The system will then be used to batch feed chemicals as required until tritium levels are reduced to a level where continuous effluent discharge operations are acceptable. To support a continuous discharge operation, it will be necessary to continuously feed chemicals.

6. System Interfaces:

The PCRV Shield Water System will interface with and require support from the existing site systems:

(1) Demineralized Water System (System 31)

The PCRV Shield Water System will require a supply of demineralized water at a flow rate of up to 50 gpm at 100 psig. Demineralized water is required for system makeup, replacement of water removed by effluent discharge operations, chemical additions, and to replace evaporative losses. The demineralized water supplied to the PCRV Shield Water System must meet typical industry standards for oxygenated, deionized water. The demineralized water for the initial PCRV fill and for makeup due to subsequent effluent discharge operations will be from the existing secondary water treatment system.

(2) Radioactive Liquid Waste System (System 62)

Tritium inventories will be initially controlled and subsequently reduced using effluent discharge operations. The discharge from the PCRV Shield Water System will initially be to the existing plant liquid waste holdup and monitoring tanks for processing and subsequent discharge. As tritium levels are reduced, the discharge will be directed to the Reactor Building sump discharge line.

(3) Electrical Power

Tie-ins to the site supplied power of 480 VAC 3-phase will be required. The skids will be pre-wired and transformers are provided to facilitate interconnections.

(4) Compressed Air System

A source of dry compressed air at a nominal value of 90 psig is required to support system operations, particularly for dewatering the strainers, the filters and demineralizers.

(5) Heating, Ventilation and Air Conditioning

The PCRV Shield Water System will be located within the Reactor Building to provide the required environmental conditions. No special or additional environmental conditions are required. The system will require a temporary connection to the Radioactive Gas Waste System and the Reactor Building ventilation exhaust system to accommodate the displaced air during the initial filling of the PCRV.

C. System Maintenance

Methods for handling the replacement of radioactive strainers, filter elements and the change out of demineralizer resins will be designed for ease of replacement and will incorporate ALARA concepts, consistent with the recommendations of Regulatory Guide 8.8 (Ref. 10). These components will be shielded as necessary to minimize occupational radiation exposures.

The system will have sufficient interconnecting piping and isolation valves to allow repair or maintenance on a portion of the system while the remainder of the system continues in operation. In the unlikely event of a leak within the system, the entire system will be isolable from the PCRV, or that portion of the system with the leak will be isolated. The strainers, filters, and demineralizers will be designed to minimize exposure during maintenance. The strainers will be provided with inserts for ease of handling during replacement. The filters will be provided with vents and drains, and filter cartridges will be removed into shielded containers to minimize exposure. Strainers, filters and demineralizers will be shielded and provided with radiation monitors within the shielding.

D. System Removal

The system will be used to support ongoing decommissioning operations. When the system is no longer required, it will be dismantled and treated as contaminated BOP equipment and piping. Prior to dismantlement, the system will be surveyed and decontaminated or disposed of as radioactive waste, as necessary.

2.3.3.7 PCRV Top Head Concrete and Liner Removal

The PCRV top head concrete and top carbon steel liner will be removed in two phases:

- Removal of approximately 10 large sections of PCRV top head concrete.
- Removal of a final 2-3 inch thick layer of activated concrete and the top of the carbon steel PCRV liner.

It is planned that the PCRV top head will be cut using diamond wire techniques, and removed in sections that can be handled with the re-reeved Reactor Building crane. These sections will be cut so as to leave a thin horizontal layer of concrete above the PCRV liner. The remaining layer of activated concrete and liner will be removed by breaking an annular portion of the concrete with a mechanical breaker to expose the liner, then cutting the liner. This sequence is performed in this manner to prevent inadvertently breaching the PCRV liner and minimize exposure of equipment and personnel to radioactive material.

Prerequisite activities that are necessary to begin removal of the top head concrete and liner include the following:

1. Detensioning and removal of selected tendons as discussed in Section 2.3.3.5.1.
2. Removal of selected highly radioactive components (control rod elements and metal clad reflector blocks) from the reactor core with the Fuel Handling Machine (FHM) as described in WBS Nos. 2.3.1.8.2 and 2.3.3.4 of the Decommissioning Cost Estimate and discussed in Sections 1.5.2 and 2.3.3.4.
3. Plugging the PCRV cooling tubes, top head penetrations, and tendon conduits as discussed in Section 2.3.3.6.1 and described in WBS No. 2.3.2.3 of the Decommissioning Cost Estimate.
4. Removal of helium purification equipment from PCRV top head wells using the Auxiliary Transfer Cask (ATC) as described in WBS No. 2.3.1.9 of the Decommissioning Cost Estimate and in Section 2.3.3.4.
5. Sealing of PCRV penetrations which are below the PCRV waterline and have had their instrumentation removed as discussed in Section 2.3.3.6.1.
6. Removal of interfering piping, instrumentation, and electrical components.
7. Flooding the PCRV prior to liner removal and acquiring access to the PCRV internal cavity as described in Section 2.3.3.6.

Plugging of the cooling tubes is a necessary requirement to mitigate the spread of contamination from the diamond wire cutting operation. The refueling, high temperature filter adsorber, and access penetrations in the top head in the path of the diamond wire saw will be plugged after the PCRV is flooded to limit the amount of cutting slurry entering the PCRV cavity. Certain penetrations will be designated for use to draw air from the cavity and provide a negative pressure in the cavity. This air will be exhausted to the Reactor Building Ventilation System (System 73) for discharge and will be monitored for concentrations of tritium and other radionuclides.

The first phase, removal of approximately ten large sections of top head concrete, consists of the following major activities (the number and shapes of these sections may change based on detailed engineering evaluation during the planning phase):

1. Seal the top head penetrations to prevent debris from entering the PCRV.
2. Set up the core drilling machines on the external wall of the PCRV to create five horizontal core drilled holes. (Figure 2.3-5).
3. Thread the diamond wire through the intersection points of the cored holes to make a loop to allow cutting of the concrete (Figure 2.3-6).
4. Insert shims in the kerf of the diamond wire cut area to prevent closing of the gap due to the weight of the concrete.
5. Make ten inclined core drilled holes to intersect with the horizontal cut kerf (Figure 2.3-7).
6. Make the five vertical sectioning cuts using the diamond wire method (Figure 2.3-8).
7. Make the six vertical tapered back cuts using the diamond wire method.
8. Rig the sections for removal.

The concrete sections will be cut using the diamond wire cutting process, consisting of a wire with collars containing a diamond-matrix and made to length for each individual cut, and a hydraulic pulley drive system to circulate the wire. The diamond wire is routed to envelop the cut area and then returned to a drive wheel on the drive system. The wheel rotates and pulls the wire through the cut areas. Hydraulic cylinders control the tension of the wire. Once the cut is started, the tension is increased to optimize cutting efficiency.

The diamond wire cutting process will utilize appropriate radiological engineering controls to contain the cutting slurry and control airborne radioactivity. The diamond wire saw uses water as a coolant and lubricant for the cutting process. However, the coolant water is independent of the PCRV Shield Water System. A water collection system will collect the cutting slurry, decant the slurry and recycle the water. In addition, airborne and loose surface contamination control will be achieved by containing the diamond wire path and drive units(s) in a containment tent(s) served by HEPA ventilation.

Removal of approximately ten sections of tophead concrete, of which the lower portions of each section may be activated, will be accomplished utilizing the re-reeved Reactor Building crane. This will leave a thin layer of activated concrete covering the PCRV liner. Specially engineered lifting attachments will be used to safely handle the heavy components, consistent with the requirements of 29 CFR 1926 and applicable ANSI standards. The concrete sections will be moved to a waste processing area for further sectioning, segregation and preparation for disposal. The first phase activity will account for the majority of the effort that will be spent to remove the top head concrete and liner. Occupational exposure is expected to be negligible during the core boring and concrete cutting operations on the top head due to the relatively low radiation fields external to the PCRV.

The second phase consists of removal of the final thin (2-3 inch thick) concrete layer and the top of the PCRV carbon steel liner. In this activity, the PCRV liner plate and adjoining concrete will be sectioned using a combination of circular water-cooled concrete saws, a hydraulic concrete breaker and a thermal torch (oxy-acetylene or oxy-lance). The hydraulic breaker will be remotely operated and therefore is not expected to involve significant personnel exposure. The concrete saw is expected to be a hydraulic-driven, track-mounted, manually-operated saw. Thermal cutting will be performed using a long-handled torch (3 to 4 feet).

The concrete saws will be used to score the cut lines around the circumference and for segmenting cuts. The hydraulic breaker will then chip away the concrete to expose the carbon steel liner (see Figure 2.3-9). The thermal torch (oxy-acetylene or oxy-lance) will then be used to cut through the liner, insulation and cover plate to free sections for removal. The layout and sequencing of cuts will take into consideration the structural stability during the disassembly process. The concrete/liner/insulation disk, after possible further segmentation, will be removed to a waste processing area for further segmenting (if necessary for disposal), segregation and preparation for disposal. Radiological engineering controls will be utilized to control the dust, smoke and potential airborne contamination related to this process. A containment will be constructed across the top of the PCRV, and HEPA ventilation will be provided during these operations. Personnel required to work within the containments will be required to wear the appropriate protective clothing and respiratory protection per ALARA review and RWP requirements.

Of the two phases, the second phase represents the greatest potential for personnel exposure. The PCRV liner plate and the few remaining inches of activated concrete will be uncovered as the final segments of the top head are removed. The PCRV liner plate is estimated to have radiation levels of up to 600 mRem/hr on contact. This estimated exposure rate is a conservative interpretation of information provided in the activation analysis for the bottom side of the cover plate, insulation, liner plate and activated concrete. Workers on the top side of this composite disk are expected to experience a lower exposure rate since the activated concrete will provide shielding from the more highly activated ferrous materials of the liner plate. Shielding for the workers will be utilized as appropriate for the close operations such as installing the saw tracks, operation of the saw and thermal cutting.

The final task of this activity is to set a PCRV work platform on the ledge of the top head opening above the reactor core. This platform will be a rotating platform with openings to provide access to all sections of the PCRV and is described in Section 2.3.3.8.2.

2.3.3.8 Dismantling PCRV Core Components

2.3.3.8.1 General Description - Graphite Blocks

Following the removal of the PCRV top head and installation of the work platform, PCRV core components will be removed. These activities will include the removal of various types of graphite blocks and other reactor internals within the core barrel down to the CSF. A listing of the types of graphite blocks that will be removed during decommissioning activities is identified in Table 2.3-1.

The top layers of blocks (i.e., metal-clad reflectors and some hex reflector blocks without Hastelloy cans) will be removed using the Fuel Handling Machine (FHM) and current plant methods to transfer the components from the PCRV to a shipping container, as discussed in Section 2.3.3.4 and WBS No. 2.3.1.8.2 of the Decommissioning Cost Estimate. Use of the FHM will provide the necessary shielding and containment while transferring components from the PCRV to the shipping containers with minimal personnel exposure. The FHM may be used to remove blocks other than those on the top layer of the core, including defueling elements and hexagonal graphite reflector blocks. However, use of the FHM for this purpose is dependent on its operability, and its availability has not been relied upon as the basis for removal of these components. The following sections provide a discussion for removal of these graphite blocks using manually operated tools.

2.3.3.8.2 General Arrangement of Work Area for Graphite Block Removal

The arrangement of the work area that will be typically used for removal of all types of graphite blocks is provided in Figure 2.3-10. The PCRV will have been filled with shield water to a level approximately 4 feet above the graphite blocks, but below the top of the PCRV liner. Suitable controls will be implemented to prevent water from splashing or the water level from approaching the exposed concrete above the top of the PCRV liner. These controls are necessary to prevent potential contamination of the concrete.

The Work Platform will have been installed on the ledge at the bottom of the hex opening in the PCRV. The Work Platform will be designed with the capability of rotating to provide access to all areas of the core. It will have three access openings to allow insertion and removal of tools and components, which will permit up to three operations to proceed in parallel. A floor will be installed between the platform and the walls of the PCRV at the level of the Work Platform. There will be three jib cranes installed on the refueling floor level to service the access openings in the platform. The Reactor Building crane will also be available to service the platform and the remainder of the refueling floor area.

A ventilation system will be installed to provide control of airborne contamination, including tritium. Air will be drawn from the refueling floor to the Work Platform, down through the access openings in the platform, and then exhausted to the Reactor Building Ventilation (exhaust) System (System 73) for discharge. The discharges from the Reactor Building Ventilation System will be monitored in accordance with the FSV Offsite Dose Calculation Manual (ODCM) (Ref. 11). The airflow from uncontaminated areas to contaminated areas through the Work Platform will minimize personnel exposure to airborne contamination.

The area on the Work Platform will be quite large, approximately 43 feet across the corners of the hexagonal opening. This will provide the capability to move personnel on the Work Platform to a considerable distance away from an operation if a significant radiation field is encountered. During dismantlement operations, workers on the work platform will be protected from direct radiation and airborne contamination during removal of core components from the open PCRV. Radiation protection features include:

- Core dismantlement will be performed underwater, shielding workers and minimizing airborne particulate radioactivity.
- PCRV Shield Water System will strip soluble radionuclides from the shield water. Tritium inventory control is discussed in Section 3.3.2.3 of this plan.
- The ventilation system will ensure a positive downward flow of air over the workers. Exhaust ducts under the work platform will carry air through a HEPA filter, then to the existing plant ventilation system.

- Procedures and equipment for core dismantlement and operation of the work platform will be provided to minimize radiation exposure to workers.
- All work will be performed in accordance with approved Radiation Work Permits.

2.3.3.8.3 Special Considerations During Graphite Block Removal

The graphite block removal tasks represent a significant portion (22%) of the project's total person-Rem estimate. Due to the repetitive nature of the tasks, even small successful reduction measures will result in a significant savings of cumulative exposure. Although this process will benefit from additional future reviews and improvements, the following considerations are being taken to reduce personnel exposures for this series of jobs:

- Use of the PCRV Shield Water System.
- Use of the Work Platform will improve worker efficiency and safety.
- Utilization of a ventilation system to move evaporated tritium and other airborne contaminants away from the work area under and around the platform.
- Use of long handled tools and submerged staging areas to perform potential high exposure activities underwater.
- Use of automated drying equipment to minimize the need for operation by personnel.
- Use of temporary shielding as appropriate to maintain exposures ALARA.
- Installation of additional area radiation monitors (ARMS) with local alarm features to detect unexpected dose rates around the platform work areas.
- Audio-visual communication equipment to support remote surveillance of activities and equipment operations.
- Use of shielding bells.

2.3.3.8.4 Prerequisites for Graphite Block Removal

Prerequisite activities that are necessary to begin removal of the graphite blocks include the following:

1. Flooding the PCRV with shield water as described in Section 2.3.3.6.
2. Removal of the top head concrete and liner as discussed in Section 2.3.3.7.
3. Installing the PCRV work platform as discussed in Section 2.3.3.7.

4. Radiological survey of the work area and installation of temporary shielding if necessary for ALARA purposes.

2.3.3.8.5 General Graphite Block Removal Sequence

The following is the general sequence of operations that will be used for removal of all graphite blocks:

1.	Removing	5.	Unloading
2.	Staging	6.	Dewatering
3.	Loading	7.	Drying
4.	Transferring	8.	Packaging

Since this general sequence of operations will be used for the removal of all types of graphite blocks, the discussion of the eight steps provided below are applicable to the removal of the defueling elements, hex reflectors (with and without hastelloy cans), the large permanent reflector blocks, and side spacer blocks with boronated pins. Relative locations of the graphite blocks within the core area around the circumference of the core, are shown in Figure 2.3-11. The activities that are specific for one type of block are discussed in the subsection following this general discussion.

(1) Removing:

The blocks will be lifted from their position in the PCRV core area, and placed in an intermediate staging area that is below the surface of the water (see Figures 2.3-12 and 2.3-13). This will be accomplished using remotely engaged long handled tools (LHT's) attached to an overhead crane that is operated by personnel on the Work Platform. The workers will be working from the Work Platform that will be installed over the flooded PCRV. The tool for handling the graphite blocks (except the side spacers) will be an expanding collet type similar to that used in the Fuel Handling Machine (FHM). The end of the tool will be inserted into the reverse counterbored hole in the top of the block with the end of the tool retracted. The end of the tool will then be expanded in the larger diameter in the lower portion of the hole and the block will be lifted utilizing an overhead crane. The side spacers will be handled by attaching a lifting bail to the top of the block using the existing threaded holes in the graphite block.

(2) Staging:

After removal from the PCRV core area and while still submerged, the blocks will be lifted and placed on an intermediate stand attached to the work platform (see Figures 2.3-12 and 2.3-13). During this operation, the block will remain submerged underwater. The LHT will be disengaged and removed, leaving the block temporarily stored on the stand.

(3) Loading:

A short handling tool with integral shielding bell will then be lowered into position on guide pins as shown in Figure 2.3-13. A grappling tool will be lowered from the inside of the shielding bell, engage the block, and lift the block into the shielding bell. The shielding bell guide pins and the storage stand will provide the necessary alignment for engagement of the tool. The actual raising of the block will be accomplished in a few minutes.

After the block has been loaded into the bell and the shielding bell has been lifted to just above the floor of the Work Platform, a catch pan with absorbent material (see Figure 2.3-14) will be installed under the shielding bell to contain possible drippings of contaminated water during transport to the dryer/shipping liner. The catch pan will be strong enough to retain the block in the shielding bell in the unlikely event that the grappling mechanism should fail. The catch pan will also provide limited shielding at the bottom of the shield bell. However, this shielding will not be sufficient to fully shield and protect the workers on the platform from the indirect scattering that will occur out of the bottom of the shielding bell. Therefore, during loading operations, radiation levels in the immediate vicinity of the shielding bell will be closely monitored and personnel access to the affected area will be limited by administrative procedural controls.

The expected dose rates on the Work Platform, both with and without the shielding bell, are shown in Figure 2.3-15 for the large permanent side reflector block, in Figure 2.3-16 for the hex reflector blocks without hastelloy cans, in Figure 2.3-17 for the hex reflector blocks with hastelloy cans, and in Figure 2.3-18 for the side spacers without boronated pins.

(4) Transfer:

As the shielding bell is moved from the work platform (using a jib crane or the Reactor Building crane) to the dewatering device and to the dryer, nonessential personnel will be required to stay clear of the area to create a clear path for movement of the load.

(5) Unloading:

Unloading of the shielding bell into the dewatering device will be accomplished by removing the catch pan and lowering the block from the shield bell into an opening in the dewatering device. An alignment fixture will be used as necessary to lower the block into the dewatering device.

(6) Dewatering:

Since some of the graphite blocks contain blind holes that will have collected a small amount of water while submerged in the PCRV, it will be necessary to place the blocks in a dewatering device to drain the water from these blind holes. A schematic of the dewatering device is shown in Figure 2.3-19. After the blocks are unloaded from the shielding bell into the dewatering device, the blocks will be rotated (tipped) approximately 90 degrees. The water that is drained from the graphite blocks will drain from the dewatering device back into the PCRV. The routing of the drain line will be such to avoid crud traps or stagnant water. The blocks will then be moved from the dewatering device into the shielding bell, the catch pan installed, and then moved to a block dryer.

(7) Drying:

Dryer units will be set up on the refueling floor. A schematic of the block dryer arrangement, and loading and unloading positions is shown in Figure 2.3-20. The shielding bell will be positioned on alignment pins over the dryer, the catch pan removed, and the block lowered into the dryer. Pneumatic push rods will progressively push the blocks through the dryer. Air will be drawn into the dryer through spring loaded louvers near the block exit end and exhausted near the block entry end to the existing Reactor Building Exhaust System. It is not planned to heat the air for drying.

(8) Packaging:

The graphite blocks will be re-loaded into the shielding bell from the dryer and transferred to the packaging area. The graphite blocks will be discharged into a shielded shipping container (see Figure 2.3-21), using an alignment fixture as necessary to assure placement for efficient use of available space. After the shipping container is filled, the top will be installed.

2.3.3.8.6 Description of Activities Specific to Block Type

A. Defueling Elements

Removal of the defueling elements will be handled as described in the eight steps described in the previous subsection. The defueling elements are not activated and were uncontaminated when installed in the core. However, cross-contamination is expected to have occurred during reactor flooding and suitable contamination control procedures will be implemented to handle the defueling elements. Due to the very low radiation levels (<1 mR/hr), it will not be necessary to stage the defueling elements and they will not be loaded into a shielding bell for transfer to the dewatering device and dryer.

B. Large Side Reflector Blocks

A typical large side reflector block is shown in Figure 2.3-22. There are 312 large side reflectors, ranging from approximately 522 to 2030 lbs. each, around the circumference of the core as shown in Figure 2.3-11. The initial task is to remove the 24 upper reflector keys, which must be accomplished in order to remove the side reflector blocks. The keys will be detached by removing the five nuts per key or by thermally cutting the keys. The large side reflector blocks will then be removed and processed using the general steps described above. The large side reflector blocks will be handled using a dual collet tool inserted into the reverse counterbored holes. Sectioning of the large side reflector blocks may be required because of packaging requirements. If sectioning is required, it will be accomplished in the Hot Service Facility (HSF), as shown in Figure 2.3-23, after the blocks have been dried. The blocks will be sectioned as necessary for packaging. The blocks will be transferred into and out of the HSF in a shielding bell with catch pan as appropriate.

C. Hex Reflector Blocks Without Hastelloy Cans

Removal of the bottom, side and top hex reflector blocks without hastelloy cans will be handled as described in the eight steps described in the previous subsection. However, a different shielding bell will be used for removal of the hex reflector blocks without Hastelloy cans. This shielding bell will also have a catch pan with absorbent material that will be installed under the shielding bell to contain possible drippings of contaminated water during transport to the dryer/shipping liner. The position of the hex reflector blocks without hastelloy cans in the core is shown in Figure 2.3-11.

D. Hexagonal Graphite Blocks With Hastelloy Cans

Each Hastelloy can hex reflector block has 0.531-inch diameter holes to accommodate Hastelloy cans. There are 270 hex reflector blocks that contain 72 Hastelloy cans and 2 hex reflectors that contain only 4 Hastelloy cans each. The Hastelloy cans are 0.51 inches in diameter, approximately 8 inches long, and contain boronated graphite. The location of Hastelloy can hex reflector blocks in the PCRV is shown in Figure 2.3-11. Table 2.3-1 indicates that the hex reflector blocks with Hastelloy cans have one of the highest radiation levels (300 R/hr) of those irradiated components to be removed from the PCRV with manually operated tools.

Removal of the hex reflector blocks with Hastelloy cans will also be handled as described in the eight steps described in the previous subsection. The Hastelloy cans in the hex reflector blocks are not expected to fall out of the block. Therefore, removal of the Hastelloy cans using a dumping or tipping operation will not be attempted. Removing the Hastelloy cans from the graphite blocks would require the use of some mechanical method (broaching, cutting, pressing, and/or crushing). After considering the methods for removing the Hastelloy cans and comparing them to the alternative of leaving the Hastelloy cans in the blocks, it was decided that the Hastelloy cans would be left in the blocks. Leaving the Hastelloy cans in the blocks eliminates the need for special equipment to remove the Hastelloy cans, simplifies the process of block removal, and will minimize personnel exposure.

E. Side Spacer Blocks With Boronated Pins

The side spacer blocks with boronated pins are shown in Figure 2.3-24. There are 1152 boronated side spacer blocks weighing approximately 100 - 150 lbs each. Their location in the core is shown in Figure 2.3-11 and dimensions of the pins are shown in Figure 2.3-25. The following changes to the eight steps in the general sequence of operations will be used for the removal of the side spacer blocks with boronated pins, due to the dumping of the boronated pins (Figure 2.3-26 is provided to illustrate the steps involved in removing the pins from the side spacer blocks):

(1) Removing

In order to remove the side spacer blocks and dump the boronated pins, a lifting bail will be installed on the top of the side spacer block. These lifting bails will be designed to fit all 19 variations of side spacer blocks and will also provide the means for upending the block to dump the boronated pins and water from the holes (as described in the following paragraphs).

The bail will be positioned on top of the block while it is underwater and will be attached by captured bolts engaging the existing threaded holes in the block. The bolts will be engaged using a long handled torque tool. The bail will be attached to a lifting tool and the block will be moved to a pin dumping station (intermediate stand) that is suspended underwater, under the Work Platform (see Sketch 1 of Figure 2.3-26).

(2) Staging/Dumping

The block will be staged underwater in the pin dumper and the lifting tool will be disengaged. A second tool with integral shielding bell will be reattached to the bail for upending (see Figure 2.3-26, Sketch 2). As the block is upended (Sketches 3 through 5), the pins will fall out onto the intermediate stand. The pins will then be pushed into a hole in the bottom of the intermediate stand and will travel through a chute to a cask liner located beneath the intermediate stand (see Figure 2.3-27). There is sufficient clearance for the pins in the spacer blocks to ensure that they are loose and will drop out of the spacer blocks easily.

The block will then be raised out of the water and into the integral shielding bell and a catch pan attached under the shield bell. The block will be surveyed as it is lifted out of the water and into the bell to confirm that no pins remain in the block. Expected contact radiation levels of the blocks with the pins removed is approximately 3 R/hr, as compared to the radiation levels of blocks containing the pins which are much greater, up to 30 R/hr. Since the block will be removed from the water in the inverted position, it will not be necessary to take it to the dewatering station. The block will be transferred directly to the dryer in the shielding bell.

(3) Drying

The shield bell containing the block will be moved to the dryer and the catch pan will be removed. The shield bell will be aligned on top of the dryer and the block will be lowered to remove the bolts attaching the block to the lifting bail. As noted above, the contact radiation level is expected to be 3 R/hr. The remainder of the operations will be performed the same as outlined in the general sequence of operations.

(4) Boronated Pin Handling

When the pins (60 R/hr on contact) are removed from the block, they will be pushed into a chute and will slide into a shipping cask liner. After a specified number of blocks have had the pins dumped into the liner, the liner will be removed from the PCRV into a shielding bell. The cask liner will have holes in the bottom to allow water to drain out when the liner is removed from the PCRV. A catch pan will be installed, and the shielding bell will be moved and the cask liner transferred to a shipping cask.

2.3.3.8.7 Other Core Components

After removing the graphite blocks identified above, the 24 lower reflector keys will be removed. The lower keys, which are made of Hastelloy X, will have estimated radiation levels of 10 R/hr at 1 meter. The lower reflector keys will be placed in a shielded container under water for movement to the radwaste area for packaging and disposal in a manner similar to that described above.

The removal of the lower keys allows the core support blocks, posts, and post seats to be removed. There are 61 core support blocks and 183 core support posts/lower post seats to be removed after all other core graphite blocks have been removed. They will be removed underwater using grappling tools similar to those identified in previous operations. As each component is lifted from the core, water will be removed from the blind holes and the piece dried. Procedures will be written for handling the components. After drying, the larger core support blocks will be sectioned. The components will be packaged and loaded into shielded shipping containers.

2.3.3.9 Removing the Core Barrel

The following prerequisites must be completed to begin dismantlement of the core barrel:

1. The PCRV top head concrete has been removed.
2. The PCRV has been flooded above the core barrel with shield water and water clarity has been established as discussed in Section 2.3.3.6.
3. Reactor core graphite blocks have been removed from the PCRV to a level low enough to permit the cutting of a core barrel section.

The core barrel and core barrel keys will be segmented underwater using remotely operated cutting equipment after the graphite core components are removed. However, if radiological surveys in the core barrel indicate that actual radiation and contamination levels are low, the PCRV water level will be progressively lowered and the core barrel and outer keys will be thermally cut above the water line. Exhaust hoods, powered by HEPA-filtered air handlers, will be positioned at the water surface or, if the cut is performed dry, in close proximity to the cut. These exhaust hoods will capture the majority of the fumes at their source. While cutting of the core barrel above the water line appears to have a schedule advantage over the underwater cutting, it will only be considered if it can be justified by an ALARA review.

If the removal of graphite core components is interrupted due to a shortage of shipping casks, work would commence cutting the core barrel underwater using remotely operated cutting equipment as the core barrel is exposed with the removal of successive layers of graphite core components. This is not expected to affect safety, occupational exposure or cause an undue schedule delay.

With either cutting alternative (i.e., underwater or above the water line), the major activities for removing the core barrel are as follows:

1. Rigging the core barrel sections for removal.
2. Making horizontal and vertical cuts in the core barrel to segment it into sections suitable for handling.
3. Removing the core barrel segments out of the PCRV.
4. Progressively removing the outer keys and thermocouple expansion joint assembly that is between the PCRV liner and the core barrel.

The cutting of the core barrel will be performed with the Work Platform in place. For underwater cutting, a mast or a remotely positioned track-mounted cutting tool will be operated from the Work Platform to make the vertical cuts around the core barrel. When the vertical cuts are complete, rigging will be attached to the core barrel segments prior to making the horizontal cuts. The horizontal cut will then be made and the core barrel segment removed. The jib cranes will be used to lift the segments to awaiting LSA boxes positioned adjacent to the opening on the work platform. The cut pattern will be predetermined based upon the size of LSA containers selected and the features of the remote cutting system. For disposal and cost estimating purposes, it was assumed that the segments were 7.5 feet high X 3.5 feet wide for a 4 foot X 8 foot LSA box and cutting was performed by a sequence of vertical cuts followed by horizontal cuts. However, if it is determined that larger pieces can be packaged, a reduction of time and exposure will be achieved. This process will continue down the entire length of the core barrel until approximately two feet of core barrel remains above the silica blocks. Removal of the lower portion of the core barrel will be coordinated with the removal of the silica insulation that is on top of the CSF.

The core barrel sections will be surveyed as they break the water to determine exposure rates before being handled. The segments are expected to have a contact dose rate of 40 mR/hr. Loose contamination is expected to be moderate (100,000 - 300,000 dpm/100 cm^2). Loose surface contamination from pieces removed from the water will be controlled by a combination of pressure washing, rinsing with clean water, wet vacuuming and swabbing. These measures will control the spread of contamination and minimize potential for airborne contamination.

2.3.3.10 Removal of the Core Support Floor (CSF)

The prerequisites necessary to begin work on the CSF are as follows:

1. All core components have been removed from the PCRV.
2. The core barrel has been removed to within a few feet of the top of the CSF.
3. The shield water has been drained down to within a few feet of the top of the CSF.
4. Loose contamination has been removed from or stabilized on the interior walls (insulation cover plate) of the PCRV.
5. The Work Platform is removed prior to lifting the CSF to the upper PCRV area.

The radiological conditions expected at this time are based on two sources, the PCRV cavity walls and the CSF. The cavity wall source consists of the fixed contamination on the wall and activated cover plate, insulation, liner plate and concrete. The dose rate from this source is estimated to be 30 mR/hr at any point within the PCRV. The CSF, as a radioactive source, consists of the surface contamination and the activated insulation on the top of the CSF, the activated CSF cladding plate, and the activated concrete. The dose rate contribution from the CSF is expected to be 400 mR/hr on contact with the insulation in place. Removal of the insulation from the top of the CSF, which contains various components and retaining devices made of Inconel, will reduce the exposure rate to approximately 360 mR/hr.

2.3.3.10.1 Removal of CSF Silica Blocks, Cover Plates and Insulation

As currently planned, the water level will be lowered to just above the top surface of the CSF. As the water level is lowered in the PCRV, the walls will be washed down with clean water to remove residual loose contamination. A remotely-operated electro-hydraulic ram hoe will be lowered into the PCRV to break up the silica blocks (see Figure 3.1-30). A removable seal plate will be affixed to each of the 12 steam generator penetrations in the CSF to prevent loose debris from entering the steam generator modules. After the silica blocks have been fragmented, a bucket attachment will be affixed to the ram hoe to remove loose debris. The ram hoe controls and operator will be on a working platform above the CSF to minimize personnel exposure. The silica block debris will be removed in unshielded containers, since radiation levels are expected to be less than 500 mR/hr. The PCRV water level will be left slightly above the CSF to minimize the potential for airborne releases during this operation.

After the silica block debris has been removed, the insulation cover plates will be peeled up by the ram hoe with a sheet ripping attachment. The cover plates and any loose silica debris can be picked up, vacuumed, or scooped up at this time. The steam generator penetration seal plates will then be removed. Once the insulation on top of the CSF has been removed, the remaining two feet of the core barrel will be removed in a manner similar to that described in Section 2.3.3.9.

2.3.3.10.2 <u>Removal of the Core Support Floor</u>

The CSF is a large disc approximately 29 feet in diameter by 5 feet thick and weighing 270 tons. As noted in Section 2.2.2, the following items must be disconnected to allow removal of the CSF from the PCRV:

(1) 12 steam generator helium inlet ducts.
(2) 12 steel support columns, located near the CSF periphery, that are welded to the cladding plate and contain an array of cooling tubes and instrumentation tubes.

There is also a monorail spider consisting of twelve heavy structural steel beams on the bottom side of the CSF, that were used to position the steam generators during construction.

Since the existing Reactor Building crane has a capacity limit of 170 tons, the CSF will be jacked-up, sectioned, surveyed and removed in sections that can be lifted by the re-reeved Reactor Building crane. Due to the tight clearance between the CSF and the PCRV cavity walls, it is necessary to raise the CSF to the upper PCRV region in order to provide access to the sides of the CSF for cutting and sectioning. The major activities that will be performed to cut and remove the CSF include the following:

1. Raising the CSF

Prior to lifting the CSF, workers will require access to the area immediately above the CSF inside the PCRV to perform the cutting of the steam generator ducts and CSF columns, and to attach the lifting cables to the CSF. These activities will be accomplished using a man-basket suspended from a crane. This method will minimize the time that will be spent in the radiation field and minimize the resultant exposure. The use of the man-basket will comply with the requirements of 29 CFR 1926.550(g) and will also be coordinated with the containments that will be in place during the various phases of the work.

Unless dose rates are determined to be significantly below those estimated, it will be necessary to disconnect the steam generator penetrations and the CSF support columns using underwater cutting. Therefore, PCRV water level will be maintained slightly above the top of the CSF to provide adequate shielding during performance of these activities. Underwater cutting, in combination with exhaust hoods and respiratory protection, will provide a suitably safe environment. A localized containment may be used to prevent the spread of airborne contamination to other areas or workers.

Stress analysis of the CSF columns will be utilized to determine the number of columns required to support the CSF at this stage of dismantlement. After the CSF has been cut free from the steel support columns, the CSF will be lifted and supported inside the PCRV. The CSF will be raised to the PCRV top head region using a strand jacking system, which uses multiple cables attached both to the CSF and to the jacking stations that have been established on top of the PCRV (see Figure 2.3-28). After raising the CSF, supports will be installed on the PCRV ledge where the PCRV top head was previously cut and removed, and the CSF will then be lowered onto these supports.

2. Segmenting the CSF

With the CSF supported in the top head area, segmenting the CSF into sections will begin. Prior to initiation of segmenting activities, radiological surveys will be performed to determine the extent of the activation in the CSF. Based on the results of the radiological surveys, shielding may be placed over the top of the CSF to reduce radiation levels to acceptable levels. Radiological containments may also be constructed if determined necessary.

Segmenting the CSF will be performed using the diamond wire cutting operation. The primary work area for the segmenting activity will be around the perimeter of the CSF. This will keep the workers away from the top of the CSF which is the significant source of radiation exposure. The diamond wire cutting process is adequate to segment the CSF and the monorail spider located under the CSF, eliminating the need to remove this monorail separately. Individual segments of the CSF will be removed by the Reactor Building crane to the fuel deck staging area, where the segments will be prepared for disposal.

2.3.3.11 Disassembling the PCRV Lower Plenum

During prior operations, the helium ducts connecting the CSF floor to the 12 steam generators were severed and the CSF was removed from the PCRV and the water level lowered to below the CSF. Removal of the CSF will make lower plenum components accessible, including the steam generator primary assemblies, the helium diffusers, the CSF support columns, the lower floor, the lower plenum insulation and other miscellaneous components (see Figure 2.2-5). The following prerequisites should be completed prior to beginning removal of the helium circulator diffuser assemblies and the steam generator primary modules:

1. The helium circulator and steam generator secondary assemblies outside the PCRV have been removed.
2. The steam generators have been disconnected from the PCRV penetration flanges.
3. The CSF has been removed from the PCRV.

2.3.3.11.1 Steam Generator Primary Assemblies:

Each steam generator primary module is approximately 6 feet in diameter, 26 feet in height and weighs 65,000 pounds. The radiation source is primarily attributable to plateout contamination with a minor contribution due to activation. The uppermost portion of the primary steam generator nearest the outlet of the reactor is estimated to have a contact dose rate of 700 mR/hr. The lower portion of the primary steam generator is estimated to have a contact dose rate of 50 mR/hr. Localized hot spots on the generators are estimated to be up to 2 R/hr on contact.

1. Disconnecting the Steam Generator Primary Assemblies

The primary modules will have been structurally disconnected from the PCRV penetration flanges during the activity that removed the uncontaminated steam generator secondary assemblies. That task (Section 2.3.3.3.2) will have been accomplished in an uncontaminated environment with a low radiation field. The primary modules remain connected to the PCRV internals by the connection of the steam generator shrouds to the plenum floor in the lower portion of the PCRV and must be disconnected to allow the lifting of the primary modules from the PCRV. The separation of the steam generator primary modules from the plenum floor is the most complex task associated with the primary steam generator removal tasks. The steam generator helium inlet ducts, which were cut from the bottom of the CSF, will be removed from atop the steam generator primary assemblies.

The steam generator primary assemblies will be rigged (to the Reactor Building crane using standard rigging techniques and devices) to secure them before the final severance cut. The PCRV water level will be maintained above the top of the primary module to reduce radiation levels while it is being separated from the plenum floor. The steam generator will be disconnected from the plenum floor using remotely-operated cutting equipment, by cutting the clamp or lower seal at the connection of the steam generator shroud to the lower floor. Any remaining instrumentation or connections between the steam generators and the lower plenum will be severed remotely.

Due to the expected radiation levels associated with the steam generator primary modules and the limited access in the area of the joint between the primary modules and the lower plenum floor, there is no simple means of making the separation. An alternative method for separating the steam generators from the plenum floor requiring similar precautions and effort is to remotely cut the plenum floor around the attachment location, using either an oxy-lance or a plasma torch. The method to be used will be based on an evaluation of the performance characteristics of both methods in the limited access in which it will be used.

Either of these methods would be utilized underwater to derive the benefit of the water for shielding the workers from radiation. Fumes from cutting and any potential airborne contamination will be collected by an exhaust hood at the surface of the water. However, if radiological surveys of the primary modules indicate that actual radiation and contamination levels are low, the PCRV water level may be lowered to obtain more direct control during the separation of the primary module from the lower plenum floor. Lowering the PCRV water level will only be considered if it can be justified by an ALARA review.

2. Removing the Steam Generator From the PCRV

Upon separation from the lower plenum floor, the steam generator will be removed from the PCRV cavity by the Reactor Building crane. As the primary assemblies are lifted from the PCRV, the outer shroud and tube outer surfaces will be washed down to remove as much contamination and cutting debris as possible, and will be allowed to drain as necessary over the PCRV cavity. The primary module will then be enveloped with poly film or Herculite to prevent the spread of loose contamination. During the movements of the modules, radiation protection personnel will ensure that distance is maintained between the workers and the source to keep exposures ALARA.

As discussed in Section 2.3.3.11, the steam generators will be moved to the truck bay to pre-staged containers for packaging for shipment. Due to the high contact dose rates that are anticipated on the steam generator primary assembly (economizer, evaporator, and superheater sections), a special shielded shipping container (Figure 2.3-29) will be required. The shipping container will consist of a metal culvert section seven foot in diameter by 27 feet long. The culvert section will be cut in half lengthwise to provide a hollow half-cylinder. Structural supports will be welded to the half section of culvert to provide structural support. The container design will take into account stay times such that radiation exposure will be minimized during packaging of the modules. Local shielding will be utilized as appropriate.

Support saddles will be mounted inside the culvert and serve a dual purpose. First, the saddles provide a means of attaching the steam generator primary assembly to the culvert and transmitting the load to the structural supports on the outside of the culvert. Second, the saddles will keep the steam generator primary assembly centered in the culvert with an annular space of about 8 inches between the inside diameter of the culvert and the outside diameter of the steam generator primary assembly.

After it is removed from the PCRV, the primary assembly will be lowered through the refueling deck access hatch to the truck bay. The partial shipping container with the steam generator will be moved to the packaging and shipping area, and the top half of the container will be installed. If required, the annular portion of the steam generator between the shroud and the tube bundle support column may be filled with grout which will encapsulate the tube bundle of the steam generator. In addition, grout may be pumped into the feedwater and steam tubes of the primary assembly. Due to the high contamination levels, it may be necessary to fill the 8-inch annular region between the outside of the steam generator shroud and the inside of the culvert with grout for shielding.

The combined weight of the shipping container, steam generator assembly, and grout will be approximately 195,000 pounds. If actual contamination levels in the steam generator primary assemblies are lower than expected, the shielding grout in the annular space between the steam generator shroud and the container may be omitted with a weight savings of about 56,000 pounds.

2.3.3.11.2 Helium Diffuser and Shutoff Valve Assemblies

The helium diffuser assemblies will have been detached from the PCRV penetrations after removal of components from within each penetration. The helium diffuser and shutoff valve assemblies will be removed using techniques similar to those described above for removal of the steam generator primary assemblies. Radiation levels on the helium diffuser assemblies are expected to be much lower than those experienced on the steam generator primary assemblies. The helium diffuser and shutoff valve assemblies will be disconnected by remotely cutting the clamp at the connection of the diffuser to the lower floor. The assemblies will be rigged to the Reactor Building crane, removed and transferred to the waste handling area for processing and disposal. Due to the lower radiation levels, no special shipping containers will be required.

2.3.3.11.3 Remaining Components

With the steam generators and helium diffusers and shutoff valves removed, all of the significant radiation sources in the PCRV will have been removed. This will allow the PCRV vessel to be totally drained. The work remaining in the lower plenum includes the removal of the CSF support columns, the lower floor and other miscellaneous lower floor area components, and the insulation and insulation cover plates on the PCRV liner and penetrations. These features will be removed utilizing hands-on tools and will be processed for disposal. The Kaowool insulation removed in this activity will most likely require removal of the absorbed water to assure compliance with shipping and disposal regulations. The removal of the absorbed water will initially be accomplished by pressing or squeezing the wet Kaowool, or other suitable drying techniques as required. All of the remaining components in the lower plenum will be removed and transferred to the waste handling area for processing and disposal.

During these final dismantling activities, the dose rates inside the PCRV lower plenum will be significantly lower than during previous operations since the largest radiation source, the steam generators, will have been removed. It is estimated that the general area radiation level will be low enough to allow activities to be performed in the lower plenum manually, which will increase productivity and still be ALARA acceptable.

2.3.3.12 Final Dismantling, Decontamination, and Cleanup Activities

The following activities are included in this task:

1. Scoring and cutting the PCRV sidewall insulation and liner.
2. Cutting and removing the activated concrete in the beltline region of the PCRV (See Figures 2.3-30 and 2.3-31).
3. Removal and/or decontamination of all remaining contaminated concrete.
4. Decontaminating the PCRV lower plenum liner.
5. Performing the final survey of the PCRV.
6. Demobilization and decontamination of the PCRV D/D tools and equipment.
7. Disposal of the PCRV Shield Water System.

The activated concrete will be removed in sectional units from the side walls of the PCRV, with the attached liner and both layers of thermal insulation intact as part of each unit. Diamond wire cutting has been selected as the method to remove the activated concrete sections.

The thermal insulation, steel cover plates and steel seal sheets will be cut, and the liner plate will be scored by thermal methods before the concrete is cut with the diamond wire technique. This prevents the diamond wire from entangling in the steel seal sheets and insulation.

Tendons which must be removed for access of the diamond wire will be detensioned and removed. Other tendons detensioned to relieve compressive stress on the kerf of the diamond wire cut will be left in place. This was discussed in Section 2.3.3.5.

Circumferential tendons at the elevations of the horizontal cuts will be removed to provide a path for the diamond wire. The diamond wire cuts will be made in two steps from opposite directions, making a complete cut underneath the activated belt line concrete as shown in Figure 2.3-30.

The inner ring of vertical PCRV tendon tubes, located 32 inches from the PCRV sidewall, are suitably positioned for removing the beltline activated concrete (see Figure 2.3-31). However, in the event that these tendon tubes prove to be unsuitable for the initiation of diamond wire cuts, new vertical holes will be core drilled.

Communications down the vertical tendon tubes or new core drilled holes, through the horizontal cut, and up through the PCRV interior will allow threading of the diamond wire for the radial cuts to be made. Sections of concrete, liner and insulation that are approximately 3 feet thick, 8 feet wide, and 40 feet long will be produced and rigged to the Reactor Building crane before the final back cut is made between every third tendon tube. These sections will be moved to a radwaste processing area for further cutting and preparation for disposal.

This cutting technique will remove a maximum depth of 32 inches at the tendon tube and a minimum depth of approximately 27 inches midway between the tendon tubes. This minimum removal depth is adequate to meet the activation analysis requirements (plus uncertainties) described in Section 3.1.4.1.

| The PCRV Shield Water System will be dismantled and decommissioned similar to balance of plant piping system. The system will be drained and the water processed as liquid waste as discussed in Section 3.3.2.2. The piping and components will be decontaminated, dismantled and packaged for disposal. The demineralizers will be the last items taken out of service. The demineralizer resins will be processed, packaged, and disposed of as radioactive waste. The demineralizers will be leased equipment, and will be decontaminated and packaged as necessary for return to the owner.

Following the removal of the activated beltline concrete, a final cleanup and decontamination of the entire PCRV cavity will be performed. Decontamination methods may include conventional wiping techniques, scabbling, scarifying, vacuum sand blast, or a hydrolaser method, depending on the degree to which the contamination is fixed on the surface. A survey of the PCRV will be conducted to verify that free release criteria has been met.

As dismantlement activities proceed, guardrails, covers, barricades, caps, etc., will be placed as appropriate consistent with industrial safety considerations. Upon completion of PCRV activities, a top head closure along with other appropriate penetration caps and guardrails will be installed in compliance with good industrial safety practices.

2.3.4 Contaminated BOP System Dismantlement and Decontamination

2.3.4.1 Introduction

The decontamination and dismantlement of contaminated or potentially contaminated balance of plant systems will be done by either (1) decontamination in place, (2) removal and decontamination, or (3) removal and disposal as radioactive waste. Systems which are contaminated or potentially contaminated above releasable limits requiring decontamination or dismantlement include the following:

1. System 13 - Fuel Handling Equipment
2. System 14 - Fuel Storage Facility
3. System 16 - Auxiliary Equipment
4. System 21 - Helium Circulator Auxiliary Equipment
5. System 23 - Helium Purification System
6. System 24 - Helium Storage System
7. System 46 - Reactor Plant Cooling Water System
8. System 47 - Purification Cooling Water System
9. System 61 - Decontamination System
10. System 62 - Radioactive Liquid Waste System
11. System 63 - Radioactive Gas Waste System
12. System 72 - Reactor Building Drain System
13. System 73 - Reactor Building Ventilation System
14. System 93 - Instrumentation & Controls

Contaminated balance of plant decommissioning is scheduled to coincide with fluctuations in critical path PCRV activities to level project manpower and to minimize competition for use of plant equipment.

In general, contaminated or potentially contaminated piping, components, structures, walls and ductwork will be dealt with in the following manner. Potentially contaminated items will be surveyed to determine acceptability for unrestricted free release or to determine the cleanup required for release. Verification that plant systems or structures may be released for unrestricted use will be provided by a comprehensive radiological assessment that provides statistically significant confidence levels for all plant systems. Since the plant systems cannot be altered for these detailed radiological surveys until the systems are no longer needed to meet NRC license requirements, the detailed surveys will be conducted during the implementation phase of the decommissioning project. The results of these radiological assessments will be used to determine the workscope required for final removal of contaminated or potentially contaminated systems and components.

The piping and equipment removal experience gained at the Shippingport Station Decommissioning Project demonstrated that contaminated or potentially contaminated piping and components can be quickly removed by plasma-arc torch without compromising contamination controls when aided by portable HEPA filtered ventilation units. Because of the relatively small volume of contaminated piping at Fort St. Vrain, however, the cost and support requirements of plasma-arc torch operations (setup, torch maintenance, and HEPA-filter changeout) may dictate the use of other methods, such as portable band saws, hydraulic shears, and alternate thermal cutting processes such as oxy-acetylene. Piping will be cut into segments of approxima[illegible] ng is removed, the open ends will be covered and the pi[illegible] ed in LSA containers (e.g., a 4-ft X 8-ft X 3-ft box). All pi[illegible] umentation, valves, and fittings can be packaged in this size of waste containers.

Piping will be removed by following controlled steps in accordance with project procedures and radiation work permits. System tagout procedures will be followed to de-energize pumps and other electrical equipment. Piping dead legs and traps will be drained of residual water. Piping released for removal will be positively marked before being turned over for dismantling. Contamination controls and waste containers will be set up to support dismantling operations. Contamination controls will include saddle tap valves for draining residual water, drip containments to capture metal filings, HEPA vacuums, anti-contamination clothing, and respirators, as identified by the radiation work permits. Contamination control enclosures may be built where necessary to prevent spread of contamination.

Any potentially contaminated piping that is embedded in concrete will be separated from the rest of the piping system near the face of the concrete structure and internally surveyed with a detector probe inserted into the pipe. Embedded pipe that satisfies the release criteria identified in Section 4.2 will be capped, tagged, and abandoned in place. Piping that does not meet the release criteria will be internally decontaminated by scrub brush or pipe-turning tools, such as a boiler tube cleaner, and internally wiped with moist rags until it meets the release criteria. If it is embedded near the surface, the pipe may be removed from the concrete with a concrete coring tool.

2.3.4.2 System 13 - Fuel Handling Equipment

The contaminated fuel handling equipment at Fort St. Vrain includes the fuel handling machine (FHM), five reactor isolation valves (Figure 2.2-11) and two refueling sleeves (Figure 2.2-12). However, the residual radiation and contamination levels for this equipment are low enough to allow manual disassembly on the operating floor.

During decommissioning activities, the following System 13 components will be used:

1. The FHM will be used to remove MCRBs from the PCRV and to place them into shipping containers or an interim storage area (such as the Fuel Storage Wells (FSW)). If placed into an interim storage area, the MCRBs will have to be removed by the FHM and placed directly into shipping containers. It may also be used to remove the Region Constraint Devices from their storage

location and to place them into shipping containers. The ATC may be used for removal of helium purification components from the PCRV top head.

2. The Refueling Sleeves (H-1304) are required to guide the FHM arm while it is in the PCRV removing MCRBs, and when unloading MCRBs from the FHM into a shipping container in one port of the Hot Service Facility (HSF).

3. The Reactor Isolation Valves are required to adapt the FHM to the PCRV and to the facility (FSW, HSF, Fuel Loading Port, Regen Pit) into which it will be unloaded.

4. The System 13 Fuel Handling Purge System provides helium to operate internal actuators in the FHM. This helium is supplied from System 24, via System 13 piping and the FHM umbilical. If either System 24 or the System 13 Purge System is inoperable, pressurized air can be used to operate the actuators.

5. The HSF Adapter & Sleeve Assembly (Zook Sleeve) and the Modified Refueling Sleeve (S-1615) will only be used if the FHM is to interface with the HSF for loading shipping containers, and repair, maintenance, and interchange of grapple heads/manipulators.

6. The Fuel Loading Port and associated equipment may be used as an area for unloading MCRBs from the FHM.

7. The Core Servicing Manipulator (H-1603) and Core Service Vacuum Tool Assembly (H-1606) are FHM attachments which may be used for special operations within the PCRV and shipping containers.

8. The spare grapple (H-1301), spare mast camera (H-1601), and spare Z-drive pumps may be used in the event of a failure of the primary component, allowing repair without affecting MCRB removal operations.

9. The Shipping Cask Loading Seal Adapters (S-1604-250) may be used if the FSV shipping liner/casks are to be used.

The FHM will be externally surveyed and any loose contamination removed. It will then be disassembled into its component parts as necessary for decontamination or disposal. Sleeves will be attached as necessary to maintain a contamination envelope. The body of the FHM will be decontaminated and will be left on the refueling deck if release for unrestricted use limits are achieved. If further disassembly is required for release, the lead shot will be removed and the body will be segmented to segregate the contaminated material from the uncontaminated components. The contaminated scrap will be disposed of as described in Section 3.3 of this plan.

The reactor isolation valve exteriors will be surveyed and decontaminated by manual means. The valves will be removed from the operating floor and the lead shot removed. The shot is not expected to be contaminated or activated. The valve bodies will be disposed offsite according to Section 3.3 of this plan.

The refueling sleeves will be surveyed and decontaminated by manual means, then surveyed for release for unrestricted use. If they cannot be decontaminated, they will be disposed of as described in Section 3.3. The purge vacuum system will be removed and disposed of as described in Section 3.3.

2.3.4.3 System 14 - Fuel Storage Facility

The fuel storage facility consists of nine fuel storage wells (FSWs) constructed of carbon steel liners suspended in concrete pits.

The FSWs were used for storing new and irradiated fuel during normal plant operation and may be used to temporarily store MCRBs or graphite reflector blocks during decommission. All fuel will have been removed from the Reactor Building prior to initiation of decommissioning activities. The actual contamination levels in the FSWs will be determined after the fuel has been permanently removed.

During decommissioning activities, the System 14 FSWs may be used as an interim storage area for MCRBs when they are removed from the PCRV with the FHM.

When the FSWs are no longer needed, each of the nine inner storage wells will be decontaminated to the criteria for release for unrestricted use, surveyed, and the top access plugs replaced. The outer wells and the reactor plant water cooling system are not contaminated and no outer well decontamination or dismantling is expected to be required. The water cooling system piping at the bottom of each pit will be cut open for survey.

Decontamination of the FSWs will be accomplished using a HEPA filtered vacuum. Following vacuuming, the wells will be mechanically blasted with sand grit or cleaned using a hydrolaser. Spent sand will be collected in catchments placed at the bottom of the well. The well drain pipe will provide water drainage if hydrolaser operation is used. After sandblasting or hydrolasing, the five standoff plates at the bottom of the wells will be removed manually. This will provide access for the final release surveys.

Minor components will be shipped as radioactive waste rather than decontaminated. the well plugs will be decontaminated and replaced and sealed after the release surveys have been completed.

2.3.4.4 System 16 - Auxiliary Equipment

The auxiliary equipment consists of the Auxiliary Transfer Cask (ATC, (Figure 2.2-12), ten Equipment Storage Wells (ESWs), (Figure 2.2-14), the Hot Service Facility (HSF), (Figure 2.2-15), and two shielding adapters (Figure 2.2-16).

The ATC was used to tra sfer the control rod drive assemblies, refueling sleeves and the shield plugs to and from the ESWs. The ten ESWs are carbon steel structures embedded in concrete. They were used to store the control rod drives and the refueling sleeves. The HSF is constructed of concrete and steel shielding and was used for inspection, repair, maintenance, testing and decontamination work.

Figure 2.2-16 is a general layout of the location of the various fuel handling and storage system components and associated auxiliary equipment on the refueling floor.

During decommissioning act. ties, the following System 16 components will be used:

1. The ATC may be used for removing and installing Refueling Sleeves into the PCRV during MCRB removal. The ATC may also be used for remov shield plugs from the ESWs, removing helium purification components, well as retrieving and storing the Refueling Sleeves in the ESWs. If Region Constraint Devices (RCDs) or Control Rod Drives and Orificing Assemblies (CRDOAs) are stored in the ESWs at the beginning of decommissioning, the ATC may be used to remove them.

2. The ESWs may be used as a shielded interim storage area for activated/contaminated components, such as Refueling Sleeves, long-handled tools, and core components. The ESWs may contain CRDOAs and/or RCDs at the start of Decommissioning which will have to be removed during Decommissioning.

3. The Shield Adapters are required to adapt the ATC to the ESWs (for removal and storage of the Refueling Sleeves), to the PCRV (for insertion/removal of the Refueling Sleeves), or to the HSF, Regen Pit or Fuel Loading Port (for miscellaneous activities).

4. The HSF may be used as a multi-purpose area. Uses include: a general dismantlement/decontamination area, an area for holding shipping containers as they are loaded by the FHM or other means, and/or a shielded interim storage area for activated/contaminated components.

All the components of the ATC above the top base (32 ft. 11 in. above the operating floor) will be removed using the Reactor Building crane. A containment sleeve will be used to seal the contaminated ports in the cask and the hoist assembly floor as they are separated. The hoist cover and lift extension will then be lowered to the operating floor and disassembled within a contamination control envelope. The components will either be packaged and shipped for burial or to a licensed facility for processing and final disposition, or decontaminated and released for unrestricted use.

The remaining structure of the ATC will be decontaminated on site. The internal bore will be decontaminated using mechanical means such as sand blasting or hydrolasing to the criteria for release for unrestricted use. After internal decontamination, the crane will be used to lay the cask body over onto the floor for disassembly and decontamination of the bottom flange. When all surfaces meet the criteria for release for unrestricted use, it will be lifted by the crane and returned to storage on the operating floor.

The three shielding adapters will be decontaminated manually to the criteria for release for unrestricted use.

The ten ESWs are internally contaminated and will be decontaminated to the criteria for release for unrestricted use and abandoned in place. Contamination levels in the ESWs will be determined when they are no longer needed. After the plugs are removed, the ESWs will be vacuumed using a HEPA vacuum assembly similar to that for the FSWs. After vacuuming, the ESWs will be further cleaned using mechanical methods as necessary to reduce the contamination to the criteria for release for unrestricted use. After decontamination, the wells will be surveyed for release for unrestricted use. The top access plugs will be decontaminated, replaced and sealed.

Following final use of the HSF for decommissioning activities, all equipment(such as the manipulators and service platform sling) will be removed. This equipment may either be decontaminated onsite or packaged and shipped to a licensed facility for processing and final disposition. The walls, floor, ceiling and remaining structural components will then be decontaminated by sandblasting or hydrolasing. HEPA-filtered ventilation will be used to maintain a negative pressure in the HSF during decontaminations.

2.3.4.5 System 21 - Helium Circulator Auxiliaries

The auxiliary equipment for System 21 was used to provide a supply of high-pressure water for the helium circulator bearing lubrication and a supply of purified buffer helium to prevent in-leakage of bearing water into the primary coolant helium. The major equipment items include buffer helium recirculators, heat exchangers, filters, pumps, helium dryers, chemical injection components, containment tanks, and compressors (see Figure 2.2-17).

Following the defueling of the reactor, the helium circulator system will no longer be used. It has no function in the decommissioning of the facility.

Contamination has been detected within the helium circulator auxiliary equipment. Surveys will be performed during disassembly to determine the extent of the contamination.

2.3.4.6 System 23 - Helium Purification Auxiliaries

The helium purification auxiliary equipment consists of two trains and was used to assist in purification of the helium used as the primary reactor coolant. Most of the contaminated major equipment items are located in the PCRV top head and include filters, adsorbers, heat exchangers, dryers and piping (see Figure 2.2-18).

System 23 equipment is located in the top head in eight wells. This equipment will be surveyed and a determination made whether to remove the equipment with the ATC or by manual means. All System 23 equipment located in the PCRV top head will be disposed of as radioactive wastes. After the wells have been emptied, they will be surveyed and decontaminated as necessary.

The remainder of the helium purification system will be surveyed and decontaminated or removed as necessary.

2.3.4.7 System 24 - Helium Storage System

The primary purpose of the helium storage system was to provide for both storage and transfer of helium from the reactor vessel to the storage tanks. In addition, the helium storage system was used in testing the control rod reserve shutdown system and for various FHM purging operations. The primary equipment items include a helium transfer compressor, storage tanks, oil absorber, and high-pressure helium supply tanks (see Figure 2.2-19).

Following the defueling of the reactor, the helium storage system will no longer be used. It has no function in the decommissioning of the facility.

The helium storage compressors have been found to be contaminated. This system, including the 108 helium storage bottles, will be surveyed during disassembly to determine the extent of the contamination. The results of this survey will be used to determine decontamination or disposal requirements for specific components.

2.3.4.8 System 46 - Reactor Plant Cooling Water System

The reactor plant cooling water system (see Figure 2.2-20) provided cooling water for process heat removal from all auxiliary equipment in the reactor plant. Three loops were provided that formed the PCRV circuit (liner cooling tubes), the PCRV auxiliary circuit (closed loop for various systems/components) and the service water circuit (open loop for various systems/components). The major equipment items include surge tanks, pumps, demineralizers, filters, heat exchangers, chemical injection (tank and pump) and recondenser chiller.

Portions of the system external to the PCRV have been found to be contaminated. The system will be surveyed during disassembly to determine the extent of the contamination. Cleanup or disposal requirements will be determined based on survey results.

The reactor plant cooling water system loop supplying the PCRV will not be used for cooling of plant components during decommissioning. It will be disconnected and isolated from the PCRV and from the FSWs before decommissioning of those systems occurs. Fifty percent of the PCRV cooling tubes will be cut and surveyed.

2.3.4.9 System 47 - Purification Cooling Water System

The purification cooling water system (two loops) provided cooling water to the helium purification system heat exchangers. The major components are pumps, expansion tanks, exchangers and associated piping (see Figure 2.2-21).

This cooling water system has been found to be contaminated. The system will be surveyed during disassembly to determine the extent of the contamination. Cleanup or disposal requirements will be determined based on survey results.

The purification cooling water system will be isolated from the helium purification system before it is decommissioned. The purification cooling water system has no other use during the decommissioning.

2.3.4.10 System 61 - Decontamination System

The decontamination system consists of a water heater, a drying air heater, a filter, pumps, a solution tank and a chemical injection system (see Figure 2.2-22).

The decontamination system will be surveyed to determine the extent and location of radioactive contamination following final system use. The decontamination system components are small, and will be removed and packaged in LSA shipping containers along with other contaminated components and piping. The decontamination solution tank may be removed in one piece for shipment, or segmented and packaged in LSA shipping containers.

2.3.4.11 System 62 - Radioactive Liquid Waste System

The major equipment items in the Radioactive Liquid Waste System include a waste sump (1000 gallon tank), pumps, filters, two 3000-gallon receiver tanks, two demineralizers, and a 3000-gallon waste monitor tank (see Figure 2.2-23).

The liquid waste system is expected to be used for its original function during decommissioning operations. Therefore, it will be one of the last systems to be decommissioned.

During decommissioning, System 62 piping and components can be used for collection, monitoring, and dispositioning of liquid effluent generated by decommissioning activities, mainly by the PCRV Shielding Water System. Additionally, fluids may be processed from decommissioning activities which originate from the Helium Regeneration Pit Drains, Liquid Drain Tank (System 63), Reactor Vent and Drain System Standpipe M-5 (System 72), Reactor Building Sump and Sump Pump (System 72), and the Reactor Plant Exhaust Filter housing drains (System 73). The latter sources are those normally encountered during reactor operation and shall be processed by established methods. All sources, including the PCRV shielding water, require the necessary piping and components that will be utilized to remain in service until no longer needed.

In addition, effluent from the PCRV Shielding Water System will require the installation of a connection between the discharge of the PCRV Shielding Water System transfer pump and System 62 piping, and slight modification of valving to utilize System 62 as desired. This will permit pumping of shielding water directly into either of the Liquid Waste Receivers. Also, valves will be installed to permit shielding water to be pumped directly into the Liquid Waste Monitor Tank without travelling through the Liquid Waste Transfer Pumps, the Liquid Waste Demineralizers, and long lengths of piping.

A characterization survey of the radioactive liquid waste system will be performed when the system is no longer needed to determine the extent and location of radioactive contamination.

The contaminated radioactive liquid waste system components are small and include: the two liquid transfer pumps, the two liquid waste sump pumps, the two liquid waste filters, and the two liquid waste demineralizers. The liquid waste monitor tank and the two liquid waste receivers may be decontaminated and abandoned in place, shipped as one piece containers, or segmented and packaged in LSA shipping containers depending on the extent and location of radioactive contamination. The liquid waste sump will be considered for either (1) decontamination to free release levels and abandonment, or (2) segmentation and packaging as LSA waste.

2.3.4.12 System 63 - Radioactive Gas Waste System

The major equipment items in this system include pre-filters, filters, exhaust blowers, tanks (vacuum, surge, and drain), and compressor (see Figure 2.2-24).

During decommissioning, System 63 piping and components can be used to capture and monitor off gases displaced from the interior of the PCRV during filling with water. Other temporary connections can be made during decommissioning, such as for sampling of Work Platform ventilation air. However, it is not expected that waste gases will be collected via the permanent connections for which the system was originally designed.

Gas displaced from the interior of the PCRV during filling with water is intended to be captured and stored in the Gas Waste Surge Tanks. After monitoring and determination that it is safe for release, the gas will be released to the atmosphere via the Ventilation System (System 73). System 63 equipment to be utilized for this purpose will remain in service until no longer needed.

In addition, capturing of PCRV off gases will require the installation of a connection between the PCRV and System 63 piping just downstream of the Gas Waste Filters, and slight modification of valving to utilize System 63 as desired. This permits use of the Gas Waste Blowers for suction, Radiation Monitors for observation of gas activity, and the Gas Waste Compressors and Gas Waste Surge Tanks for storage.

Following final use of the system, the radioactive gas waste system will be surveyed to determine the extent and location of radioactive contamination. The large components such as the two gas waste surge tanks and the gas waste vacuum tank may be decontaminated and abandoned in place, shipped as one-piece units, or segmented for packaging and shipping. The other components are small enough to be shipped in LSA shipping containers with other contaminated piping.

Decontamination of these systems will be by manual mechanical methods depending on the levels of contamination found during the characterization survey. The system will not be used in the decommissioning of the plant.

2.3.4.13 System 72 - Reactor Building Drain System

The major equipment items include drain tanks, sump, pumps, piping and filters (see Figure 2.2-25). Two gravity flow drains are provided to direct drainage from the Reactor Building equipment, piping and floor drains to either the radioactive liquid waste sump for potentially contaminated liquids or the Reactor Building sump for all other liquids. The drain system will continue to be used for its original function during much of the decommissioning work and will be one of the last systems to be decommissioned.

When no longer required to remain operational, the system will be surveyed, and a decontamination and decommissioning decision will then be made. Contaminated piping or components will be either removed and shipped in LSA containers, or decontaminated to the criteria for release for unrestricted use and left in place.

The portion of this system that drains to the Reactor Building sump is not expected to be contaminated. The portion of the system that drains to the radioactive liquid waste sump is expected to be contaminated and is included in dismantlement and removal plans.

2.3.4.14 System 73 - Reactor Building Ventilation

The Reactor Building HVAC system services various areas of the Reactor Building with heated or cooled air. All ventilation air, whether outdoor or recirculated, is filtered before distribution. In addition, the reactor plant HVAC system maintains building differential pressure control. As shown in Figure 2.2-26, this system consists of several air handling units and filters. The only part of the system considered to contain possible contamination is the Reactor Building exhaust filters, HSF vent, and the analytical room vent.

The reactor plant exhaust filters are composed of banks of moisture separators and HEPA filters.

During decommissioning, System 73 will be used to maintain the reactor building pressure subatmospheric for selected decommissioning operations as required by the Decommissioning Technical Specifications. The system consists of three trains, one of which will normally be in continuous operation. One train is sufficient to maintain the reactor building subatmospheric. The reactor plant exhaust filters will be periodically monitored and filter media changed, as necessary. Filter change out will be based on excessive pressure drop across the HEPA filters.

System 73 will also be used to support the Airborne Contamination Control System (ACCS) which draws air from under the Rotary Work Platform. The ACCS is a temporary addition that will be used during decommissioning and ties into existing System 73 ductwork. The ACCS consists of several ducts that will pull air from under the platform. The ducts will tie together forming a single duct that will then be routed to roughing filters to remove any particulate material. After the roughing filters the ACCS duct will tie into the existing ductwork, upstream of one of the reactor plant exhaust filters. A spool piece will be added at the interface of the ACCS and existing plant ducts. The spool piece will include dampers to isolate the ACCS, if necessary. If one filter is not available due to changing of the filter media, that filter can be isolated and the air flow diverted to one of the other two filters. The ACCS and spool piece will be removed at the end of decommissioning.

The ventilation system has been found to be contaminated. This system will be maintained during decommissioning to provide ventilation for decommissioning operations. Near the completion of decommissioning activities, surveys will be taken to determine the final disposition of the system.

2.3.4.15 System 93 - Instrumentation and Controls

The instruments and tubing to be removed or decontaminated originate at PCRV penetrations. These include thermometer penetrations, process and moisture instruments, helium circulator instruments, and helium vent piping.

Moisture monitors will be removed during dismantling the PCRV. All other instrument interfaces to contaminated or potentially contaminated systems will be addressed when the respective system is decommissioned. Those System 93 components will be either removed or verified to be below the limits for release for unrestricted use. All systems are scheduled for inclusion in the characterization survey. Contaminated system compone :ts will be decontaminated or disposed of as LSA waste.

2.3.5 Decommissioning Schedule

The individual tasks making up the decommissioning effort have been delineated using a work breakdown structure (WBS) approach. Figure 2.3-32 is a schedule of the major decommissioning tasks which includes PCRV and balance of plant system dismantling and decontamination, and site decommissioning. This schedule is used as the top-level view of the project milestones and detailed schedules. Throughout the project, dismantling the PCRV is the critical path activity, with the BOP dismantling activities scheduled to coincide with periods of reduced PCRV efforts as a means of workload leveling. During the planning phase, work will be directed toward characterizing the site, preparing the decommissioning plan, and planning and writing the procedures and specifications for the implementation phase.

The major activities and programs to be developed during the planning phase include:

1. Initial site characterization
2. Decommissioning planning
3. Work specifications and procedures
4. Quality assurance plan
5. Radiation protection program
6. Waste management plan
7. Project performance and control

The schedule depicts the planning phase occurring over an 18 month period, and the actual dismantlement and decontamination activity at the site occurring over a 39 month period.

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TABLE 2.3-1
ESTIMATED CONTACT DOSE RATES
FOR GRAPHITE BLOCKS

	GRAPHITE BLOCK DESCRIPTION	NO. OF BLOCKS	ESTIMATED CONTACT DOSE RATE	
1)	Defueling Blocks	1,482	<1	mR/hr
2)	Hexagonal Reflector Blocks w/no Hastelloy Cans	1,687	500	mR/hr
3)	Large Permanent Reflectors	312	<30	R/hr
4)	Reflector Keys	24	<100	mR/hr
5)	Side Spacer Blocks			
	(a) with Boron Rods	1,152	30	R/hr
	(b) Boron Rods removed	1,152	<3	R/hr
	(c) Boron Rods	276,096	60	R/hr
6)	Bottom Reflector Blocks			
	(a) with Hastelloy Cans	272	300	R/hr
	(b) Hastelloy Cans removed	272	500	mR/hr
	(c) Hastelloy Cans	19,448	10,000	R/hr
7)	Core Support Block Hastelloy Keys	24	10[1]	R/hr
8)	Core Support Blocks (61) & Posts (183)	244	15	mR/hr
9)	MCRBs (non-control rod)	6	300	R/hr

[1] - Dose Rate at one meter

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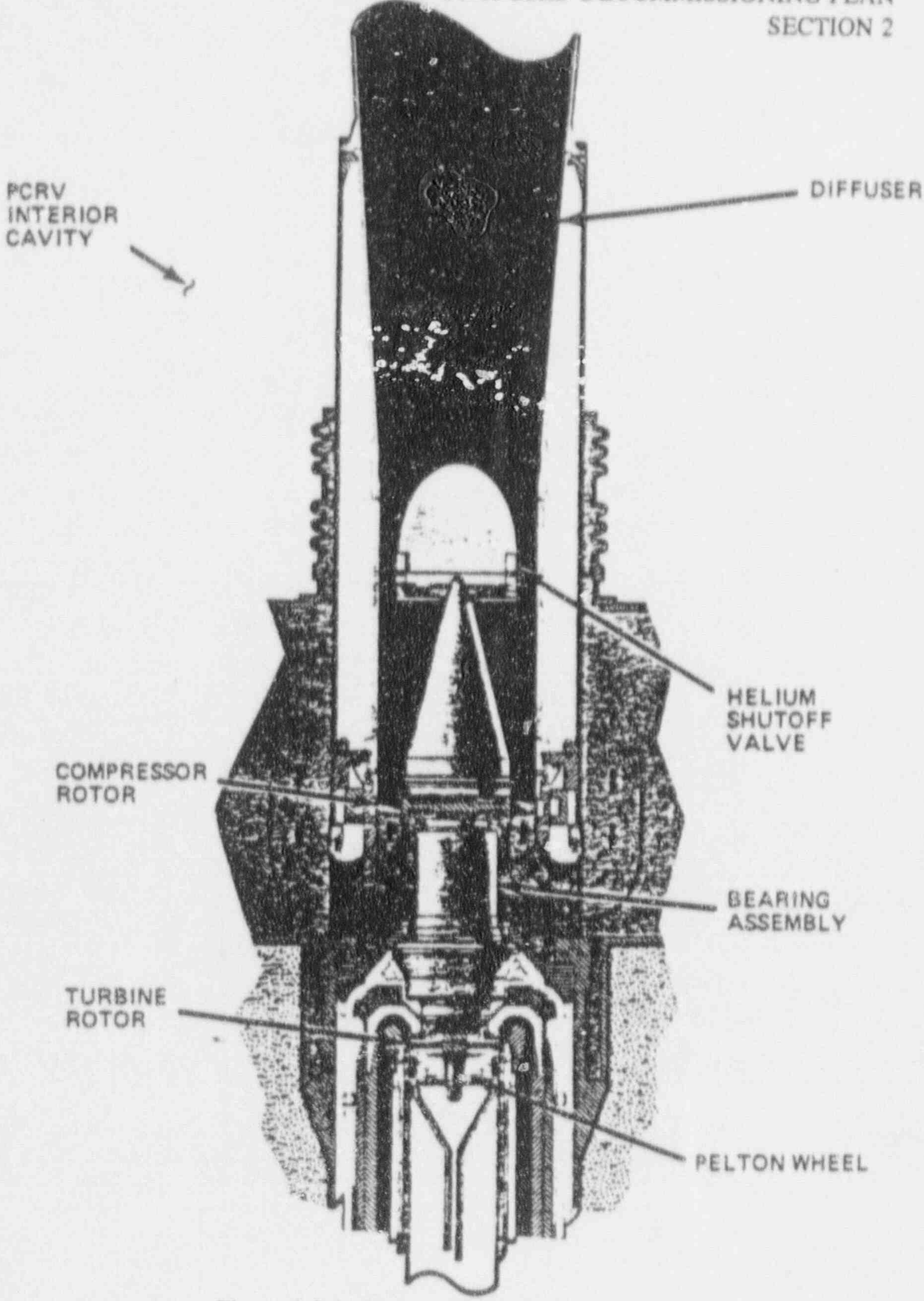

Figure 2.3-1 Helium Circulator Installation

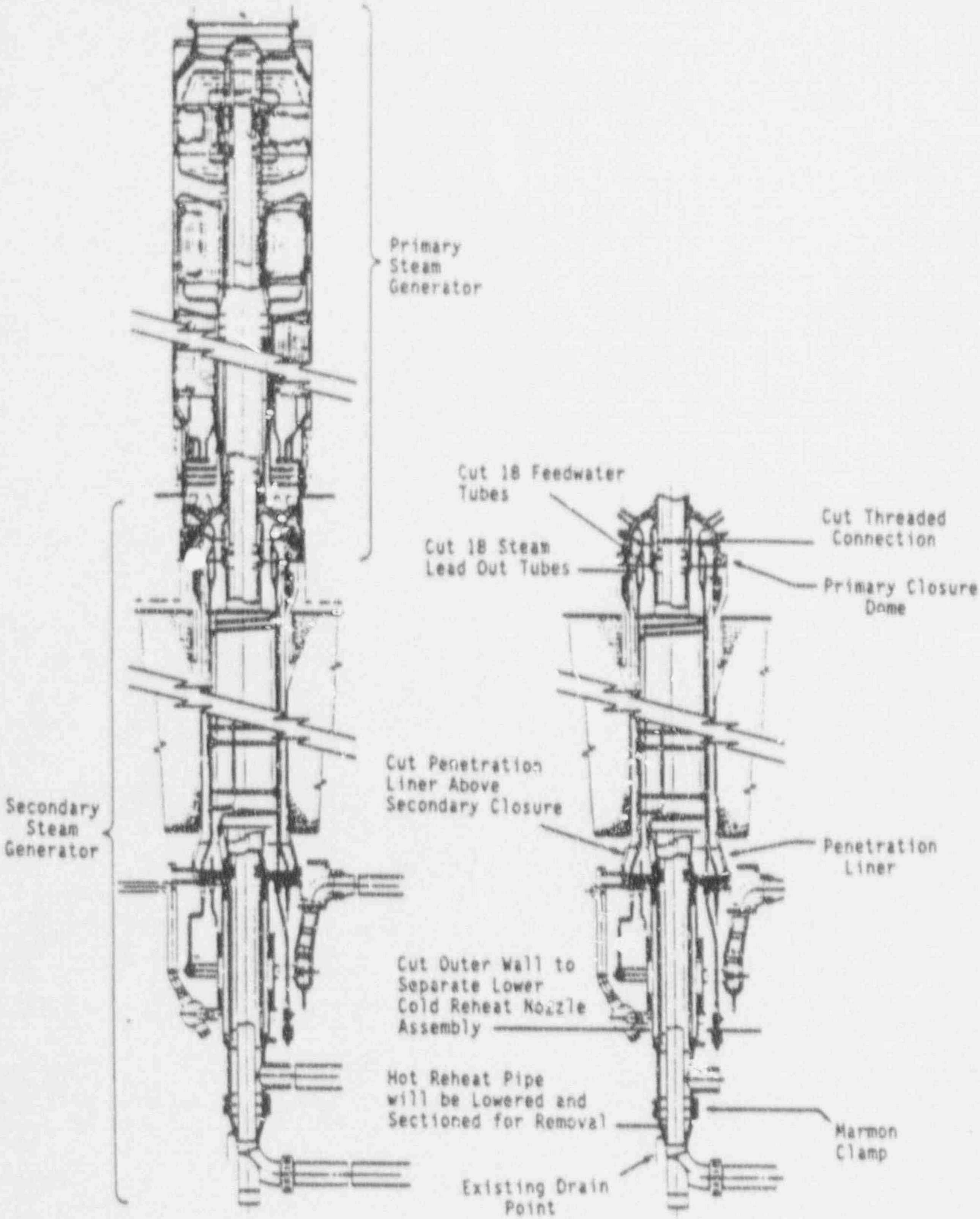

Figure 2.3-2 Steam Generator Module

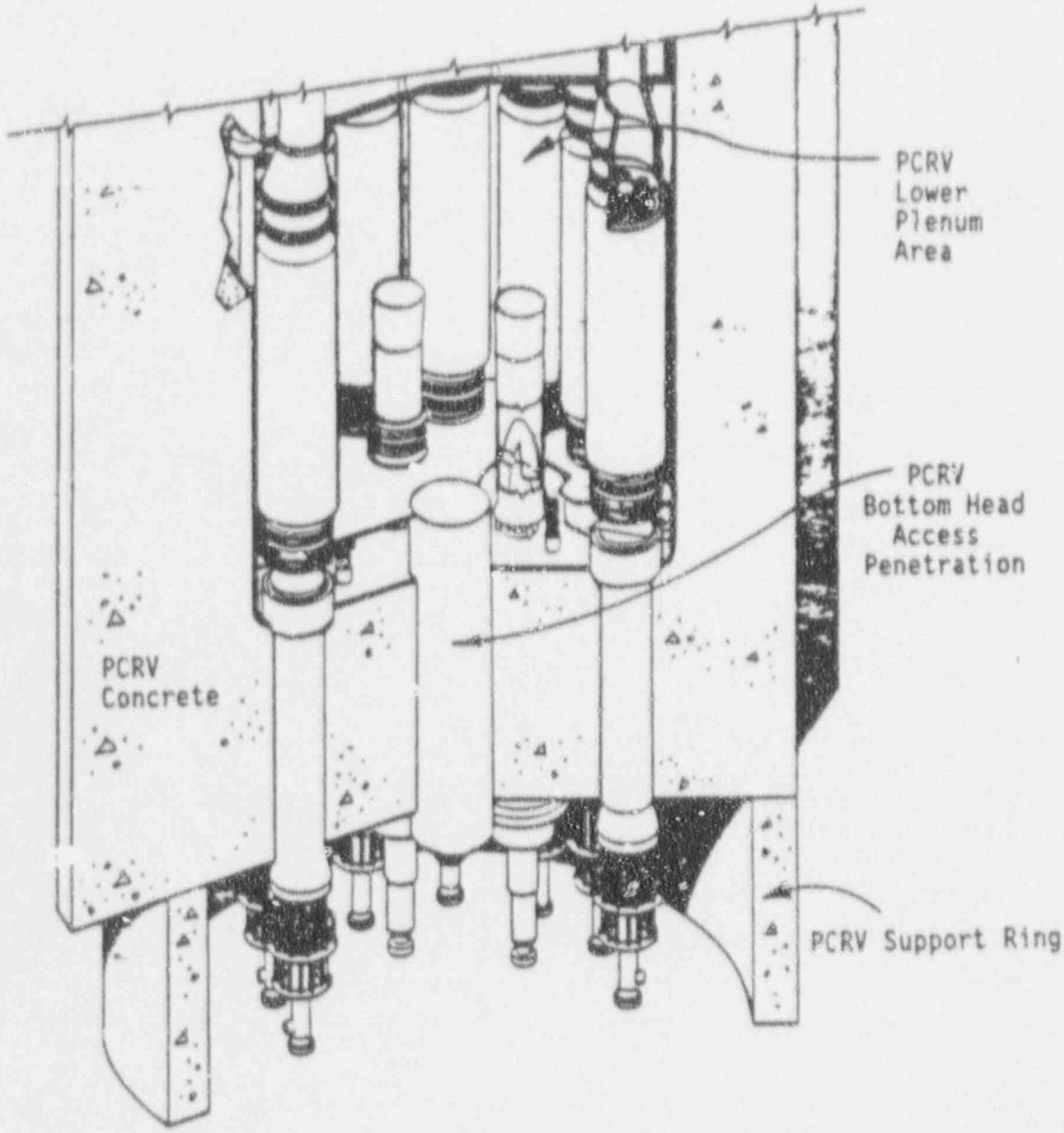

Figure 2.3-3 PCRV Lower Plenum

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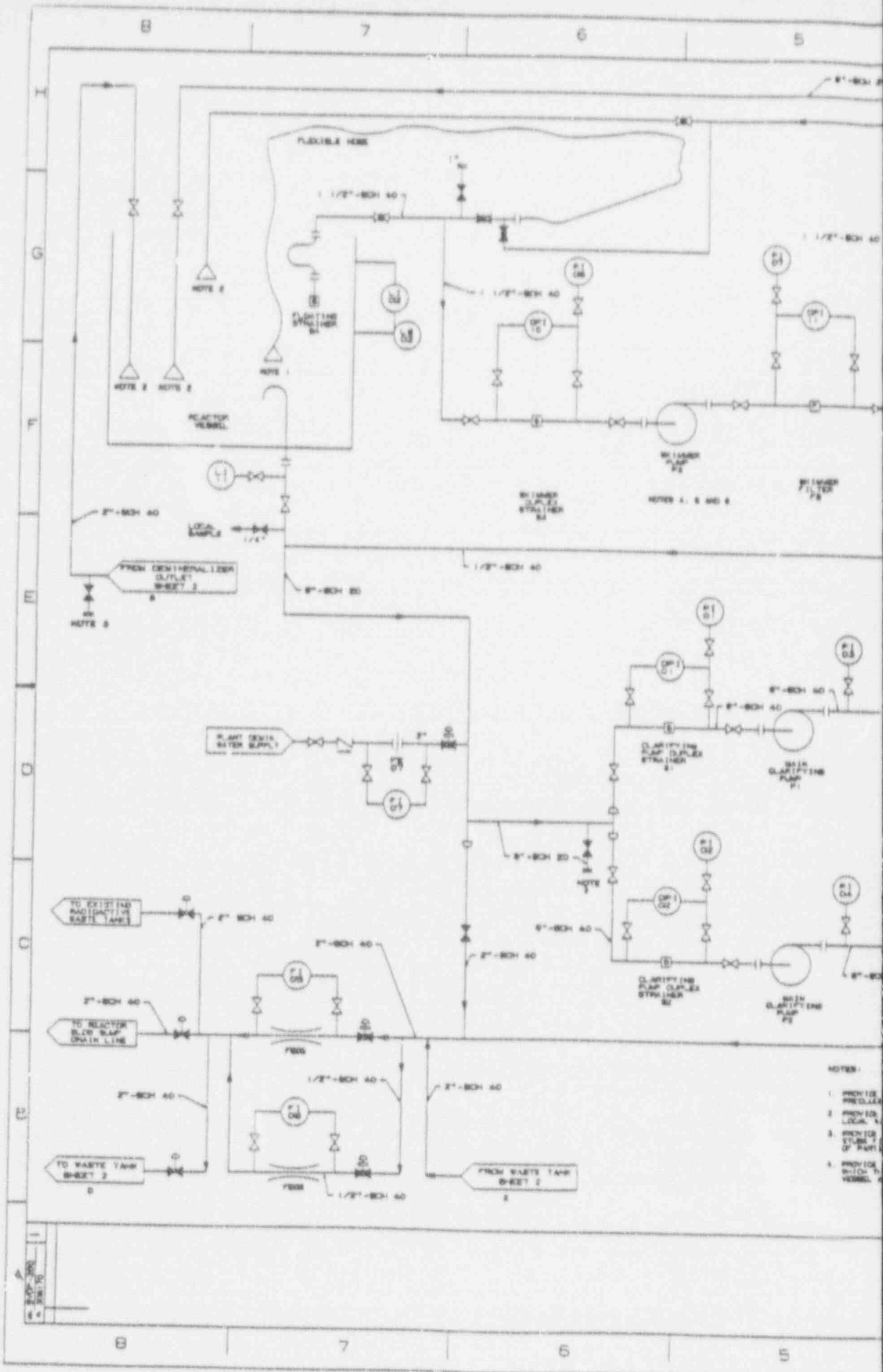

FLEXIBLE HOSE
1 1/2"-SCH 40
NOTE 2
NOTE 1
REACTOR VESSEL
FLOATING STRAINER
SKIMMER PUMP
SKIMMER DUPLEX STRAINER
SKIMMER FILTER
2"-SCH 40
LOCAL SAMPLE
FROM DEMINERALIZER OUTLET SHEET 2
1/2"-SCH 40
6"-SCH 20
PLANT DEMIN WATER SUPPLY
CLARIFYING PUMP DUPLEX STRAINER
MAIN CLARIFYING PUMP
TO EXISTING RADIOACTIVE WASTE TANKS
TO REACTOR BLDG SUMP DRAIN LINE
TO WASTE TANK SHEET 2
FROM WASTE TANK SHEET 2
NOTES:

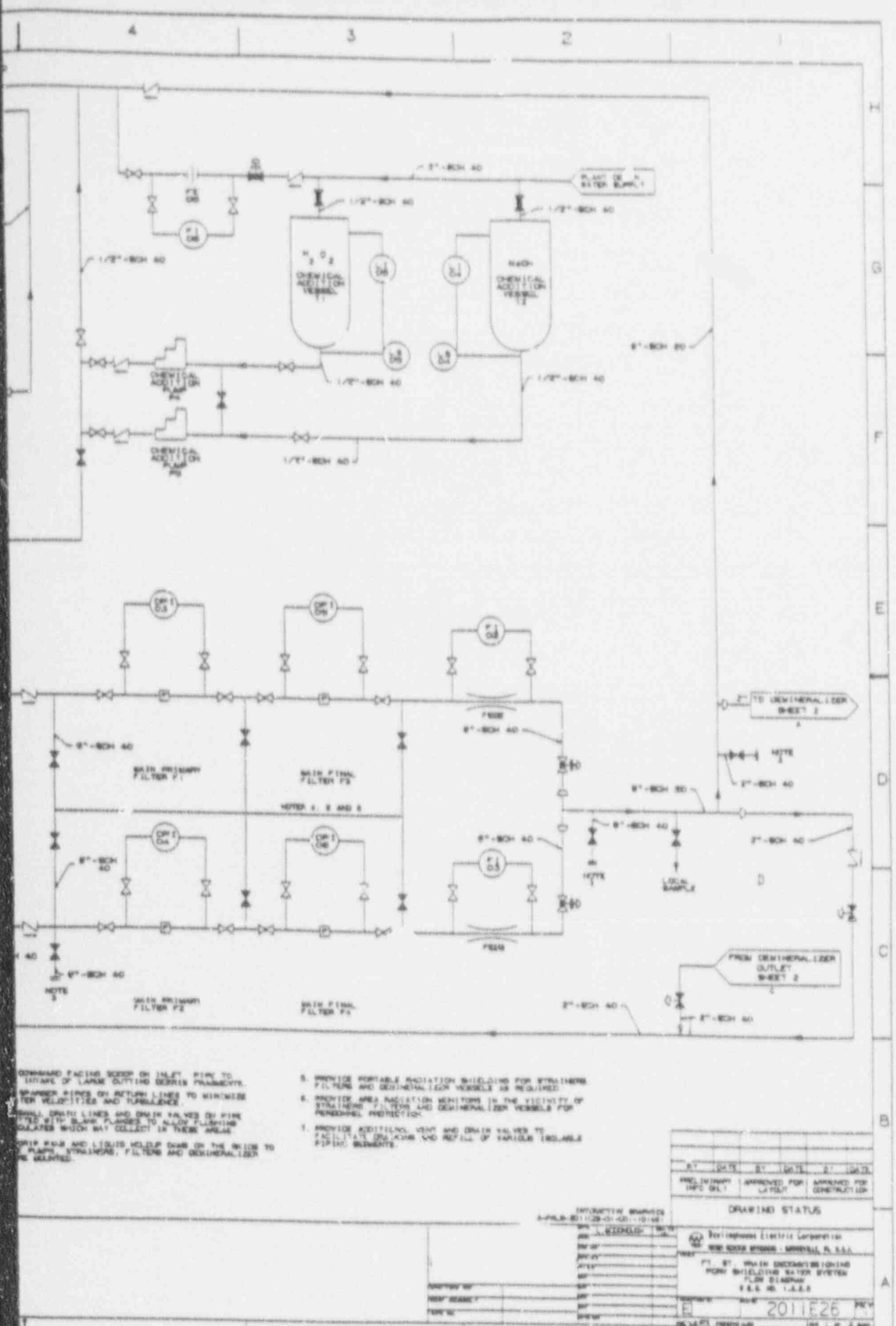
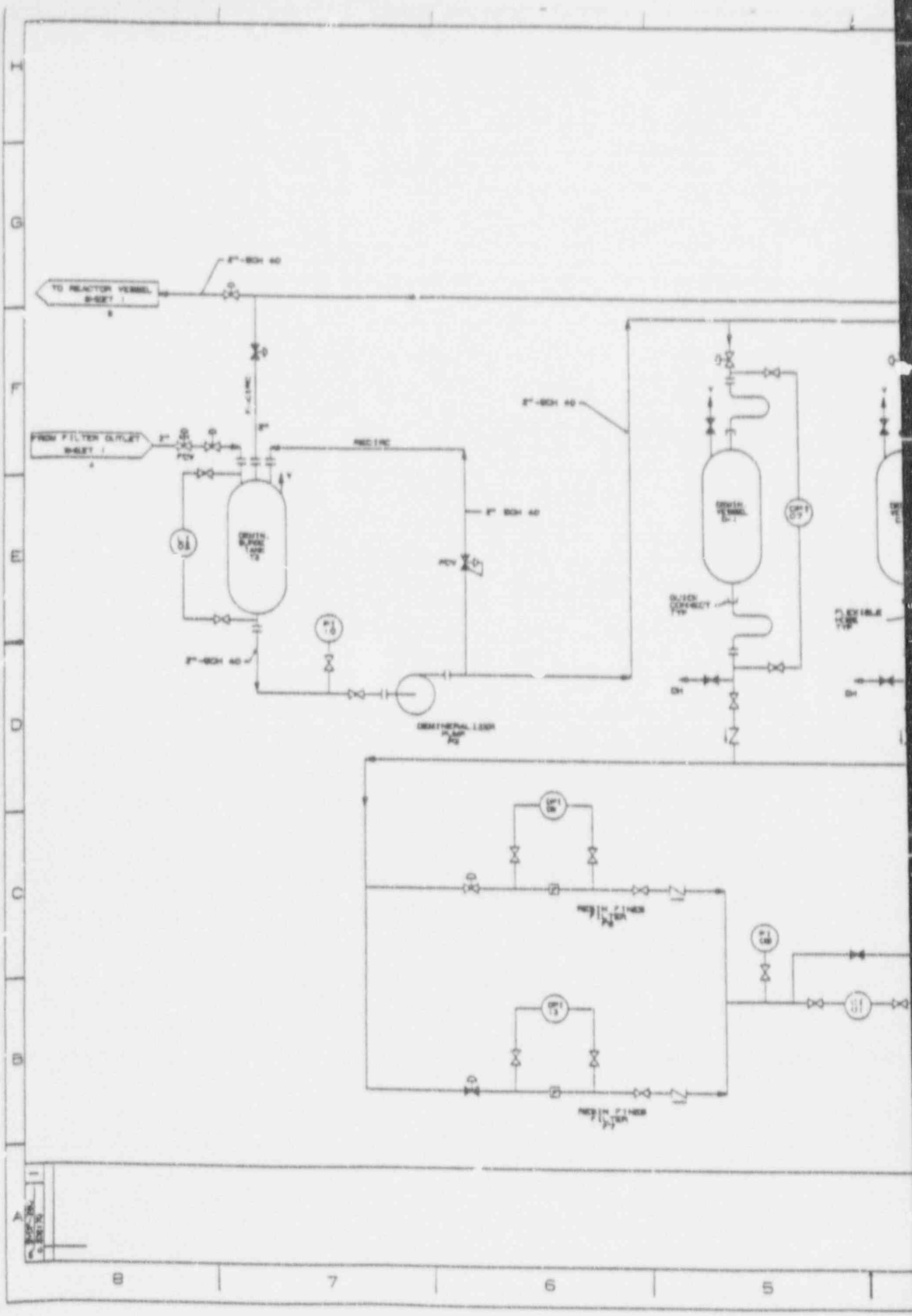


Figure 2.3-4 PCRV Shield Water System (Sh. 1)

SI
APERTURE
CARD

Also Available On
Aperture Card

9204280079-14


TO REACTOR VESSEL
SHEET 1
FROM FILTER OUTLET
SHEET 1
RECIRC
2" SCH 40
DEMINERALIZER
PUMP
P2
QUICK
CONNECT
TYP
FLEXIBLE
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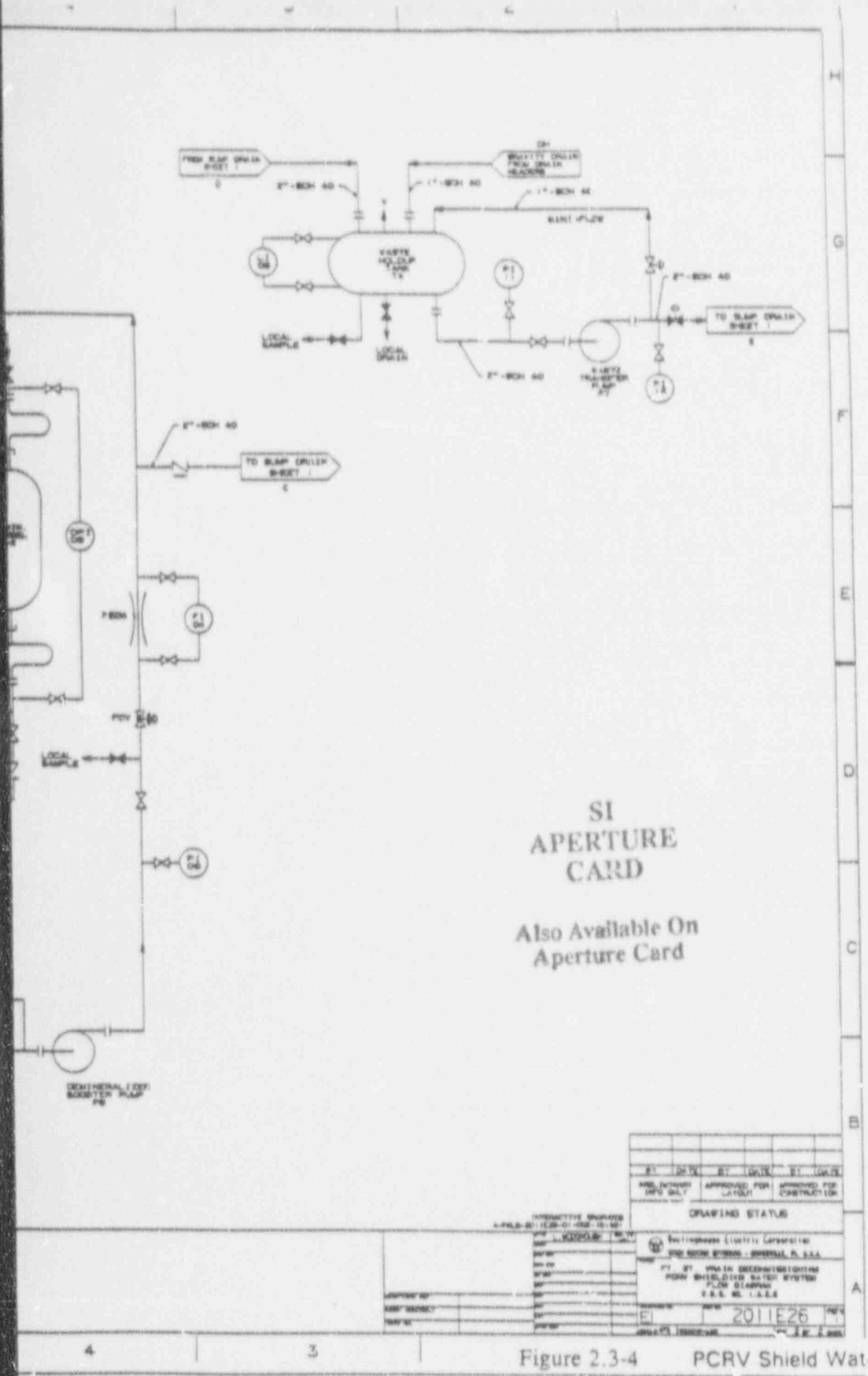

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Also Available On
Aperture Card

Figure 2.3-4 PCRV Shield Water System (Sh. 2)

9204280079-15

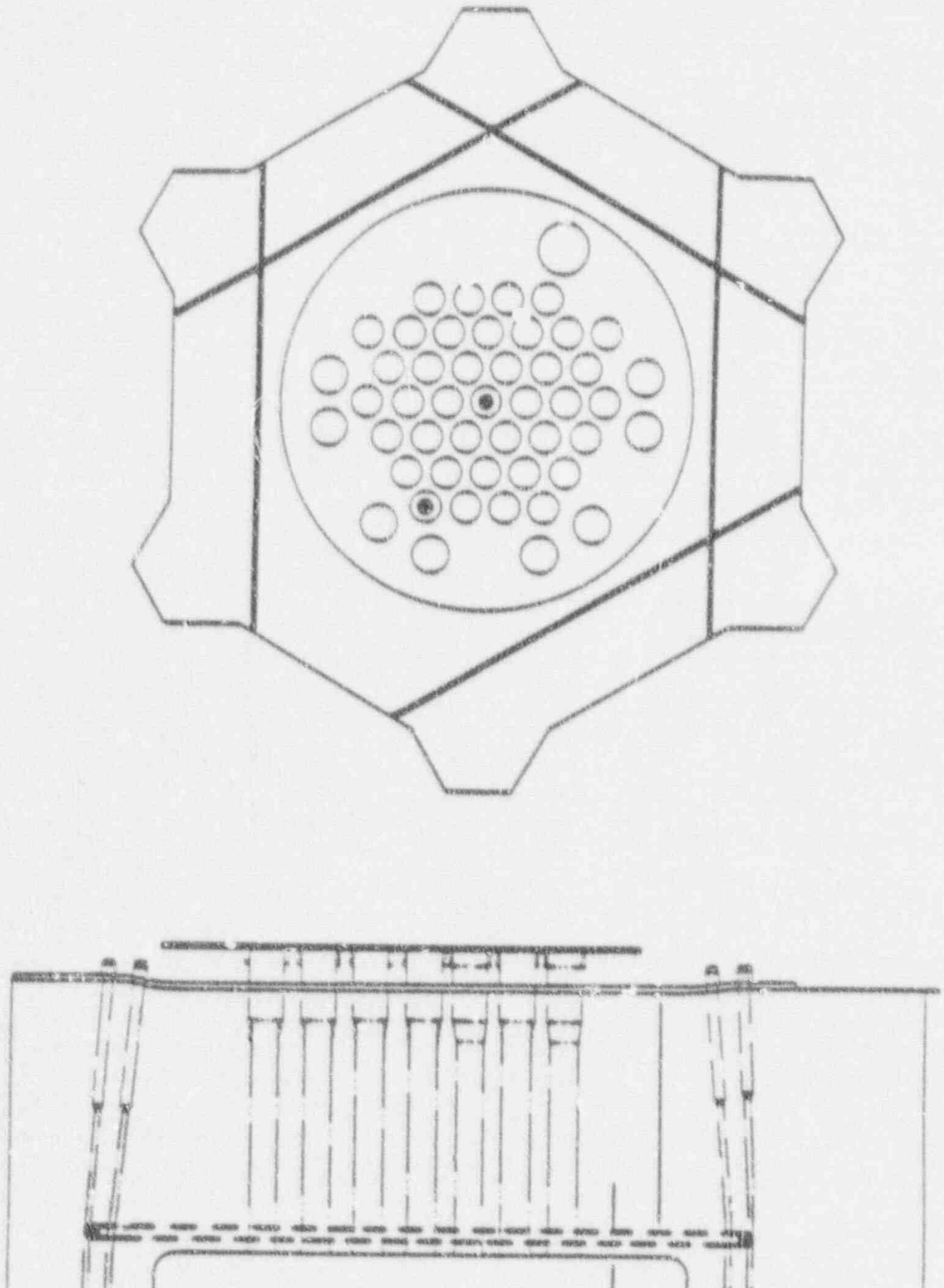


Figure 2.3-5 PCRV Top Head Cutting Arrangement

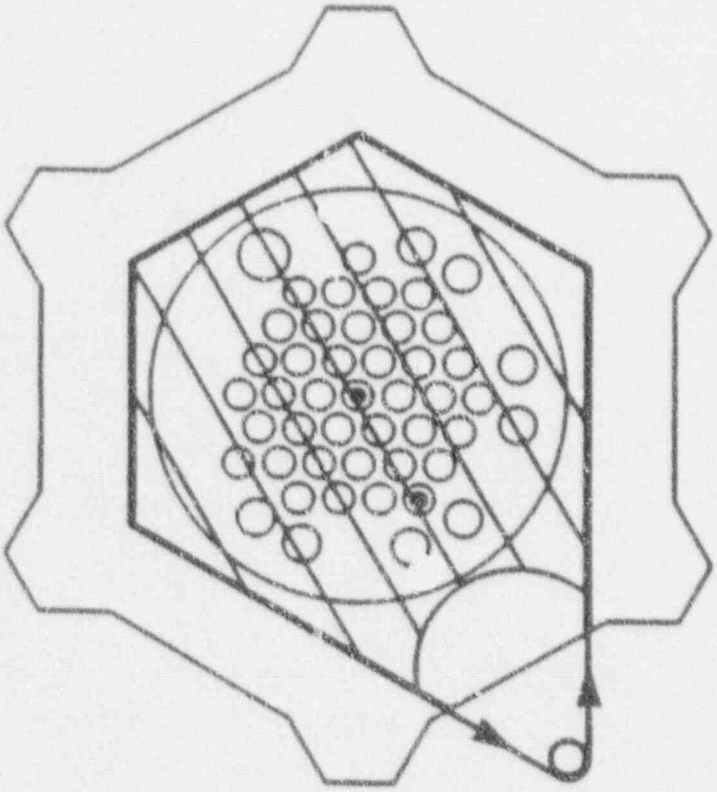


Figure 2.3-6 PCRV Cutting Configuration - Inserting the Diamond Wire

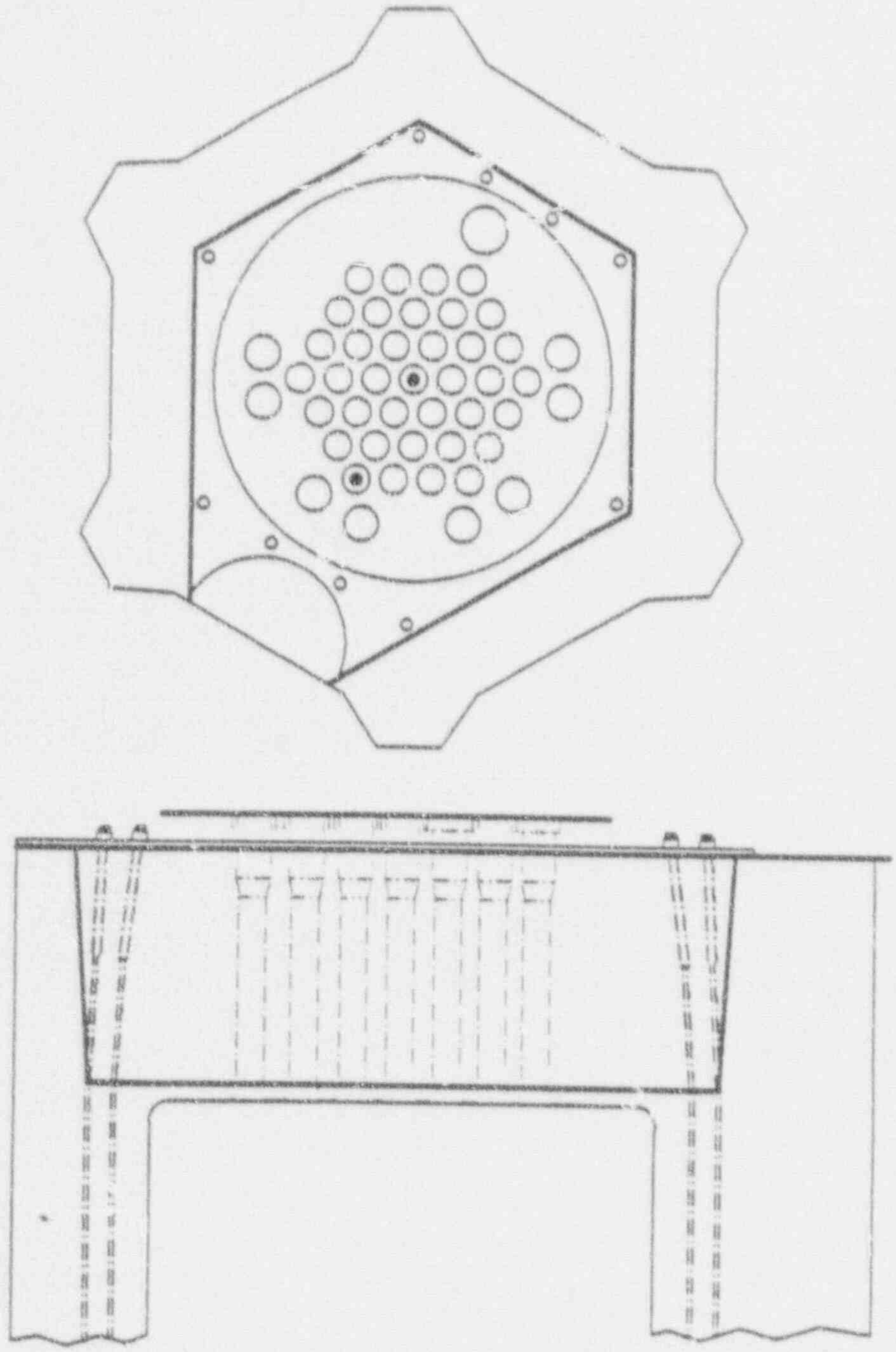


Figure 2.3-7 PCRV Cutting Configuration - Inclined Core Drilled Holes

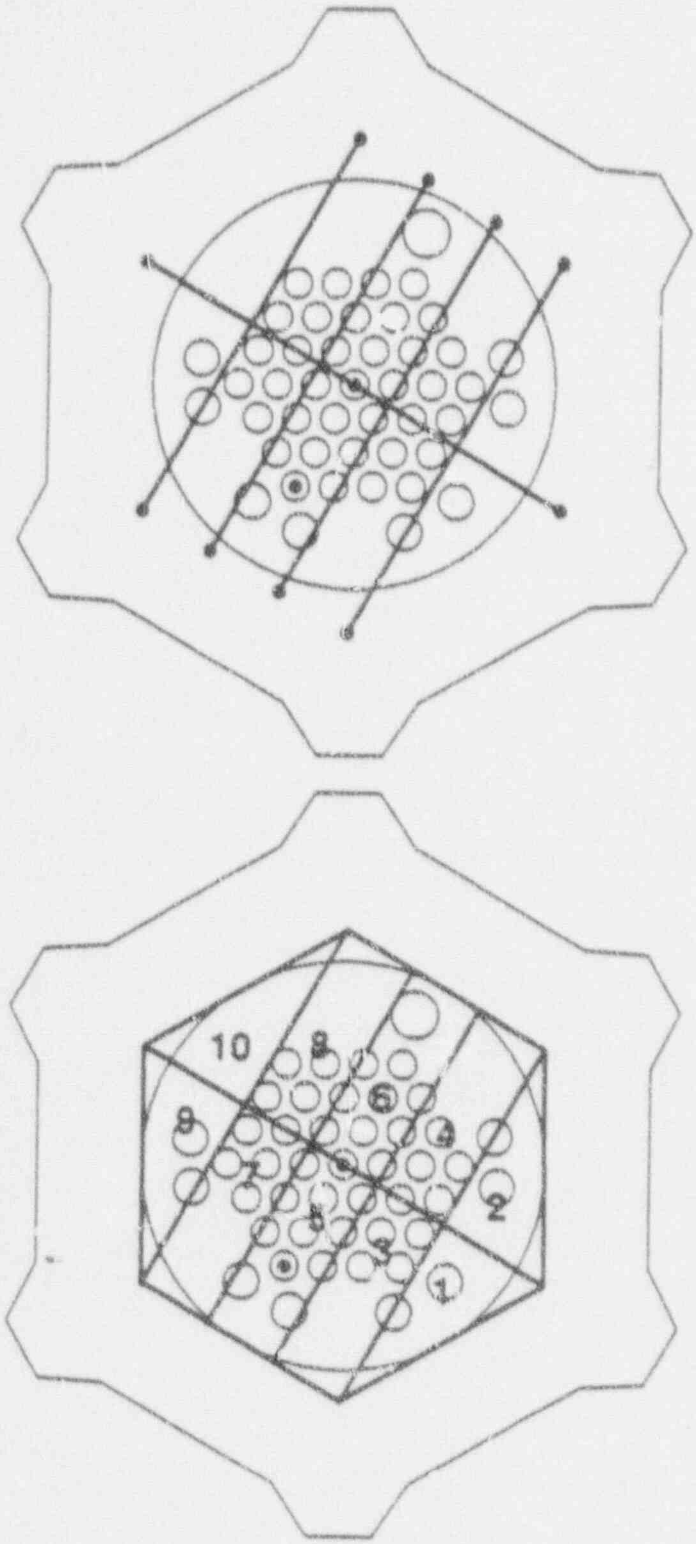


Figure 2.3-8 PCRV Cutting Configuration - Vertical Sectioning Cuts

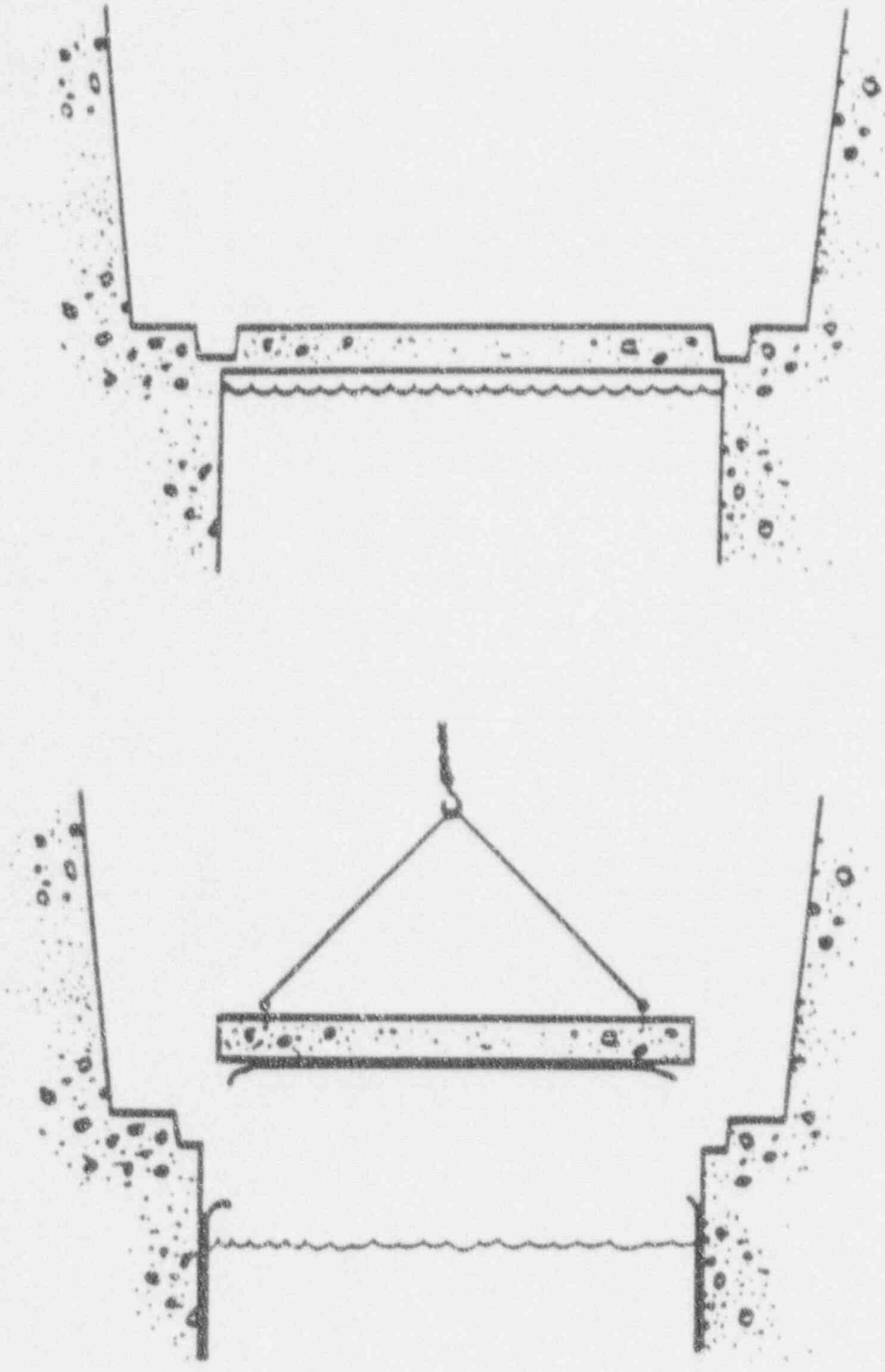


Figure 2.3-9 Removal of Remaining PCRV Top Head Concrete

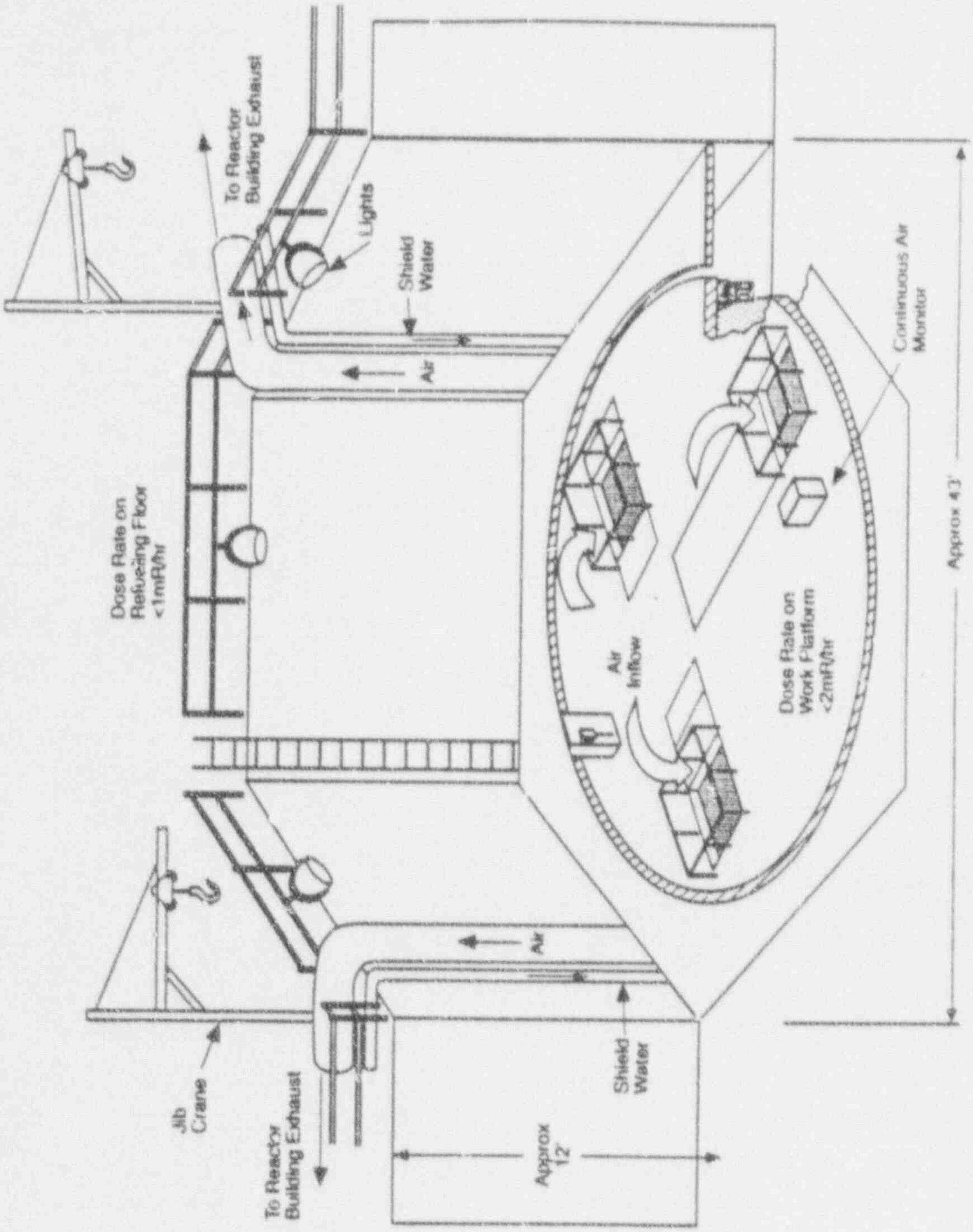


Figure 2.3-10 Rotary Work Platform Over PCRV

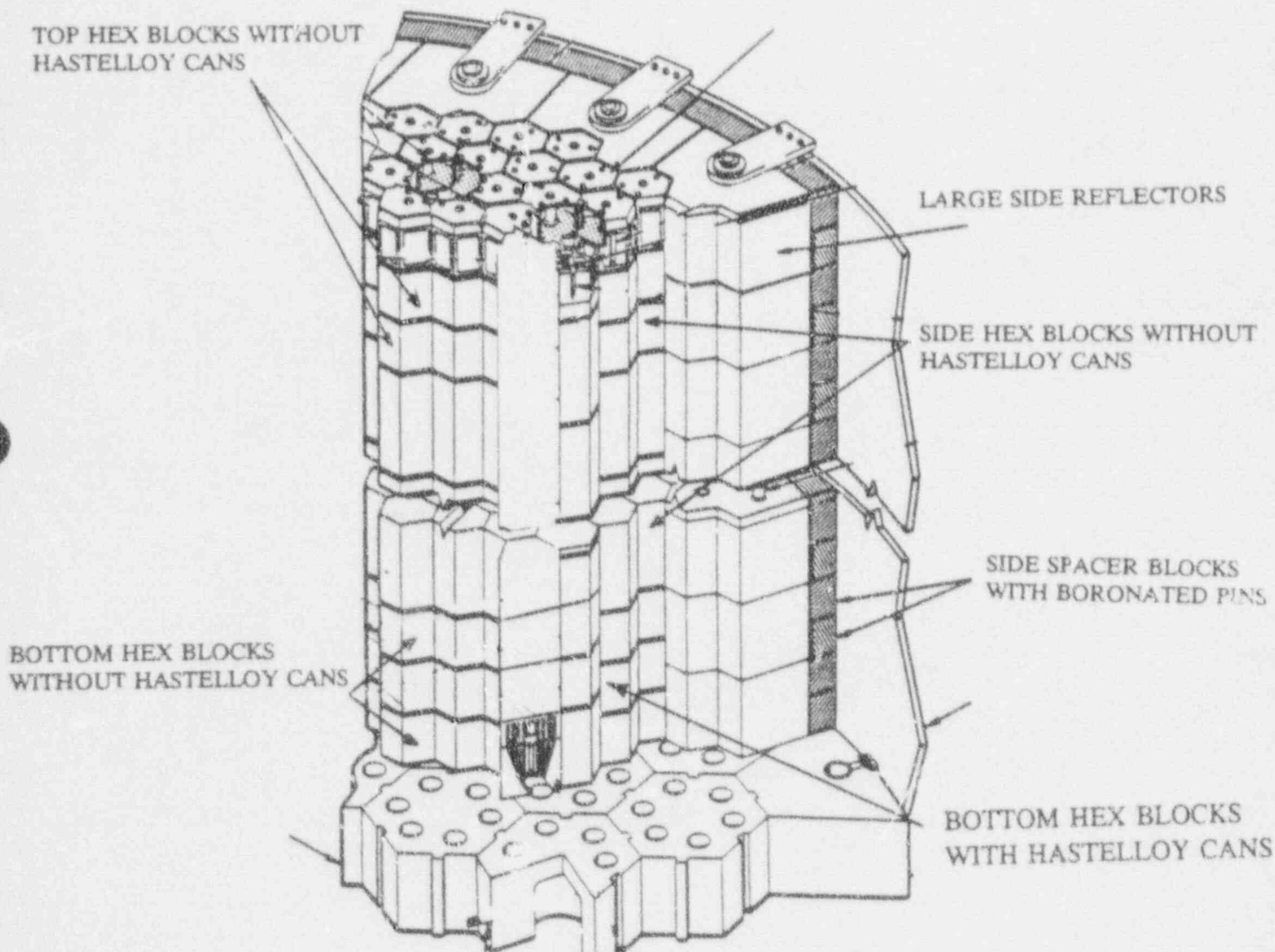


Figure 2.3-11 Location in Core of Graphite Blocks

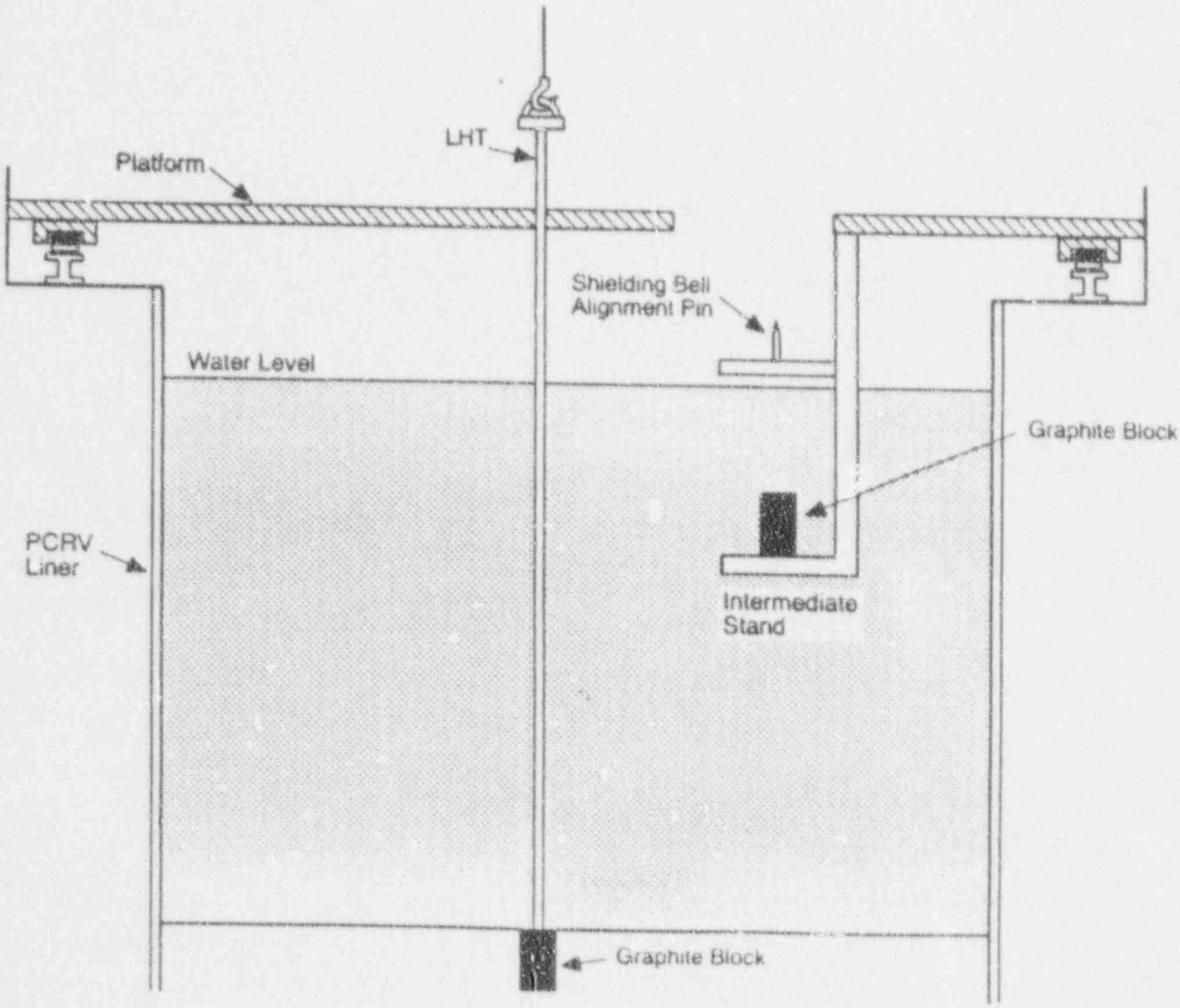


Figure 2.3-12 Graphite Block Intermediate Stand

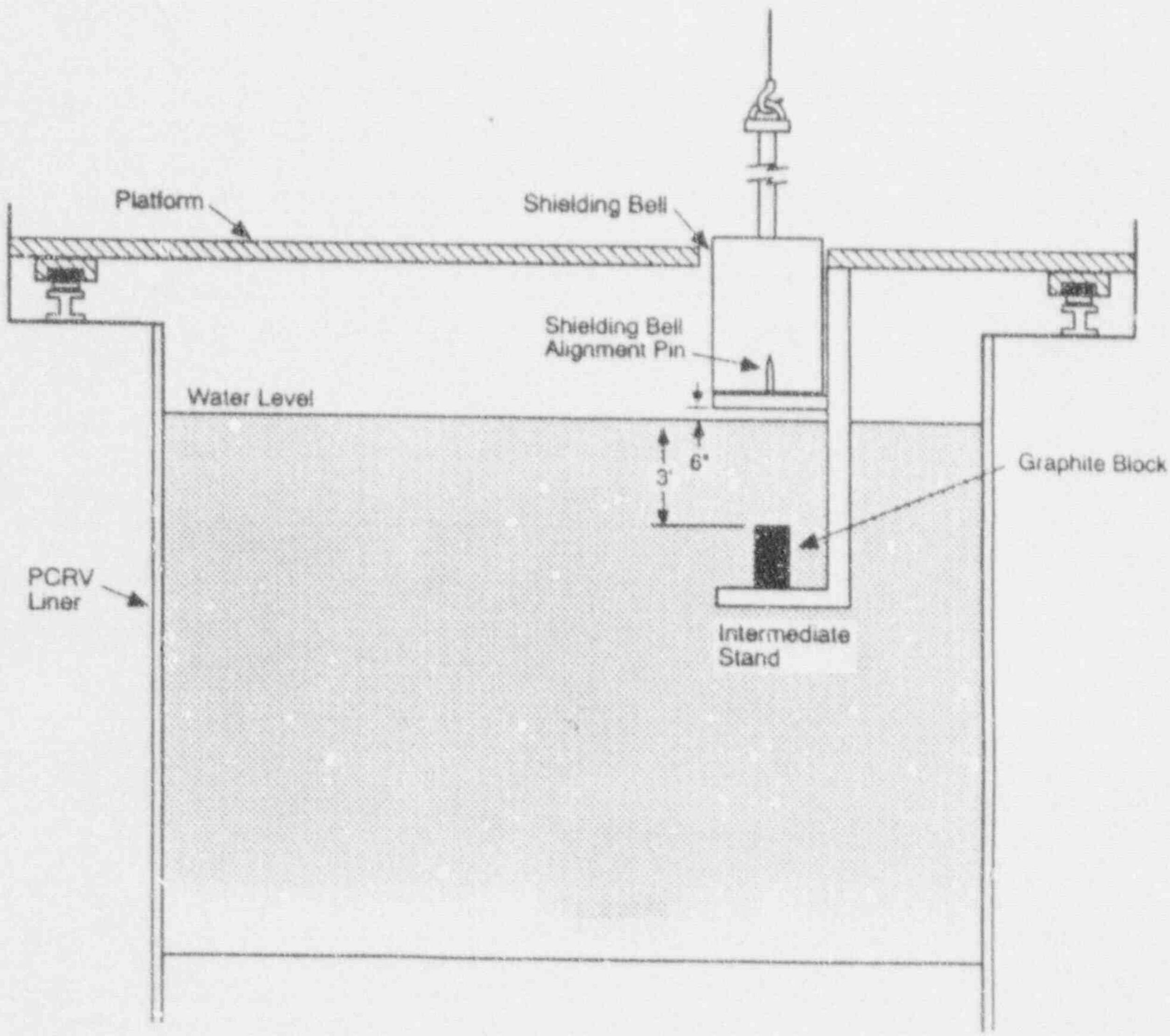


Figure 2.3-13 Loading Shielding Bell

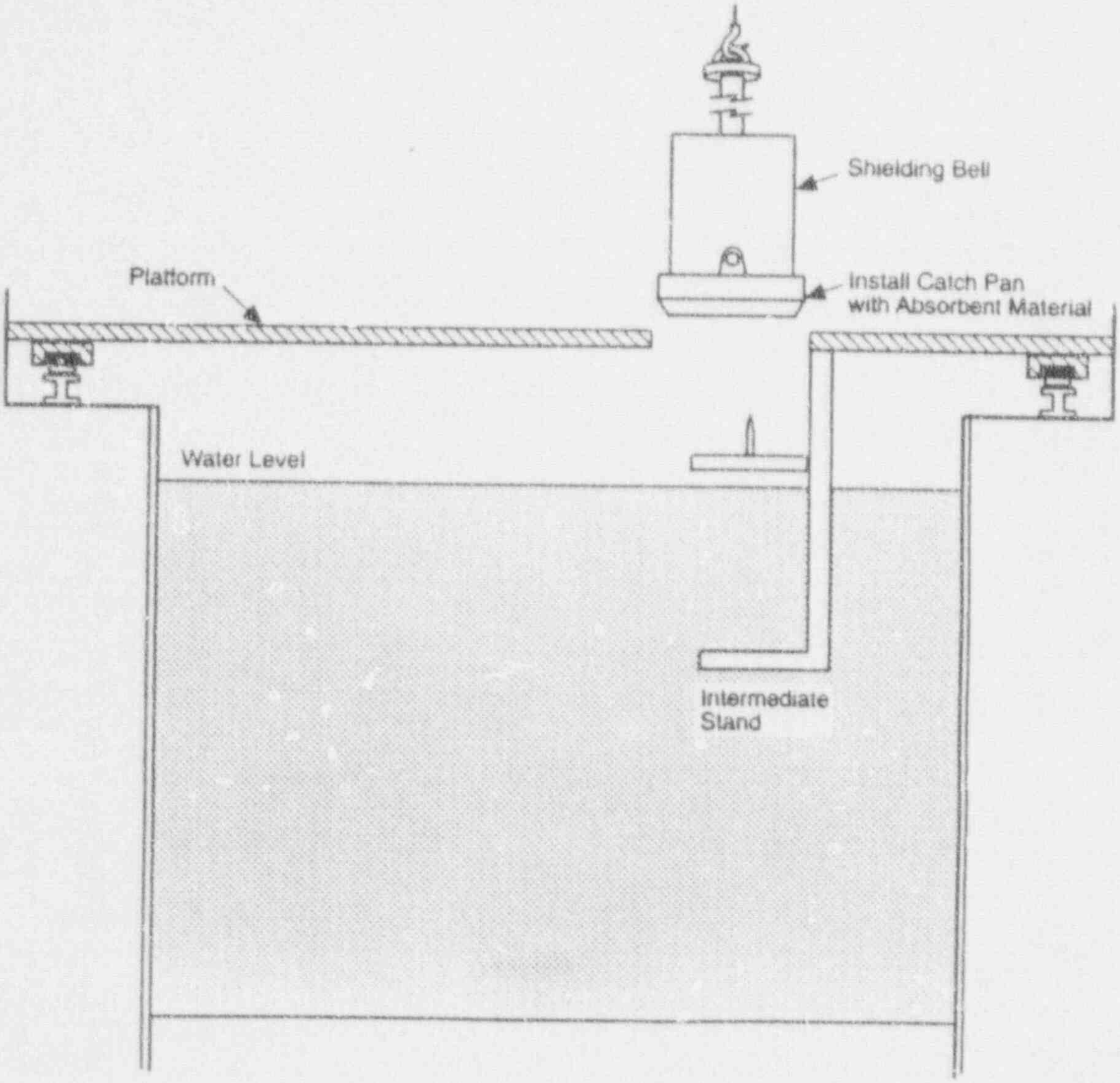


Figure 2.3-14 Shielding Bell with Catch Pan

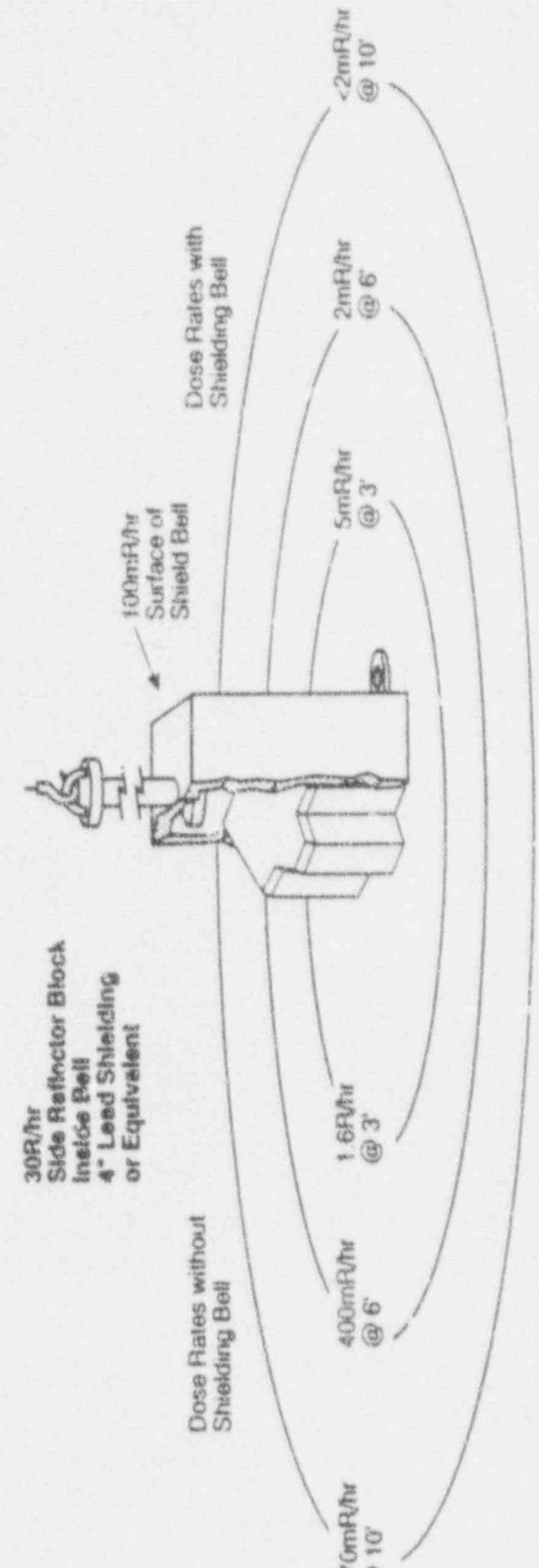


Figure 2.3-15 Large Side Reflector Block Dose Rates

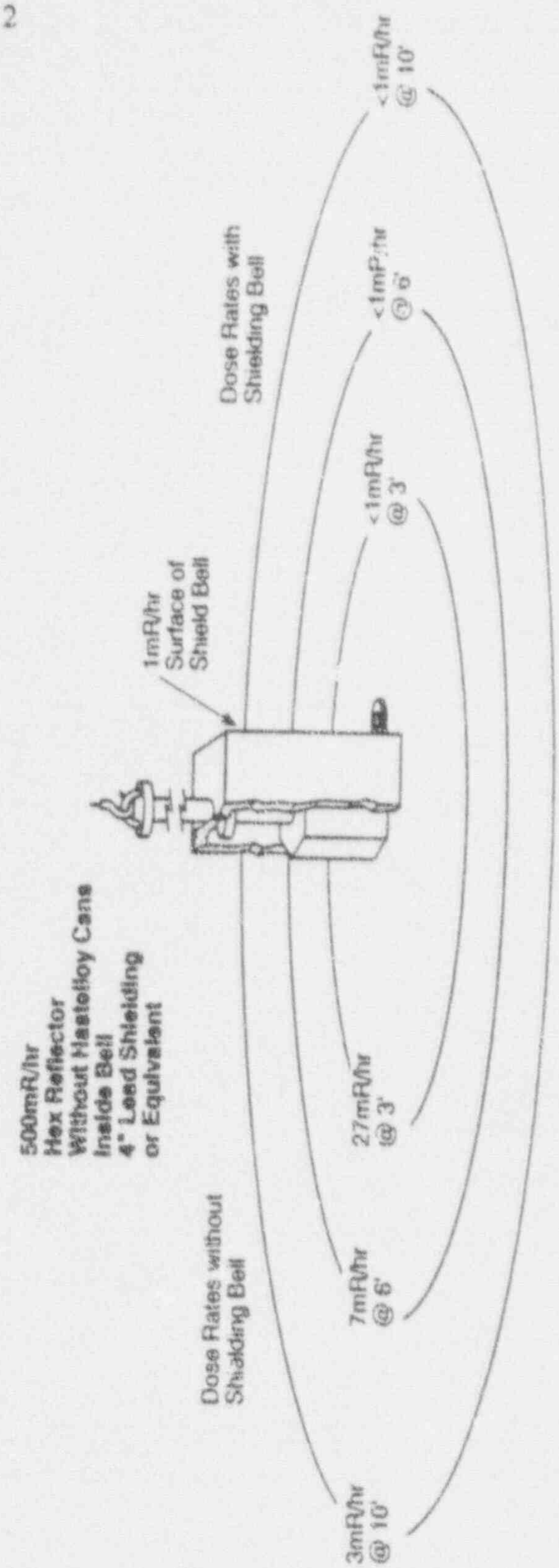


Figure 2.3-16 Hex Reflector Block (Without Hastelloy Cans) Dose Rates

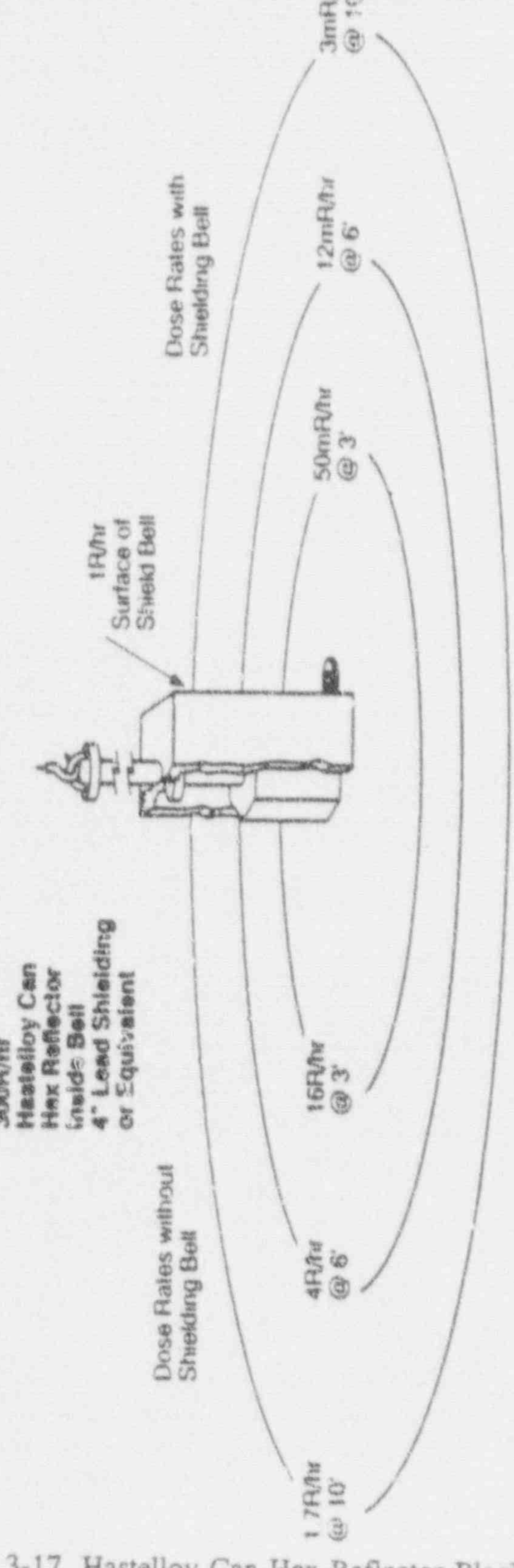


Figure 2.3-17 Hastelloy Can Hex Reflector Block Dose Rates

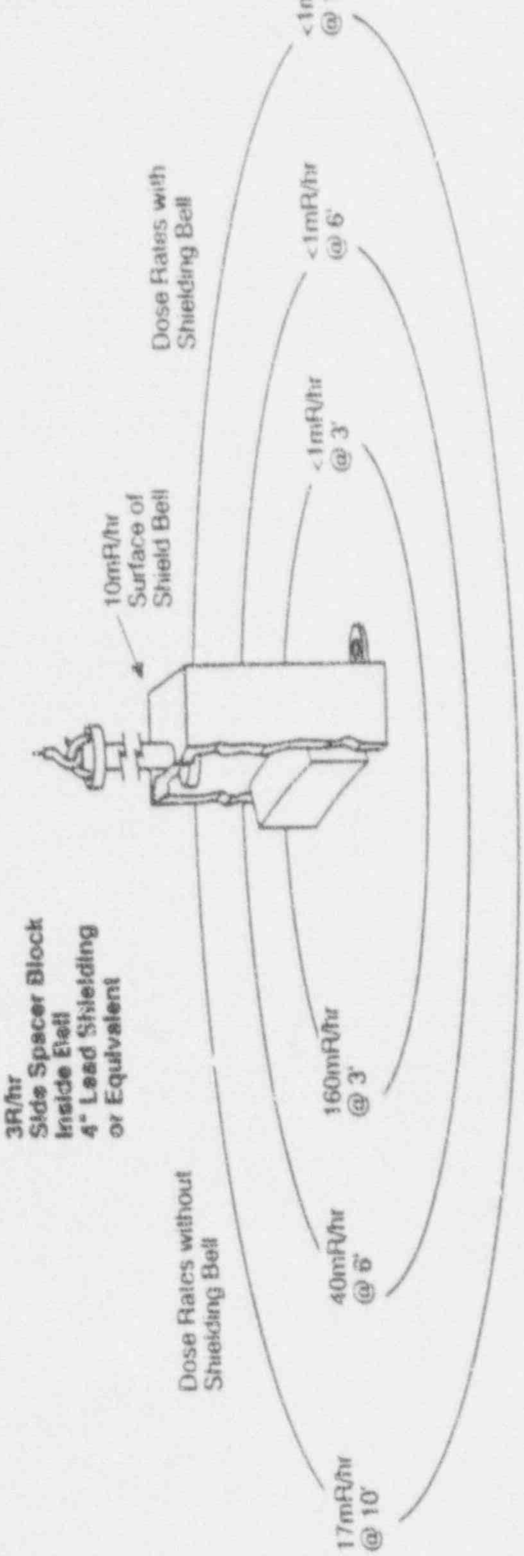


Figure 2.3-18 Side Spacer Blocks (Without Boronated Pins) Dose Rates

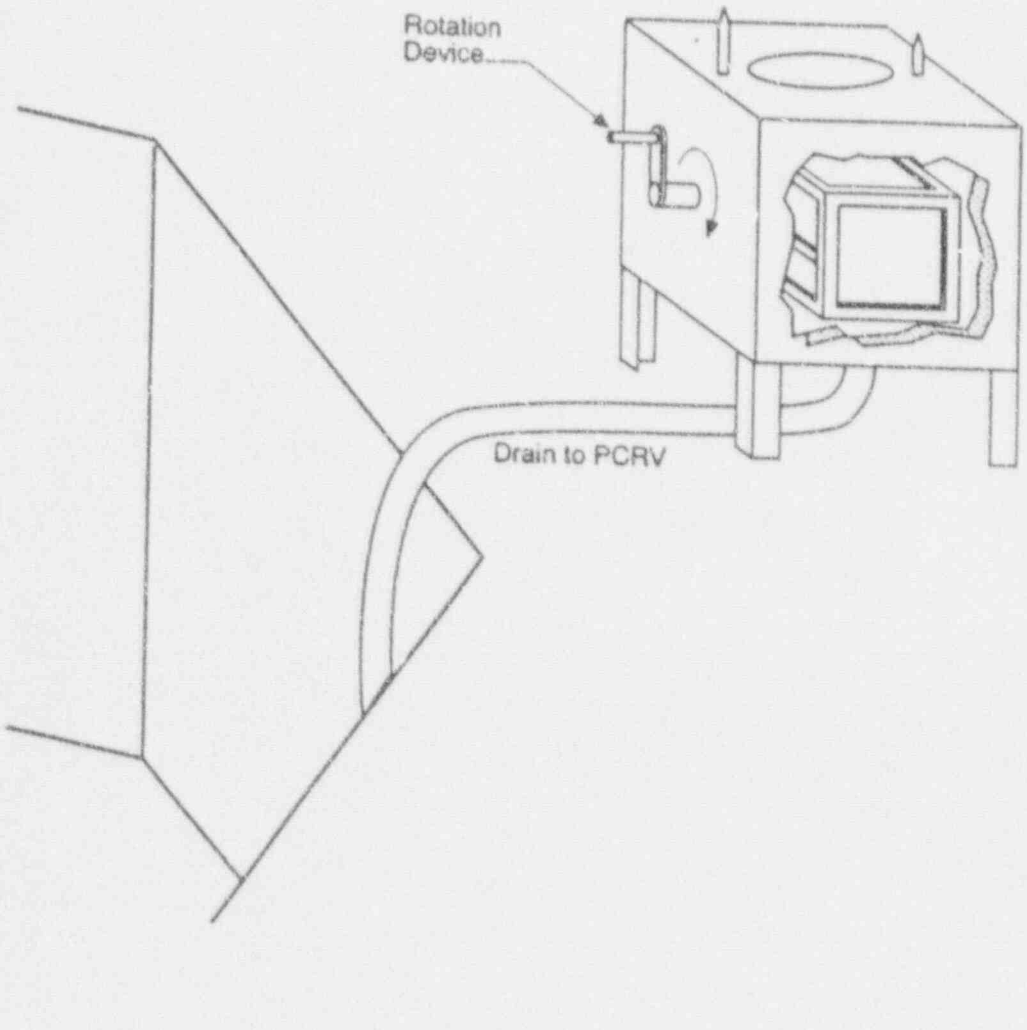


Figure 2.3-19 Dewatering Device

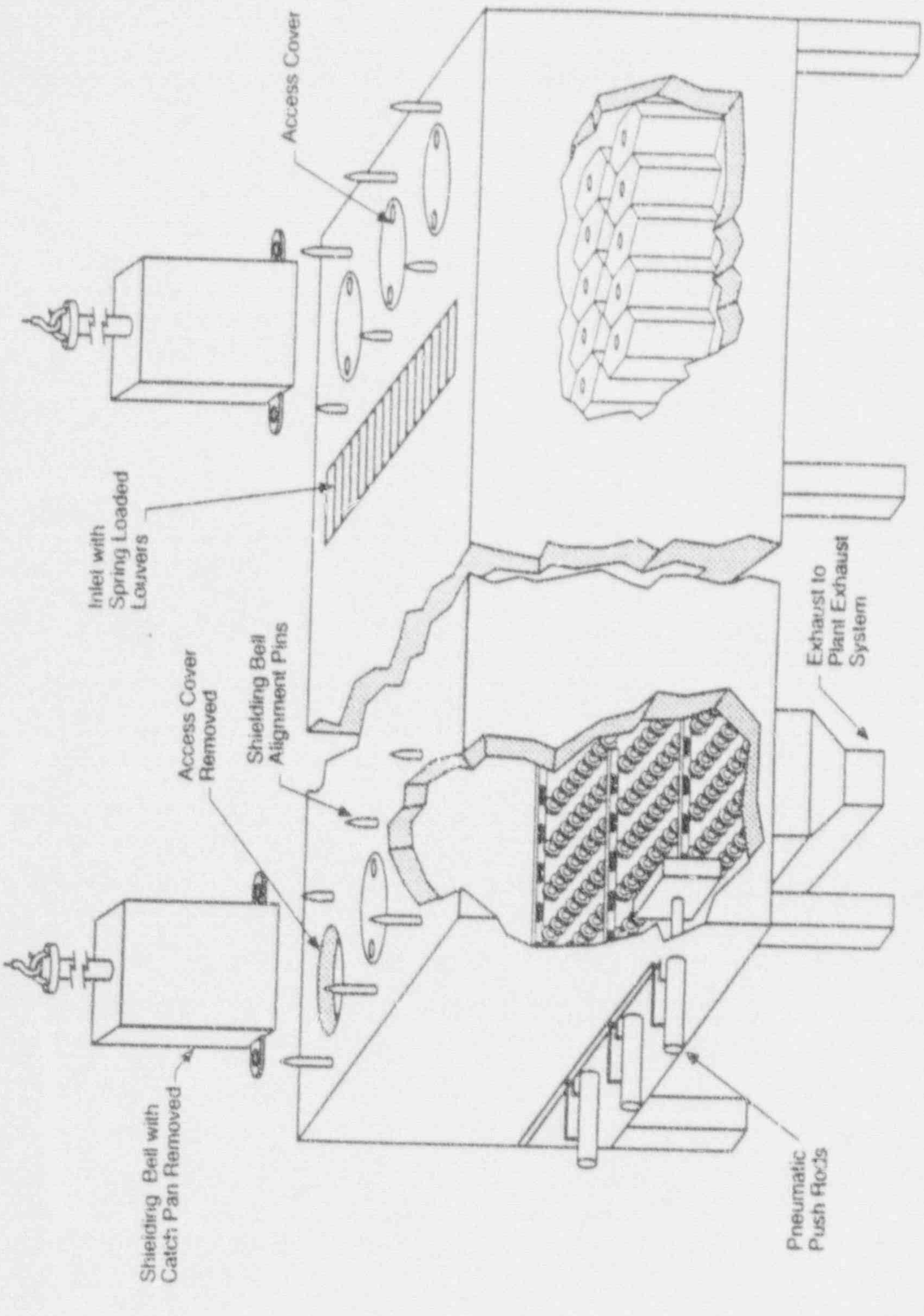


Figure 2.3-20 Block Dryer Arrangement (Loading/Unloading)

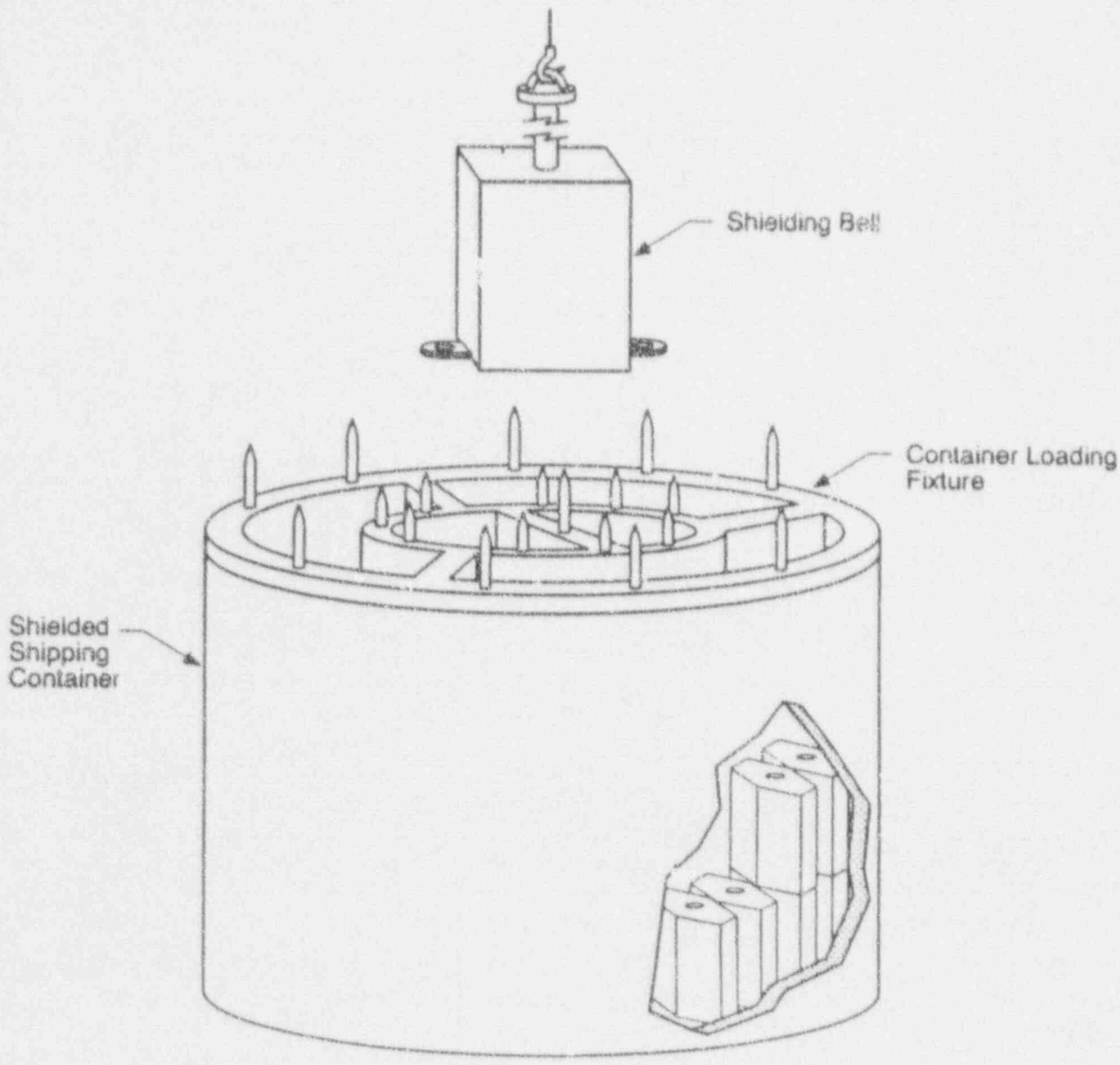
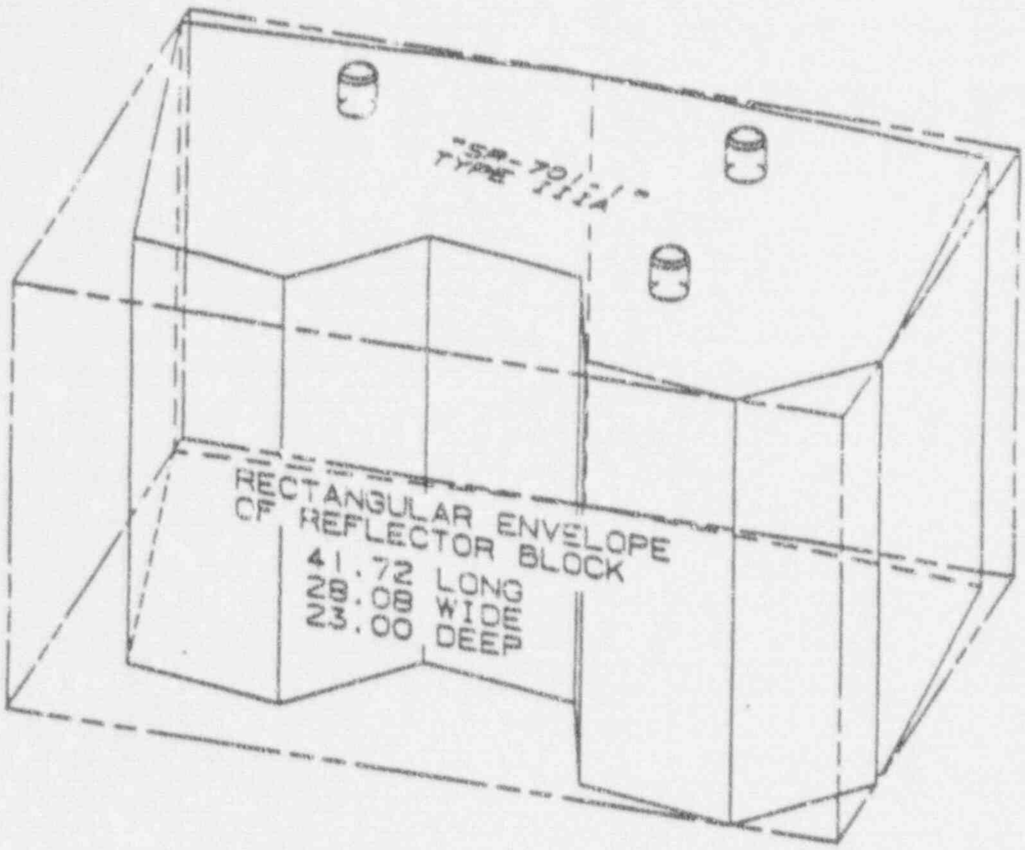


Figure 2.3-21 Loading Shipping Container



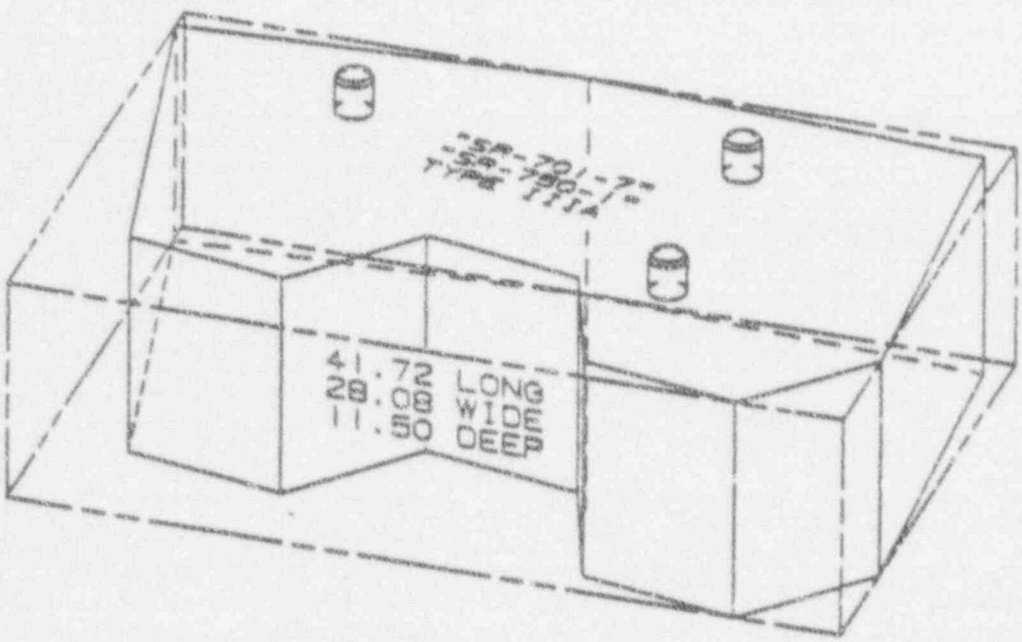


Figure 2.3-22 Large Side Reflector Block (Typical)

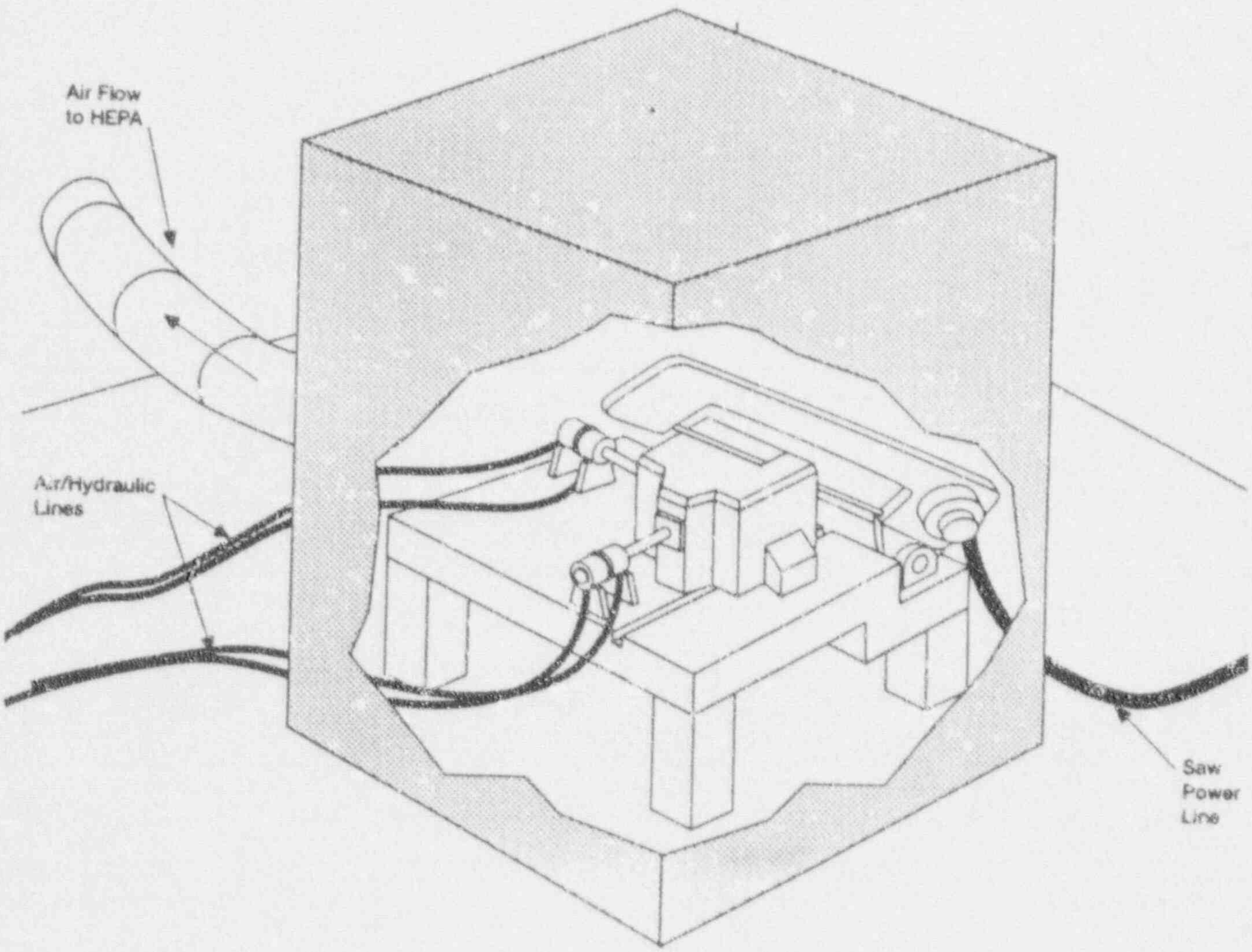


Figure 2.3-23 Large Side Reflector Block - Sectioning Station

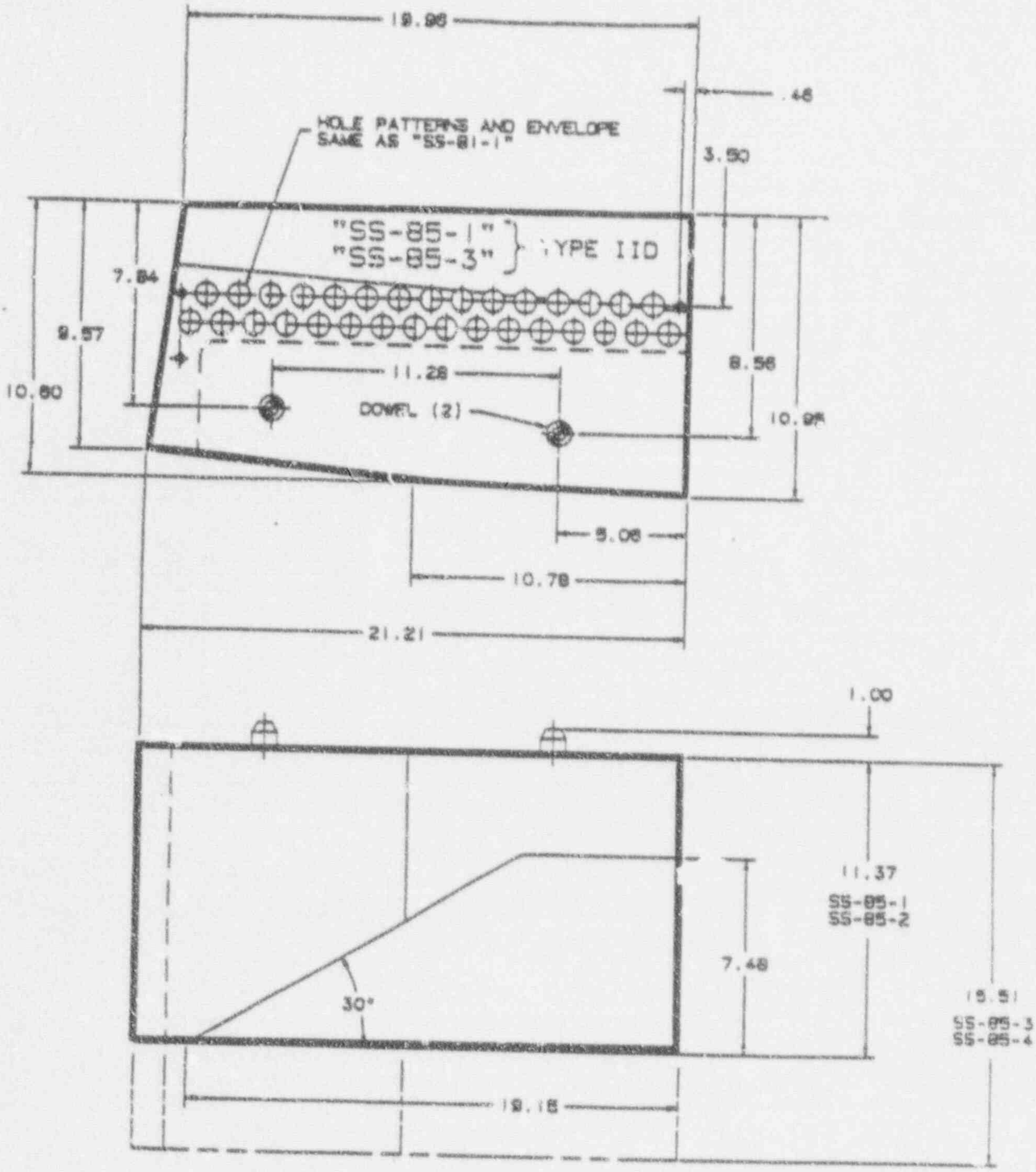


Figure 2.3-24 Side Spacer Block (Typical)

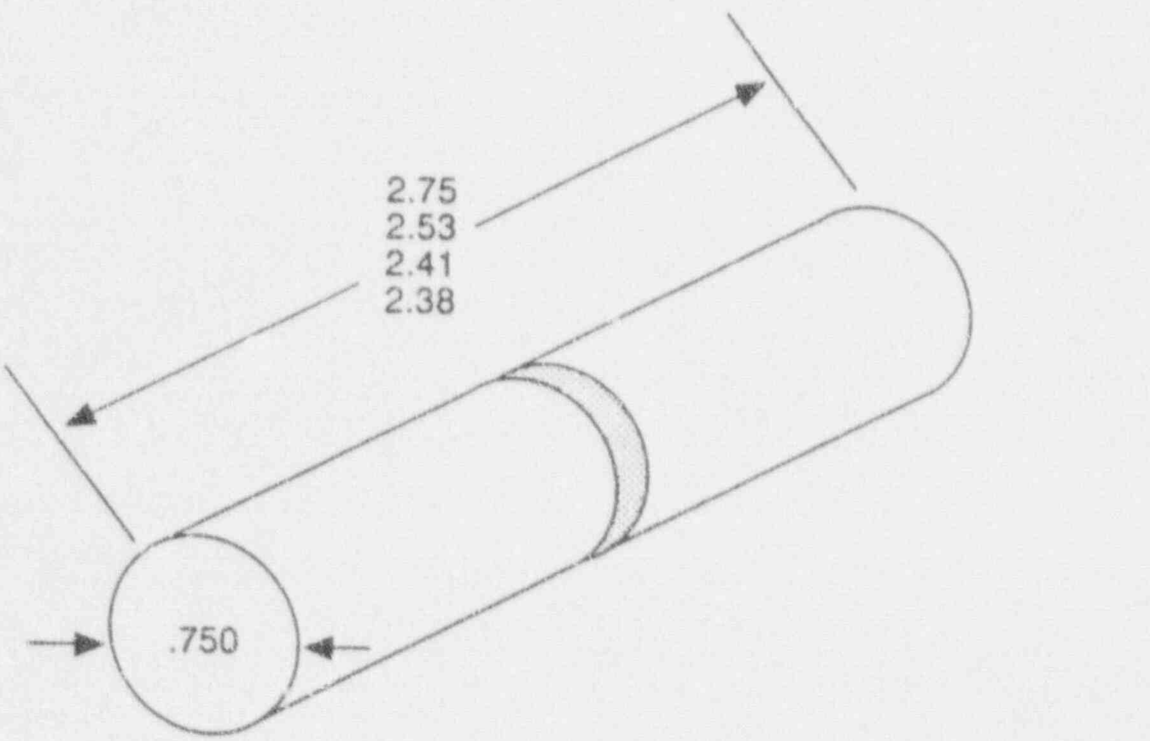


Figure 2.3-25 Boronated Rod

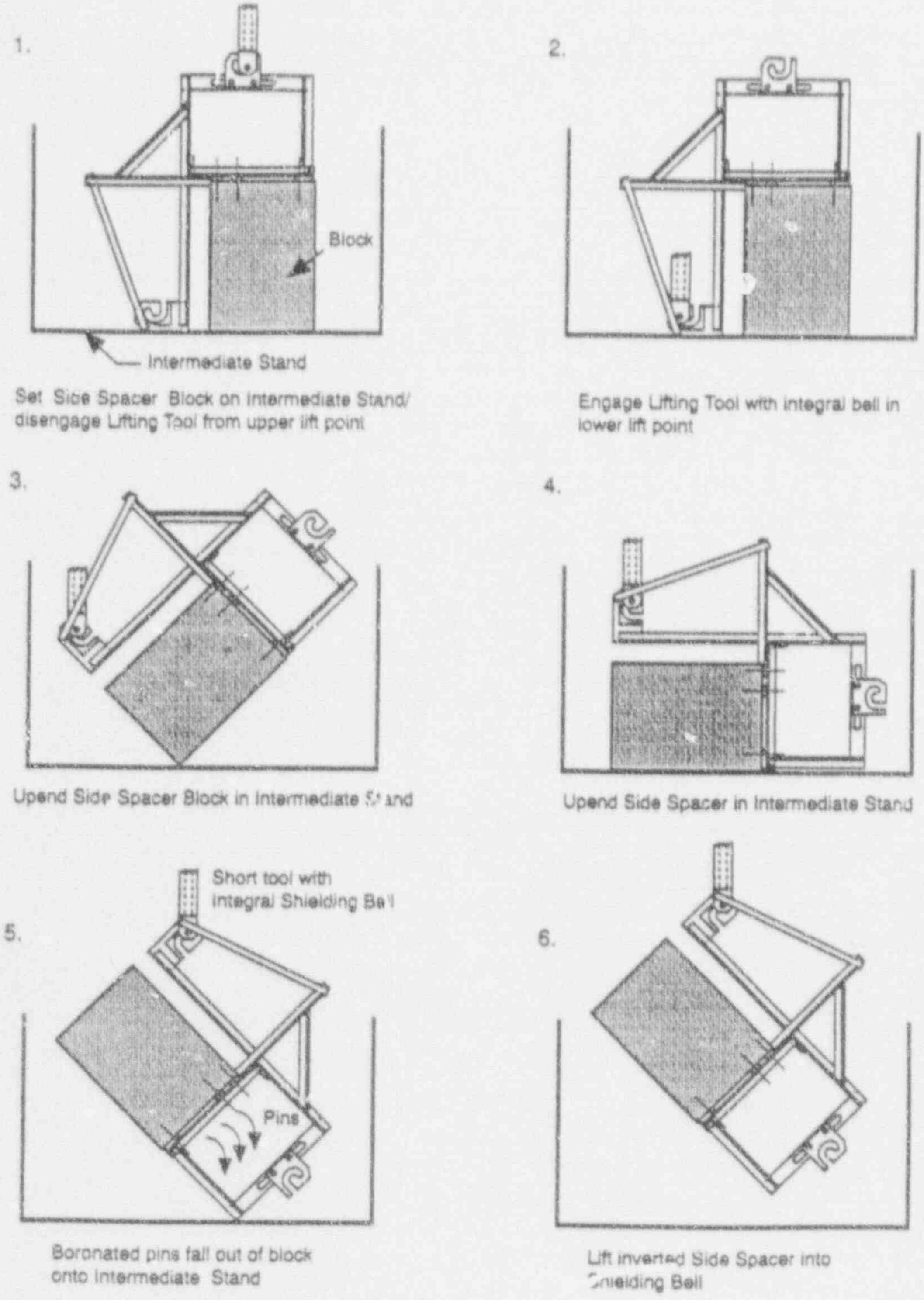


Figure 2.3-26 Side Spacer Block Pin Dumping

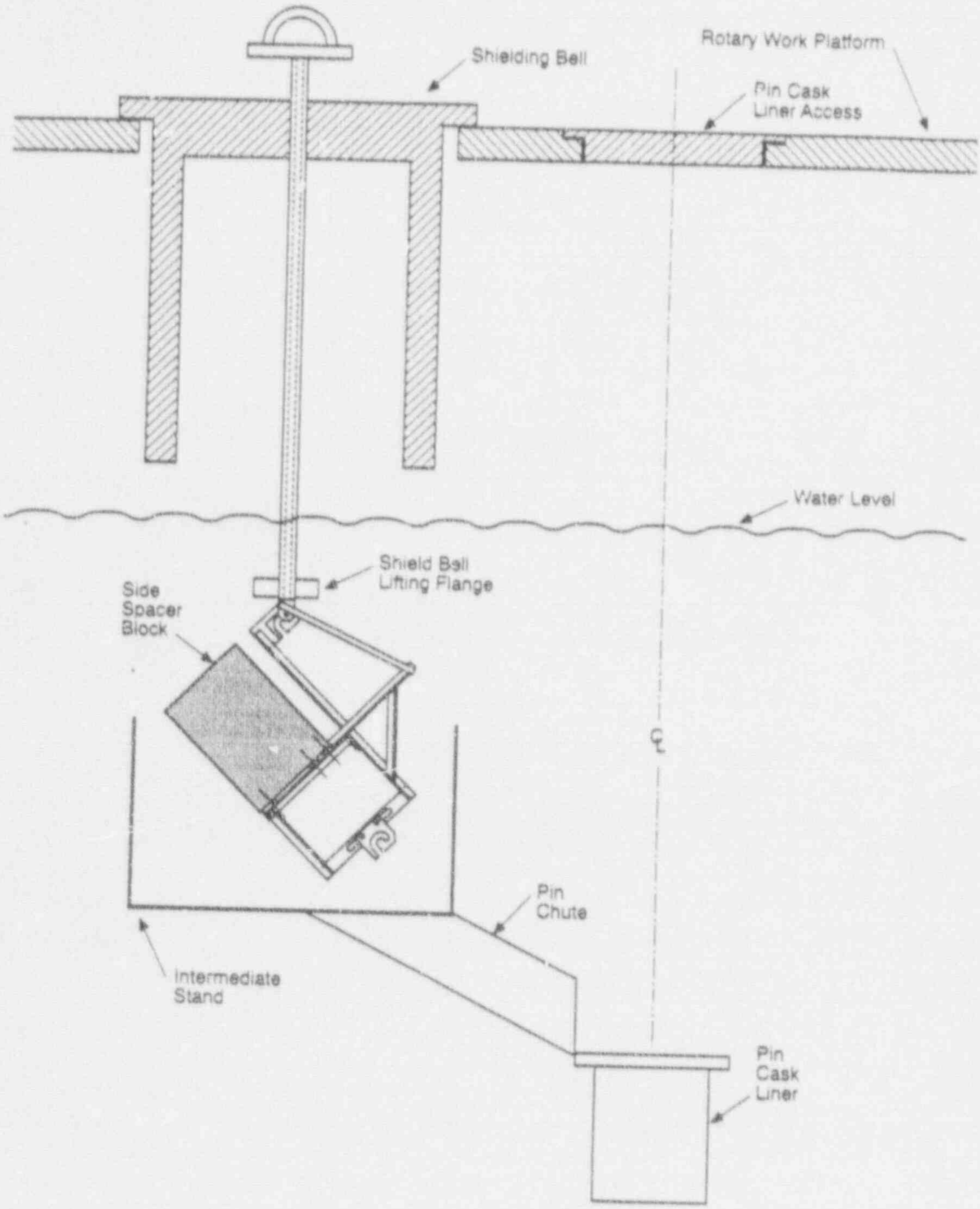


Figure 2.3-27 Side Spacer Pin Collection

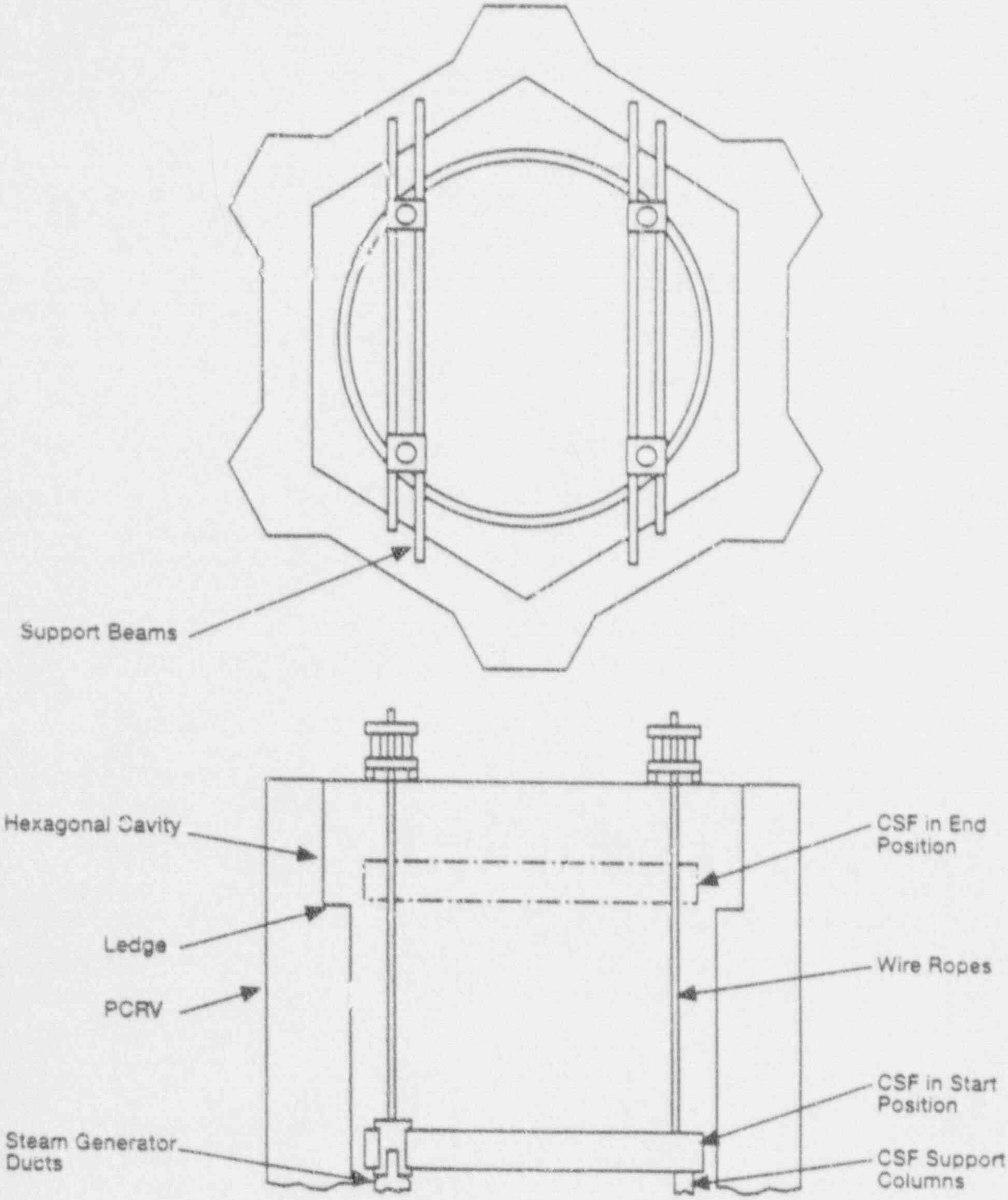


Figure 2.3-28 CSF Four Point Jacking System

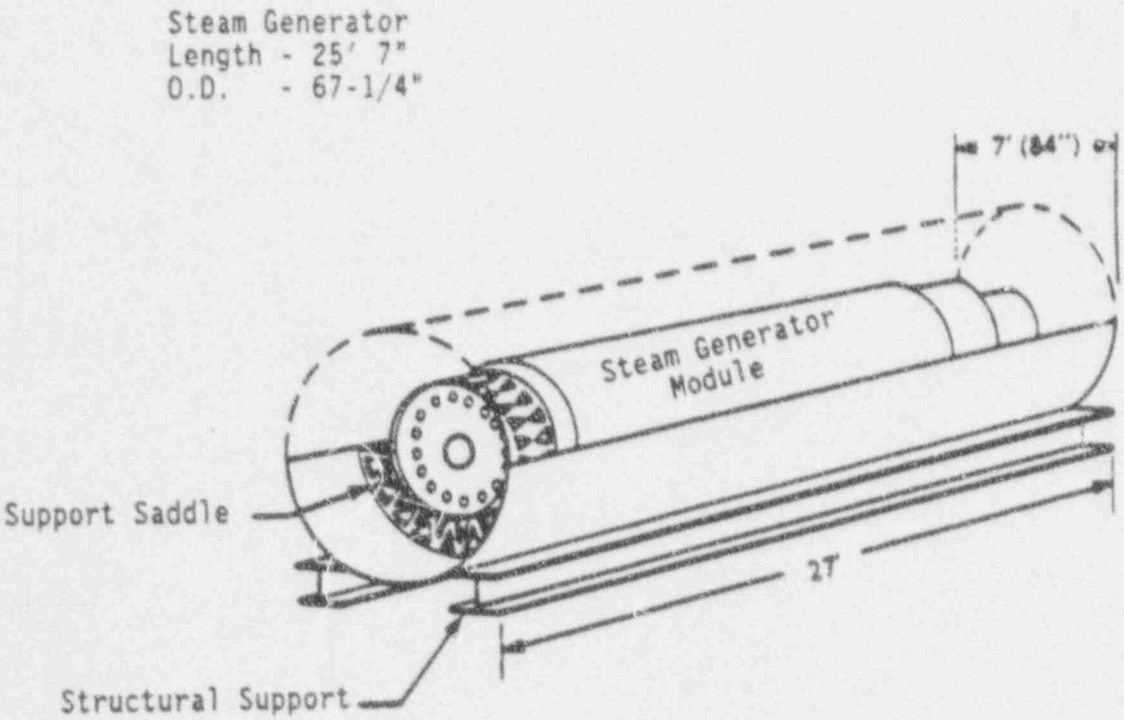


Figure 2.3-29 Steam Generator Shipping Container

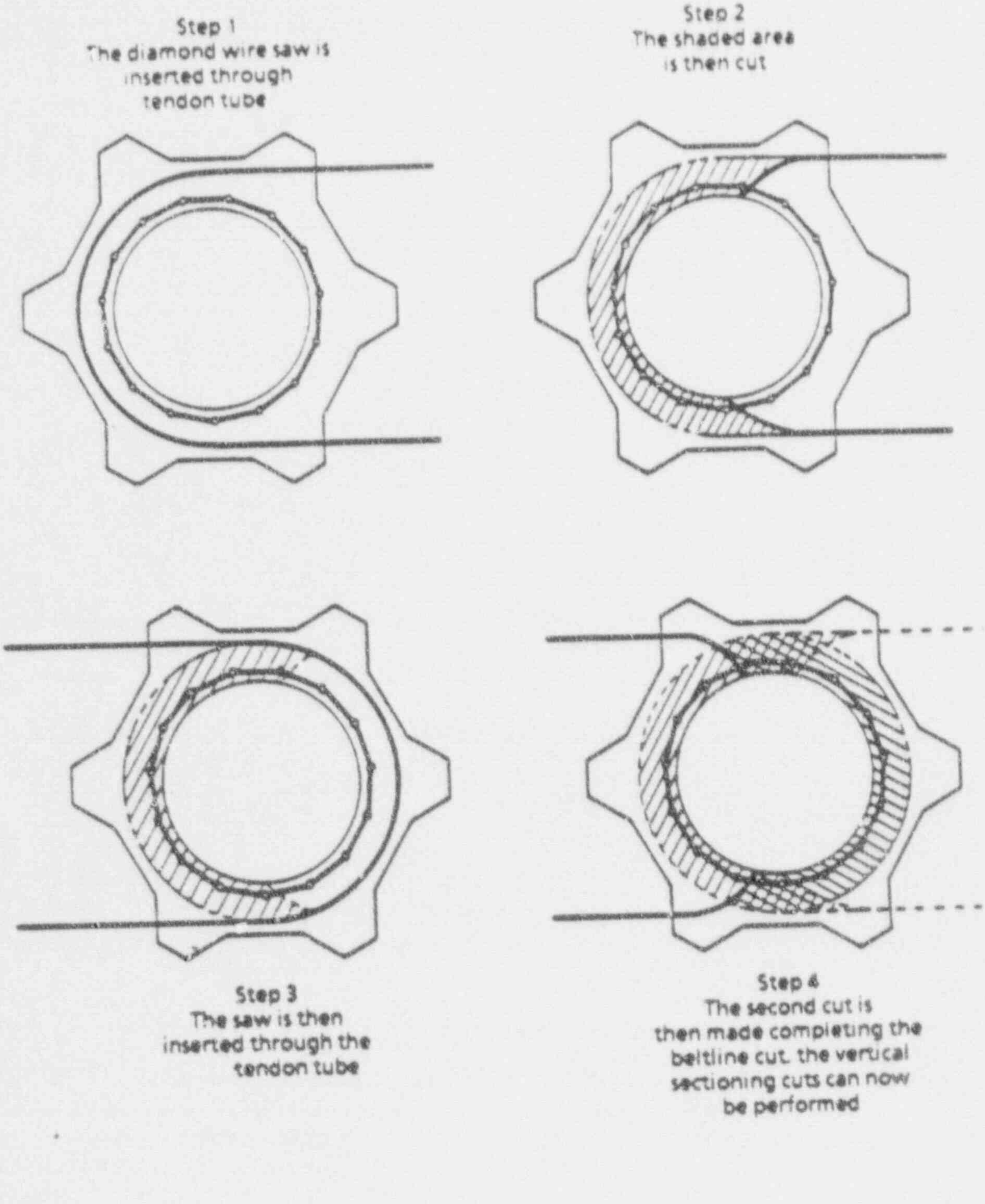


Figure 2.3-30 PCRV Beltline Concrete - Horizontal Cuts

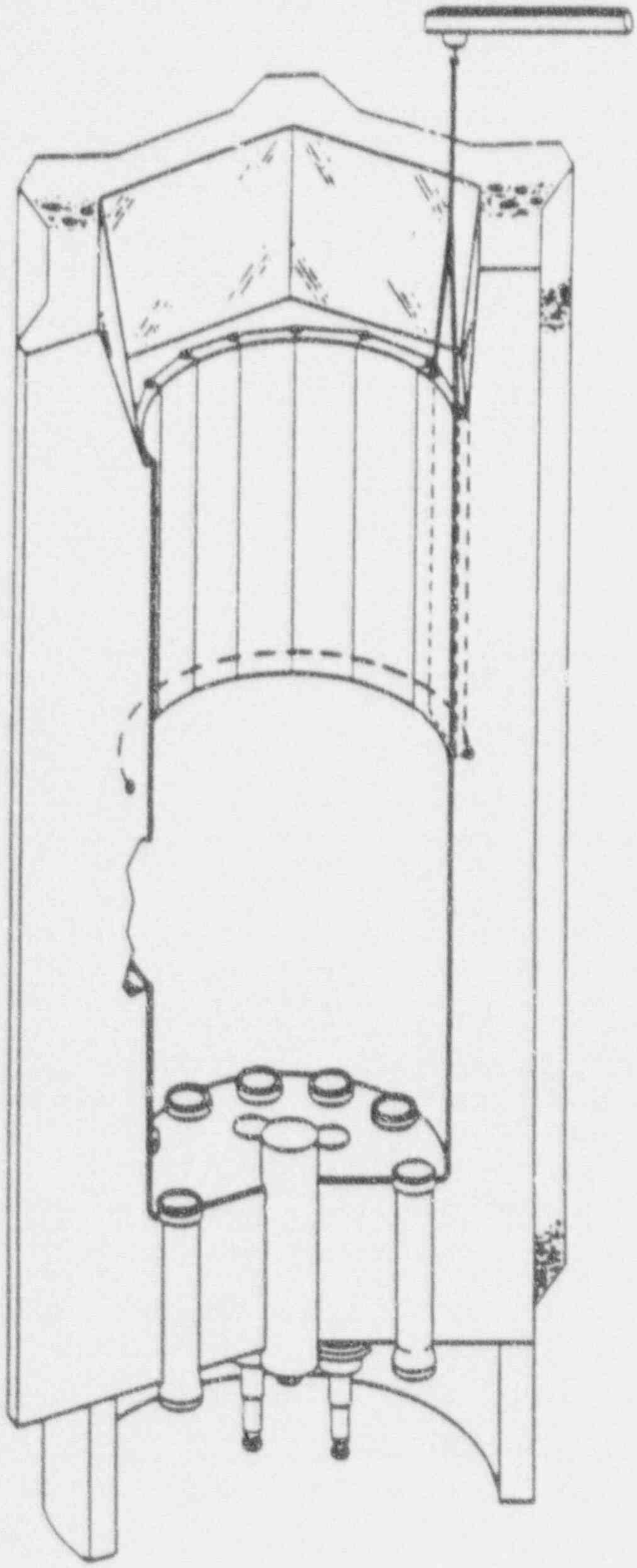


Figure 2.3-31 PCRV Beltline Concrete - Vertical Cuts

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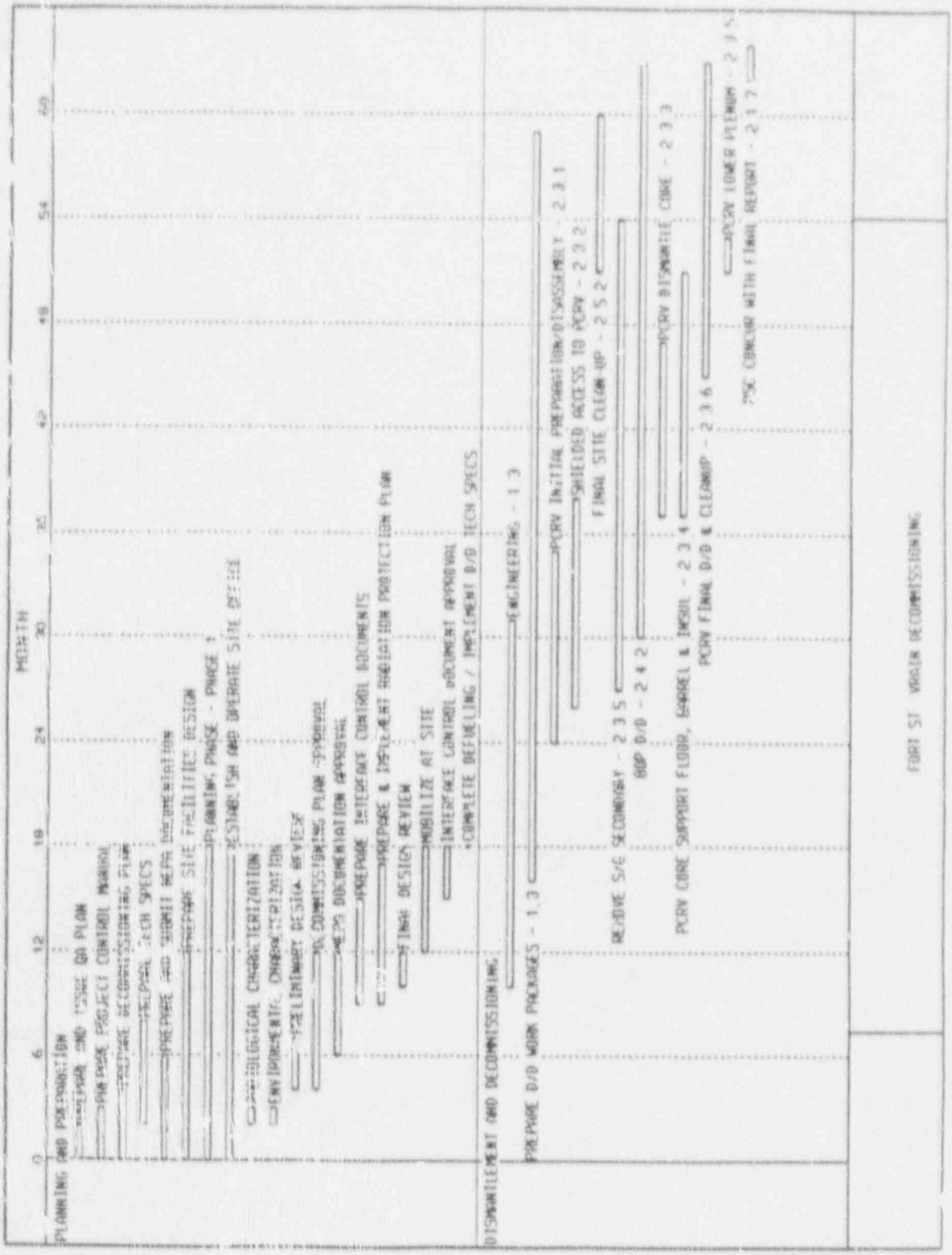

Figure 2.3-32 Fort St. Vrain Decommissioning Schedule (Sh. 1 of 6)

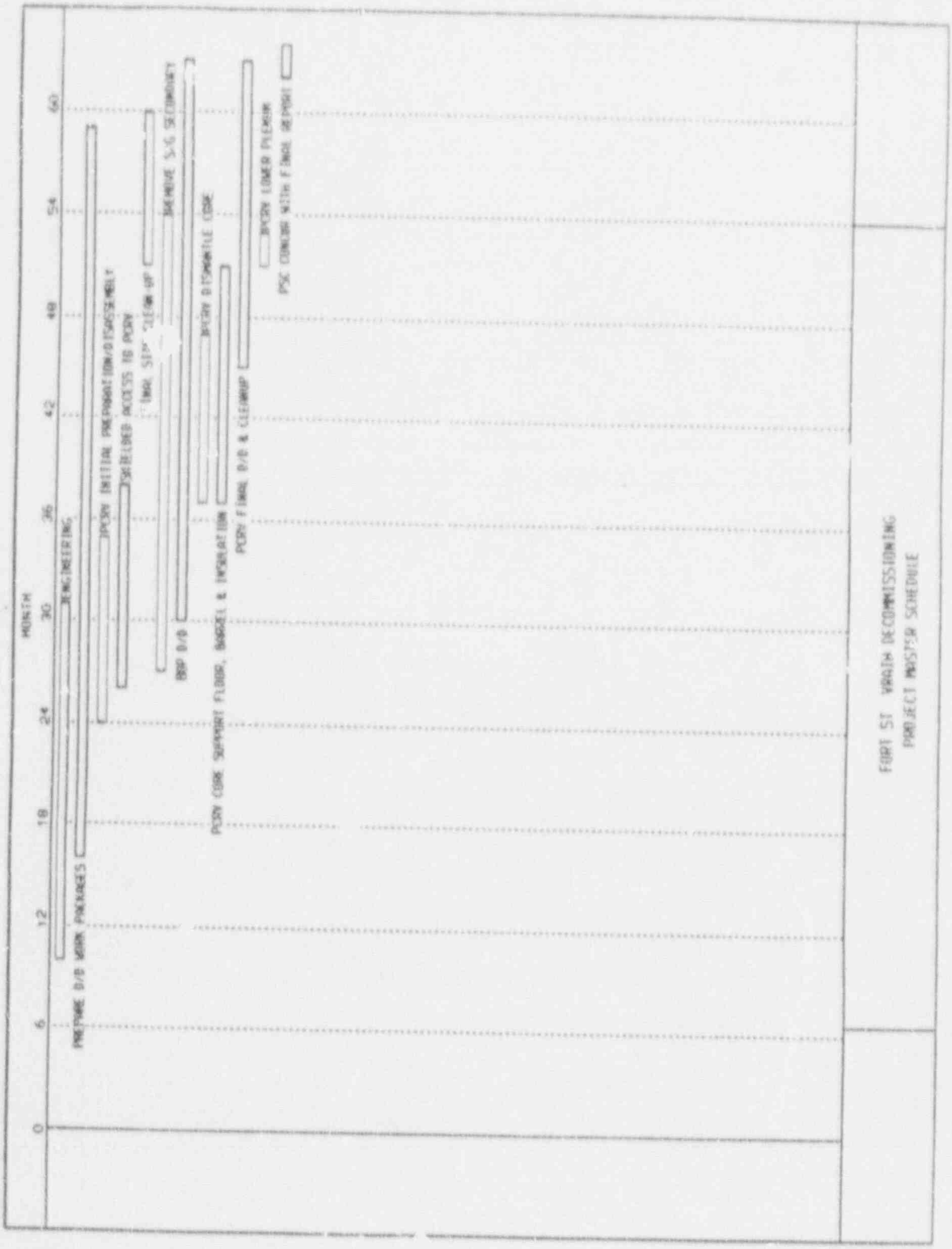

Figure 2.3-32 Fort St. Vrain Decommissioning Schedule (Sh. 2 of 6)

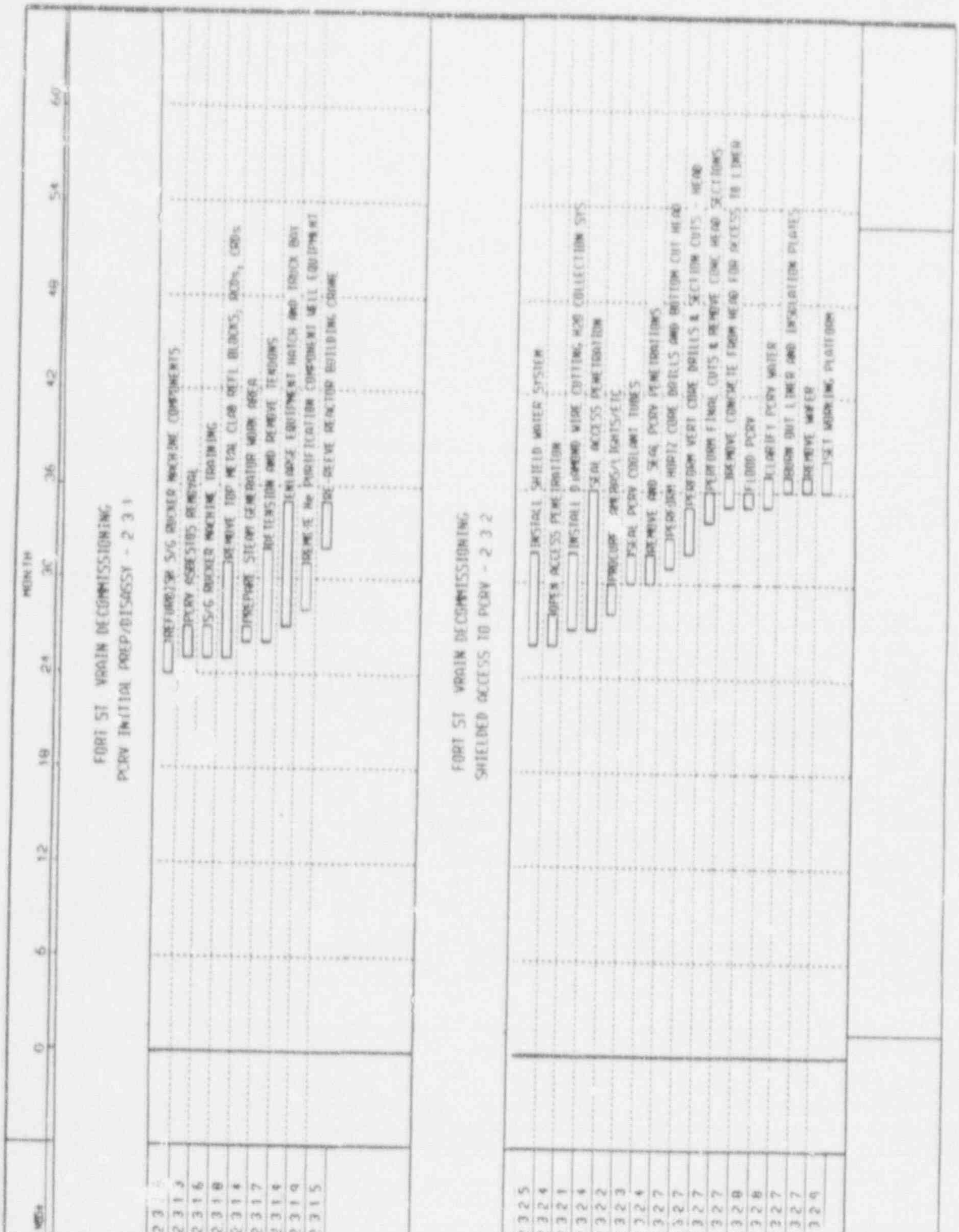

Figure 2.3-32 Fort St. Vrain Decommissioning Schedule (Sh. 3 of 6)

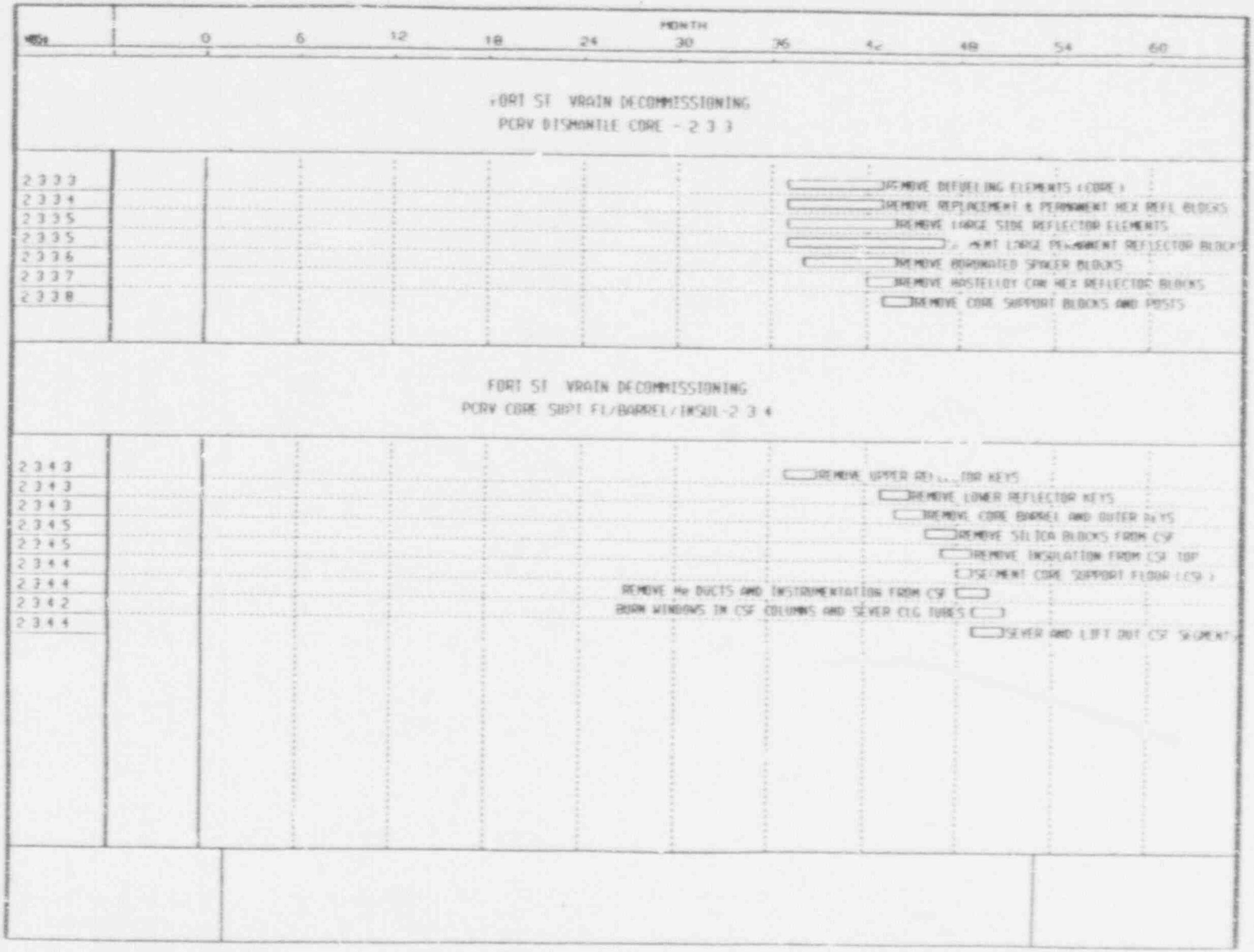

Figure 2.3-32 Fort St. Vrain Decommissioning Schedule (Sh. 4 of 6)

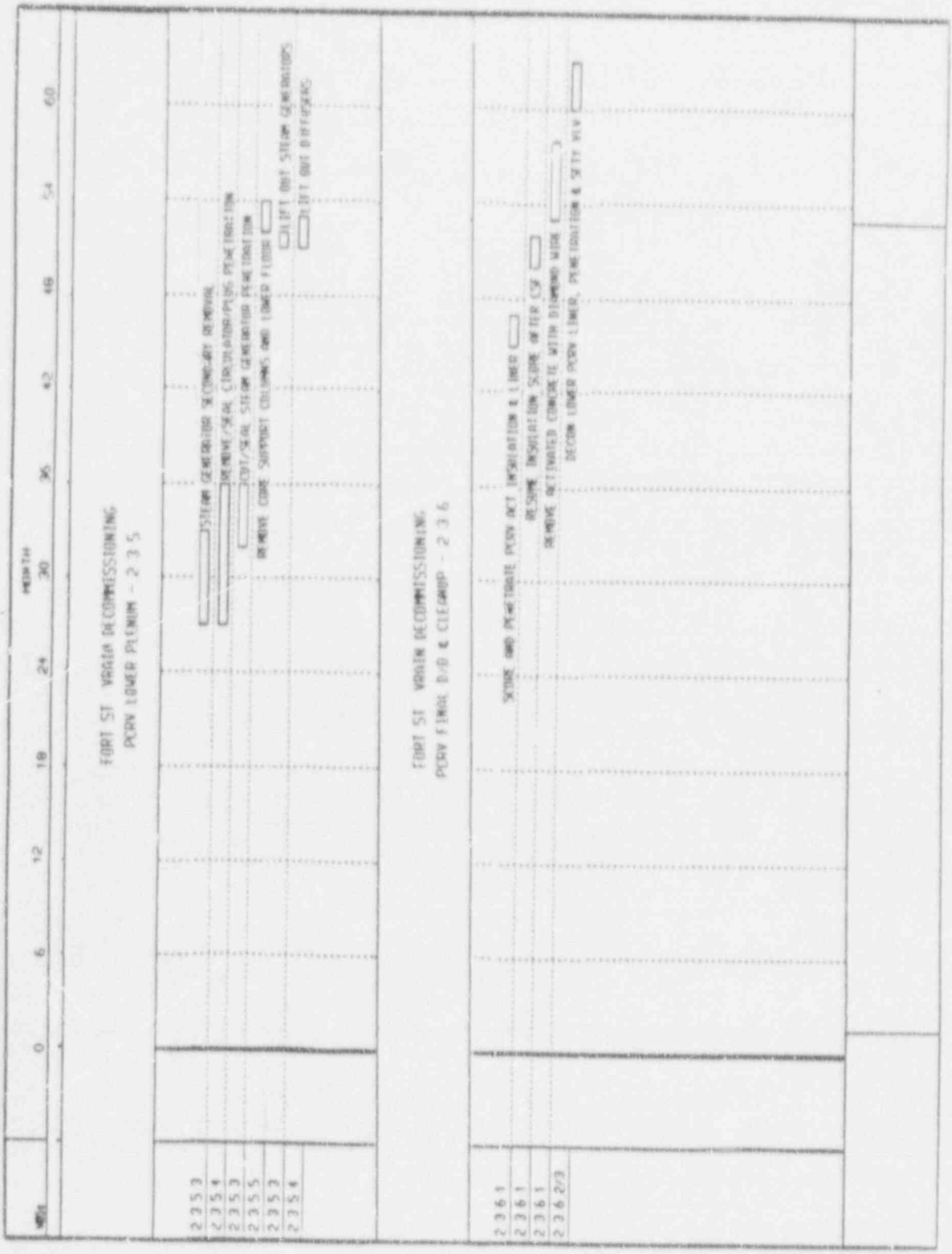

Figure 2.3-32 Fort St. Vrain Decommissioning Schedule (Sh. 5 of 6)

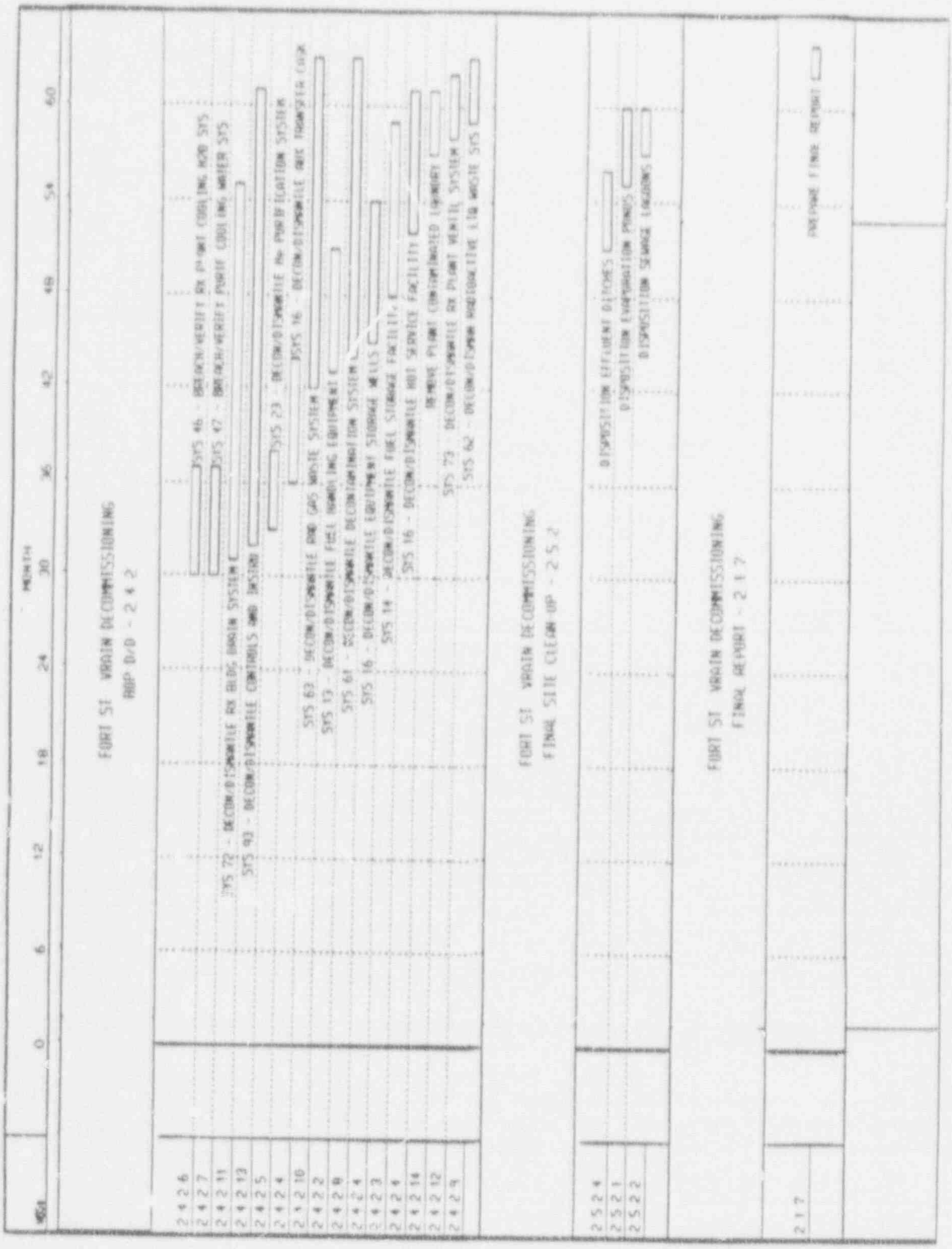

Figure 2.3-32 Fort St. Vrain Decommissioning Schedule (Sh. 6 of 6)

2.4 DECOMMISSIONING ORGANIZATION AND RESPONSIBILITIES

2.4.1 PSC Commitment

Public Service Company of Colorado (PSC) is fully committed to compliance with the existing license and applicable regulatory requirements during all phases of the Fort St. Vrain decommissioning. PSC s commitment to the safe decommissioning of the facility will be accomplished with diligence and quality service. Corporate principles, policies, and goals will be followed to ensure performance excellence, management competence, and high standards in every facet of the decommissioning project.

2.4.2 PSC Decommissioning Organization and Functions

The PSC Decommissioning staff for the Fort St. Vrain Nuclear Generating Station and the interface with the Westinghouse team is shown in Figure 2.4-1. The manpower level is approximately 60 people including the key staff members and all performance level people. Overall onsite control and responsibility for all decommissioning activities for both PSC and contractor personnel rests with the PSC Decommissioning Program Director. A Deputy Director assists the Program Director in all aspects of decommissioning program management. Within the PSC organization, five main groups report to the Decommissioning Program Director. The groups consist of the Project Assurance Manager, Facility Support Manager, Operations Manager, Decommissioning Engineering Manager, and Project Controls Manager. Contractor reporting requirements and lines of authority are identified in Section 2.5. The PSC Decommissioning Program Director interfaces directly with the Westinghouse Project Director for decommissioning activities.

During the decommissioning process, PSC will retain responsibility for the 10 CFR 50 license and therefore will maintain the following responsibilities:

1. Overall management oversight of all decommissioning project activities.
2. Sole point of contact with all regulatory agencies within the Federal, State and local governments.
3. Overall responsibility for all licensing activities.
4. Overall management of those plans and programs required to comply with licensing requirements, including: access control, radiation protection, Quality Assurance, maintenance and operation of existing

plant systems, training and configuration management.

The key decommissioning staff members perform the functions described in the following subsections.

2.4.3 PSC Vice-President

The Vice President responsible for nuclear activities, provides leadership and direction at the corporate executive level and has the authority and responsibility to ensure that all activities to carry out decommissioning are performed safely and within applicable regulations.

The Vice President responsible for nuclear activities, shall have a minimum of fifteen years executive experience in waste management, decontamination and decommissioning, and nuclear operations. The Vice President must have a formal education in an engineering or physical science field. Knowledge in the areas of regulation and compliance, decommissioning techniques, and applied radiation protection programs are required. In addition, a background of knowledge with respect to NRC and DOE is desirable.

2.4.4 Decommissioning Program Director

The Decommissioning Program Director is directly responsible to the Vice President responsible for nuclear activities. The Decommissioning Program Director coordinates and oversees all decommissioning activities. This position provides direction to the support groups to ensure radiological and industrial safety, compliance with regulatory requirements, cost-effectiveness, and interfaces for PSC Labor Relations of the decommissioning project. The Westinghouse Team Project Director will report to this position.

The Decommissioning Program Director shall have a minimum of ten years responsible plant experience with formal education in an engineering or physical science field. A significant technical background to have good working knowledge of plant principles of operation, maintenance and engineering principles. Additional knowledge in the areas of regulation and compliance, decommissioning techniques and applied radiation protection programs are required.

2.4.5 Deputy Director

The duties of the Decommissioning Program Office have been divided between the Decommissioning Program Director and the Deputy Director. The Deputy Director also reports to the Vice President responsible for nuclear activities. The Deputy Director is required to meet the same qualifications as the Decommissioning Program Director, and is authorized to fulfill all of the duties of the Program Director as required.

2.4.6 Project Assurance Manager

The Project Assurance Manager is responsible for Quality Assurance oversight (including QA reviews, audits and monitoring (surveillance) activities), licensing and regulatory compliance, and overall industrial safety. To ensure the independence of the QA function, this position reports to the Vice President responsible for nuclear activities on quality assurance matters (as indicated by the dotted line in Figure 2.4-1). The Project Assurance Manager reports directly to the Decommissioning Program Director for administrative direction and implementation of the Quality Assurance Plan, coordination and direction for licensing activities, and coordination direction of the industrial safety program (as indicated by the solid line in Figure 2.4-1).

The Project Assurance Manager shall have a minimum of five years experience in a responsible position that includes coordination, direction and supervision of personnel, a formal education in an engineering or physical science field, and a working knowledge and understanding of nuclear plant design and operation and construction practices is required. A balance of experience in quality assurance related activities and in regulatory/compliance activities is preferred.

2.4.7 Facility Support Manager

The Facility Support Manager is responsible for Radiation Protection, ALARA, Access Control and Training programs. This position is also responsible for managing support areas of emergency planning, records control and retention, PSC training, PSC materials and facilities.

The Facility Support Manager has the overall responsibility for the Radiation Protection Program described in Section 3.2 of this plan, and shall serve as the PSC Radiation Protection Manager. The Facility Support Manager represents the formal line of communication and authority between Fort St. Vrain and the Westinghouse team for radiation protection matters related to decommissioning. This individual will be responsible for ensuring that the Radiation Protection Program and procedures meet the goals and standards established by PSC management and the governing regulatory agencies. The Facility Support Manager will also be directly responsible for the Radiological Environmental Monitoring Program and the Decommissioning Emergency Response Plan. This individual will meet the qualifications contained in NRC Regulatory Guide 1.8 "Qualification and Training of Personnel for Nuclear Power Plants" (Ref. 12). The duties and responsibilities of the Facility Support Manager with respect to the Radiation Protection Program are described in further detail in Section 3.2.3 of this plan.

The Facility Support Manager shall have a minimum of five years experience in a responsible position that includes coordination, direction and supervision of personnel. A formal education in engineering or the physical sciences or the equivalent experience in a science or engineering subject is preferred. Formal training in radiation protection is required.

2.4.8 Operations Manager

The Operations Manager is responsible for the overall conduct and management of operations and maintenance functions. These responsibilities include system operations, testing and surveillances, system maintenance, lay-up and turnover.

The Operations Manager shall have a minimum of eight years of responsible power plant experience of which five must be nuclear power plant experience, including coordination, direction and supervision of personnel. A thorough working knowledge and understanding of plant design and operation and maintenance functions (including instrumentation and control maintenance activities) are required.

| ### 2.4.9 Decommissioning Engineering Manager

| The Decommissioning Engineering Manager is responsible for the administrative and technical functions of the decommissioning project. Responsible areas include | management of contract work, technical assistance, and evaluation and approval of contract changes. This position is also responsible for the general oversight of field work, preparation of engineering evaluations and coordination with operations.

The Decommissioning Engineering Manager shall have a minimum of a Bachelor's Degree in engineering or the physical sciences and have a minimum of five years of professional level experience in nuclear services, nuclear plant design and operation, including coordination, direction and supervision of personnel. A working knowledge and understanding of decommissioning techniques, scheduling and contract administration is required.

2.4.10 Project Controls Manager

The Project Controls Manager is responsible for reviewing and reporting on decommissioning performance against base line schedules and budgets, legal decommissioning contract administration, recommending changes in decommissioning project direction, developing project cost estimates and issuing regular performance indicator reports.

The Project Controls Manager shall have a minimum of five years of professional level experience in nuclear services, nuclear plant design and operation, including coordination, direction and supervision of personnel. A college level degree in engineering or the physical sciences is required. Additional knowledge in contract administration, strategic planning and cost control is required.

2.4.11 Decommissioning Safety Review Committee

The DSRC reports to the Vice President responsible for nuclear activities. The function of this committee is to monitor decommissioning operations to ensure that they are being performed safely. This committee will review and audit major decommissioning operations dealing with radioactive material and radiological controls. In addition, they will review work specifications and administrative procedures, reportable occurrences under 10 CFR 20 and 10 CFR 50, and changes made in accordance with 10 CFR 50.59. Specific membership, duties and responsibilities of the DSRC are identified in the Decommissioning Technical Specifications.

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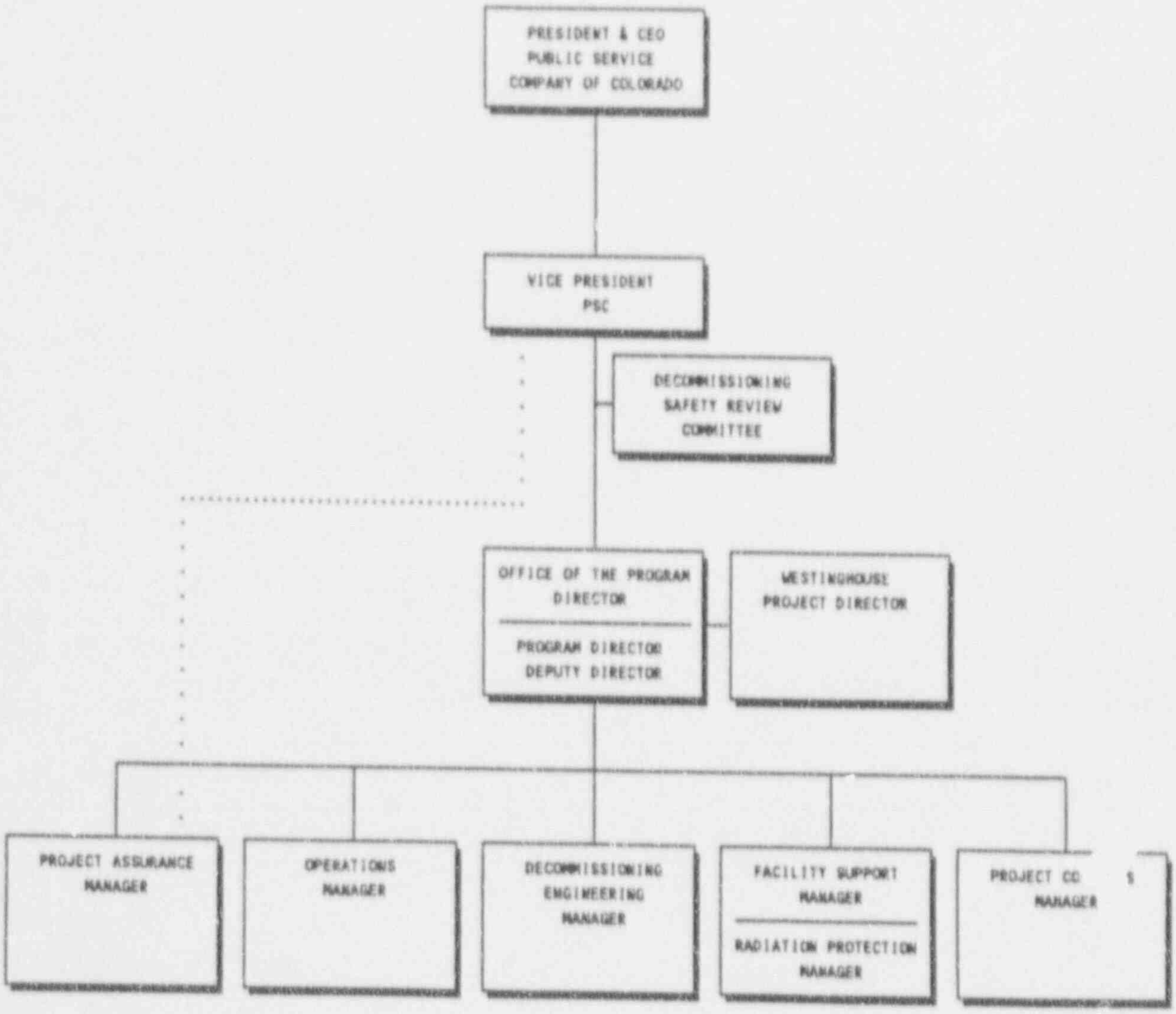

Figure 2.4-1 PSC Decommissioning Organization

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2.5 CONTRACTOR RESPONSIBILITIES

2.5.1 Westinghouse Team Organization and Functions

This section describes the responsibilities, work scope, and qualifications of the Westinghouse team that will perform the decommissioning. Since PSC retains overall licensing responsibility, the PSC and Westinghouse team interface will be structured to clearly demonstrate PSC compliance and control as required. Westinghouse will, as a minimum, obtain approval of top level project procedures, plans and programs that could have an impact on license compliance or safety.

2.5.2 Westinghouse Team Scope of Work

Based on a competitive bid selection process, PSC selected the Westinghouse team to perform the decommissioning, dismantlement and decontamination of Fort St. Vrain. This team is an affiliation of Westinghouse and MK-Ferguson Corporations. Westinghouse is the overall lead organization for the program.

Within the Westinghouse team, Westinghouse will be responsible for overall project management. In addition, Westinghouse will also be responsible for decommissioning engineering, licensing support, and will provide the project quality plan throughout the project. The overall responsibilities of each of the Westinghouse team members are summarized in Table 2.5-1. The Westinghouse Quality Assurance organization, responsibilities and reporting lines of communication are described in Section 7 of this plan and depicted in Figure 2.5-1. MK-Ferguson will provide the site labor, labor management and supporting infrastructure for decommissioning.

The Fort St. Vrain decommissioning project will be conducted in two phases (See Section 1.2.5). A breakdown of the Westinghouse team work scope is provided in Appendix I of this plan.

2.5.3 Organization of the Westinghouse Team

This section identifies the Westinghouse team organization and their responsibilities in the Fort St. Vrain decommissioning project. The Westinghouse team combines many years of successful experience in the design, construction, operation, and decommissioning of commercial and government-owned nuclear facilities. Westinghouse and MK-Ferguson have a strong commitment to the project and to operating in a safe, environmentally sound, cost-effective and responsible manner.

The Westinghouse team Organization Chart, Figure 2.5-1, shows the interrelationship of the positions within the Westinghouse team project organization. Descriptions of the responsibilities and qualifications are provided in the following paragraphs.

2.5.3.1 Fort St. Vrain Westinghouse Project Director

The Project Director is the most senior and responsible management position in the Westinghouse team project organization. The Westinghouse team Project Director will provide a single point of contact for PSC on the decommissioning effort. The Project Director reports to the PSC Program Manager for Decommissioning and is fully responsible for Westinghouse team personnel, plant safety, prevention of environmental occurrences, quality assurance, project integrity, costs, schedule, efficiency, and technical output of the overall program.

The Project Director will be responsible for project implementation for both project phases and will have full authority to administer Westinghouse team resources. The Project Director reports directly to the Vice President of the Westinghouse Energy Systems Business Unit.

Other duties and responsibilities include the following:

1. Establish project manning requirements, organizational structure, scope, and necessary levels of expertise.
2. Select and manage the project staff.
3. Ensure that the project schedule and budget are properly detailed and defined.
4. Direct the set up of all project control programs, operating plans, and technical services.
5. Ensure that the project meets applicable regulatory standards.
6. Direct all phases of site work, including preplanning, mobilization, training, temporary facility erection, decontamination and dismantling activities, and project closeout.
7. Ensure that all work activities are carried out according to the project standards of safety, quality, and reliability.
8. Direct team members, technical services, and operations and control activities for entire project.
9. Enforce adherence to the project policies and procedures.

2.5.3.2 Technical Services Manager

The Technical Services Manager is responsible for engineering and licensing support. The Technical Services Manager reports directly to the Westinghouse Project Director. A requirement for a Technical Services Manager is based on the need for quality engineering and technical support services to ensure successful on-site operation.

The Technical Services Manager is responsible for the technical services organization, which will perform a wide variety of work in support of the overall facility decommissioning. Initial efforts include completion of the decommissioning plan, tooling design, and procedure and process definition. Following completion of this preliminary work, emphasis will shift to providing technical support in design of tools, development of procedures operation, waste processing and waste management, radiochemistry and radiological controls for the D/D effort and waste disposal activities.

Duties of the Technical Services Manager will consist of managing department manpower and funding allocations. The Technical Services Manager also ensures that technical aspects of the project are done in a safe, disciplined, and quality manner.

Other duties and responsibilities of the Technical Services Manager include the following:

1. Perform the engineering necessary to support work package development, including tooling design, prepare material lists.
2. Ensure proper review/approval of engineering documents, purchase orders, field design changes, and other documents, as required.
3. Maintain engineering team to provide design engineering support.
4. Incorporation of technical requirements, methods, regulations and procedures for waste processing activities into engineering and operational documents.
5. Provide input to establish an engineering schedule/budget and continuously monitor cost/accomplishments against established budget and schedule.
6. Advise the project manager of changes in plans or changed conditions affecting costs or schedules.

2.5.3.3 Operations Manager

The Operations Manager is responsible for the performance of all dismantling, decontamination, and conversion activities in a safe, disciplined, and quality manner. The Operations Manager reports directly to the Westinghouse Project Director.

The Operations Manager is responsible for the safe, disciplined management of the decontamination and dismantling activities, waste processing, and facilities management by implementing the radiation protection program, and quality assurance plan throughout his department. The Operations Manager will also ensure that adequate short-term internal planning is accomplished and that this planning is in agreement with the project master schedule, as well as PSC goals and objectives. The Operations Manager is also charged with accurately identifying the personnel and physical resources required to complete all production tasks, and for identifying and integrating the operations department scope of work, budget, and schedule.

Other duties and responsibilities of the Operations Manager include the following:

1. Manage the day-to-day activities of the project team at the site as well as the subcontractors. These activities include decommissioning, decontamination, waste handling and site maintenance.
2. Prepare work packages and specs for the modification or removal of plant structures.
3. Prepare and manage work packages for decontamination, dismantling, and asbestos removal and disposal.
4. Estimate field activity costs and record them.
5. Prepare procedures and specs for modifications, deenergizing, or removal of electrical power, lighting and switchgear, and systems operation.
6. Prepare and manage work packages for the modification and removal of piping, components and systems, including HVAC.
7. Supervise project procurement.
8. Manage project site industrial safety program and medical facilities.
9. Ensure that training is provided to the work force.
10. Provide work package document control.
11. Acquire and manage craft labor for decommissioning, decontamination, waste handling, and site maintenance.
12. Manage and interface routine project activities with PSC, including as a minimum clearance and system turnover.

2.5.3.4 Project Radiation Protection Manager

The Project Radiation Protection Manager has the responsibility for the implementation of the Fort St. Vrain Decommissioning Radiation Protection Program. This includes Radiation Protection Program development under the direction of the PSC Radiation Protection Manager, implementation and assuring compliance with applicable regulations. The Project Radiation Protection Manager will serve as the co-Chairman of the ALARA committee with the PSC Radiation Protection Manager. The Project Radiation Protection Manager reports directly to the Westinghouse Project Director.

The Project Radiation Protection Manager will be responsible for the approval of the content of the radiation protection training programs, for the selection and approval of all radiation protection staff members, and for the review and approval of all radiation protection procedures. The Project Radiation Protection Manager will be qualified in accordance with NRC Regulatory Guide 1.8 "Qualification and Training of Personnel at Nuclear Power Plants" (Ref. 6).

The duties and responsibilities of the Project Radiation Protection Manager are discussed in further detail in Section 3.2 and include the following:

1. Implement and maintain an effective radiation protection program as required for the Fort St. Vrain decommissioning.
2. Establish and maintain an effective ALARA program.
3. Establish and maintain a program that minimizes the volume of radioactive waste and that ensures safe transportation and disposal of radioactive waste material.
4. Provide radiation protection input to decommissioning planning.

2.5.3.5 Project Control Manager

The Project Control Manager is responsible for all scheduling, project control and reporting systems, and the integration of reports at the project level. The Project Control Manager reports directly to the Westinghouse Project Director.

The Project Control Manager ensures that all relevant information regarding cost/schedule integration and control is available in the proper format (either summary or detailed data). The Project Control Manager will also address any schedule variances, including outlining the problem, providing potential solutions, assessing input and reporting analysis results. This will be accomplished by the set up of an appropriate level budget/schedule control system broken down into definable work packages. Necessary subsystems, such as collection, reporting, and analysis, will combine to form a total system that will provide a sig ificant management tool.

Other duties and responsibilities of the Project Control Manager include the following:

1. Prepare and evaluate proc activity data.
2. Supervise overall cost and scheduling functions.
3. Prepare management reports.
4. Prepare and coordinate detailed activity schedules.
5. Forecast cost and analyzes trends.
6. Evaluate schedule impacts and formulate alternate plans as necessary.
7. Ensure time and labor studies are done to determine costs on specific operations.
8. Maintain interface with the PSC administrative and scheduling functional groups.
9. Establish and maintain a records retention system.
10. Establish and maintain a management information system.
11. Establish and perform audit activities, as required (financial, schedules, progress).
12. Prepare and verify project invoices.

2.5.3.6 Quality Assurance Manager

The Westinghouse team Quality Assurance Manager has direct access to the Vice President and General Manager, Energy Systems Business Unit, on all quality assurance related issues and reports to the Westinghouse Project Director for administrative direction and implementation of the Quality Assurance Plan. The Quality Assurance Manager is responsible for implementation of the Quality Assurance Plan described in detail in Section 7 of this plan.

2.5.3.7 Corporate Commitment

Executive corporate management of each Westinghouse team member will continue to monitor Fort St. Vrain decommissioning project progress through direct lines of communication and reporting (See Figure 2.5-1). The Westinghouse Project Director will report to the Vice President and General Manager, Energy Systems Business

Unit.

The Fort St. Vrain decommissioning project has been assigned a high priority within MK-Ferguson. The Operations Manager is responsible for MK-Ferguson's project scope, and reports to the Executive Vice President, MK-Ferguson.

2.5.4 Westinghouse Team Qualifications and Experience

The Westinghouse team has extensive and comprehensive experience performing all the activities necessary to successfully decommission Fort St. Vrain. Expertise in each of the disciplines essential to successful completion of the Fort St. Vrain project is evidenced in the matrix of projects and experience provided in Table 2.5-2. Westinghouse and MK-Ferguson have shared joint work experience on the following projects:

1. Shippingport Decommissioning Project
2. WEPCO (Point Beach) Steam Generator Replacement Project
3. WPPSS Design and Construction Projects
4. AEP (D. C. Cook) Steam Generator Repair Project
5. A1W/A4W Nuclear Reactor Prototype
6. Shippingport Plant Modification
7. Savannah River

This shared experience will promote a cohesive approach, productivity, close integration under Westinghouse project management, and consistency in the Fort St. Vrain project.

2.5.4.1 Site Release Experience

The Westinghouse team has successfully achieved the unrestricted release of the facilities listed in Table 2.5-3.

MK-Ferguson currently is the DOE contractor for the Uranium Mill Tailings Remedial Actions Project (UMTRAP). This effort, which began in 1983, encompasses 22 sites and approximately 700 vicinity properties in ten states. The scope of this project includes verifying the effectiveness of remedial actions. These remedial actions are documented in the vicinity property completion reports.

Westinghouse personnel were contributors to the document "Final Consolidated Implementation Plan for Site Release, Rev. 1". This plan was used to direct site release activities at the Shippingport Decommissioning Project. Westinghouse personnel have actively participated in final site characterization and final report preparation activities.

2.5.4.2 Radiological Protection Experience

The Westinghouse team has extensive experience in designing and implementing effective radiation protection programs for projects like Fort St. Vrain. The team has developed or played a major role in developing radiation protection and ALARA programs for routine and outage activities. Examples of facilities where plans have been successfully implemented include:

- Limerick Generating Station
- Peach Bottom Atomic Power Station
- Nine Mile Point Unit 2
- Waterford 3 Steam Electric Station
- Salem Generating Station
- Rancho Seco Nuclear Plant
- Pilgrim Nuclear Power Station
- E.I. Hatch Nuclear Plant
- Shoreham Nuclear Power Station

Westinghouse and MK-Ferguson are experienced in developing ALARA programs and evaluating methods of reducing occupational radiation exposure (ORE).

1. Westinghouse ALARA Programs:

   - Developed dose models for tracking exposure by task, identifying areas where improvement is needed, and developing cost effective solutions.
   - Sponsers the Radiation Exposure Management seminar, an international symposium for communicating and discussing ORE topics among plant health [illegible] and ALARA engineers from plants designed by Westinghouse and others.
   - Participates in Electric Power Research Institute (EPRI) cooperative programs, aimed at identifying and reducing radiation sources in nuclear plants.

- Performed radiological assessments for various plant sites and licenses, including National Nuclear Corporation, Mitsubishi Heavy Industries and NIRA/SOPREN.
- Provided onsite ALARA consultation and coordination during San Onofre and Millstone steam generator sleeving, Connecticut Yankee refueling, Krsko (Yugoslavia) steam generator maintenance, and Point Beach steam generator replacement.

2. MK-Ferguson ALARA Programs:

   - ALARA program results achieved at three operating nuclear plants (Point Beach, D.C. Cook, and Vermont Yankee) and the Shippingport decommissioning project. In the D.C. Cook project, over 70 percent of the initial 1900 person-rem estimate was saved. At Shippingport, the estimated 1000 person-rem was reduced to an actual expenditure of 160 person-rem.
   - Construction management services for the construction, modification, decontamination and decommissioning of various sites, including Savannah River, Knolls Atomic Power Laboratory, INEL, UMTRAP, and the Weldon Spring remedial action project.
   - Construction ALARA/health physics, chemical decontamination program management and radioactive waste management services for the recirculation system piping replacement project at the Vermont Yankee Nuclear Power Plant from 1984 to 1986.
   - Full-scope construction support and construction management services for the decommissioning of the Shippingport station reactor.

2.5.4.3 Waste Handling and Packaging Experience

Westinghouse has experience in providing effective packaging and safe transportation of these packages. In 1989, Westinghouse subsidiaries made over 700 shipments of radioactive materials to disposal sites. These shipments were in accordance with 49 CFR, 10 CFR, and applicable federal, state, and burial site criteria.

The Westinghouse team has demonstrated its ability to handle, package, and transport transuranic (TRU) waste for many years at Hanford, Washington; Savannah River, South Carolina; West Valley, New York; Shippingport, Pennsylvania; Oak Ridge, Tennessee; Fernald, Ohio; Ottawa, Illinois, and Montclair, New Jersey, as well as at more than 60 other nuclear sites throughout the United States. This expertise precludes the problems associated with inadequate packaging or labeling, and ensures that transport equipment is in top condition and drivers are trained and dedicated to safe and efficient hauling of radioactive waste. This expertise and techniques, combined with a complete array of in-house equipment and capabilities, will provide a comprehensive waste management program, of which packaging and transportation are integral parts. Table 2.5-4 highlights the experience the Westinghouse team has in handling, packaging and disposing of various types of wastes expected to be involved in the Fort St. Vrain project.

MK-Ferguson has been responsible for handling and packaging of radioactive materials/waste on various projects over the last 30 years. Two projects of special note are:

1. The Shippingport modification project in the mid-70's included removal of major components and interferences to modifying the unit to a light water breeder reactor. MK-Ferguson prepared detailed work procedures and satisfied requirements to ship all waste materials from Shippingport to Barnwell.
2. The INEL Chemical Processing Facility project included total decontamination and removal of existing systems and components used to process expended fuel preparatory to vitrification. All materials were catalogued, packaged and shipped for long term storage without incident.

Westinghouse has demonstrated the ability to handle, package, and transport greater-than-Class-C waste (GTCC), for customers such as Monsanto Corporation in Dayton, Ohio. Westinghouse also developed the procedures for handling the GTCC waste expected to be encountered during decommissioning of the mixed oxide facility at Nuclear Fuel Services in Erwin, Tennessee.

TABLE 2.5-1
WESTINGHOUSE TEAM RESPONSIBILITIES

	MK-FERGUSON	WESTINGHOUSE
PHASE I:		
Project Management	- Procurement - Safety	- Project Control - General Administration - QA Plan - Licensing/Permitting - Health, Safety & Environment
Engineering	- Site Preparation Specification - Training Program	- Site Characterization - Decommissioning Plan - Project Manuals - Specifications - Asbestos & Liquid Waste - Testing & Training Program - Engineering Planning
PCRV D/D Design/ Specifications/ Procedures	- Core Support Floor/Barrel/ Insulation - Lower Plenum	- Preparation/Disassembly - Shielded Access - Dismantle Core - Dismantle/Decon/Cleanup - Options - Procedures for Selected Systems
System D/D Design/ Specifications/ Procedures	- Disassembly Tools - Dismantling Specification & Procedures	- Tools/Equipment - Site Cleanup
Site Cleanup Specification/Procedures		- Demobilization - Backfill Option
Solid Waste Management Plan		- Procedures

TABLE 2.5-1
WESTINGHOUSE TEAM RESPONSIBILITIES (Continued)

	MK-FERGUSON	WESTINGHOUSE
PHASE II:		
Project Management	- General Administration - Site Engineering - Project Closeout	- Project Control - QA - Licensing/Permitting - Health, Safety and Environment
Common Facilities/ Services	- Site Preparation - Testing and Training - Procurement	- Liquid Waste Disposal - Decontamination - Radiological Surveys/Access
PCRV Dismantlement/ Decontamination	- Initial Prep/Disassembly - Shielded Access - Core Support Floor/Barrel/ Insulation - Lower Plenum - Dismantle/Decon/Cleanup	
System Dismantlement/ Decontamination	- Preparation/Disassembly - Dismantling	- Preparation/Disassembly
Site Cleanup		- Site Cleanup - Demobilization - Backfill Option
Waste Preparation, Packaging, Shipping, Disposal & Disassembly	- Dismantling	

TABLE 2.5-2
RELEVANT WESTINGHOUSE TEAM EXPERIENCE

	Project Management	Project Controls	Design Engineering	Remote Tooling	Quality Assurance	Quality Control	Planning & Scheduling	Contract Administration	Radiological Engineering	Waste Packaging & Disposal	Waste Transportation	Records Management	Project C/O	Craft Labor Management	Reactor Vessel Dismantlement	Staff/Facility Services	Staff/facility Modifications	Procurement Management	Work Package Development
Shippingport Decommissioning	W MK-F	W MK-F	MK-F	W	W	W MK-F	W MK-F	MK-F	W MK-F	MK-F	W MK-F	W MK-F	MK-F	MK-F	MK-F	MK-F	MK-F	MK-F	MK-F
Savannah River Plant	W MK-F	W MK-F	W	W	W MK-F	W MK-F	W MK-F	W MK-F	W	W	W	W MK-F	W MK-F	W MK-F		W MK-F	W MK-F	W MK-F	W MK-F
West Valley Fuel Reprocessing Plant	W	W	W	W	W	W	W	W	W	W	W	W	W	W		W	W	W	W
Old Dominion Electric Fossil Plant			W		W	W						W	W				W		
Wisconsin Electric Steam Generator Replacement	W MK-F	W MK-F	W	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W	W MK-F	W MK-F	W MK-F		W MK-F	W MK-F	W MK-F	MK-F
AEP Steam Generator Replacement	W MK-F	W MK-F	W	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W	W MK-F	W MK-F	MK-F		MK-F	W MK-F	W MK-F	MK-F
Shippingport Plant Modified Program	W MK-F	W MK-F	W	W	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	MK-F	W MK-F	W MK-F	W MK-F	W	MK-F	MK-F	W MK-F	W MK-F
Hanford Site	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
A1W/A4W Reactor Program	W MK-F	W MK-F	W	W	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W	W	W MK-F	W MK-F	W MK-F	W	W MK-F	W MK-F	W MK-F	W MK-F
Idaho National Engineering Laboratory	W MK-F	W MK-F	W		W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	W MK-F	MK-F	MK-F	W MK-F	W MK-F	W MK-F
Florida Power Corporation	MK-F	MK-F			MK-F	MK-F	MK-F	MK-F				MK-F	MK-F	MK-F		MK-F	MK-F	MK-F	MK-F

TABLE 2.5-3
FACILITIES APPROVED FOR UNRESTRICTED RELEASE

COMPANY	DESCRIPTION	REGULATORY AUTHORITY
Monsanto Corporation Dayton, OH	Source Fabrication Facility	US NRC
Watch Dial Facility Ohawa, IL	Radium Watch Dial Facility	State of Illinois
Exxon Nuclear Corporation Richland, WA	Uranium Laser Enrichment Equipment	US DOE
Hittman Nuclear, Inc. Columbia, MD	Contaminated Equipment Handling & Repair Facility	State of Maryland
Smith, Kline & French Swedesboro, PA	Radioisotopes Research Facility	US NRC
Shippingport Nuclear Plant Shippingport, PA	US Naval Reactors/US DOE Facility	US DOE
Numanco, Inc. Prairieville, LA	Source/Calibration Facility	State of Louisiana
Miles Pharmaceutical New Haven, CT	Isotopes/Process Facility	US NRC

TABLE 2.5-4
WASTE HANDLING AND PACKAGING EXPERIENCE

CLIENT	PROJECT
Upjohn Manufacturing Barceloneta, PR	Underground storage tank leakage assessment
Weber USA, Inc. Sanford, NC	Ground water quality assessment
Goodyear Tire & Rubber Danville, VA	Remedial investigation and feasibility study
First Union National Bank Charlotte, NC	Asbestos survey/removal
Gould, Inc. Cleveland, OH	Asbestos survey
Kenal Peninsula borough Soldotna, AK	Air monitoring and sample analysis program
ITT Corporation Oak Ridge, TN	Volume Reduction
New York Power Authority	Radioactive waste reduction and disposal service
Virginia Power	Radioactive waste reduction and disposal
Department of Energy/Idaho Chemical Processing Plant	Waste and hazardous material handling and treatment
Georgia Power Company	Health physics, waste and radiological services
Louisiana Power & Light	Health physics, waste and radiological services
Philadelphia Electric Co.	Waste and radiological services
Long Island Lighting Co.	Waste and radiological services
Public Service Electric & Gas	Radiation protection training
Union Electric	Pre-operational health physics appraisal
DOE-WIPP	Waste packaging and transportation

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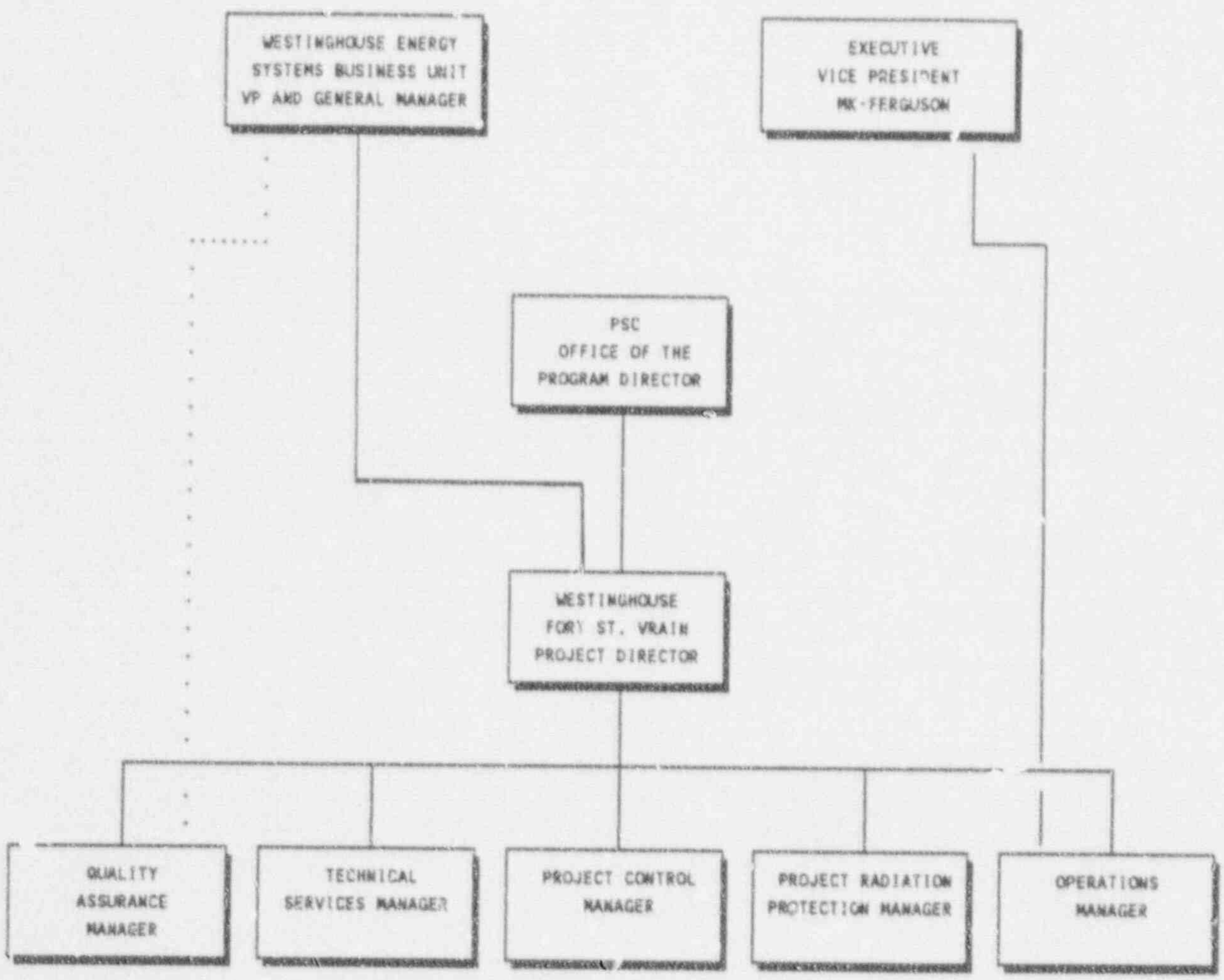

Figure 2.5-1 Westinghouse Team Organization Chart

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2.6 TRAINING PROGRAM

All personnel who may require access to the work areas or a radiologically controlled area (RCA) associated with the Fort St. Vrain Decommissioning, whether PSC employees, contractor employees, or visitors, shall receive appropriate training commensurate with the potential hazards to which they may be exposed.

2.6.1 General Employee Training

General Employee Training (GET) will be provided to all personnel assigned to decommissioning on a regular basis. This training will include:

1. Project orientation/Access Control.
2. Introduction to Radiation Protection.
3. Quality assurance.
4. Industrial safety.

2.6.2 Radiation Worker Training

Basic radiation worker training shall be provided to persons who routinely work in radiologically controlled areas of the project. Basic radiation worker training covers a large range of topics including:

1. Fundamentals of radiation.
2. Biological effects of radiation.
3. External radiation exposure limits and control.
4. Internal radiation limits and controls.
5. Contamination limits and controls.
6. Management and control of radioactive waste, including waste minimization practices.
7. Response to emergencies.
8. Radiation Protection Program.

In addition to a classroom presentation of the topics identified above, participants in basic radiation worker training are required to participate in the following demonstrations:

1. The proper procedures for donning and removing a complete set of protective clothing (excluding respiratory protection equipment).

2. The ability to read and interpret self reading and electronic dosimeters.
3. Proper procedures for entering and exiting a contaminated area, including use of proper frisking techniques.
4. An understanding of the use of an Radiation Work Permit (RWP) by working within the requirements of a given RWP.

Personnel completing basic radiation worker training are required to pass a written examination on the material presented. Completion of this training qualifies an individual for unescorted access to radiologically controlled areas of the project.

2.6.3 Specific Job Training

Specific job training will be provided to selected workers based upon their job assignments and their need to know. Training programs shall assure the following:

1. Personnel responsible for performing activities are instructed as to the purpose, scope, and implementation of applicable controlling procedures.
2. Personnel performing activities are trained as appropriate, in principles and techniques of the activity being performed.
3. The scope, objectives, and methods of implementing the training programs are documented.

Examples of this training are as follows:

1. Respirator training: Personnel whose work assignments require them to use respiratory protection devices will receive training in the devices that they will be required to use. The training program follows the requirements of 10 CFR 20.103 and Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection" (Ref. 12). Training consists of a classroom session and a simulated work session; in addition, fit testing and medical evaluations are required in order to use respiratory protection devices.
2. Asbestos worker training.
3. Mock-up training.
4. Training on use of special tools or equipment
5. Work package briefings.
6. Fire watch.
7. Radioactive material transportation training.

8. Health physics technician training: Training and qualification of health physics, technicians and supervisors will be conducted in accordance with ANSI/ANS 3.1-1981 (Ref. 14).

2.6.4 Non-Radiation Worker Indoctrination

All non-radiation workers who require access to a radiologically controlled area will receive an appropriate indoctrination prior to being permitted access into RCAs. This indoctrination will include as a minimum:

1. The requirement that non-radiation workers remain with their escort at all times and follow the directions of the escort.
2. A description of the radiological conditions and required controls of the area to be entered.
3. The purpose and proper use of dosimeters, including how to read a self-reading and electronic dosimeters and the appropriate exposure limits.
4. Potential emergency situations and proper actions to take in such events.

2.6.5 Radiation Protection Staff Training

Training and qualification requirements of the radiation protection staff during the decommissioning have been established through the guidance provided by NUREG-0761 (Draft) "Radiation Protection Plans for Nuclear Power Plants" (Ref. 15). Section 3.2.4 of this plan describes the radiation protection staff training and qualification requirements.

2.6.6 Training Records

Records of training will be maintained which will include trainees name, date of training, type of training, test results, authorization for protective equipment use, and instructors name. A list of qualified instructors will be maintained.

Training records will be organized in several ways, to allow either a listing of an individuals qualifications or listings of personnel due for retraining. The interval between training and retraining will be identified, as appropriate, in training procedures.

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2.7 REFERENCES FOR SECTION 2

1. PSC letter, Crawford to Weiss, dated January 20, 1992; "Confirmation of PSC's Selection of the DECON Decommissioning Alternative", (P-92029).

2. Regulatory Guide 1.86 "Termination of Operating Licenses for Nuclear Reactors", June 1974.

3. NRC letter, Erickson to Crawford, dated May 21, 1991; "Fort St. Vrain Nuclear Generating Station Amendment No. 82 to Facility Operating License No. DPR-34", (G-91106).

4. "Evaporation Atlas for the 48 Contiguous United States", NOAA Technical Report NWS-33, Department of Commerce, 1982.

5. STAAD-III/ISDS, Revision 14.0, General Purpose Structural Analysis Program for static and dynamic analysis; (Proprietary) Research Engineers, Inc. of Marton, N.J., Copyright 1991.

6. NRC Regulatory Guide 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants", Rev. 1, 1973

7. NRC Regulatory Guide 1.61 "Damping Values for Seismic Design of Nuclear Power Plants", 1973.

8. "Building Code Requirements for Reinforced Concrete", (ACI 318-83) American Concrete Institute, Detroit, Michigan, (Revised 1986).

9. NRC Regulatory Guide 1.143 "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed In Light-Water-Cooled Nuclear Power Plants", Rev. 1, October 1978.

10. USNRC Regulatory Guide 8.8, "Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be ALARA", Rev. 3, June 1978.

11. Fort St. Vrain Offsite Dose Calculation Manual.

12. NRC Regulatory Guide 1.8 "Qualification and Training of Personnel at Nuclear Power Plants", Rev. 2, April 1987.

13. NRC Regulatory Guide 8.15 "Acceptable Programs for Respiratory Protection," October 1976.

14. "Selection, Qualification and Training of Personnel for Nuclear Power Plants," ANSI/ANS 3.1-1981.

15. NUREG-0761, "Radiation Protection Plans for Nuclear Power Reactor Licensees" (Draft), March 1981.

SECTION 3
PROTECTION OF OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY

3.1 FACILITY RADIOLOGICAL STATUS

3.1.1 Facility Operating History

Construction of the Fort St. Vrain Nuclear Generating Station was authorized by the NRC by issuance to Public Service Company of Colorado a provisional construction permit on September 17, 1968. Construction was complete in December 1973. Fuel was loaded and nuclear criticality achieved on January 31, 1974. After a prolonged period of startup testing, low-power operation and plant modifications, the plant was committed for commercial operation July 1, 1979. Full power operation was achieved on November 16, 1981.

In August 1989, the plant was shutdown due to control rod drive problems. Due to these problems, as well as additional mechanical and financial concerns, the PSC Board of Directors decided not to restart the plant. This announcement was made August 29, 1989. PSC has now commenced defueling and has begun preliminary plant closure activities.

During the operational history of the plant there have been no spills or release of radioactive effluents resulting in significant residual radioactive contamination either onsite or offsite. However, there have been a few routine plant operations that may have resulted in residual radioactive contamination in areas which are inaccessible.

Specifically, the Fuel Storage Wells (FSWs) and Equipment Storage Wells (ESWs) on the refueling floor were used to store spent fuel and highly radioactive components. Over the years of transferring various components and spent fuel, it is anticipated that high levels (e.g. > 5,000,000 dpm/100 cm^2) of loose surface contamination will have accumulated on horizontal surfaces. The lower portions of these wells are inaccessible at present (See Figure 2.2-13). At various times throughout plant history, the Hot Service Facility (HSF) has also had levels of loose surface contamination measuring greater than 5,000,000 dpm/100 cm^2. Periodic decontamination of the HSF was typically performed using water, and as a result, crud traps may have been created in inaccessible areas. To date, no crud traps have been identified in accessible areas containing drain piping from the HSF (See Figure 2.2-15).

3.1.2 Radiation Sources

3.1.2.1 Description of Instrumentation and Survey Techniques

In August 1990, radiation and contamination surveys were performed in the Reactor and Turbine Buildings. These surveys focused on identifying of the major contributors to radiation levels above background and areas containing both fixed and loose surface contamination.

The radiation surveys were performed using the instruments listed below and were performed to detect gamma radiation only. Radiation levels were reported in units of mRem/hr. Radiation levels are measured either as general area (approximately waist high), contact (typically measured with the probe within one inch of the radiation source), or at a distance from the contact reading (approximately 18 inches from the source of radiation).

INSTRUMENT	SCALE	RANGE/SWITCH SETTINGS
Eberline RO-2	mRem/hr	0-5/0-50/0-500/0-5000
Ludlum 19	μR/hr	0-25/0-50/0-250/0-500/0-5000

Fixed contamination surveys were performed using Eberline RM-14/15 friskers which measure beta-gamma contamination in counts per minute (cpm) using a scale of 0 - 500 cpm with switch settings of x1, x10, x100, and x1000 (x1000 available on the RM-15 only). Conversion from cpm to disintegrations per minute (dpm) uses a conservative counting efficiency of ten percent. Survey results are reported in units of dpm/probe area, which is approximately 15 square centimeters.

The counting of wipes (or smears) for loose surface contamination was performed using either a Tennelec LB 5100 or a Harshaw TASC-12-A-6 which analyzed beta activity only. Although the minimum detectable activity (MDA) will vary slightly on a daily basis, the typical MDA for these instruments is approximately ten dpm. Results are reported in units of dpm/100 cm^2. (100 cm^2 is the area over which the wipe/smear is taken, approximately four square inches).

Radiological surveys in the past have shown that alpha contamination (both fixed and loose surface) is not present above natural background levels at Fort St.

Vrain. Spot checks for alpha contamination are performed on a routine basis to confirm this.

Generally, the results of these surveys demonstrated that greater than 95% of the plant areas have radiation levels corresponding to natural background (in the 0.004 to 0.032 mRem/hr range). In the results summarized in Table 3.1-1 at the end of this section, only those areas with radiation levels above these background levels are noted.

Additionally, fixed contamination levels are generally less than 1000 dpm/15 cm^2 and loose surface contamination levels of less than 1000 dpm/100 cm^2. Most survey results are less than 100 dpm/100 cm^2. In some locations, tritium may be present as fixed contamination. Due to the low energy beta activity emitted by tritium (E_{avg} = 0.005 MeV), normal survey methods will not detect the tritium and therefore actual tritium levels are not measured. Fixed contamination is typically imbedded within the first few centimeters of concrete surfaces.

The contribution to area radiation levels from facilities, rooms and structures where various components are undergoing routine plant maintenance activities were not included in the survey results due to the temporary, transient nature of such activities.

Figures 3.1-1 to 3.1-19 provide specific results of these area radiation surveys. Table 3.1-1 provides a summary of the survey results with a description of the major contributors to the radiation levels. Reactor and Turbine Building elevations are shown in Figure 3.1-20. Where results are not listed, contamination and/or radiation levels are not greater than background levels. Systems which are potentially contaminated are identified in Table 3.1-1 by system number for each elevation on which they are located.

3.1.2.2 Turbine Building Survey Results

General area radiation levels throughout the Turbine Building are primarily due to natural background. Contamination levels (both fixed and loose) are less than 1000 dpm/100 cm^2 in all locations and generally less than 100 dpm/100 cm^2. Piping from the potentially internally contaminated Systems 11 and 73 extends from Level 7 (El. 4829') to the roof of the Reactor Building.

3.1.2.3 Radiation Sources Outside the Reactor and Turbine Buildings

Radioactive materials are stored on a temporary basis inside Sea-Vans and cargo trailers. The locations of these trailers are indicated on Figure 3.1-21. Varying amounts of radioactive materials may be stored in these trailers, but external radiation levels are typically less than 0.2 mRem/hr.

The only permanently contaminated area outside the Reactor and Turbine Buildings is the Compactor Building directly east of the main cooling tower (see Figure 3.1-1 and 2.2-1). General area radiation levels vary from 0.2 to 0.5 mRem/hr primarily due to residual contamination inside a radioactive waste compactor. Loose surface contamination levels are generally less than 100 dpm/100 cm^2. The compactor contains loose surface contamination of 50,000 dpm/100 cm^2 and fixed contamination levels of 50,000 dpm/100 cm^2. There are two concrete bunkers in the Compactor Building which have loose surface contamination levels of 5,000 dpm/100 cm^2 and fixed contamination levels in the first few centimeters of the concrete averaging approximately 20,000 dpm/100 cm^2. The presence of tritium is also suspected in the fixed contamination of the bunkers. This building is also used for staging of radioactive wastes (including liquids) and materials.

Piping associated with the Radioactive Liquid Waste System (System 62) also runs underground from the exit point from the Reactor Building to the main cooling towers. Sample results of oil collected in an associated oil separator have occasionally shown trace amounts of tritium, Co-60, Cs-137 and Cs-134.

Routine surveys do not indicate any radiation or contamination levels above background in the Radiochemistry Laboratory located in the Technical Support Building (See Figure 2.2-1), although small amounts of radioactivity may later be found in drain piping from this facility to the Radioactive Liquid Waste System (System 62).

3.1.3 Current Environmental Radiological Status

3.1.3.1 Beta-Gamma Radiation in Surrounding Environs

The environmental radiological status of the site and surrounding areas has been monitored during the entire pre-operational, operational, and post-operational phases of the plant through the Radiological Environmental Monitoring Program

(REMP). This program includes surveillances in surrounding areas to gather environmental data in the following areas: external gamma activity levels, air sampling data, water sampling data, milk data, aquatic pathways, and food products. Sample locations are located near the site boundaries and in outlying areas. Details of the results of these surveillances can be found in Reference 1 and in p... REMP reports, which are provided annually to the NRC.

During the spring and summer of 1990, additional data were taken to further characterize the site. Soil samples were taken inside and outside the protected area, gamma radiation surveys were performed inside the protected area, and downwind air samples were taken with respect to the predominant wind direction (from the NE).

Environmental radiation surveillance data from all past REMP reports and the recent characterization data indicate that the predominant source terms found above natural background levels are due to Chernobyl and past nuclear weapons test fallout. External radiation sources to area residents are due to naturally-occurring background radiation and atmospheric fallout.

The recent characterization data included the exposure rate from gamma-ray emitting radionuclides and were measured using thermoluminescent dosimeters (TLD). The TLD stations were constructed at 72 different locations inside and outside the controlled area boundary. Each station contained packets with two chips of CaF2(Dy), which are identical to those used in the REMP. The measurement period for the TLDs was 92 days. The mean of the two chips in each station was used to determine the mean exposure rate. The overall mean exposure rate from the TLD packages was 0.32 mRem/day. This value is not statistically different from the mean value found in the 1989 REMP report (Ref. 1) of 0.38 mRem/day for the Fort St Vrain facility area. Reference 1 indicated that since the inception of power production by the reactor, there has been no detectable increase in the external exposure rate due to planned or unplanned reactor releases.

The concentrations of gross beta activity due to the combination of naturally occurring radionuclides and fission product radionuclides was determined from air samples at two locations downwind from the predominant wind direction. A particulate filter for gross beta analysis and an activated charcoal cartridge for I-131 or noble gas radionuclide analyses were in the sample line. Tritium in atmospheric water vapor is collected passively by silica gel at each of these locations. Sampling methodology was identical to that utilized in the REMP. Fort St. Vrain operational technical specifications no longer require measurement of gross alpha activity. Gross beta activity measured in air particulates was principally due to naturally occurring radionuclides or from soil resuspension. The mean weekly activity air concentrations measured at the northern and southern monitors were 16 femtoCuries(E-15)/m^3. These concentrations are comparable to those found in the REMP program. Past REMP data has shown that there has never been a significant difference observed between facility and reference sites (Ref. 1). It is concluded, therefore, that based on the current radiological data and past REMP data, the reactor air effluents of particulate fission products or activation products are not a source of dose commitment for the Fort St. Vrain environs population.

3.1.3.2 Soil Samples

Soil samples were taken at 124 locations inside and outside the controlled area. Samples were taken at each location from a depth of ten centimeters and an area of 95 square centimeters. Two samples were taken at each location to produce a sample size sufficient to fill a one quart volume. Samples were dried, ground to a constant density, and sealed in the quart container. After a three week period, each container was counted using Ge(Li) gamma-ray spectroscopy to determine the activity concentration of important fission products, activation products and naturally occurring radionuclides.

Deep core samples (taken at approximately 12 percent of the soil sample locations) were taken to approximately 150 centimeters in depth. The core samples were collected in polyethylene tubes, which were frozen and sectioned off to obtain samples at various depths. The deep core samples were analyzed using the same techniques as the soil samples.

Results of the soil samples indicate the presence of statistically significant Cs-137 concentrations. These concentrations are due to world-wide fallout remaining from the United States, USSR and Chinese nuclear weapons tests, and the Chernobyl accident. This is supported by the fact that the Cs-137 concentrations are the same in the entire front range of Colorado and other reactor-generated fission products or activation products were not present in the samples.

3.1.3.3 Results of REMP Surveillances

Tritium is the only radionuclide that was detected in concentrations above background in any effluent pathways that could be attributed to reactor operation. Since tritium is released as tritiated water, the dilution by the surrounding hydrosphere is significant. Elevated levels of tritiated water (Ref. 1) were detected in downstream surface water samples on occasion, but the yearly mean values of downstream surface water was not statistically greater than upstream concentrations. Tritium concentrations measured in milk were all less than the lower limit of detection (LLD). However, slight increases in the downstream tritium levels, which were discussed in the 1986 REMP report, showed that the radiation dose commitment that can be calculated as a result of the increases was found to be negligible as compared to natural background radiation dose rates.

The REMP program has, over the years, been shown to be of adequate scope and sensitivity to detect any accidental releases from Fort St. Vrain operation. It is concluded that the dose commitments calculated for the closest inhabitants or other parts of the nearby ecosystems due to reactor operations are negligible. In addition to the REMP data, the most recent characterization data both inside and outside the controlled area boundary supports this conclusion. The negligible release of radioactivity from Fort St. Vrain is due to its unique gas cooled design.

3.1.4 Radionuclide Inventory

3.1.4.1 Activated Components within the PCRV

An activation analysis (Ref. 2) was performed for the PCRV and associated internal components and is provided in Appendix II. The analysis was performed to estimate the isotopic composition, magnitude and extent of residual radioactivity which could be present in the PCRV after the end of operations. The actual operating history of the plant was used in the analysis by considering the total effective full power days (EFPD) generated by the plant until its shutdown in August 1989. The analysis consisted of three sections: (1) neutron flux estimates in the PCRV; (2) activation analysis of the PCRV and internal components; and (3) calculation of gamma dose rates (in air) inside the PCRV due to non-removable (fixed) components.

3.1.4.1.1 Computer Codes

The activation analysis required the use of several computer codes and various input data libraries. The ANISN code (Ref. 3) was used to determine the neutron flux throughout the reactor core and outward through the reflectors, helium flow paths, insulation, PCRV liner and PCRV concrete. The activation of selected components within the PCRV was then determined using the REBATE computer code (Ref. 4). Finally, gamma doses (in air) within the PCRV were calculated using the REBATE, ANISN and other data manipulation codes.

3.1.4.1.2 Material Compositions

Material compositions of components were determined from a variety of sources. In most cases, material compositions were identified from component drawings which referenced standard material specifications. Assumptions for the number densities of trace elements, such as europium (Eu), cobalt (Co), and niobium (Nb), were based on design manuals, previous analytical investigations and NUREG/CR-3474 "Long Lived Activation Products in Reactor Materials" (Ref. 5). In general, the reactor internals are made of carbon steel, graphite or concrete. Few major components are made from stainless steel or Inconel. Details of the actual compositions and trace element assumptions are found in Reference 2, which is provided in Appendix II.

3.1.4.1.3 Computational Models

The analysis was computed using three one-dimensional models: (1) Radial - core center line outward through the PCRV side (see Figure 3.1-22), (2) Axial Up - core center line upward through the PCRV top head and (3) Axial Down - core center line downward through the core support floor. Below the CSF, activation was assumed to be insignificant with the exception of the activation of the top of the steam generator modules due to neutron streaming effects (Ref. 6). Descriptions of each of these models are provided in the following paragraphs.

3.1.4.1.4 Radial Model

The "Radial" model consists of the following components:

1. Side removable reflectors
2. Large permanent side reflectors
3. Boronated side spacer blocks
4. Core barrel
5. Kaowool insulation and insulation cover plates
6. PCRV liner and cooling tubes
7. PCRV concrete and rebar
8. Reflector keys and carbon steel metal shell

The removable (hexagonal) graphite side reflector elements are located just outside of the active core (See Figure 3.1-23). A typical block is approximately 31 inches in height and 14 inches across the flats. Outside the removable side reflectors are the large permanent side reflector blocks. These blocks are irregular in shape (See Figure 3.1-23) and have an average volume of 3.358E+05 cc each.

Between the large permanent side reflectors and the core barrel are the boronated side spacer blocks (Figure 3.1-23). These graphite blocks contain boronated stainless steel pins which provided neutron shielding during power operations. The number of pins vary with respect to the blocks position relative to the active core region.

The core barrel (Figure 3.1-23) is located just beyond the boronated spacer blocks and serves as the lateral restraint of the fuel and reflectors. The barrel is constructed of carbon steel, in three sections which vary in thickness from 2.25 inches to 2.75 inches and is approximately 29 feet in height. The core barrel was modeled in two sections because the upper 12 feet is constructed of a slightly different material than the bottom two sections.

Continuing outward from the core barrel, Class A Kaowool insulation and cover plates (Figure 3.1-24) cover the inside of the PCRV liner. The insulation is a ceramic fiber material and the cover plates are constructed of carbon steel.

The PCRV liner (Figure 3.1-24) is a 3/4-inch carbon steel plate vessel in the form of a right circular cylinder, 75 feet in height with an inside diameter of 31 feet. Carbon steel cooling tubes, welded to the outer (concrete) side of the liner, provided cooling to the concrete during power operations. The liner and cooling tubes were modeled homogeneously for the activation analysis.

The PCRV serves as containment of the nuclear steam supply system (NSSS). The concrete walls vary in thickness from 9 feet to 15-1/2 feet, and the vessel is approximately 106 feet high. The PCRV was modeled as a homogeneous mixture of concrete and rebar.

Two final components modeled were the carbon steel side reflector block keys (Figure 3.1-23) which connect the core barrel to the large side reflectors and the carbon steel metal shell for the top most large side reflectors (half length reflectors).

3.1.4.1.5 Axial Up Model

The "Axial Up" model included the following components:

1. Removable graphite reflectors
2. Metal clad reflector blocks (MCRBs)
3. Region constraint devices (RCDs)
4. Lower orifice valve assembly
5. Kaowool insulation and insulation cover plates
6. PCRV liner and cooling tubes
7. PCRV top head concrete and rebar

The MCRBs are located on the top most level of the core area, just above the removable graphite reflectors, (see Figure 3.1-23) and provided structural stability and neutron shielding during power operations. All blocks are hexagonal in shape, approximately 15 inches in height and 14 inches across the flats. The 37 central column MCRBs (Figure 3.1-25) are constructed primarily of stainless steel. The remaining 270 MCRBs, with and without coolant holes (Figure 3.1-26), are constructed of carbon steel.

The RCDs (Figure 3.1-27) provided restraint of fuel regions during power operations. The RCDs are located on top of the MCRBs, keying fuel columns between regions together. The triangular main body of the device is made of carbon steel, approximately 5 inches thick. The "legs" of the RCD are approximately 7 inches in length and are composed of Inconel.

The orifice valve assembly (Figure 3.1-28) is located just above the central column MCRB. The lower portion of this assembly, primarily composed of carbon steel, was modeled as part of the axial up model.

The final three components (Kaowool/cover plates, PCRV liner/cooling tubes and PCRV concrete/rebar) were modeled as previously discussed in the radial model.

3.1.4.1.6 Axial Down Model

The "Axial Down" model included six components:

1. Removable bottom reflectors
2. Core support blocks and core support posts
3. Silica block insulation
4. Kaowool insulation and insulation cover plates
5. CSF liner and cooling tubes
6. CSF concrete and rebar

Directly beneath the active core are removable hexagonal bottom reflectors (Figure 3.1-29). These include graphite reflectors, graphite reflectors containing boronated Hastelloy-X cans and graphite transition reflectors which channel coolant from the bottom reflectors to the core support blocks. The core support blocks and core support posts (Figure 3.1-29) are permanent components which lie directly below the removable reflectors and act as support for the fuel and reflectors. Three layers of Class C silica insulation (blocks) are located above the cover plate/Kaowool which are just above the CSF liner (See Figure 3.1-30). The CSF liner is a 3/4-inch carbon steel liner encasing the five foot thick concrete/rebar core support floor (See Figure 3.1-29).

3.1.4.1.7 Activation Analysis Results

The results of the activation analysis are summarized in Table 3.1-2. Detailed results can be found in Appendix II. The nuclides of importance as well as the total estimated radionuclide inventory for activated components inside the PCRV are listed in the table.

The dominant nuclides for metallic components are Fe-55, Co-60, Ni-63 and Mn-54. Traces of Nb-94 and Fe-59 are also present in some metallic components. The dominant gamma emitter in the stainless steel components was determined to be Co-60, although Nb-94 is also present. Due to the high concentrations of Co-60 in the boronated spacers blocks, these components are the primary dose contributors inside the PCRV.

The activity in graphite components is dominated by tritium and Fe-55, which were generated due to impurities in the graphite. Due to the large volume of graphite and the high curie content of tritium and Fe-55 these components are the largest contributors to the overall radionuclide inventory. No credit was taken for the migration of tritium out of the graphite.

The Kaowool insulation and silica blocks were determined to have fairly low activities. The carbon steel cover plate contains almost all the activity in the Kaowool/cover plate assemblies. The silica block activity is dominated by Fe-55.

The PCRV concrete/rebar mixture contains many activation products due to the presence of trace elements. In the short term, Co-60 is the dominant gamma emitter, while Eu-152 and Eu-154 are the dominant long term gamma emitters. The nuclide contributing most to the total activity is Fe-55. Other nuclides present in lower activities were: Cs-134, Ca-45, Ag-110m, tritium, C-14, Fe-59, Ni-59, Ni-63, Nb-94, Mn-54, and Ca-41. Specific details of the calculated isotopic breakdown for each activated component can be found in Appendix C of Appendix II.

As indicated in Table 3.1-2, the majority of the activity in the concrete is contained in the first 1.5 feet in all directions. Table 3.1-3 indicates the estimated required amount of concrete which must be removed to achieve the recommended release limit for unrestricted use (5 μR/hr above background). The activation analysis predicts that at five years after shutdown, approximately 24 inches of concrete will require removal from the PCRV sidewalls to achieve a dose rate of 3.4 μR/hr. The 24-inch depth is based on the assumption that the dose rate in the PCRV will be due to contributions from the top head, CSF and PCRV sidewalls. The tophead and CSF will be removed during decommissioning, leaving only the PCRV sidewalls contributing to the dose rate within the PCRV. In this case, a dose rate of 5 μR/hr is predicted to be achieved when approximately 23 inches of PCRV sidewall concrete is removed.

| Estimates of dose rates (in air) for each direction within the PCRV are listed in Table 3.1-3 and the total dose inside the center of the PCRV (in air) is the sum

of the dose rate for all three directions. Table 3.1-3 also indicates the estimated dose rate contribution (in air) for various stages of component removal for an individual located in the center of the PCRV.

The activation analysis modeled the PCRV concrete and rebar as a homogeneous mixture. In the actual rebar configuration, two sets of rebar lay just outside the PCRV liner and the remainder of the rebar lays at least 1.5 feet beyond the inside ring of tendons. The two inner sets of rebar will be removed during decommissioning and the outer sets of rebar will not be activated. Therefore, the assumption of a homogeneous mixture at a depth of 23 inches of concrete is conservative.

A sensitivity study of the contribution of the rebar to the overall dose rate was performed to assess this conservatism. The rebar number densities were removed from the homogeneous mixture and the activation analysis was rerun. The resulting predicted dose rates at five years after shutdown, with 20 inches and 22 inches of concrete removed, are 6.15 μR/hr and 3.14 μR/hr, respectively. Therefore, the actual predicted removal depth is approximately 21 inches rather than 23 inches to achieve a dose rate in the 5 μR/hr range.

3.1.4.1.8 <u>Activation Analysis Verification</u>

The thermal neutron flux and trace element abundances are considered to be the two most important potential sources of uncertainty in the activation analysis. An action plan was developed (Ref. 7) to assess the accuracy and sensitivity of these parameters and the impact to the overall activation analysis results. This action plan was designed to validate neutron flux and verify material composition assumptions. The action plan provides additional confidence that the activation analysis results provide reasonable predictions of component activities and resulting dose rates. The action plan was divided into two activities:

- Verification of the neutron flux predictions by comparison of predicted activities with measurements taken from activated samples of known composition.

- Sensitivity analysis performed on the PCRV concrete trace element abundances to evaluate potential sensitivity of the amount of PCRV concrete to be removed to satisfy final release limits.

The action plan has been completed and the results were forwarded to the NRC in Reference 8. The results confirm that the original analytical methods and assumptions were reasonable and that the previous estimates of the amount of concrete that must be removed are conservative. Even allowing for the worst case variations in activity levels described in Reference 8, current plans to remove between 27 inches and 32 inches of PCRV concrete will ensure satisfaction of the 5 μR/hr at 1 meter release criterion.

1. Neutron Flux Verification

The validation of the neutron flux was assessed by comparison of predicted specific activities to measured activities for specimens of known composition. Wire and Charpy specimens were removed from the PCRV top head to verify thermal neutron flux predictions from the ANISN (Ref. 3) calculations and to assess the conservatisms of cobalt impurity assumptions used in carbon steel. PCRV tendon wires from a vertical PCRV tendon located 8 inches beyond the predicted concrete removal depth were also removed, analyzed, and the results compared to analytical activity predictions.

a. Wire Specimens. Three wire specimens, located in the PCRV top head directly above the core and adjacent to the PCRV liner, were removed and were radiochemically analyzed for their specific isotopic activities. The analysis results were compared to the analytical predictions from the previous calculations (Ref. 9). One wire, composed of 99.5% aluminum and 0.5% cobalt, was judged to provide the best data for validating the thermal neutron flux due to the known accuracy of its cobalt composition. A comparison between the analysis and the previous calculations of this wire was in agreement within 3%, indicating that the estimates of the thermal flux in the PCRV top head area are quite reasonable.

b. Charpy Specimens. Carbon steel Charpy V-notch specimens from the same top head location as the wires were also analyzed. The average Co-60 specific activity actually measured in the Charpy specimens was approximately half the value predicted by analytical methods. Therefore, the results provide evidence that the flux predictions are reasonable and the assumptions of the cobalt levels used in the analysis were conservative.

c. PCRV Tendon Wire Samples. To assess the accuracy of the activation analysis (Ref. 2) predictions, the accuracy of the neutron flux solution was determined through comparison of predicted versus actual specific activities of the tendon wires. The closest set of vertical tendons to the inside of the PCRV lie at a distance of 32 inches from the inside of the PCRV liner. Wires were selected from a tendon that was located radially next to PCRV core region 22 (a high powered region during operating cycle 4). The location of the selected tendon corresponds to a maximum active fuel radius (i.e., where the tendon wires are closest to the active fuel), resulting in a maximum activity in the selected tendon wires.

Six wires were pulled at equidistant positions around the circumference of the tendon, which provides confidence that at least one wire would be located closest to the core, resulting in the highest activity. Four test sample segments were selected from each wire to provide axial profile activation information, corresponding to the following PCRV and core elevations: (1) top fuel block; (2) slightly above core midplane; (3) bottom fuel block; and (4) bottom of the CSF. The predicted specific activity of each of the tendon wires from the activation analysis (Ref. 2) is extremely low, in the pCi/g range for both Co-60 and Mn-54, which are the only isotopes anticipated to be detectable. A low neutron population in the vicinity of the tendons increases the difficulty in analytical prediction of the neutron flux at that location.

The results of the sample analysis were compared with predicted specific activities for each axial location and indicate that the thermal flux (based on the Co-60 activity at core midplane) at the tendon location was under-predicted by the activation analysis by a factor of about 2.8. However, this is considered to be in reasonable agreement, considering the distance from the core and the number of mean free paths (about 12) traveled by the neutrons through the concrete before reaching the tendon wire.

In comparison with available activation data in NUREG/CR-5343 (Ref. 10), the accuracy of the thermal flux prediction is reasonable. A comparison of the predicted and actual measured activities found in NUREG/CR-5343 resulted in agreement between 10% and a factor of 2. However, the predictions and the actual data measurements were made for areas near the reactor core, where activation flux levels were much higher (and much better characterized) than in the area of the PCRV tendon wires, which are relatively far away from the active core.

It was concluded in NUREG/CR-5343 that very good agreement can be obtained near fueled regions. The Charpy and wire specimen data also confirm this conclusion. Predictions further away from the core become more difficult. No data from NUREG/CR-5343 was available at large distances from the reactor core, but the results from the tendon wire analysis appear to be reasonable, based on the accuracy of near core predictions in NUREG/CR-5343.

As indicated above, the predictions nearer the core should be more accurate. The neutron flux at the 24-inch concrete removal depth is predicted to be higher by about an order of magnitude than the flux at the tendon wire location. It is anticipated that the agreement between the actual and predicted flux at the location where 24 inches of concrete would be removed should be more accurate.

If the flux at a depth of 23 inches of concrete removed were under-predicted by a factor of 2.5 to 3, it would require approximately 4 inches of additional concrete to be removed to obtain a dose rate in the 5 μR/hr range, which is still within the first row of tendon tubes and therefore within the amount of concrete to be removed by the current dismantlement plan identified in Section 2.3.3.12.

2. Material Composition Verification

Analytical sensitivity studies have been performed for the homogeneous rebar/concrete mixture to assess the effect of trace element abundances on the amount of concrete required for removal in the radial direction. The studies show that if the maximum abundances of trace elements identified in Reference 5 are used (rather than the average abundances), an additional 2 inches of concrete would require removal.

The activation analysis modeled the PCRV concrete and rebar as a homogeneous mixture. In the actual configuration, two sets of rebar lay just outside the PCRV liner and the remainder of the rebar lays at least 1.5 feet beyond the inside ring of tendons. The two inner sets of rebar will be removed during decommissioning and the outer sets of rebar will not be activated. Therefore the assumption of a homogeneous mixture at a depth of 23 inches of concrete is conservative. A sensitivity study of the contribution of the rebar to the overall dose rate was performed to assess this conservatism. The results of this study indicates that approximately 2 inches less concrete would require removal than originally predicted.

Surface samples of the PCRV radial concrete were taken and analyzed to determine the actual trace element abundances in the PCRV concrete. Six samples were taken at the same elevation as the active core. Analysis indicates that there is no significant variation of the trace element abundances among the samples and provides support for the assumption that PCRV concrete trace element abundances do not vary widely throughout the different mixes of concrete. The trace element abundances in the PCRV concrete all fall within or below the ranges listed in NUREG/CR-3474 (Ref. 5). It is therefore reasonable to assume that the results of the surface samples, when combined with the sensitivity analysis and NUREG/CR-3474 data, provide a high level of confidence in the activation analysis results.

Conclusions

In order to obtain a more accurate prediction of the required removal depth for the concrete, the activation analysis was recalculated for the concrete utilizing the information obtained from the verification efforts identified above. The thermal flux was assumed to be under-predicted by a factor of 2.8, no rebar was assumed to exist in the concrete at the required removal depth, and the average measured trace element abundances from the PCRV surface samples were used. The analysis was also performed for a worst case scenario using the highest trace element abundances found in NUREG/CR-3474. The results of the analysis predict a required concrete removal depth of 21 inches, which is considerably less than the minimum proposed removal depth of 27 inches. Even in a worst case scenario (NUREG/CR-3474 maximum trace element abundances), the required removal depth (27 inches) is still within the minimum proposed removal depth.

Section 2.3.3.12 describes the dismantlement plan for removal of the PCRV sidewall concrete. This plan is based on use of the diamond wire saw to cut between every third tendon tube located in the inner row of tendon tubes, located 32 inches from the PCRV sidewall. This cutting technique will remove, as a minimum, a depth of approximately 27 inches of concrete. This minimum removal depth is adequate to meet the activation analysis requirements (21 inches) and accommodate maximum uncertainties due to neutron flux (4 inches) and material composition (2 inches).

The data obtained from the verification efforts and the results of the recalculated activation analysis provide strong evidence that the predictions from the original activation analysis are reasonable. Additionally, the comparison with the results from NUREG/CR-5343 indicate that the accuracy of the results are acceptable. Based upon the measured data and comparisons with analytical predictions, the calculational methods and material composition assumptions for the concrete provides reliable estimates of the activation products within the PCRV. Additional details of the verification effort can be found in Reference 8.

3.1.4.2 Plateout Analysis for PCRV Internal Components

3.1.4.2.1 Plateout Analysis Bases and Computer Codes

A plateout distribution analysis of radioactive nuclides produced in the reactor core was performed for the PCRV and internal components (Ref. 11). The purpose of this analysis was to estimate the plateout concentrations and distributions in the primary coolant circuit. Analyses were performed from the beginning of cycle (BOC) 1 to the end of operations after 890 EFPD. The axial and radial core power distributions were calculated and used with flux distribution data as input to fission product release codes. Full-core fuel and graphite temperature distributions, fuel failure and release of key fission gases and metals were then calculated. Based on the full-core analysis for key fission gases and metals, the total plateout and helium purification system inventories of radioactive nuclides were estimated.

Plateout distributions were calculated using the PADLOC (Ref. 12) computer code. The PADLOC code performs a mass transfer calculation using mass transfer correlations and sorption isotherms to determine the partitioning of condensable radionuclides between the flowing coolant and the fixed surface in a recirculation loop. The plateout model in PADLOC is limited to one-dimensional cylindrical geometry, such that all components of the primary circuit must be modeled as an equivalent series of coupled sections of parallel banks of cylindrical tubes. Reference sorption isotherms were used to describe the sorptive capacity of the primary circuit materials for the radionuclides of concern.

3.1.4.2.2 Plateout Analysis Methodology

Typically, the two dominant sources of fission products released from the core are heavy metal contamination (heavy metal outside the coated fuel particles) and fuel particles whose coatings fail in service. In addition, the volatile metals (Cs and Sr) can, at sufficiently high temperatures and over long periods of time, diffuse through the silicon carbide (SiC) coatings and be released from the intact fuel particles.

Calculations were performed to predict plateout distributions in the primary coolant circuit for the following key nuclides: Sr-90, I-129, I-131, Cs-137, Cs-134 and Te-127m. The source terms for fission product plateout analysis include both a direct release contribution and, where applicable, a precursor contribution. In the case of the cesium isotopes, there is a direct release of both Cs-137 and Cs-134 metal from the core. Cs-137 plateout also results from the release and subsequent decay of its precursor contributor, Xe-137. Cs-134 has no gaseous precursor. Similarly for Sr-90, there is a direct Sr-90 metal release as well as the contribution from it Kr-90 precursor. Only direct release contributions are considered from I-129, I-131 and Te-127m. The plateout analysis included a comparison of the calculated and measured plateout inventories for Cs-134, Cs-137 and Sr-90 based on measurements on the plateout probe that was removed from the PCRV after final reactor shutdown.

3.1.4.2.3 Plateout Analysis Results

It is anticipated that any internal PCRV component that has come in contact with primary coolant will require decontamination or will be removed for disposal as radioactive waste. This includes not only the core graphite and structural components (which are also activated), but also the steam generator modules, helium circulators and Kaowool insulation. The results of the plateout analysis are shown in Tables 3.1-4 and 3.1-5. Table 3.1-4 lists the plateout concentration (Ci/cm^2) on primary circuit components for the key nuclides, Cs-137 and Sr-90. Table 3.1-5 identifies the integrated plateout (Ci) of primary circuit components for the following nuclides: Cs-134, Cs-137, I-131, I-129, Sr-90 and Te-127m. Additional information on the analysis results, analytical models and comparisons with measured data are located in Reference 11.

3.1.4.3 Contaminated Systems, Structures and Components

In August 1990, comprehensive radiation and contamination surveys were performed in the Reactor and Turbine Buildings to identify the major contributors to radiation levels above background. Due to on-going maintenance, defueling, and component removal activities in progress at the time of the survey, it should be noted that radiation and contamination levels may vary due to the movement of various radioactive components. Additionally, certain PCRV internal components may be removed from the PCRV prior to commencement of decommissioning activities which may change radiation and contamination levels elsewhere in the plant.

When compiling the radiation survey results, the contributions from various pieces of portable equipment such as ventilation units, vacuum cleaners, decontamination equipment, etc., were neglected due to the transient nature of their use.

An engineering analysis of the total curie inventory at Fort St. Vrain was completed in June 1989 and the results of this analysis have been summarized in Table 3.1-6. This analysis is based upon past survey results, activation analysis, plateout analysis and general estimation of contamination levels occurring in the various systems. The survey results and estimation of contamination levels were then applied over the estimated surface area of the associated system. This analysis accounts for all expected radioactivity at Fort St. Vrain with the exception of fuel.

Section 3.1.2 contains a detailed summary of the radiation survey results. These surveys were performed to identify general radiation and contamination levels in frequently accessed areas of the facility. More detailed surveys of individual areas will be required when determining specific work plans during actual decommissioning.

3.1.5 Tritium Analysis

3.1.5.1 Introduction

During the Fort St. Vrain decommissioning project, the PCRV cavity will be flooded with water to provide shielding and contamination control as described in Section 2.3.3.6. Flooding the PCRV will result in the release of radionuclides (that exist in the PCRV as a result of activation and plateout) into the water. One of the radionuclides of primary concern is tritium, since a fraction of the tritium inventory is expected to leach out of the graphite blocks into the water and the tritium cannot be removed by conventional processing means employed by the PCRV Shield Water System. The amount of tritium to be handled by the PCRV Shield Water System and potential exposure to personnel depends on both the total amount of tritium present in the graphite and other components inside the PCRV, and the fraction that is released to the water. However, since measured data on the actual tritium concentrations that are in the Fort St. Vrain PCRV graphite components and the rate at which the tritium leaches into the water from the Fort St. Vrain graphite do not exist, the amount of tritium that enters the PCRV water has been estimated, based on (1) a conservative calculation of the total amount of tritium produced during power operation (i.e. 100,000 curies) and (2) actual measurements of tritium leach rates from British Magnox reactor graphite. It is estimated that approximately 500 Curies (or 0.5% of the total tritium inventory) will enter the water. The PCRV Shield Water System is being designed to process this tritium inventory for discharge using the existing liquid effluent discharge path.

An assessment has also been made of the impact if the maximum theoretical amount of tritium (100,000 curies) is released into the PCRV shield water. Included are impacts on air handling, tritiated water disposal, contamination, and personnel protection. It was found that these impacts, although significant, can be managed without undue safety hazards and within reasonable costs. Allowing for this extreme case, decommissioning can proceed and will be accomplished within the decommissioning cost estimate previously submitted to the NRC, as will be discussed in this response. In addition, with considerations for the worst credible accident and this extreme case, decommissioning will also be accomplished without undue risk to the safety of the public.

3.1.5.2 Sources of Tritium From Reactor Operation

The main sources of tritium generated during Fort St. Vrain reactor operation include the following:

(1) ternary fission in the fuel particles
(2) n,p reaction with He-3 in the coolant
(3) n,α reaction by Li-6 impurities in the graphite and other components

The tritium produced in the fuel by ternary fission totaled about 10,000 Curies and is expected to be contained by the fuel particle coatings. This tritium will be removed when the fuel is removed prior to decommissioning. The tritium produced from He-3 reactions was minimized by using helium with a low concentration of He-3 and totaled about 3000 Curies. This tritium was either removed by the gas purification system or was absorbed in the core. Most of this absorption would have occurred in fuel graphite blocks near the coolant channels, and the majority of the tritium generated by this reaction will also be removed when the reactor is defueled prior to decommissioning.

Table 3.1-2 identifies the amounts of tritium determined to be present in the PCRV as a result of the activation analysis. The removable graphite reflector blocks located at the top, bottom and sides of the core were included in the results of the activation analysis since it was conservatively assumed that these removable reflector blocks could be in the PCRV when it is flooded. The preferred method for removing these hexagonal reflector blocks is by means of the FHM prior to flooding the PCRV. However, use of the FHM for this purpose is dependent on its operability and its availability has not been relied upon for removal of these blocks.

Table 3.1-7 provides a summary of the key parameters of these hexagonal removable reflector blocks. These blocks are comprised of H-327 and H-451 graphites. Although more than one-third of these removable reflector blocks were removed from the PCRV during the three core refuelings and replaced with unirradiated blocks, the activation analysis conservatively assumed that all blocks were irradiated over the full 890 EFPD reactor operating lifetime. Based on these assumptions (and a Lithium impurity of 0.1 ppm), a tritium inventory of 3,208 Curies is estimated to be contained in the removable hexagonal reflector block graphite.

The maximum tritium inventory in the graphite expected to exist in the PCRV when it is flooded is provided in the table on the following page. For the purposes of estimating the amount of tritium in the graphite, a tritium inventory of 100,000 Curies is assumed.

3.1.5.3 Description of Fort St. Vrain Graphites Retaining Tritium

From the standpoint of tritium generation, the graphite in Fort St. Vrain is primarily of two types. The primary graphite of interest is the HLM graphite used for the

COMPONENT	CURIES	PERCENT
Large permanent side reflectors	82,588	(84.8%)
Boronated side spacer blocks	11,532	(11.8%)
Removable hexagonal reflector blocks	3,208	(3.3%)
Core support blocks and bottom reflectors with hastelloy cans	48	(<0.1%)
TOTAL	97,376	

large side reflector blocks and the side spacer blocks. HLM graphite is less pure than the graphite used in fuel elements, with a maximum specification for lithium of 2 ppm.

The second graphite of interest is the relatively high purity graphite (either H-327 or H-451) that was used for the fuel elements and removable hexagonal reflector blocks. This high purity graphite is specified to have less than 0.1 ppm of lithium. The amount of tritium contained in these blocks is expected to be relatively low in comparison to the tritium activity in the HLM graphite blocks.

Table 3.1-7 provides a summary comparison of the major properties of the graphites found in the core area. As seen from the table and the above description of sources of tritium, over 96.4% of the tritium produced from the Li-6 reaction is produced in the HLM graphite. In particular, due to the neutron flux depression caused by the boron pins in the side spacer blocks and lithium's thermal neutron capture cross section, most of this tritium will have been generated in the large permanent side reflector blocks. These blocks are solid (with no coolant holes) and have a relatively low surface-to-volume ratio, which is expected to result in lower release rates, as discussed later. This figure clearly shows that removal of any of the HLM graphite blocks to obtain tritium data is not possible with the FHM due to the size (weighing approximately 1500 lbs each) and location of these blocks. Additional information can be obtained by reviewing Figures 2.2-5 and 2.2-10.

Conservative calculations of the total amount of tritium that could potentially be in the graphite blocks have been made. Based on the maximum specification value for lithium impurity in the HLM graphite, the theoretical maximum amount of tritium that can be in the total system is approximately 100,000 Curies. This estimate was derived in the activation analysis (Ref. 2) using the calculated neutron flux in the graphite and the actual reactor power history. The calculated flux was derived from one-dimensional neutron transport calculations in the axial up, axial down, and radial directions. These calculations produce the maximum flux in each direction and therefore are expected to overestimate the activation, especially in corner regions. An additional conservative assumption is that all of the tritium produced in the graphite has been retained, i.e., none has diffused out during reactor operation or subsequent shutdown.

3.1.5.4 Expected Tritium Release Into the PCRV Shield Water System

Data on tritium leaching from graphite obtained by the British (Ref. 13) is considered to be directly relevant to determine the fraction of the tritium inventory likely to be leached from the Fort St. Vrain graphite after the PCRV is flooded. These British measurements were made in support of decommissioning of the Magnox and AGR plants, and form the basis for disposal planning for irradiated graphite for the European Community. The graphite in the British tests is typical of that used in the Magnox and AGR reactors. Key parameters for the British graphite test samples are also included in Table 3.1-7 for comparison with data for Fort St. Vrain graphites.

As noted previously, the leach rate of the tritium in the British test was measured to decrease with time starting at about 0.1% per day and declining to below 0.0001% per day after several months. Applying these values to Fort St. Vrain, a curve of tritium release rate versus time was prepared with an initial tritium release rate of 0.5% of the tritium inventory in the graphite released in about the first month after flooding the PCRV. Use of this release rate results in a release of 500 Curies from the graphite to the water, based on an assumed initial tritium inventory of 100,000 Curies in the core graphites. Thereafter, the tritium release rate from the graphite is assumed to continue to decrease, falling to a release rate of less than 0.0001% per day within several months, consistent with the results of the British test.

3.1.5.5 Conclusions Regarding Expected Tritium Leaching

Based on a comparison of key properties and operational history between the British test sample with the Fort St. Vrain HLM graphite, the properties of the Fort St. Vrain HLM graphite are expected to result in a more conservative behavior than the British Magnox test samples with respect to tritium leach rate and the fractional release of tritium. HLM surface-to-volume ratios are significantly lower, indicating that water ingress will not occur as rapidly and tritium migration to the graphite surface will take significantly longer. Irradiated densities of the HLM is greater than the British graphite samples, indicating lower porosity and a lower leach rate in the HLM graphite due to density. Effects of both reactor power history and primary coolant favor the HLM graphite, since the effect on increased porosity should be greater in the British samples than in the HLM.

Therefore, the leach rate for the HLM graphite is not expected to be greater than that determined for the British Magnox graphite samples, and use of the leach rate determined by the British test in demineralized water should represent a conservative upper bound on the leach rate that should be experienced when the PCRV is flooded and the HLM graphite is immersed in water.

3.1.6 Initial Site Characterization Program

The results of the Fort St. Vrain Initial Site Characterization Program were reported to the NRC in Reference 14. The purpose of this program was to collect and analyze radiological survey data to determine the extent of decontamination and dismantlement activities. In accordance with this program, more than twenty thousand measurements were made on more than five thousand survey locations. Reference 14 identifies the areas examined and summarizes the results of these examinations.

3.1.6.1 Results of Site Characterization Surveys

The Site Characterization Program divided the Fort St. Vrain facility into four major elements, identified below with the results of the characterization in each area.

1. Structural Characterization

The results of the structural characterization indicate that the only structures with contamination levels above release limits are the Reactor Building and the Radwaste Compactor Building. Structures with contamination levels above background were the Reactor Building, Turbine Building, Helium Storage Building, New Fuel Storage Building, Radiochemistry Laboratory, and Radwaste Compactor Building. The loose contamination was composed primarily of Co-60. Alpha contamination was not detected in any structures.

2. BOP and Equipment Characterization

The systems characterization determined that twenty plant systems had no radioactivity above background and 17 systems contained various levels of contamination. System 79 (Radiochemistry Laboratory Ventilation), discussed in Section 2.3.4.14, was not verified as contaminated at the time of the characterization survey. However, it is frequently used to vent radioactive materials and is treated as a contaminated system when conducting filter changes and maintenance.

3. PCRV and Internals

The PCRV was inaccessible for characterization. Historical data, calculations, and limited measurements support the general dose rates provided in the activation analysis results. Additional measurements will be made during actual decommissioning.

4. Environmental

The characterization used historical data from the Radiological Environmental Monitoring Program, and assessed soil and water samples and direct measurements. Results of the evaluation of environmental media samples, taken both within and outside the Fort St. Vrain protected area, are inconclusive at this point. Results will be provided at a later date.

In addition, nine smears from the Reactor Building structural surveys and one smear from System 63 (Radioactive Gas Waste System) were analyzed off-site by an independent laboratory. The primary gamma isotope was identified to be Co-60 and was detected on all ten smears. Additional isotopes that contributed to gamma levels were Cs-134 (2 smears), Cs-137 (3), Mn-54 (2), and Ag-110m (1). Four of the smears indicated low levels of H-3 and nine of the ten smears indicated the presence of C-14. Nine of the ten smears indicated high levels of Fe-55. The smear with the highest gross beta results indicated a level of approximately 460 dpm/100 cm^2 of gross alpha, but showed no detectable levels of plutonium, uranium or californium.

3.1.6.2 Comparison with Previous PDP Information

Information contained in the PDP was based on historical data that renders a direct comparison of PDP data and Site Characterization Program (SCP) results inconclusive for most structures. Most of the areas and information previously presented in Section 3.1.2 are not as comprehensive as the SCP data, and therefore there is no basis for comparison. However, radiation levels presented as actual values less than 0.2 mRem compare favorably with the SCP data. See Reference 14 for further detailed information.

3.1.6.3 Conclusions of Site Characterization Program

Some of the more noteworthy features of Reference 14 are the following:

- The only structures with contamination levels that will require decontamination are the Reactor Building and the Radioactive Waste Compactor Building.
- Only a few of the PCRV internal components were available for sampling, since this area is generally inaccessible. The measured results from this limited sampling generally agree with the activation analysis provided in Section 3.1.4. Based on these measurements, PCRV internal dose rates are not expected to differ substantially from those previously estimated.
- The analysis of plant systems showed general agreement with the extent of contamination presented in Section 3.1.2, although contamination was found in several systems that were previously thought to be less than the release criteria. Descriptions of these systems in Section 2.3.4 have been updated to identify that the systems are contaminated. Any additional decontamination or disposal activities can be performed within the cost estimate contingency funds.

The Fort St. Vrain Radiological Site Characterization Program will be an ongoing program throughout the dismantlement process. The results of the site characterization will assist in the determination of final survey plans, frequency of surveys and instrumentation to be used. It will also be used as a general performance indicator to assess the effectiveness of the overall site decontamination. The data will be utilized for radioactive waste management, assessing potential hazards during the decontamination and decommissioning work, for determining safety controls, and accurately scheduling the decommissioning activities.

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TABLE 3.1-1
RADIOLOGICAL SURVEY SUMMARY

LEVEL	REACTOR BUILDING ELEVATION	INTERNALLY RADIOACTIVE SYSTEMS	SOURCE OF RADIATION/ CONTAMINATION	RADIATION LEVELS (mR/hr)	CONTAMINATION LEVELS LOOSE (DPM/100 cm^2)	FIXED (DPM/15 cm^2)
13	4916' 8"	46, 47				
12	4906' 8"	46, 47				
11	4881' 0"	11, 12, 13, 14, 15, 16, 21, 23, 46, 47, 72, 93	Shine thru FSW's and ESW's	General Area - 0.044		
10	4864' 0"	11, 13, 14, 16, 21, 23, 46, 47, 72, 93	New Fuel Loading Port Hot Service Facility Purge Vacuum Pumps	General Area - 0.8 Contact - 6.0 (See Level 9 results) General Area - 0.032	30,000	5,000 - 10,000
9	4849' 0"	11, 14, 16, 21, 23, 46, 47, 61, 62, 63, 72, 93	Regeneration System Hot Service Facility	General Area - 0.15 General Area - 0.5	100,000	10,000 - 50,000
8	4839' 0"	11, 14, 16, 23, 46, 47, 61, 62, 63, 72, 93	Access to HSF HSF Sump	General Area - 0.5 General Area - 50 Contact - 200	50,000 100,000	10,000 - 50,000
7	4829' 0"	11, 14, 16, 46, 61, 62, 63, 72, 93	Irradiated Thermocouples	General Area - 2.8 Contact - 4.0		
6	4816' 0"	11, 46, 61, 62, 63, 72, 93	Gas/Liquid Waste System Piping	General Area - 0.02 Contact - 1.2		

TABLE 3.1-1 (Continued)
RADIOLOGICAL SURVEY SUMMARY

LEVEL	REACTOR BUILDING ELEVATION	INTERNALLY RADIOACTIVE SYSTEMS	SOURCE OF RADIATION/ CONTAMINATION	RADIATION LEVELS (mR/hr)	CONTAMINATION LEVELS LOOSE (DPM/100 cm²)	FIXED (DPM/15 cm²)
5	4791' 0"	11, 46, 61, 62, 63, 72, 93	Gas/Liquid Waste System Piping	Contact - 0.25		5,000 - 10,000
4	4781' 0"	46, 47, 61, 62, 63, 72, 93	Decontamination System	General Area - 0.5 Contact - 3.0	600	500 - 1,000
3	4771' 0"	46, 47, 61, 62, 63, 72, 93	Decontamination Laundry	General Area - 0.4 Contact - 2.2	1,400	100 - 500
			Floor of Vault Containing T-6101			500 - 1,000
2	4756' 0"	46, 47, 61, 62, 63, 72, 93				
1	4740' 5"	21, 46, 47, 61, 62, 63, 72, 93	Gas Waste Compressor Drains (3)			100 - 500
			Liquid Waste Sump		5,600	30,000
	Below Floor Level	72	Reactor Building Sump			100 - 500

TABLE 3.1-2
ACTIVATION ANALYSIS RESULTS
(Total Curies Three Years After Shutdown)

	H-3	C-14	Ca-41	Ca-45	Mn-54	Fe-55	Fe-59	Co-60	Ni-59	Ni-63	Nb-94	Ag-110	Eu-152	Eu-154	Others	Curies
FIXED COMPONENTS																
1. Core Barrel	-	-	-	-	0.11	7.38	<0.01	1.03	-	-	<0.01	-	-	-	0.01	8.43
2. CSF Liner	-	-	-	-	<0.01	139.98	<0.01	2.27	<0.01	0.04	<0.01	-	-	-	<0.01	142.29
3. PCRV Liner	-	-	-	-	0.08	110.34	<0.01	4.34	<0.01	0.09	<0.01	-	-	-	<0.01	114.79
4. CSF/Kaowool Insulation & Cover Plates	-	<0.01	<0.01	-	<0.01	87.20	<0.01	2.24	<0.01	0.08	-	-	-	-	<0.01	89.52
5. CSF Silica Blocks	-	<0.01	<0.01	-	<0.01	246.54	<0.01	6.33	<0.01	0.22	-	-	-	-	<0.01	257.09
6. PCRV Kaowool Insulation & Cover Plates	-	<0.01	<0.01	-	0.01	5.57	<0.01	0.44	-	-	-	-	-	-	0.01	6.03
7. Metal Shelf - Large Side Reflector	-	-	-	-	<0.01	0.01	<0.01	<0.01	-	-	-	-	-	-	<0.01	0.01
8. Large Side Reflector & Permanent Hex Blocks	82557.70	-	20.11	77.44	0.30	441114.00	<0.01	3446.24	-	-	-	-	-	-	0.21	527216.00
9. Core Support Blocks	47.19	-	<0.01	0.01	<0.01	69.15	-	0.54	-	-	-	-	-	-	<0.01	116.89
10. Reflector Keys	-	-	-	-	<0.01	0.01	<0.01	<0.01	-	-	-	-	-	-	<0.01	0.01
11. Borated Spacer Blocks	11531.50	1.02	0.81	3.12	<0.01	47208.60	<0.01	7097.13	2.81	392.45	-	-	-	-	0.26	66237.70
TOTAL																594,184.76
REMOVABLE COMPONENTS:																
1. Metal Clad Block - Control Rod	-	-	-	-	0.06	18451.70	<0.01	4342.78	2.08	290.39	0.18	-	-	-	0.01	23087.20
2. Metal Clad Block - Non Control Rod	-	-	-	-	0.12	169668.20	<0.01	2786.29	-	-	<0.01	-	-	-	<0.01	172455.01
3. Region Constraint Device	-	-	-	<0.01	0.07	71.85	<0.01	48.93	0.01	1.27	0.01	-	-	-	<0.01	122.14
4. Orifice Valve	-	-	-	-	0.17	299.25	<0.01	115.56	-	-	-	-	-	-	<0.01	414.98
5. Hastelloy Cans	-	-	-	<0.01	0.07	300.94	<0.01	3407.45	0.67	88.33	<0.01	-	-	-	<0.01	3797.48
6. Removable Graphite Reflector	3208.53	-	4.34	16.99	0.13	6054.36	<0.01	2485.61	-	-	-	-	-	-	<0.01	11747.96
TOTAL																211524.77

TABLE 3.1-2 (Continued)

COMPONENT/ ISOTOPE	H-3	C-14	Ca-41	Ca-45	Mn-54	Fe-55	Fe-59	Co-60	Ni-59	Ni-63	Nb-94	Ag-110	Eu-152	Eu-154	Others	Total Curies
Concrete Radial:																
1st Six Inches	0.26	<0.01	<0.01	0.02	<0.01	7.93	<0.01	0.31	<0.01	<0.01	<0.01	<0.01	0.31	0.31	0.03	8.89
2nd Six Inches	0.09	<0.01	<0.01	<0.01	<0.01	2.81	<0.01	0.10	<0.01	<0.01	<0.01	<0.01	0.11	<0.01	0.02	3.13
3rd Six Inches	0.01	<0.01	<0.01	<0.01	<0.01	0.33	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	0.37
4th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04
5th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
6th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
7th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TOTAL																12.44
Concrete - Top Head																
1st Six Inches	2.84	<0.01	0.04	0.18	0.01	87.79	<0.01	3.37	<0.01	<0.01	<0.01	0.01	3.45	0.35	0.28	98.32
2nd Six Inches	0.73	<0.01	<0.01	0.05	<0.01	22.95	<0.01	0.79	<0.01	<0.01	<0.01	<0.01	0.90	<0.01	0.04	25.35
3rd Six Inches	0.07	<0.01	<0.01	<0.01	<0.01	2.26	<0.01	0.08	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	0.01	2.52
4th Six Inches	0.01	<0.01	<0.01	<0.01	<0.01	0.24	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.27
5th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04
6th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
7th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TOTAL																126.71
Concrete - CSF:																
1st Six Inches	0.16	<0.01	<0.01	0.01	<0.01	5.12	<0.01	0.17	<0.01	<0.01	<0.01	<0.01	0.20	0.02	0.01	5.69
2nd Six Inches	0.01	<0.01	<0.01	<0.01	<0.01	0.34	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	0.38
3rd Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03
4th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
5th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
6th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
7th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
9th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
10th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TOTAL																6.10

TABLE 3.1-3

PCRV DOSE RATES IN AIR AT 5 YEARS AFTER SHUTDOWN

RADIAL	GAMMA DOSE RATE R/Hr
All components (from large side reflector to PCRV concrete)	9.7E + 01
Large side reflectors removed (from spacers to PCPV concrete)	2.3E + 02
From core barrel to PCRV concrete	2.1E - 02
PCRV liner and concrete only	8.8E - 03
PCRV concrete only	4.5E - 03
22" PCRV concrete removed	6.3E - 06
24" PCRV concrete removed	3.4E - 06
AXIAL UP	
All components (from Kaowool insulation to PCRV concrete)	1.7E - 01
PCRV liner and concrete only	4.4E - 01
PCRV concrete only	1.7E - 01
32" PCRV concrete removed	7.6E - 06
34" PCRV concrete removed	4.4E - 06
36" PCRV concrete removed	2.6E - 06
AXIAL DOWN	
All Components (from core support blocks to core support floor)	6.1 - 02
PCRV liner and concrete only	2.5E - 01
PCRV concrete only	1.8E - 02
20" PCRV concrete removed	5.3E - 06
22" PCRV concrete removed	2.7E - 06

TABLE 3.1-4

ESTIMATED PLATEOUT CONCENTRATION ON
MAJOR PRIMARY CIRCUIT COMPONENTS
AT END OF REACTOR LIFE (890 EFPD)

COMPONENT	PLATEOUT CONCENTRATION			
	Sr-90		Cs-137	
	dpm/100 cm^2	Ci/cm^2	dpm/100 cm^2	Ci/cm^2
Lower Reflectors	5.98 E6	2.69 E-8	7.85 E7	3.54 E-7
Steam Generator				
Reheater Section[1]	1.11 E7	5.02 E-8	2.54 E7	1.15 E-7
Economizer Section	2.17 E5	9.78 E-10	4.85 E7	2.18 E-7
Circulator	2.88 E6	1.30 E-8	6.10 E6	2.75 E-8
Circulator Outlet	1.24 E5	5.60 E-10	9.56 E4	4.31 E-10
Core Barrel Annulus	1.63 E6	7.33 E-9	9.27 E5	4.18 E-9
Upper Reflectors	1.10 E7	4.95 E-8	5.31 E6	2.39 E-8

[1] Steam generator component with the highest estimated plateout concentration

TABLE 3.1-5

INTEGRATED PLATEOUT ON EACH PRIMARY CIRCUIT COMPONENT AT END OF LIFE (890 EFPD)

BRANCH NAME	Cs-134[1] (Curies)	Cs-137[1] (Curies)	I-131[2] (Curies)	I-129[2] (Curies)	Sr-90[2] (Curies)	Te-127m[2] (Curies)
Lower Reflector	2.729E+00	5.752E+00	6.490E-03	5.662E-09	4.380E-01	3.412E+01
Core Support Blocks	5.869E-02	1.319E-01	3.122E-04	2.723E-10	7.671E-03	5.964E-01
Core Exit Plenum	1.198E-02	2.822E-02	2.166E-04	1.890E-10	1.449E-03	1.052E-01
Steam Generator Inlet	4.951E-04	7.086E-04	1.027E-02	5.563E-09	1.331E-02	8.466E-01
Steam Generator Reheater	2.000E-01	7.807E-01	7.059E-01	3.295E-08	3.420E-01	2.031E+01
Superheater	5.331E-01	1.988E+00	1.664E+00	8.942E-08	1.098E-01	6.648E+00
Economizer	1.291E+00	3.378E+00	3.134E+01	8.284E-08	1.514E-02	7.719E-01
Evaporator	7.847E-01	7.063E-01	1.186E+03	2.725E-07	5.726E-03	1.296E-01
Steam Gen. Outlet Plenum	2.064E-03	1.994E-03	1.199E+01	1.119E-08	5.129E-04	3.388E-04
Circulators	1.383E-02	1.443E-02	4.744E+00	3.312E-09	6.801E-03	2.270E-03
Circulator Outlet Plenum	4.851E-04	7.594E-04	6.790E+00	1.128E-08	9.875E-04	7.962E-05
Core Barrel/Liner Annulus	1.076E-02	2.392E-02	4.363E+01	3.614E-08	4.197E-02	1.767E-03
Core Inlet Plenum	1.267E-03	4.949E-03	1.901E+01	3.164E-08	1.004E-02	2.083E-04
Upper Reflectors	7.228E-02	3.893E-01	2.641E-01	3.326E-07	8.043E-01	1.186E-02
Side Reflectors	1.041E-04	1.037E-03	1.669E-01	2.858E-07	1.443E-03	1.707E-05
Purification System	9.754E-05	3.984E-04	2.554E+00	4.213E-04	8.725E-04	1.610E-05
TOTAL	5.712E+00	1.32E+01	1.309E+03	4.225E-04	1.800E+00	6.355E+01
TOTAL (3 YEARS	2.081E+00	1.23E+01	0.00E+00	4.224E-04	1.675E+00	5.98E-02

(1) Plateout distribution based upon sorption isotherms for unoxidized alloy steel surfaces.

(2) Based on the source rate calculated from the zenon data using the square root of half-life dependence.

TABLE 3.1-6

ESTIMATED CURIE TOTAL AT FSV
(Three Years After Shutdown)

NOTE: The systems listed below are those systems which are known to be contaminated, or experiencing on-going maintenance, defueling and component removal which may transfer contamination to other systems and/or locations.

System No.	System	Total Curies	
		From Activation	From Loose Contamination [1]
11	PCRV and Internal Components	7.94 E+05	2.54 E+02
12	Controls Rods and Drives	1.84 E+04	N/A
13	Fuel Handling Equipment	N/A	8.95 E-03
14	Fuel Storage Facility	N/A	2.08 E-02
16	Auxiliary Equipment	N/A	9.05 E-03
17	Reactor Removable Reflector	4.82 E+05	N/A
21	Primary Coolant	N/A	6.01 E+01
22	Secondary Coolant	N/A	5.68 E+03
23	Helium Purification	N/A	9.33 E-01
61	Decontamination Systems	N/A	1.06 E-05
62	Radioactive Liquid Waste	N/A	4.06 E-05
63	Radioactive Gas Waste	N/A	8.15 E-05

[1] Includes an estimate of loose surface contamination due to activated corrosion products.

TABLE 3.1-7
GRAPHITE PROPERTIES COMPARISON TABLE

PARAMETER	Large Side Reflector	Boronated Side Spacer Blocks	Removable Reflector	Core Support Blocks	British Test Sample	Remarks
Type of Graphite	HLM	HLM	H-451/H-327	PGX	(Reactor Grade)	2 Samples from Magnox Reactor
Density						
Unirradiated	1.8	1.8	1.72 - 1.77	1.76	1.82	
Irradiated	1.8	1.8	1.72 - 1.77	1.76	1.7	
Surface to Volume Ratio (cm^{-1})	0.08	0.75	0.12 - 0.53	**	1.5	** - A/V ratios not significant due to very small tritium curie content
Total Mass (g)	1.83 E8	6.11 E7	1.5 E8	8 E7	680	
Total Volume (cc)	1.015 E8	3.40 E7	8 E7	4.5 E7	376*	* - Actual sample size; 2 samples tested
Total Tritium Content (Ci)	82,558	11,532	3500	47		
Tritium Concentration (μCi/cc)	813	340	<0.01	0.6	10.7*	* - Measured value 2.2 E5 Bq/g
Major Impurities (ppm)						
Li	<2	<2	<0.1	<2	<0.05	
Fe	2000	2000	<20	1900	10	
Co	0.2	0.2	<0.01	0.2	0.02	
Flux History (EFPD)	89	890	≤890	890	≈3550	
Thermal Flux ($n/cm^2/sec$)	3.8 E13	<3.8 E13	<3.8 E13	<3.8 E13	3.4 E13	
Maximum Temperature (°C)	300 - 500	300 - 500	400 - 700	700		
Primary Coolant	Helium	Helium	Helium	Helium	CO_2	

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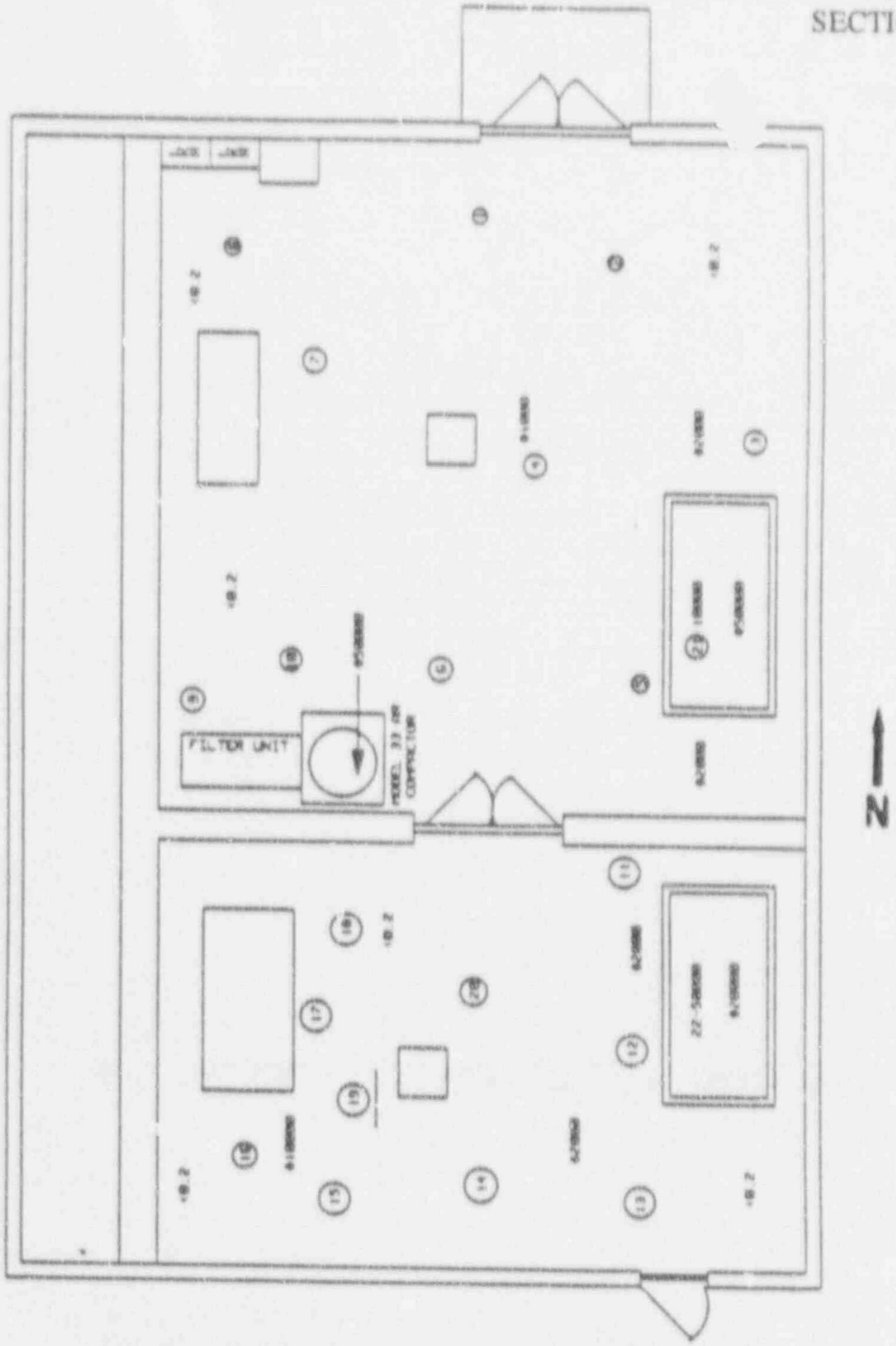
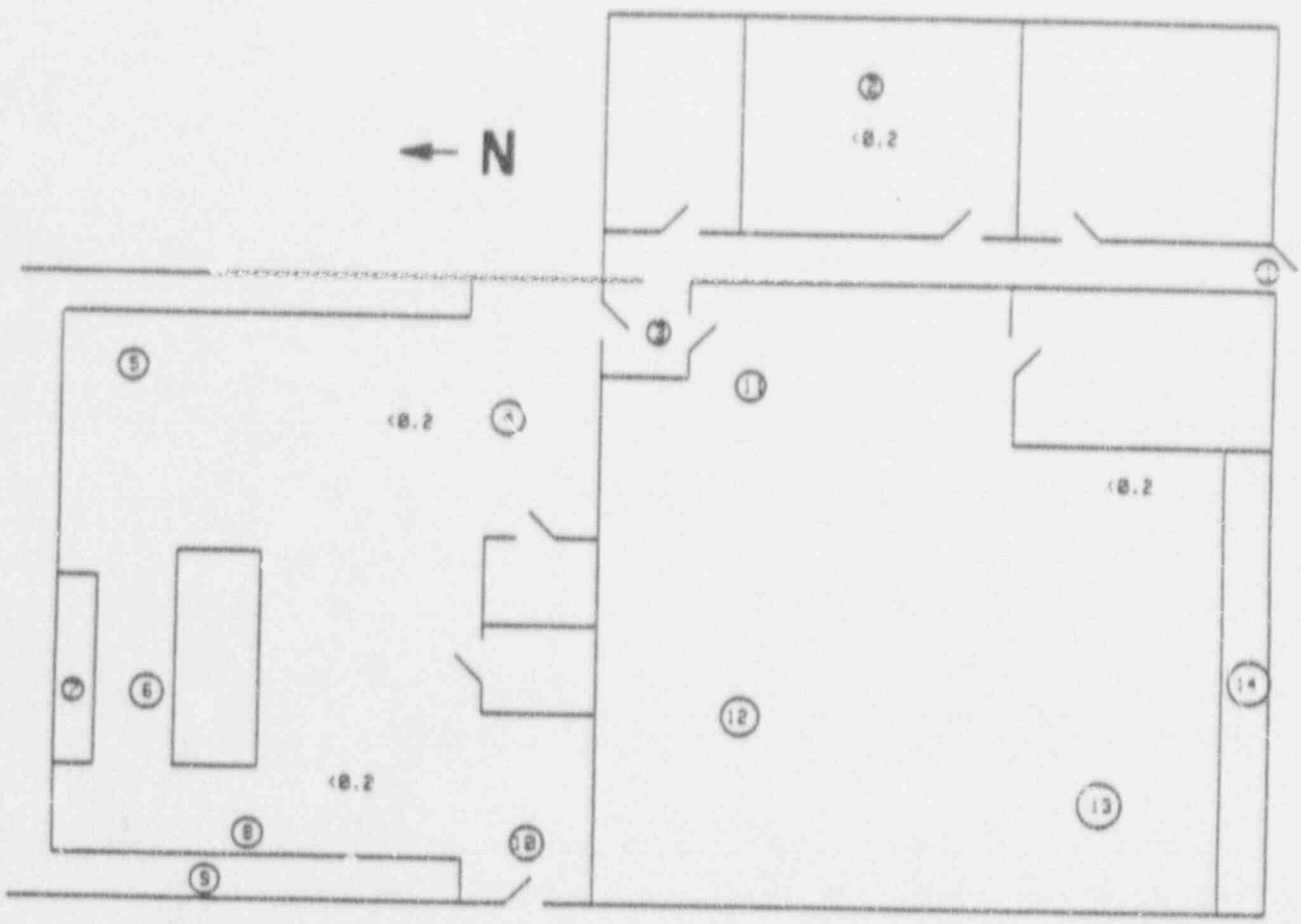


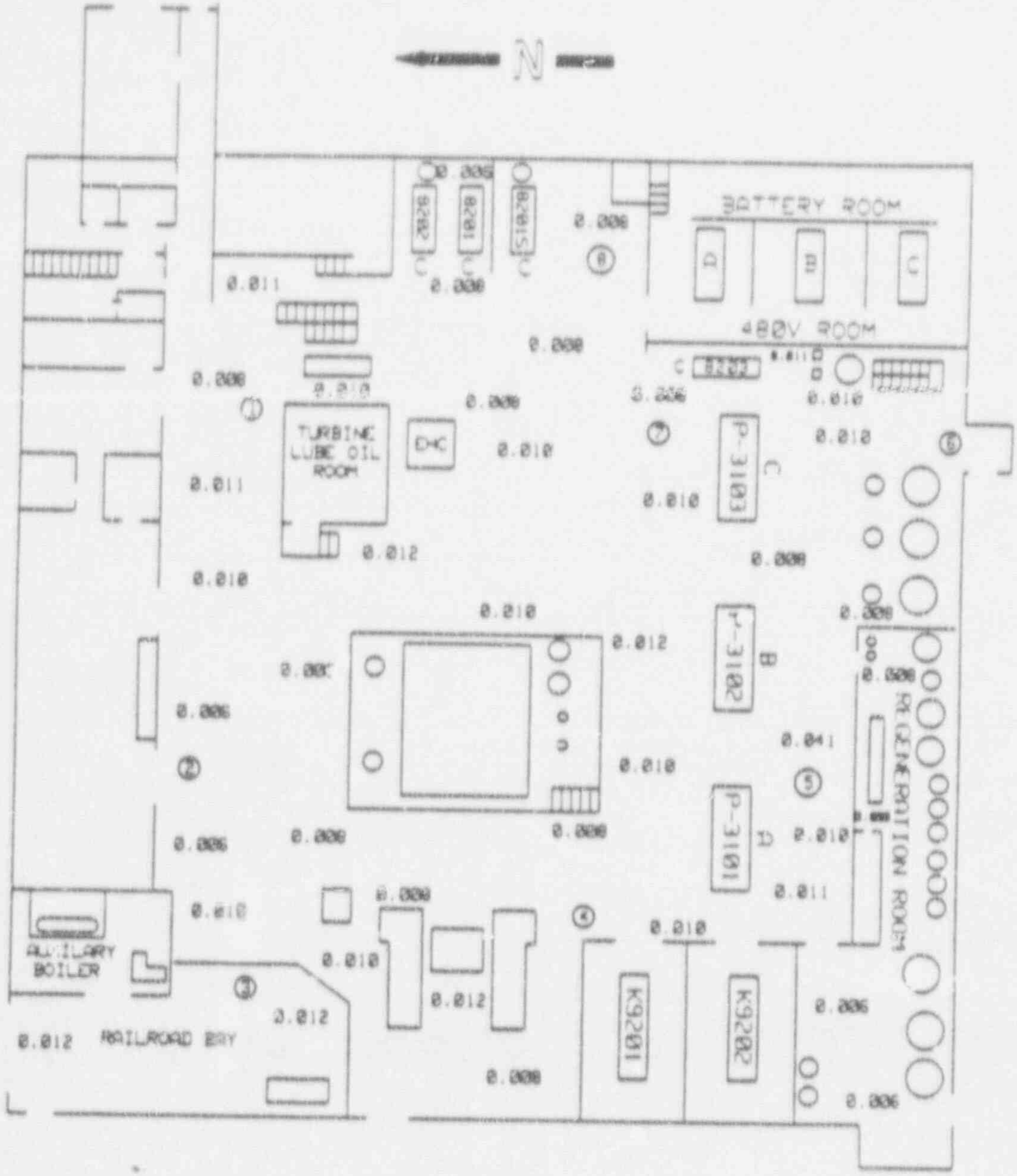
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm^2 unless a value is adjacent to the circle)

Figure 3.1-1 Compactor Building Radiation Survey



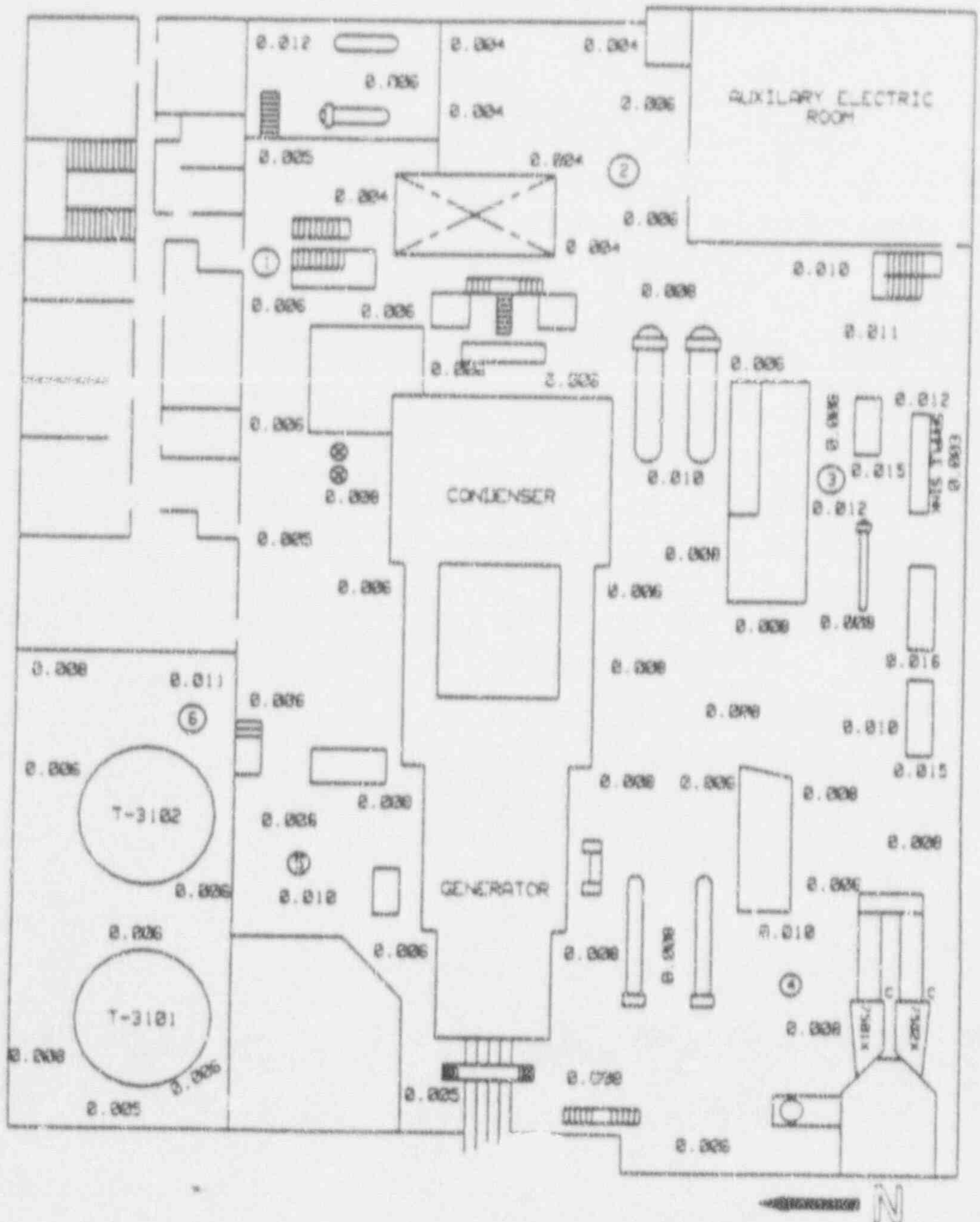
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm² unless a value is adjacent to the circle)

Figure 3.1-2 Radiochemistry Laboratory Radiation Survey



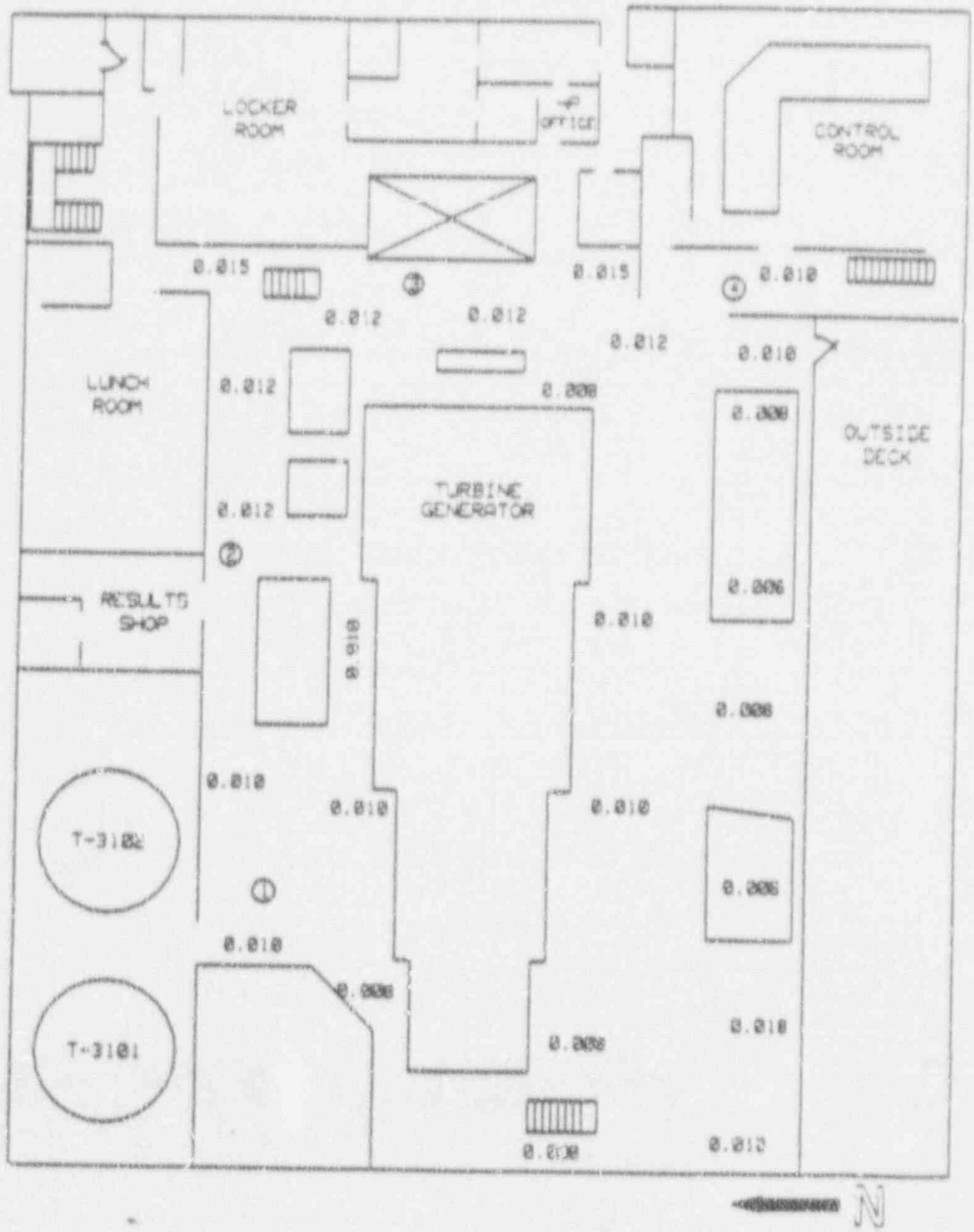
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm² unless a value is adjacent to the circle)

Figure 3.1-3 Turbine Building Radiation Survey - Level 5 (Elev 4791')



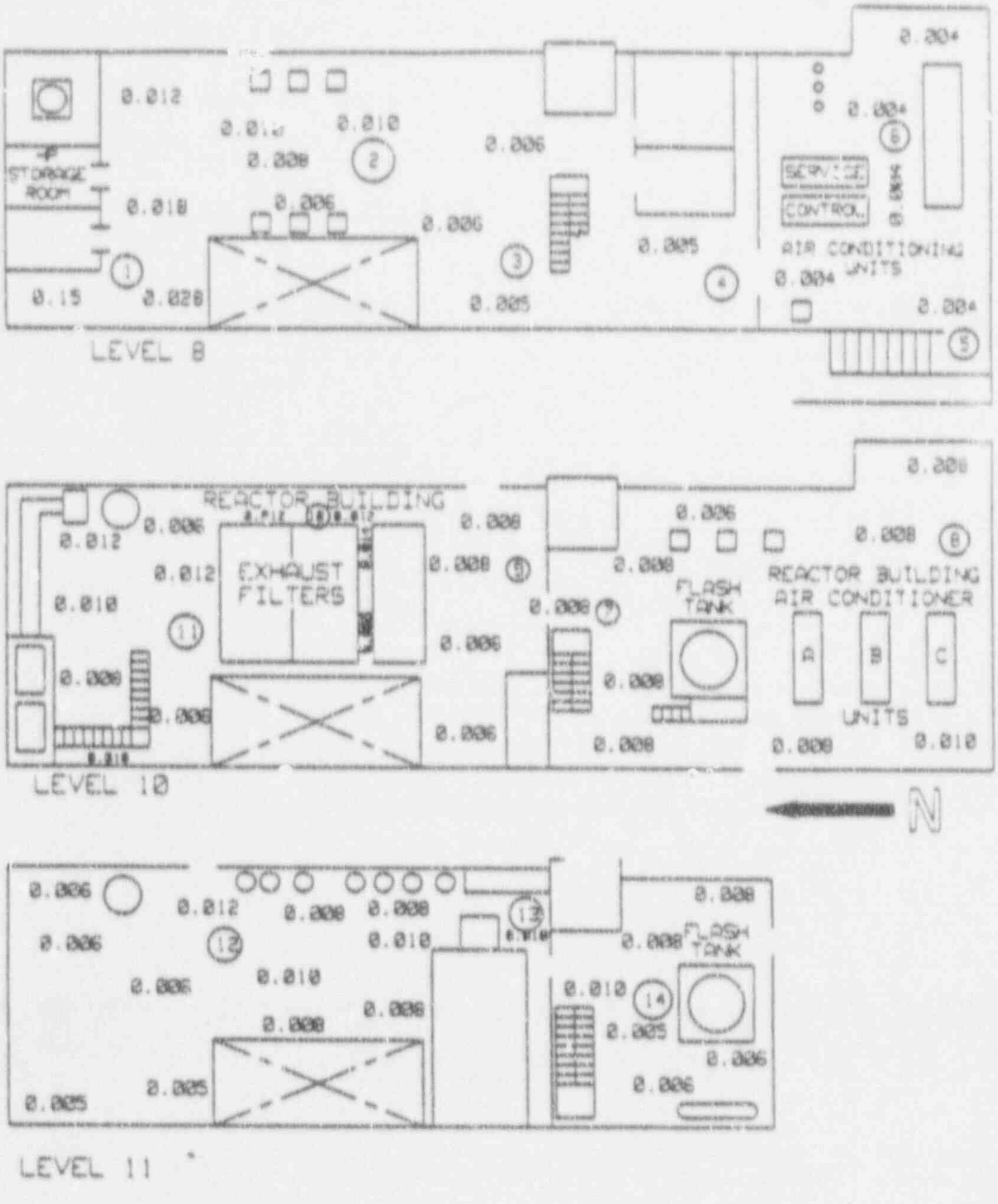
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm^2 unless a value is adjacent to the circle)

Figure 3.1-4 Turbine Building Radiation Survey - Level 6 (Elev 4811')



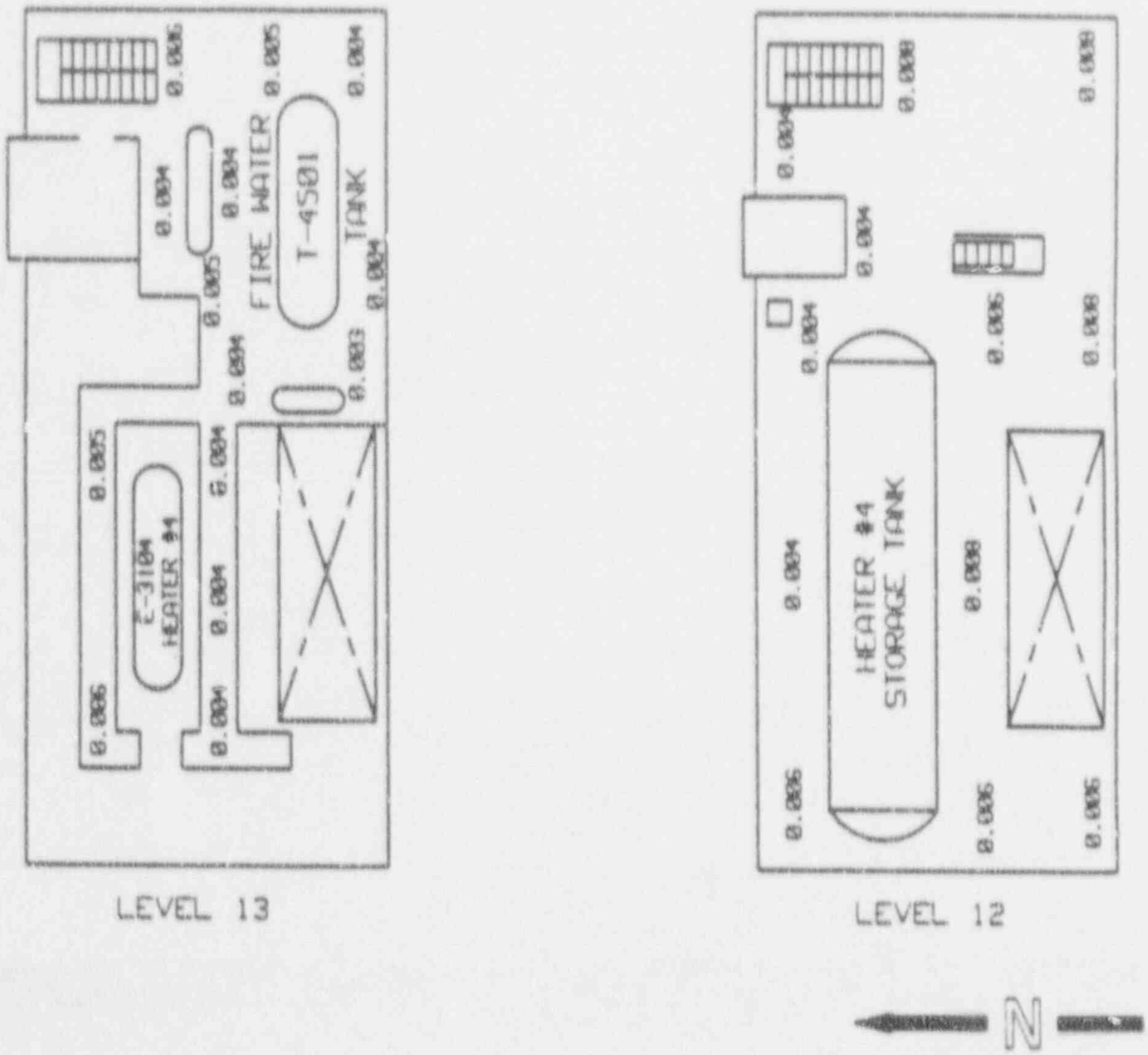
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm^2 unless a value is adjacent to the circle)

Figure 3.1-5 Turbine Building Radiation Survey - Level 7 (Elev 4829')



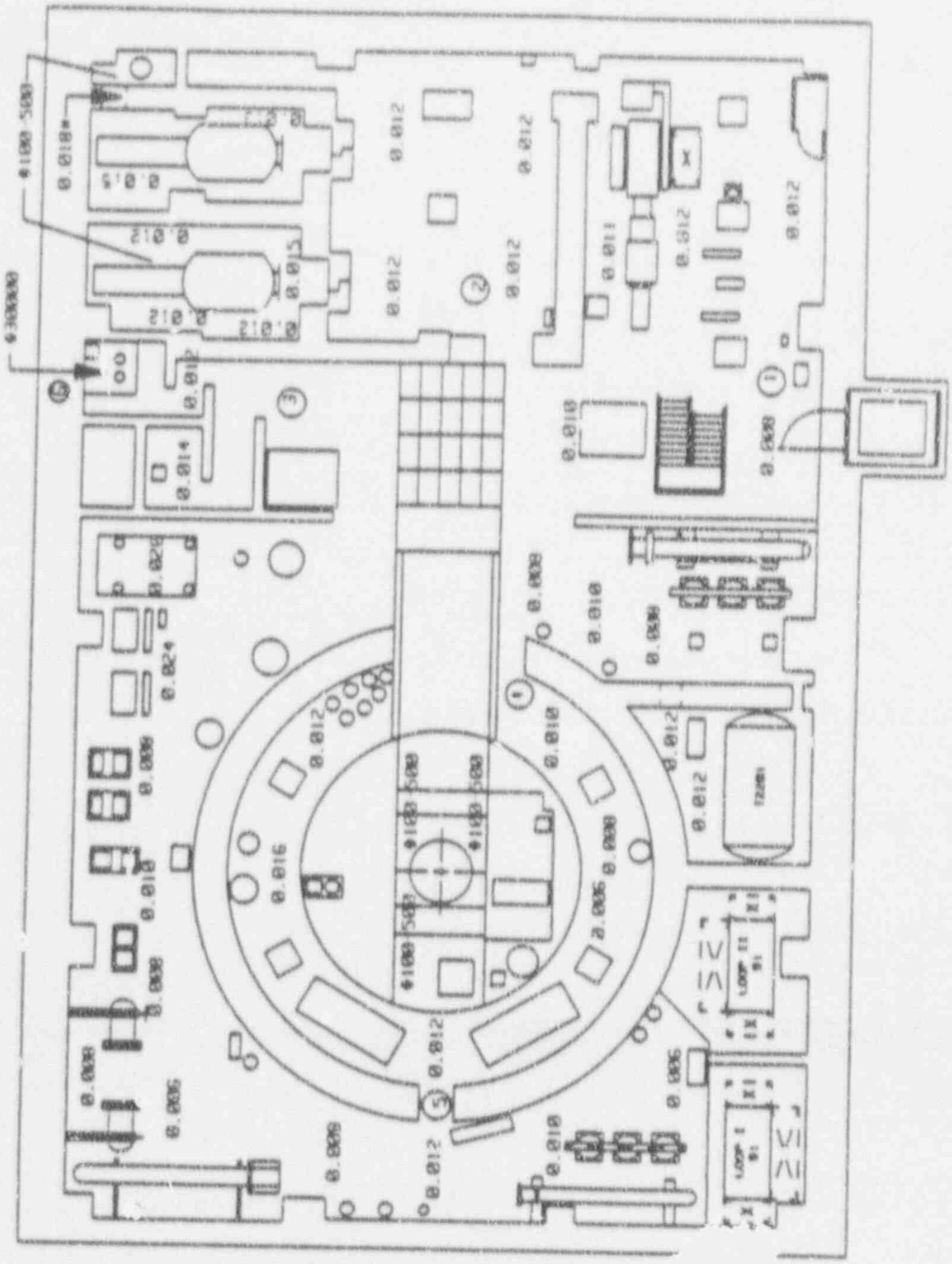
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm^2 unless a value is adjacent to the circle)

Figure 3.1-6 Turbine Building Radiation Survey - Level 8, 10, & 11 (Elev. 4846', 4864', 4884')



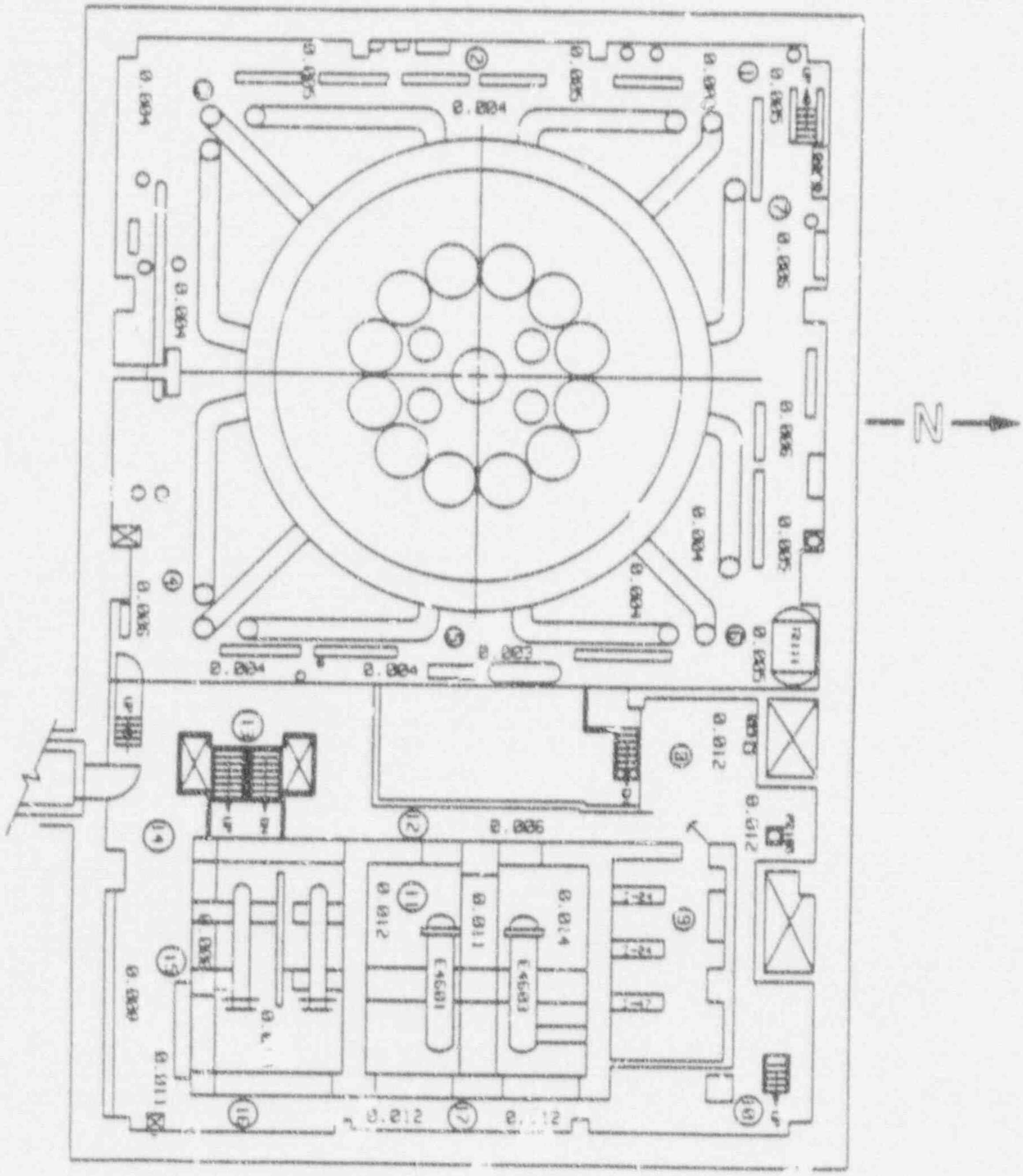
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm^2 unless a value is adjacent to the circle)

Figure 3.1-7 Turbine Building Radiation Survey - Level 12 & 13 (Elev 4904', 4921')



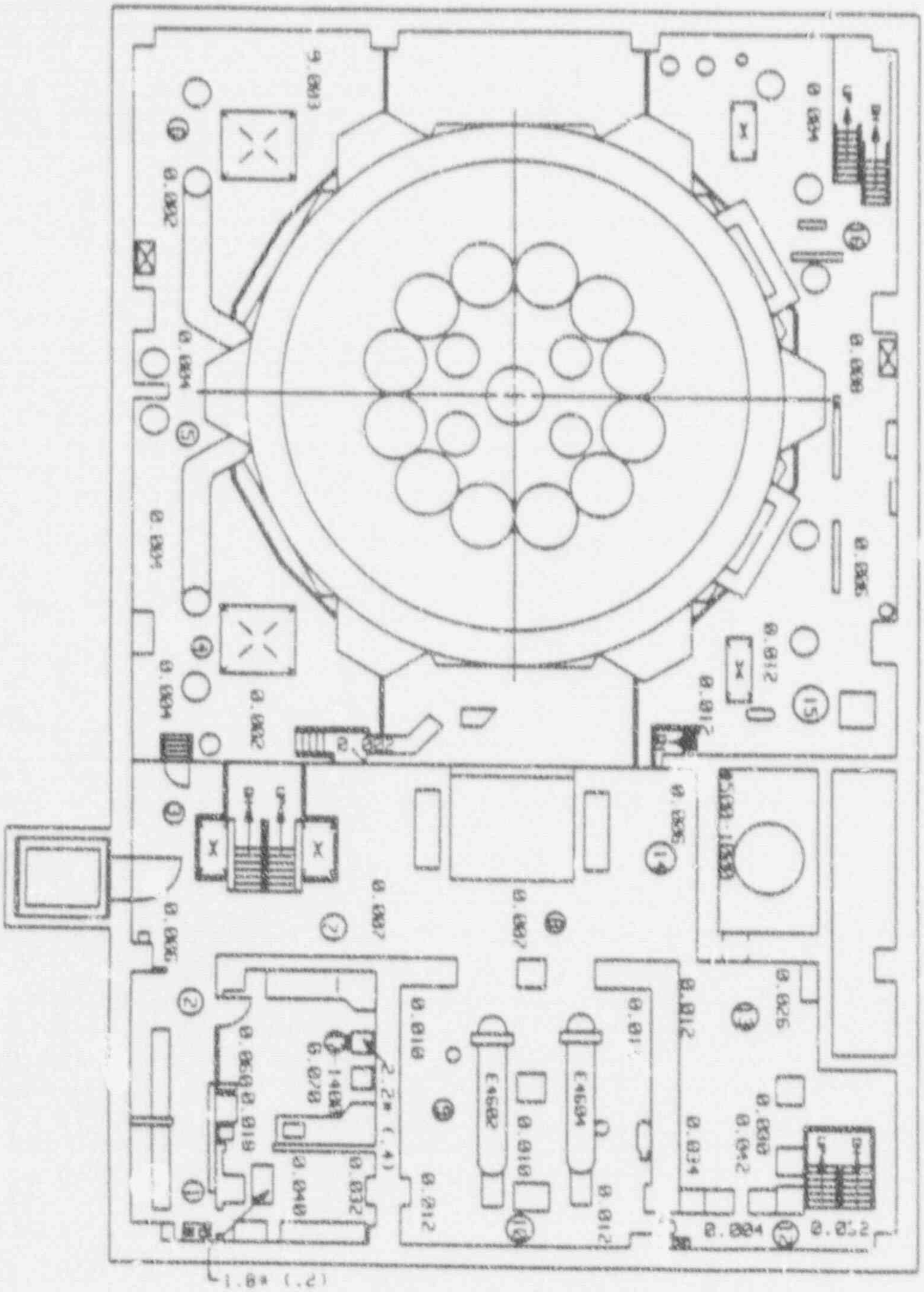
LEGEND: All radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm² unless a value is adjacent to the circle)

Figure 3.1-8 Reactor Building Radiation Survey - Level 1 (Elev 4740')



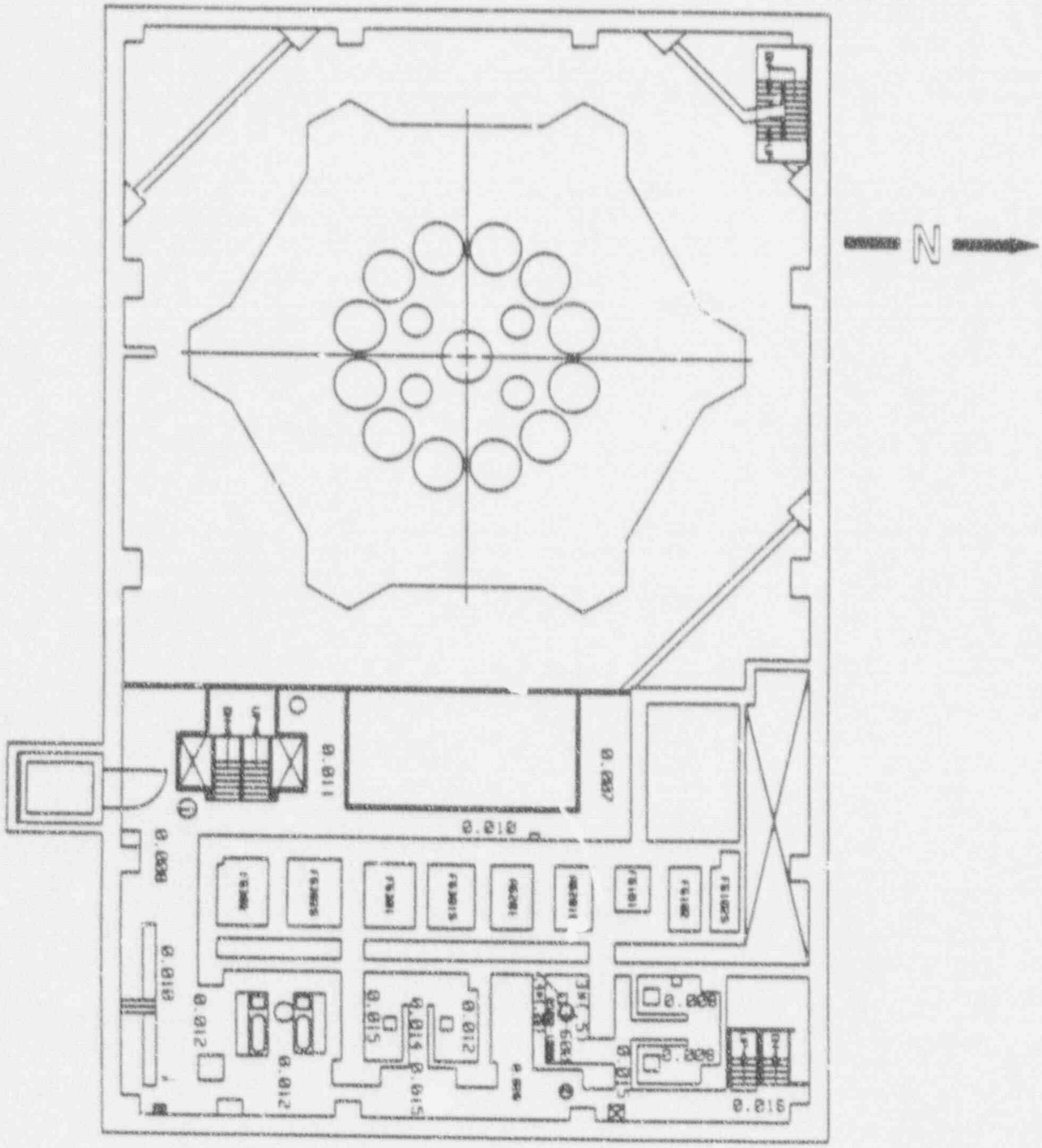
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level at 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm^2 unless a value is adjacent to the circle)

Figure 3.1-9 Reactor Building Radiation Survey - Level 2 (Elev 4756')



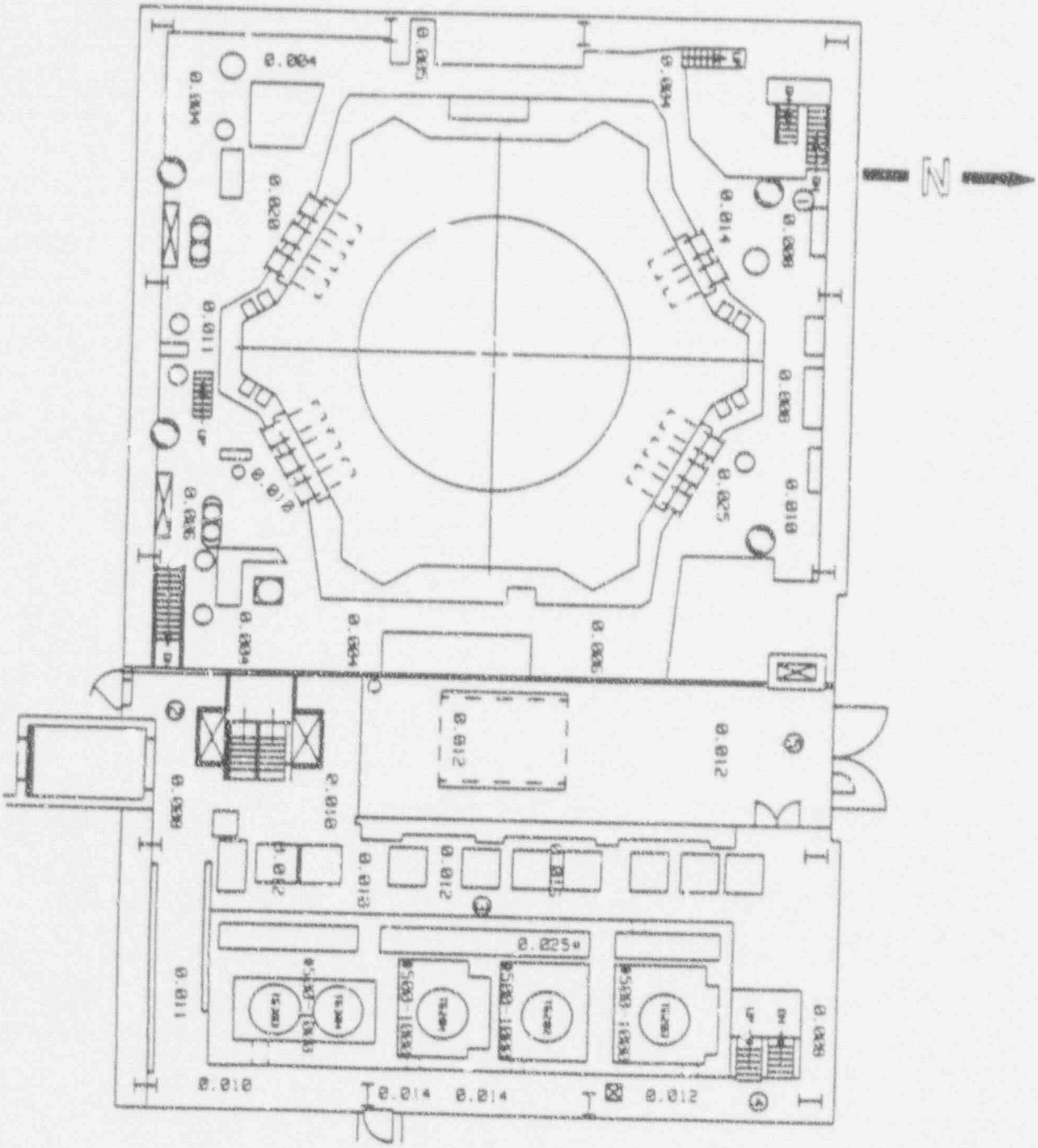
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm^2 unless a value is adjacent to the circle)

Figure 3.1-10 Reactor Building Radiation Survey - Level 3 (Elev 4771')



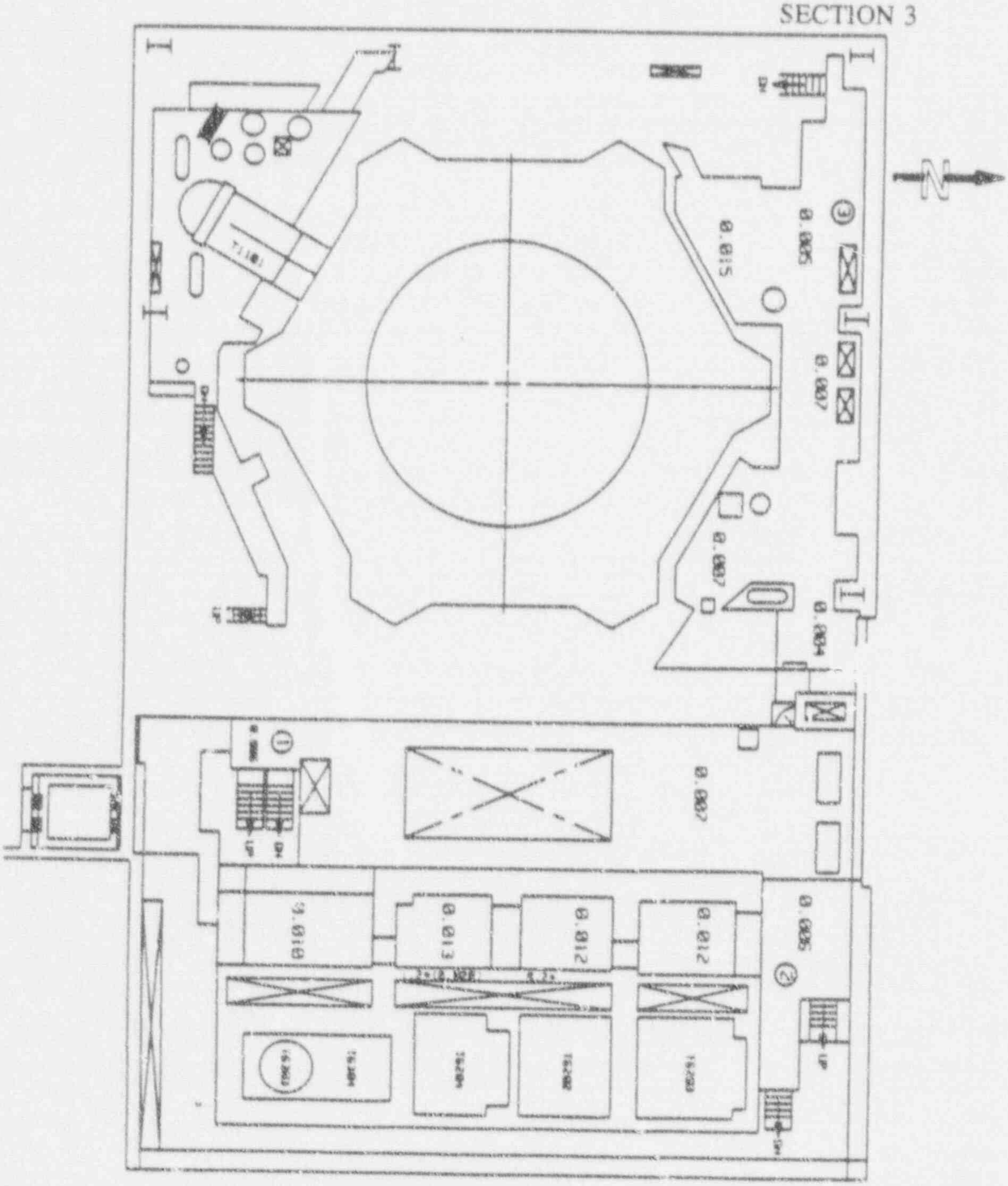
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level at 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm² unless a value is adjacent to the circle)

Figure 3.1-11 Reactor Building Radiation Survey - Level 4 (Elev 4781')



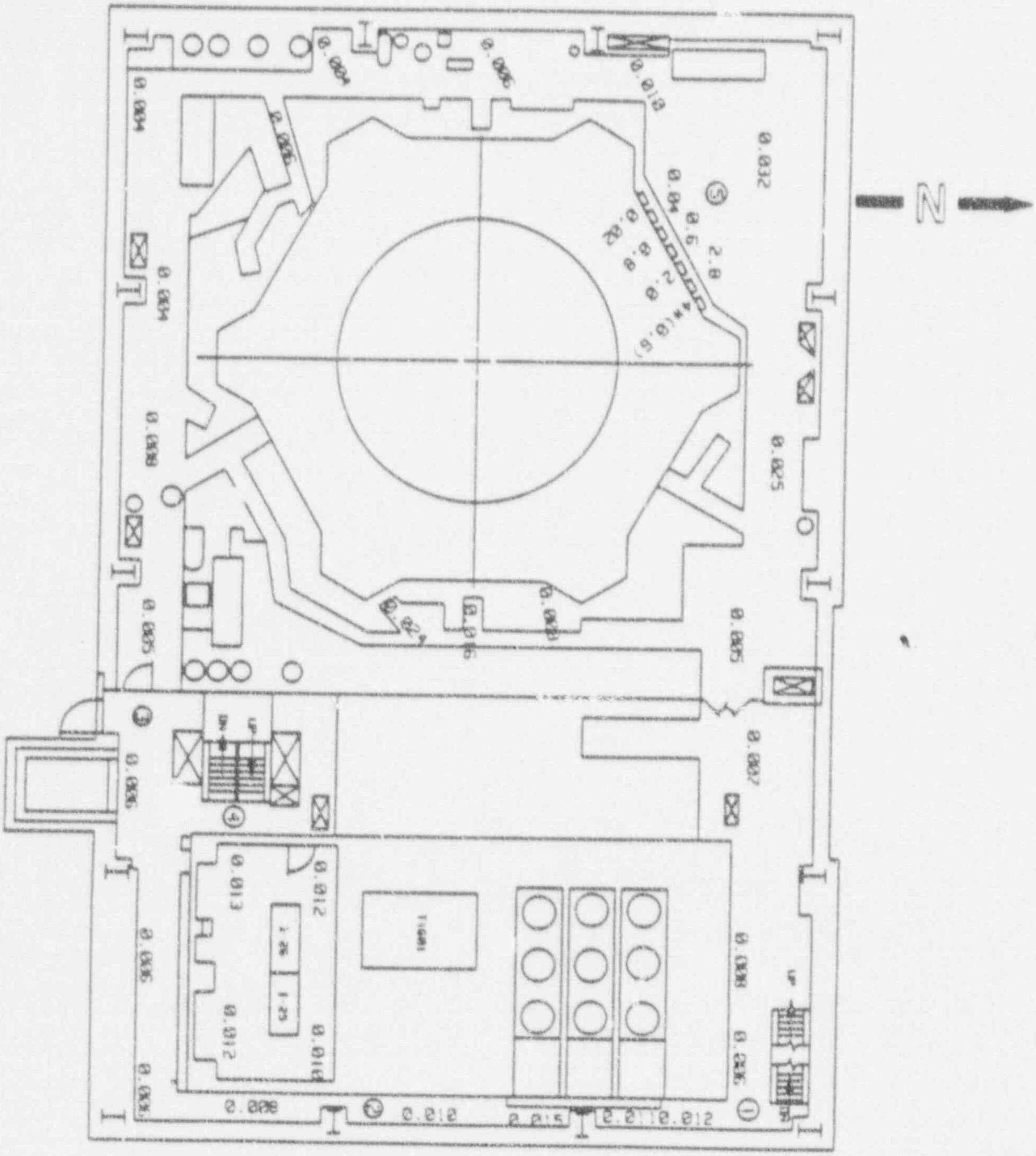
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm² unless a value is adjacent to the circle)

Figure 3.1-12 Reactor Building Radiation Survey - Level 5 (Elev 4791')



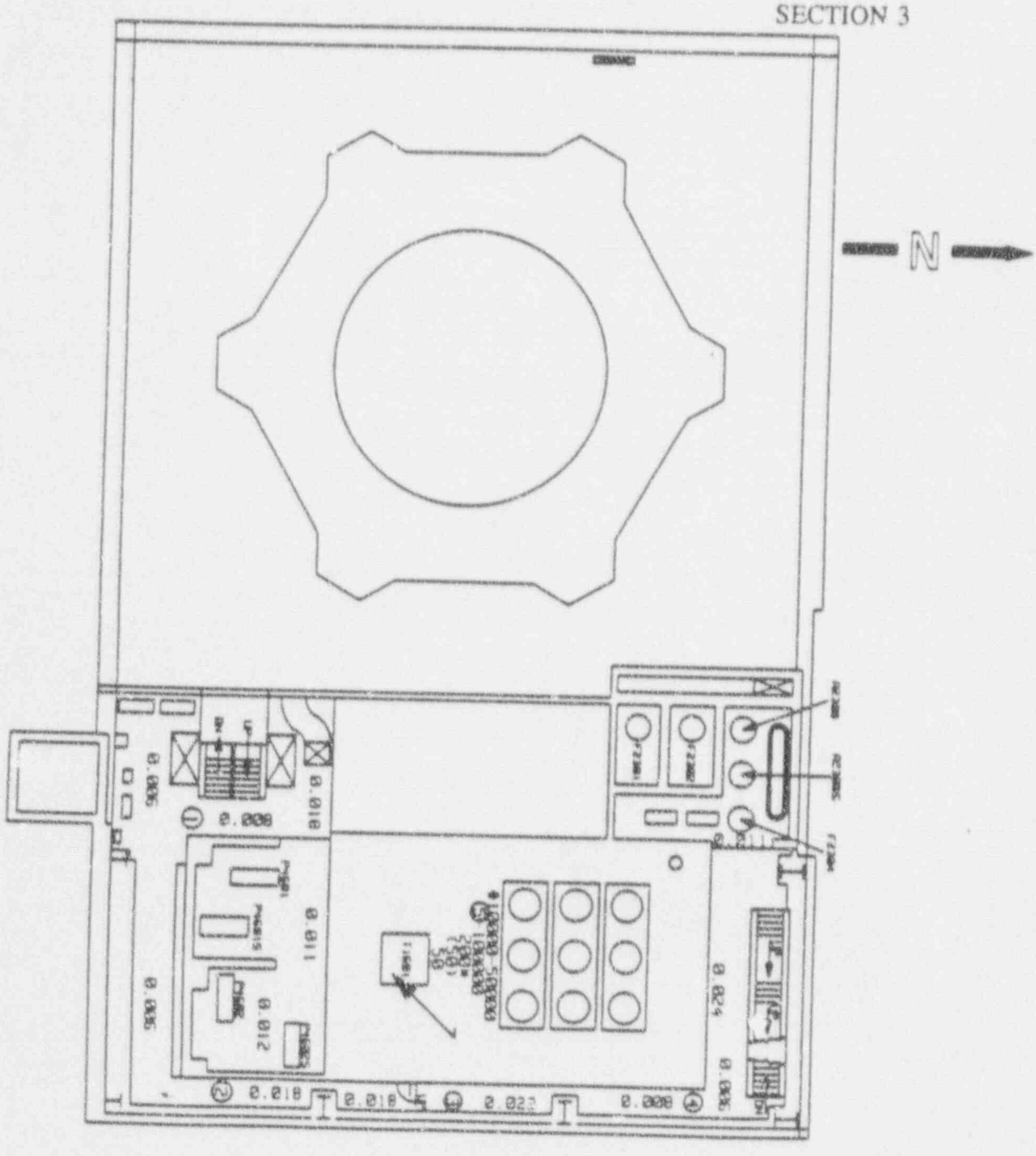
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm^2 unless a value is adjacent to the circle)

Figure 3.1-13 Reactor Building Radiation Survey - Level 6 (Elev 4816')



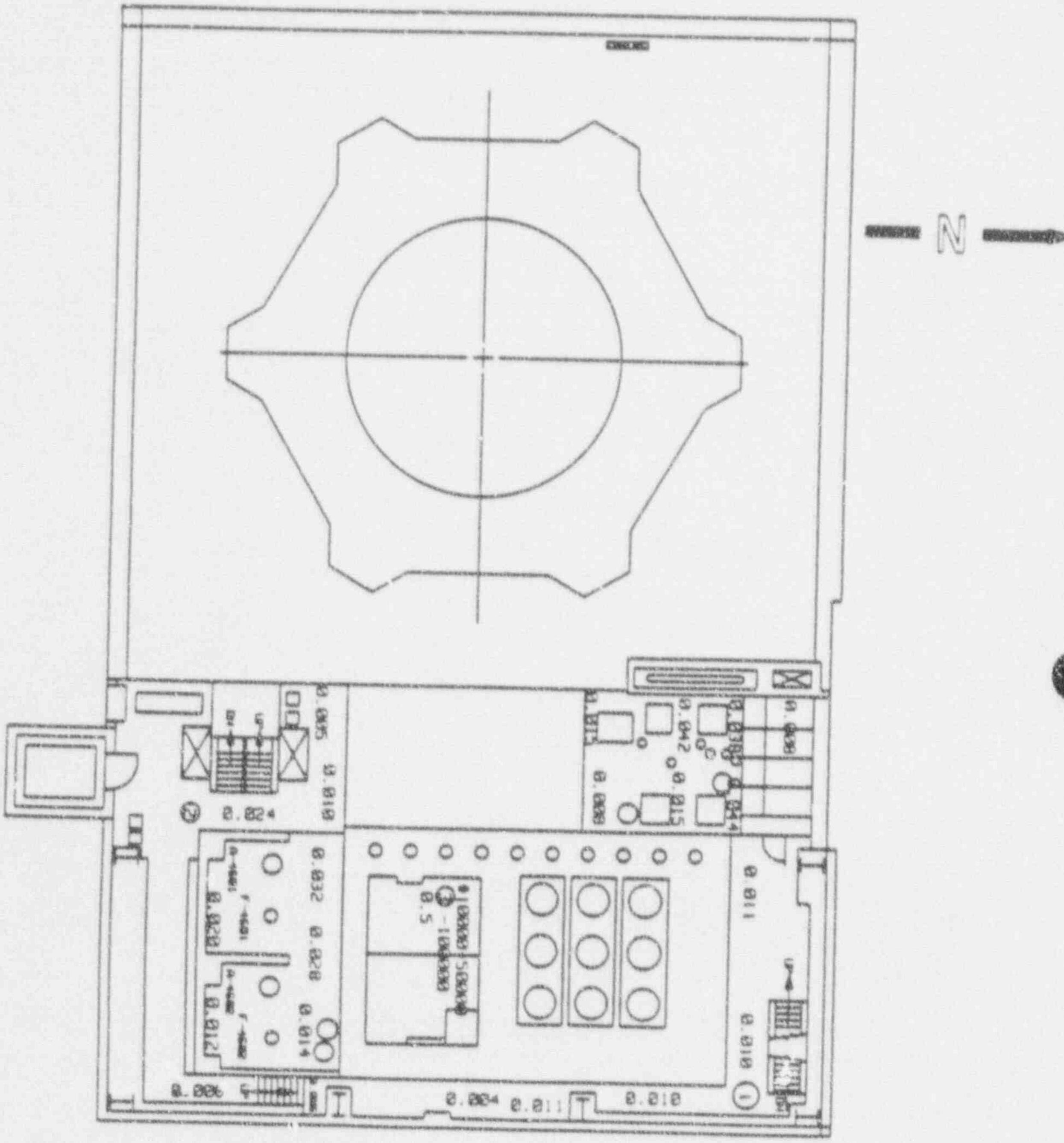
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm^2 unless a value is adjacent to the circle)

Figure 3.1-14 Reactor Building Radiation Survey - Level 7 (Elev 4829')



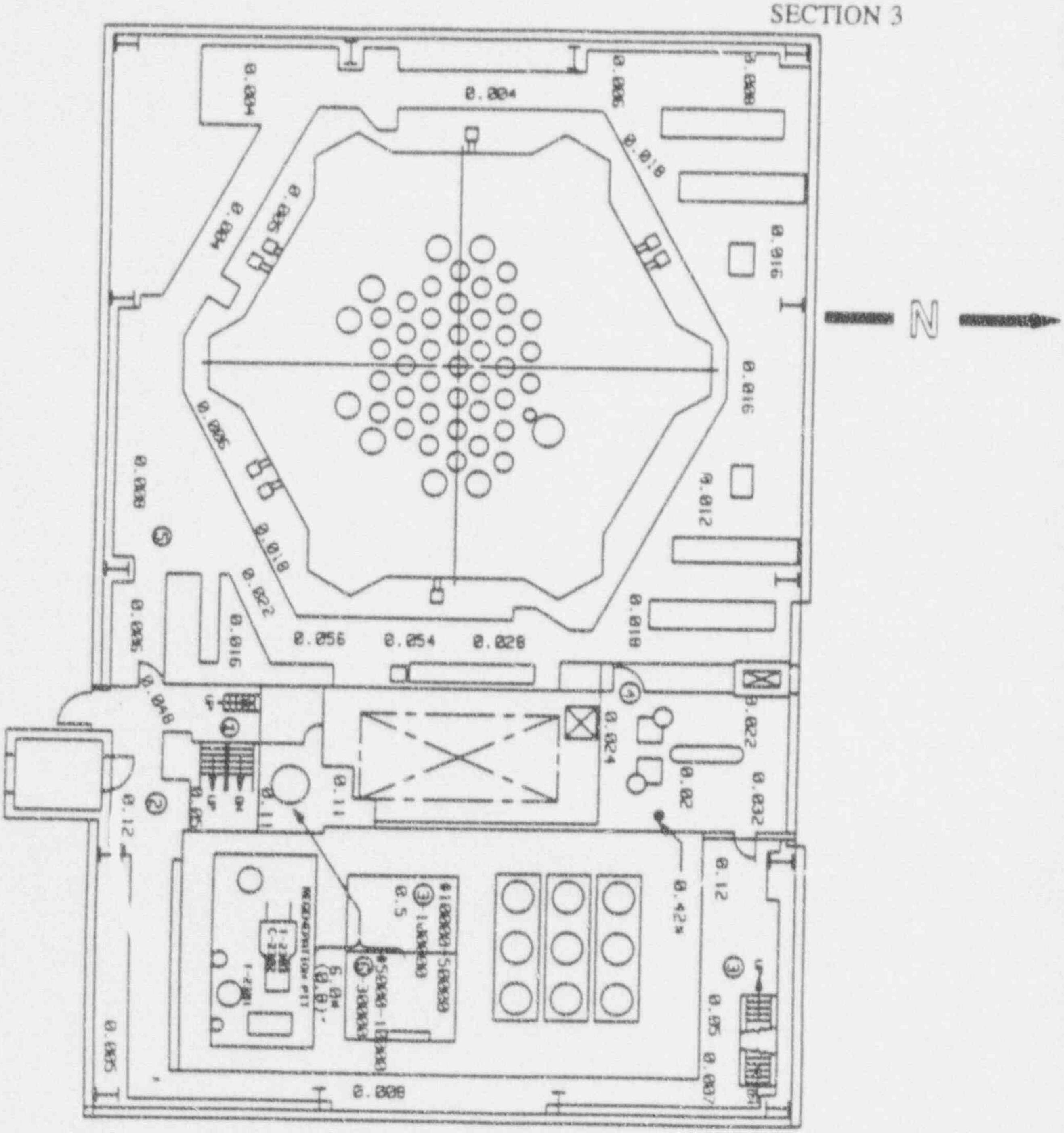
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm^2 unless a value is adjacent to the circle)

Figure 3.1-15 Reactor Building Radiation Survey - Level 8 (Elev 4859')



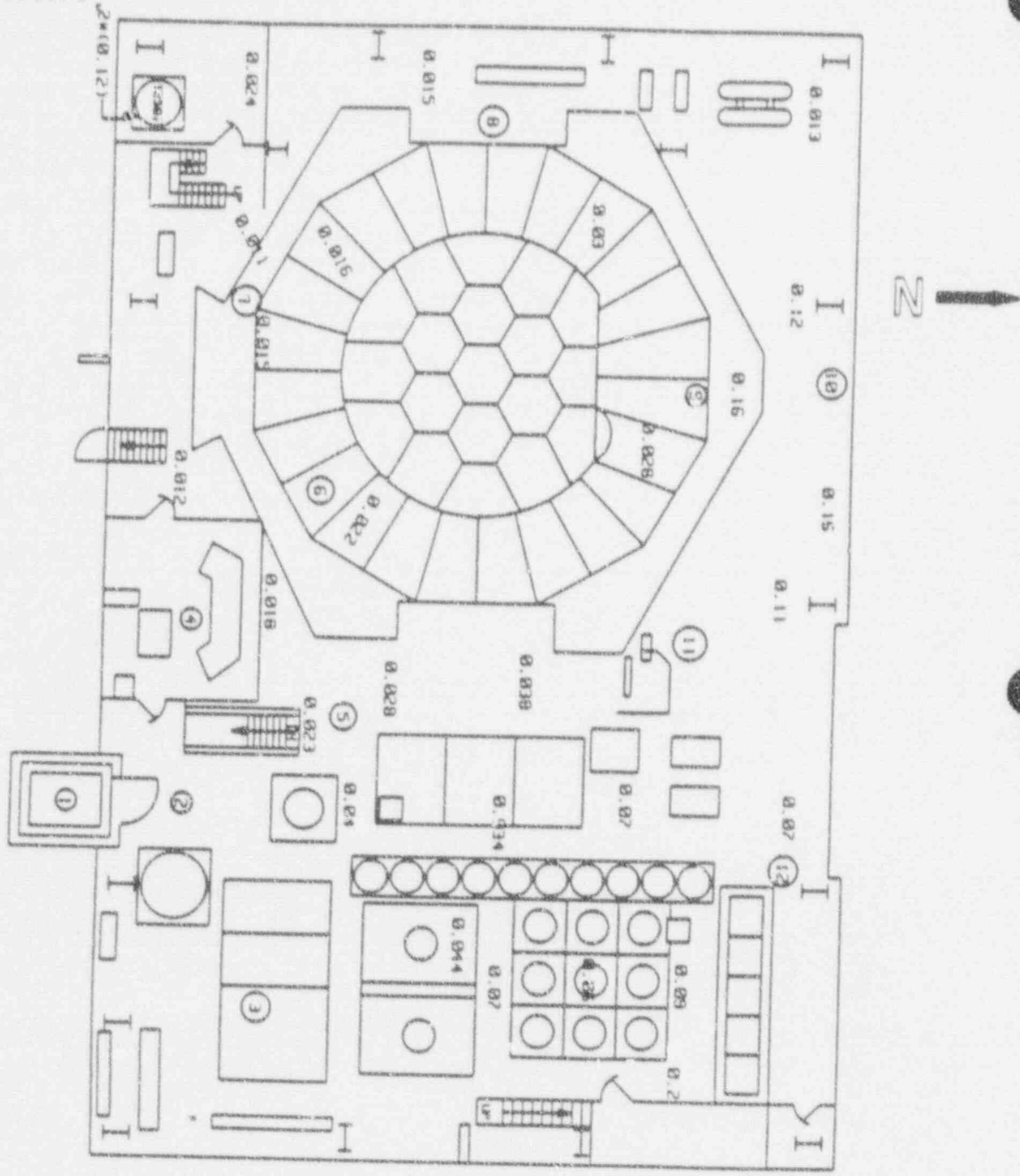
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level at 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm^2 unless a value is adjacent to the circle)

Figure 3.1-16 Reactor Building Radiation Survey - Level 9 (Elev 4849')



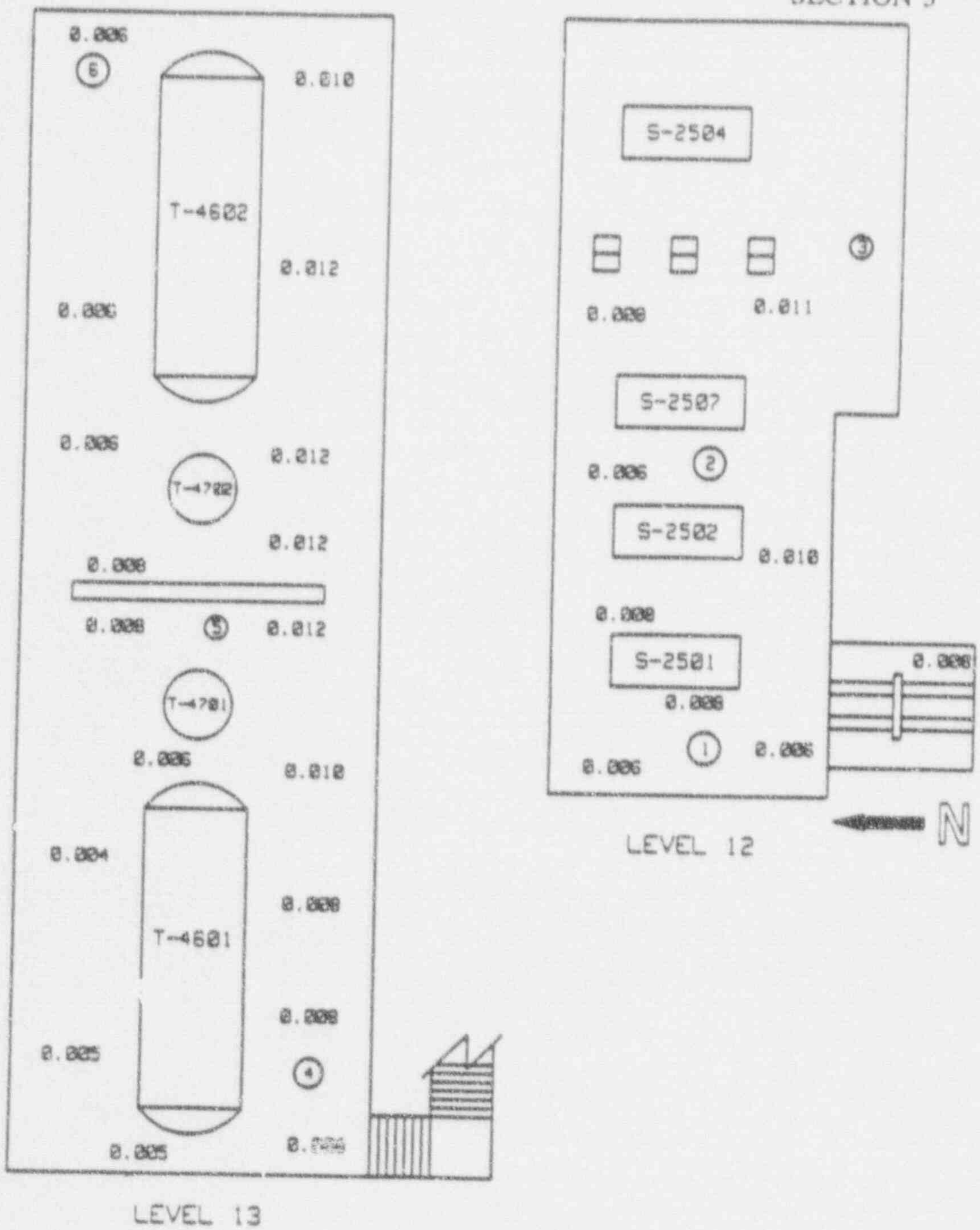
LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm² unless a value is adjacent to the circle)

Figure 3.1-17 Reactor Building Radiation Survey - Level 10 (Elev 4864')



LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm² unless a value is adjacent to the circle)

Figure 3.1-18 Reactor Building Radiation Survey - Level 11 (Elev 4881')



LEGEND: All Radiation levels in mrem/hr
* Denotes contact radiation reading
( ) denotes radiation level an 18 inches
Circled numbers indicate loose surface contamination survey point (all values <100 DPM/100 cm^2 unless a value is adjacent to the circle)

Figure 3.1-19 Reactor Building Radiation Survey - Level 10 & 11 (Elev 4864', 4881')

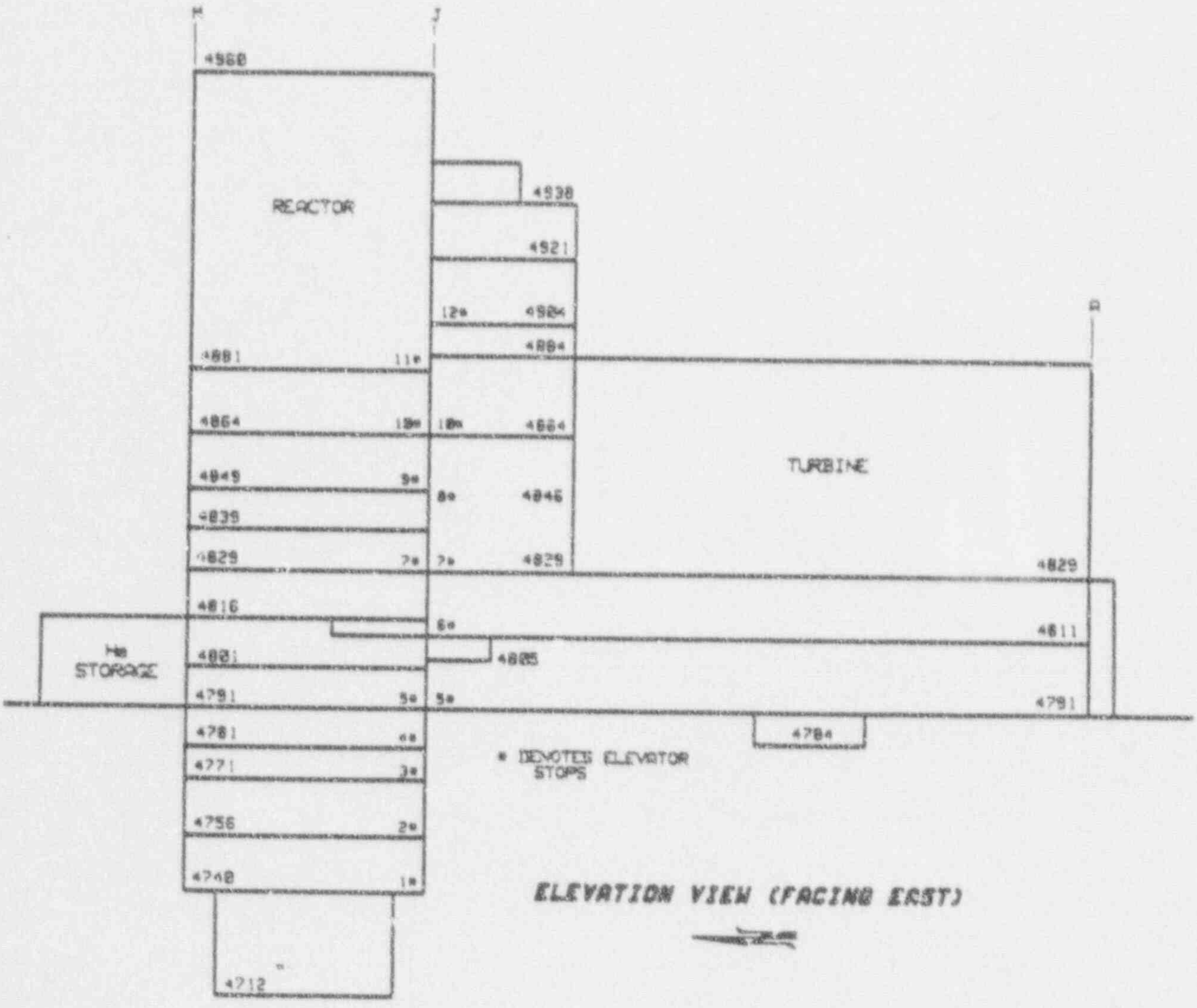


Figure 3.1-20 Turbine And Reactor Building Elevations

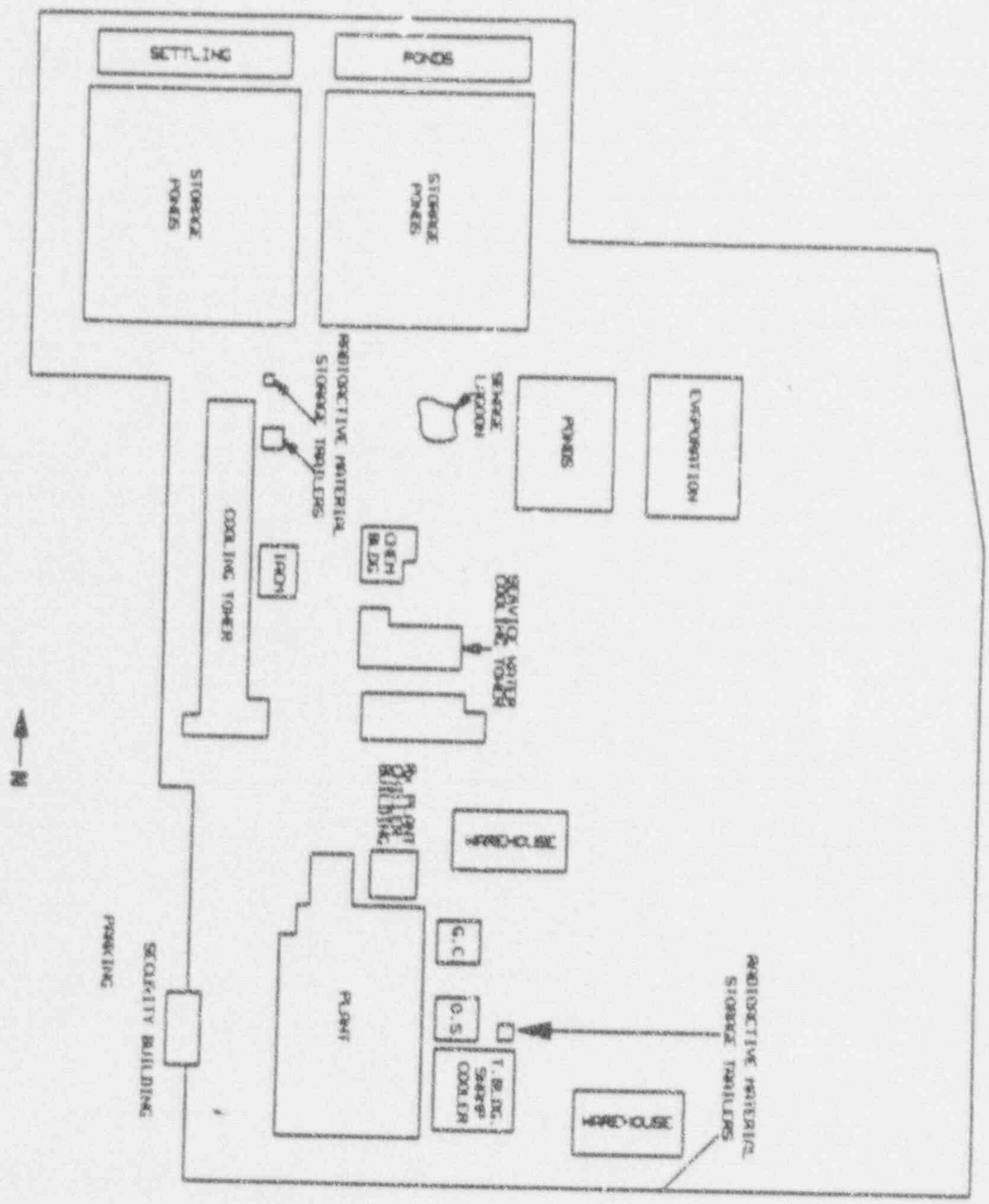


Figure 3.1-21 Location of Site Trailers

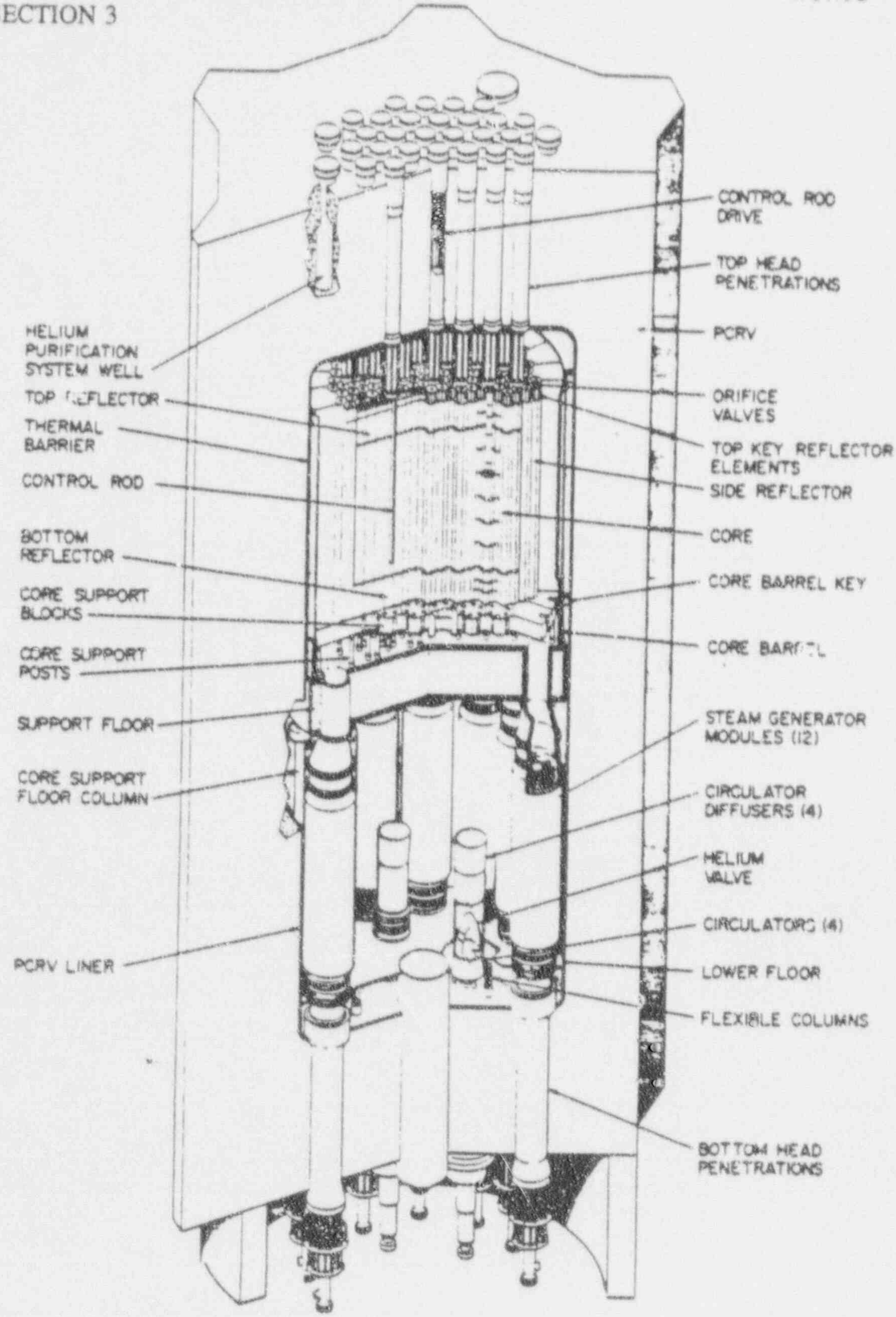


Figure 3.1-22 PCRV and Internal Components

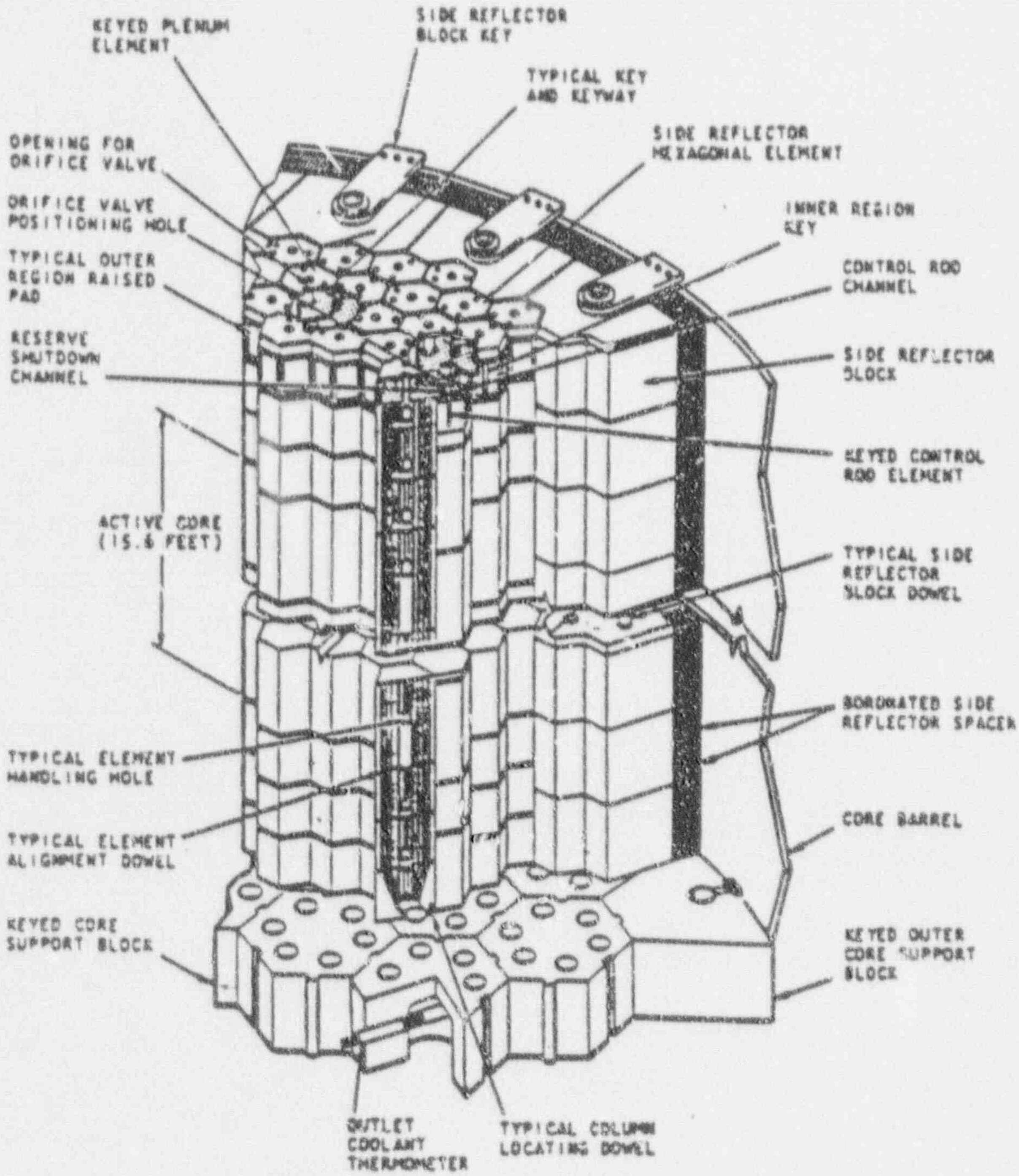
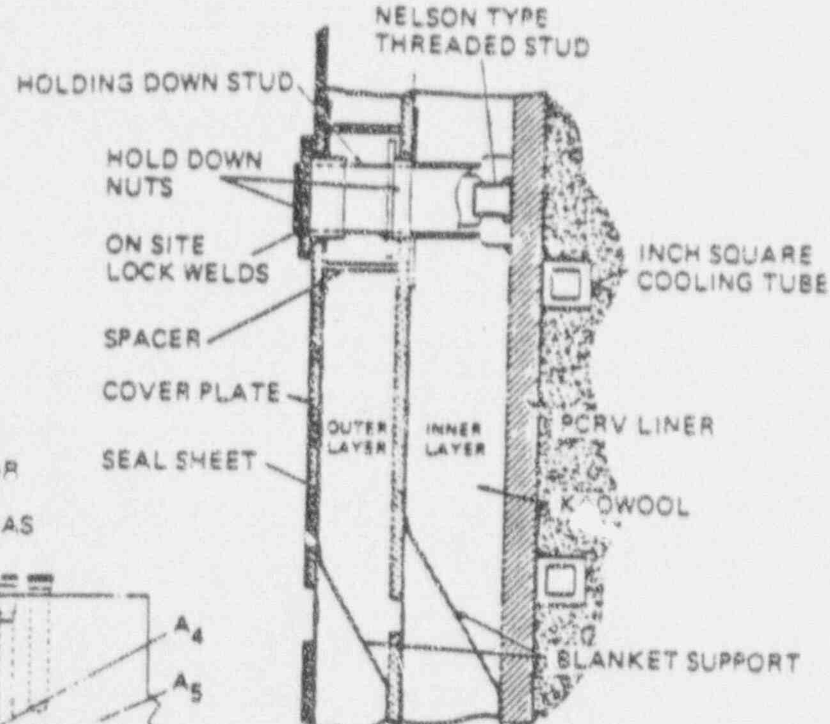
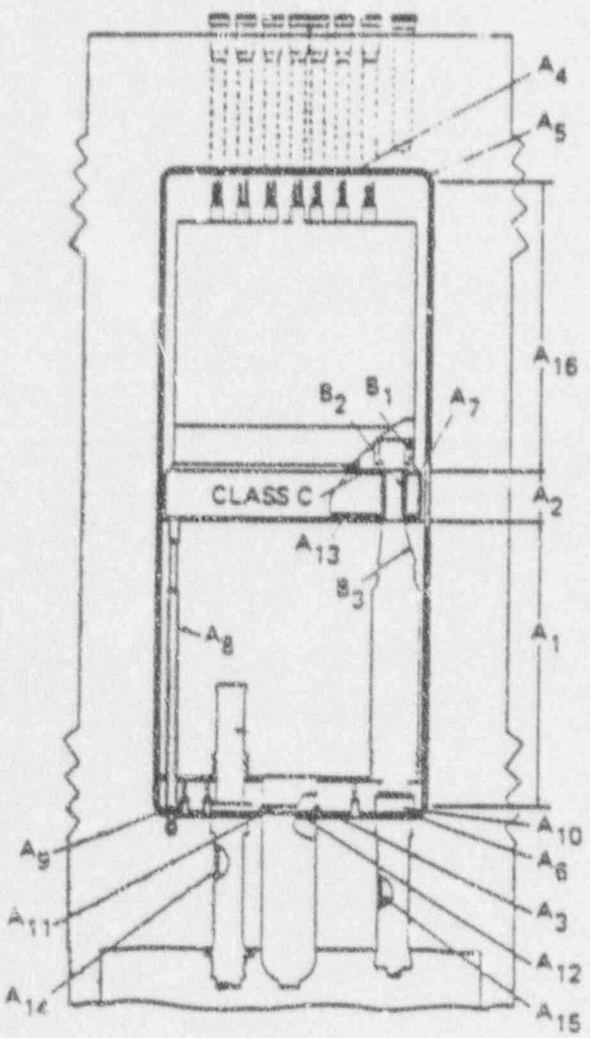


Figure 3.1-23 Core Arrangement



TYPICAL SECTION THRU INSULATION IN AREA A_1

CROSS SECTION REACTOR SHOWING LOCATION OF THERMAL BARRIER AREAS



AREA	OVERALL THICKNESS TO TOP OF COVER PLATE	INSULATION MATERIAL THICKNESS AS INSTALLED	
		INNER	OUTER
	CLASS A		
A_1	4-9/16 IN	2-1/4 IN	1-3/4 IN
A_2	3-13/16 IN	2-1/4 IN	1 IN
A_3	3-9/32 IN	3 IN	NONE
A_4	4-9/16 IN	2-1/4 IN	1-3/4 IN
$A_{5\&N}$	≥3-9/16 IN	≥2-1/4 IN	≥1-3/4 IN
A_7	3-5/16 IN	1-3/4 IN	1 IN
$A_{8\&9}$	1-9/32 IN	1 IN	NONE
A_{10}	2-9/32 IN	2 IN	NONE
A_{11}	3-9/32 IN	3 IN	NONE
A_{12}	3-9/32 IN	3 IN	NONE
A_{13}	4-9/16 IN	2-1/4 IN	1-3/4 IN
A_{14}	1-9/32 IN	1 IN	NONE
A_{15}	3 IN	METALLIC	INSULATION
A_{16}	3-13/16 IN	2-1/4 IN	1 IN
	CLASS B		
B_1	3-1/2 IN	3-1/4 IN	NONE
B_2	3 IN	1-1/8 IN	1-1/8 IN
B_3	2-1/4 IN	1-3/4 IN	NONE
	CLASS C		
C	12 IN	2-3/4 IN	9 IN

Figure 3.1-24 Class A Insulation and PCRV Liner

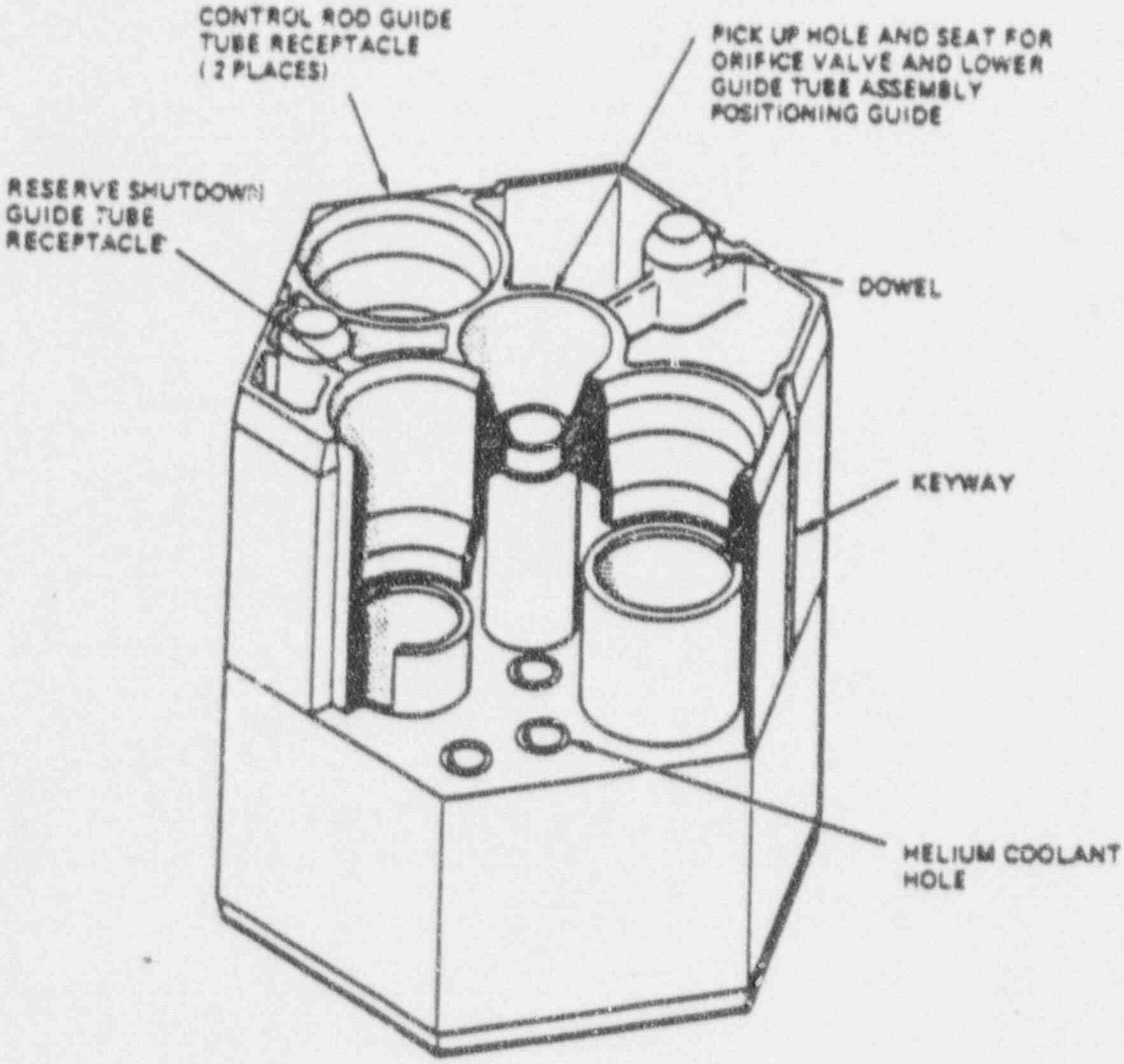


Figure 3.1-25 Central Column Metal Clad Reflector

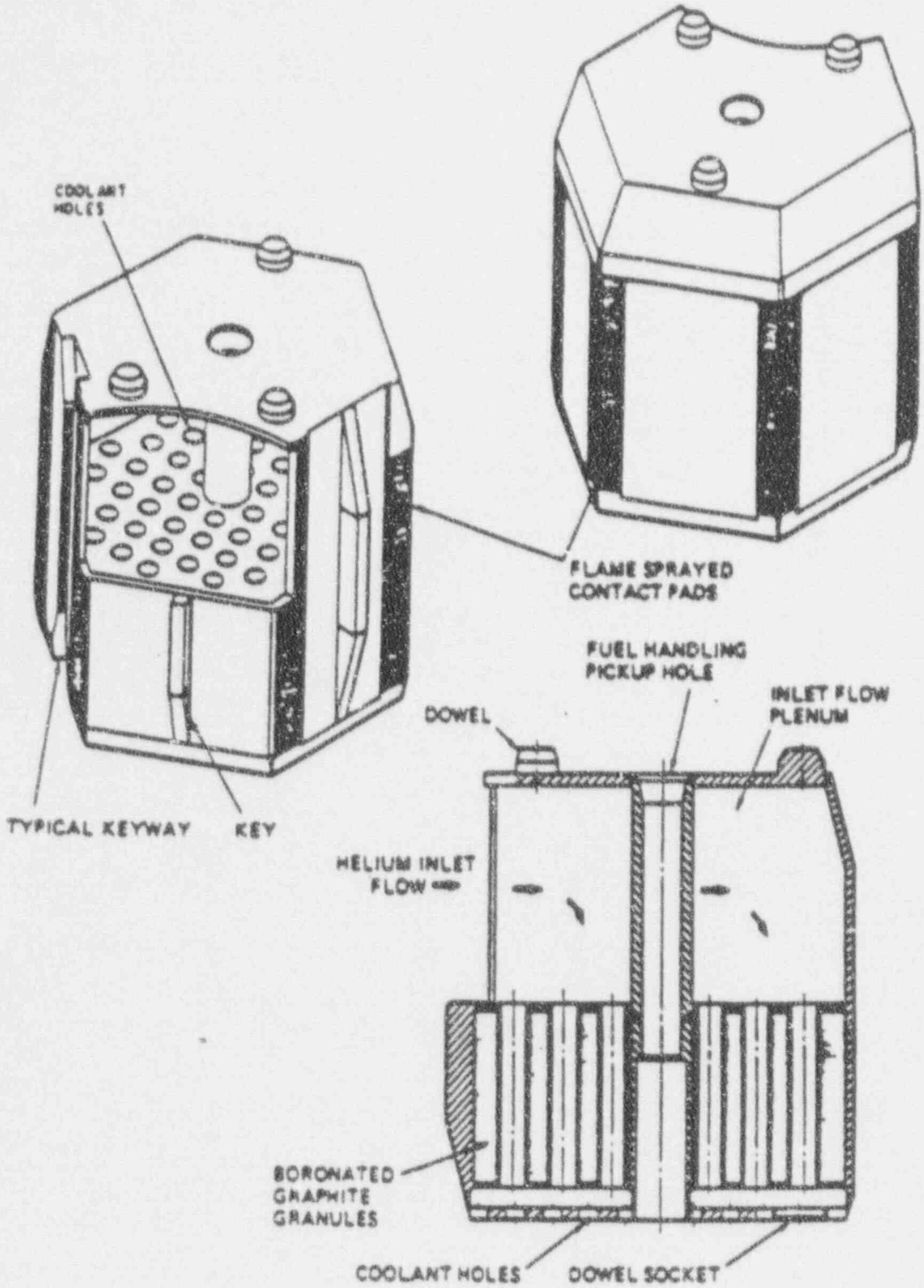


Figure 3.1-26 Side Column Metal Clad Reflector

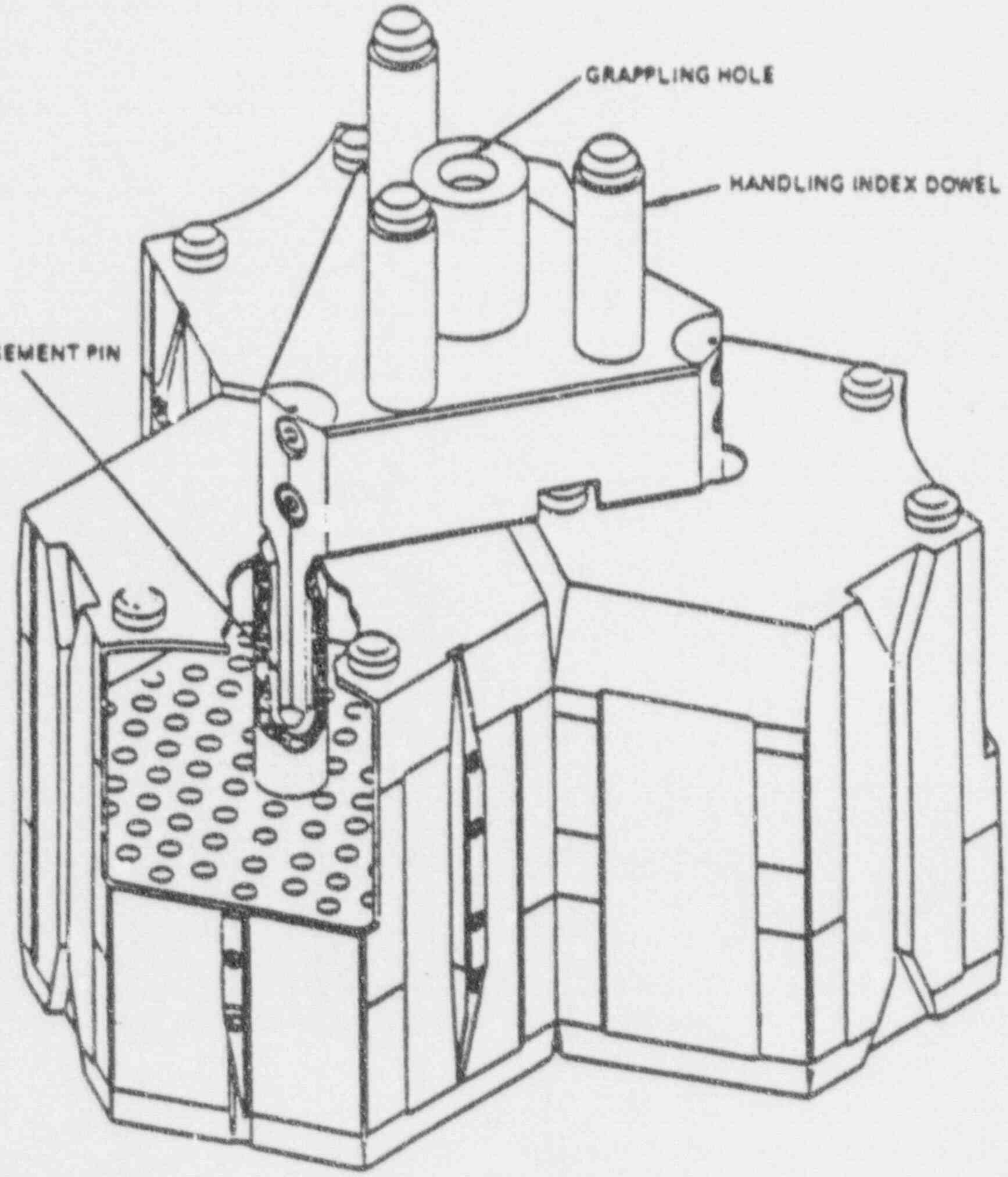


Figure 3.1-27 Region Constraint Devices (RCDs)

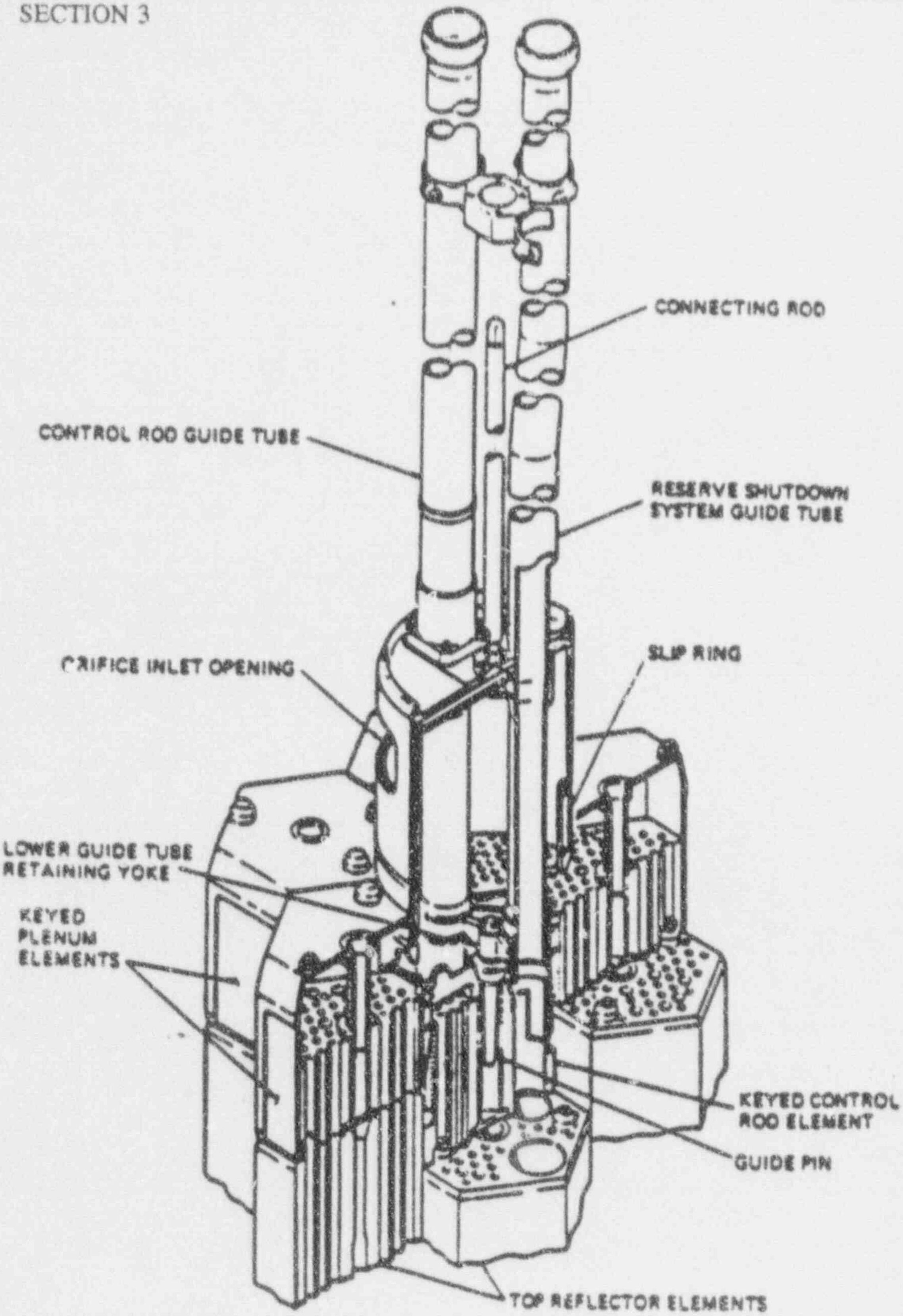


Figure 3.1-28 Lower Orifice Valve Assembly

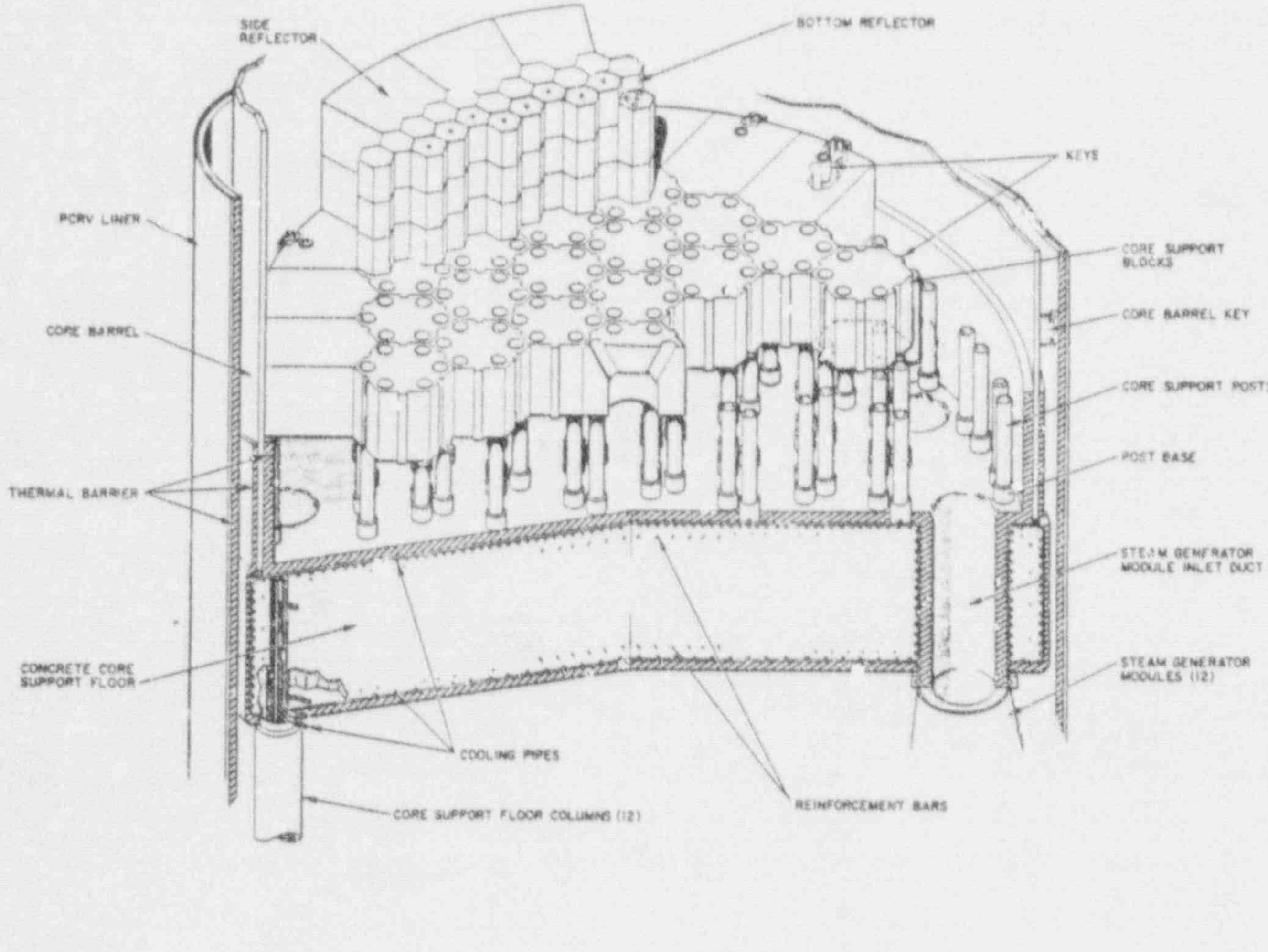


Figure 3.1-29 Core Support Arrangement

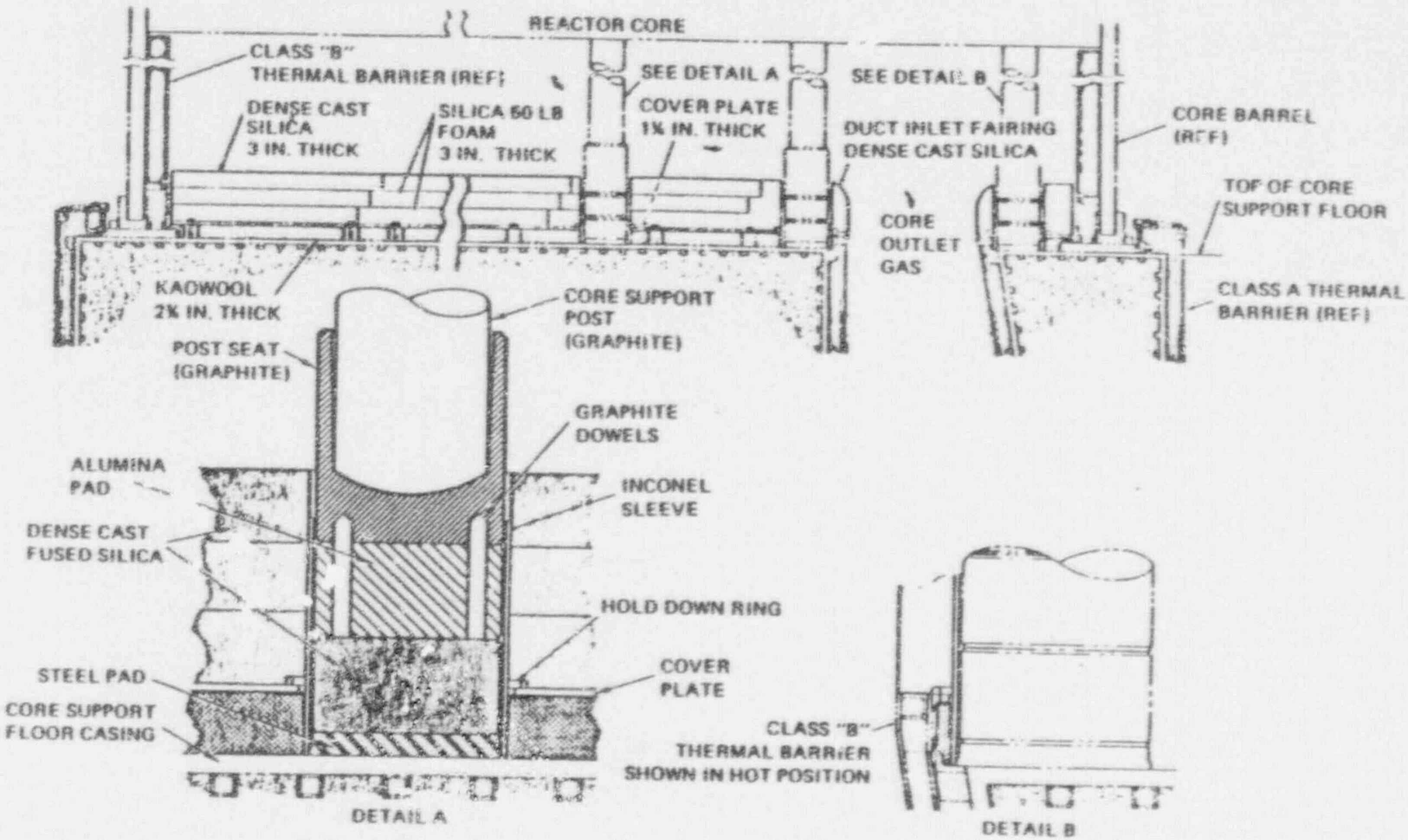


Figure 3.1-30 Class C Insulation

3.2 RADIATION PROTECTION PROGRAM

3.2.1 Introduction

This section sets forth the policy and the requirements of the Radiation Protection Program to be implemented during the decommissioning of the Fort St. Vrain facility. This section is the highest tier document of the Radiation Protection Program and provides definitions of the Radiation Protection organization, responsibilities, authorities, administrative policies, program objectives and standards to implement the Radiation Protection Program. This section will also be used as the basis document for all Radiation Protection Program administrative and implementing procedures.

Title 10 Code of Federal Regulations, applicable regulatory guidance documents and industry standards are the basis of the Radiation Protection Program. This section was specifically formatted using Draft NUREG-0761, "Radiation Protection Plans for Nuclear Power Reactor Licensees" (Ref. 15), which provides guidance for the content of a "Radiation Protection Plan". It also incorporates the guidance contained in NRC Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be as Low as is Reasonably Achievable" (Ref. 16) and NRC Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as is Reasonably Achievable" (Ref. 17).

3.2.2 Management Policy

3.2.2.1 Management Policy Statement

PSC and its management are committed to the safe decommissioning of the Fort St. Vrain facility. The primary objective of the Radiation Protection Program is to protect the workers, visitors and the general public from radiological hazards that have the potential of developing during the decommissioning project. PSC and its contractors will provide sufficient qualified staff, facilities and equipment to perform the Fort St. Vrain facility decommissioning in a radiologically safe manner. PSC is committed to strict compliance with regulatory requirements, radiation exposure limits, and limits regarding release of radioactive materials. In addition, PSC will make every reasonable effort to maintain radiation exposures and releases of radioactive materials in effluents to unrestricted areas As Low As Reasonably is Achievable (ALARA). The ALARA philosophy will be incorporated into all decommissioning activities and have full management support.

3.2.2.2 Administration Policy

Activities conducted during the Fort St. Vrain decommissioning project that have the potential for exposure to radiation or radioactive materials will be managed by qualified individuals who will perform program operations according to procedural guidelines. Radiological hazards will be monitored and evaluated on a routine basis to maintain radiation exposures and the release of radioactive materials to unrestricted areas as far below specified limits as is reasonably achievable. All decommissioning project work activities, and each element of the Radiation Protection Program will be specifically defined and implemented using written manuals, procedures and instructions. Radiation protection training will be provided to all occupationally exposed individuals to ensure they understand and accept the responsibility to follow all procedures and to maintain their radiation dose ALARA.

Project management will ensure that work specifications, designs, and work packages involving potential radiation exposure or handling of radioactive materials incorporate effective radiological controls. Project supervisors will include radiation protection considerations in the work activities under their control.

Radiation protection records will be prepared and maintained using high standards of accuracy, traceability and legibility to meet the requirements of regulatory agencies and company procedures.

3.2.2.3 ALARA Policy

All activities at Fort St. Vrain involving radiation and radioactive materials shall be conducted such that radiation exposures to employees, contractors, and the general public are maintained ALARA, taking into account current technology and the economics of radiation exposure reduction in relationship to the benefits to health and safety.

Project management will establish specific goals and objectives for the Fort St. Vrain decommissioning project ALARA program. The ALARA program will be based on the guidance provided in Regulatory Guides 8.8 and 8.10 (References 16 and 17). The ALARA program will incorporate current technology and sound radiation protection practices to maintain exposure to ionizing radiation ALARA.

3.2.2.4 Regulatory Compliance Policy

Project management will maintain the Radiation Protection Program in compliance with the requirements of 10 CFR (as amended), 49 CFR and to the extent practical, the information contained in industry standards, Regulatory Guides and other guidance documents referenced in Section 3.2. The decommissioning of Fort St. Vrain is scheduled to occur during the transition to the revised 10 CFR 20 regulations. PSC intends to implement the revised 10 CFR 20 no later than January 1, 1994, in accordance with the current schedule for providing sufficient regulatory guidance to allow for effective implementation. Depending on the projected status of the Fort St. Vrain decommissioning project as of January 1, 1994, PSC may apply for an exemption of the implementation of the requirement of the revised 10 CFR 20 for the remainder of the decommissioning project. Following implementation, the Radiation Protection Program will be periodically assessed against any newly issued regulatory guidance and modified, if necessary.

3.2.2.5 Waste Minimization and Disposal Policy

Project management will implement and enforce a program for minimizing the generation of radioactive wastes. Implementing procedures will be developed for the use, classification, treatment, packaging and shipment of radioactive material. These procedures will ensure strict compliance with applicable Federal, State and local regulation and burial site criteria.

Project management will establish waste minimization goals. To ensure these goals are achieved, all decommissioning personnel will receive training in the applicable procedures and practices to minimize the generation of radioactive waste.

3.2.2.6 Respiratory Protection Policy

Project management is committed to minimizing the inhalation of air contaminated with dusts, mists, fumes, gases, vapors and radionuclides. The primary means of achieving this goal will be to prevent or mitigate the hazardous condition at the source. Every reasonable effort will be made to achieve this objective by using engineering controls, including process modification, containment and ventilation techniques. The use of respiratory protection equipment will be consistent with the goal of maintaining the total effective dose to personnel ALARA.

A respiratory protection program will be developed, implemented and maintained in accordance with 10 CFR 20 and using the regulatory guidance found in NRC Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection" (Ref. 18), and the NUREG-0041 "Manual of Respiratory Protection Against Airborne Radioactivity Materials" (Ref. 19).

3.2.3 Radiation Protection Organization and Functions

3.2.3.1 Radiation Protection Organization

The Radiation Protection Organization will ensure that a high level of performance in radiation protection is achieved through effective implementation and control of radiation protection activities. This high level of radiation protection performance will be achieved through the combined efforts of PSC management and the Westinghouse Team.

The PSC management structure that will oversee and control the Radiation Protection Program during the decommissioning project is shown on Figure 2.4-1, "PSC Decommissioning Organization Chart". The PSC organization will provide control, direction and oversight, and ensure the implementation of the Radiation Protection Program.

The PSC Decommissioning Program Director and the Westinghouse Project Director have ultimate responsibility for assuring that an effective Radiation Protection Program is implemented during the Fort St. Vrain decommissioning. This corporate and project interface will ensure a coordinated and effective approach to the minimization of individual and collective dose and the control of radioactive materials during decommissioning.

Reporting directly to the PSC Decommissioning Program Director will be the PSC Facility Support Manager. The PSC Facility Support Manager has oversight responsibility for the development and implementation of the Radiation Protection Program policies and standards and is the PSC Radiation Protection Manager (RPM) for the decommissioning project. The PSC Facility Support Manager will serve as a member of the Decommissioning Safety Review Committee and will also serve as a Co-chairman of the ALARA Committee. The PSC Facility Support Manager will ensure that PSC has the proper control and authority over decommissioning activities as they relate to radiation protection. The PSC Facility Support Manager represents the formal line of communication and authority between Fort St. Vrain management and the Westinghouse organization for radiation protection matters. The PSC Facility Support Manager will be responsible for approval of the Radiation Protection Program manuals and the content of radiation protection training programs. The PSC Facility Support Manager will also be directly responsible for the Radiological Environmental Monitoring Program and the Emergency Response Plan. The PSC Facility Support Manager will be qualified in accordance with NRC Regulatory Guide 1.8 "Personnel Selection and Training" (Ref. 20), and ANS/ANSI 3.1 "Selection, Training and Qualification of Personnel for Nuclear Power Plants" (Ref. 21). The staff positions (Senior Health Physicists) reporting to the PSC Facility Support Manager will provide review and evaluation functions to ensure that the Radiation Protection Program policies and standards are implemented.

The Westinghouse Project Radiation Protection Organization will be administered by the Project Radiation Protection Manager (PRPM), under the authority of the PSC Radiation Protection Manager. Figure 3.2-1, "Westinghouse Team Radiation Protection Organization Chart" shows the key members of the Radiation Protection Organization. The Project Radiation Protection Manager, under the direction of the PSC Facility Support Manager, has the responsibility for the Radiation Protection Program development, implementation and compliance with the applicable regulations. The Project Radiation Protection Manager will be qualified in accordance with NRC Regulatory Guide 1.8 (Ref. 20) and ANS/ANSI 3.1 (Ref. 21).

The Project Radiation Protection Manager will report directly to the Westinghouse Project Director. This reporting chain will ensure sufficient authority and independence to implement an effective Radiation Protection Program. It will also provide a direct line of communication to senior project management.

The Project Radiation Protection Manager will have the authority to stop work whenever activities have the potential to jeopardize the health and safety of workers, visitors or the general public. This authority will not be limited to radiological safety issues. If the activities violate operational parameters, administrative guidelines, safety requirements or Radiation Protection procedures,
the Project Radiation Protection Manager will have the authority to stop work. The authority to overrule the Project Radiation Protection Manager's stop work order may only come from the PSC Decommissioning Program Director, PSC Facility Support Manager or the Westinghouse Project Director.

The staff positions shown on Figure 3.2-1 will have the primary responsibility for providing technical direction, implementation of the Radiation Protection Program, and supervision of the activities of the Radiation Protection Technicians and support personnel. Designated radiation protection staff members will be qualified in accordance with NRC Regulatory Guide 1.8 (Ref. 20) and ANS/ANSI 3.1 (Ref. 21), and will serve as the qualified substitute for the Project Radiation Protection Manager. The staff positions will have the authority to stop work whenever activities jeopardize the radiological health and safety of workers, visitors or the general public, or, if the activities violate Radiation Protection procedures.

The number and titles of positions shown on Figure 3.2-1 may be modified during the course of decommissioning. This may be necessary during initial project start-up and demobilization. Changes to the Radiation Protection organization will require approval from the PSC Facility Support Manager (PSC Radiation Protection Manager).

3.2.3.2 Functional Descriptions

The effective implementation of the Radiation Protection Program is the responsibility of all project personnel. Specific responsibilities for the implementation of the Radiation Protection Program are listed below.

The PSC Vice President, responsible for nuclear activities, is responsible for the safe decommissioning of Fort St. Vrain and is the designated Corporate Officer for PSC.

The PSC Decommissioning Program Director is responsible for conducting facility decommissioning in accordance with regulatory requirements including those activities related to radioactive materials and radiation exposure. Major responsibilities related to the Radiation Protection Program include the following:

1. Ensure support for the ALARA program from project personnel.
2. Participate in the selection of specific radiation protection goals and objectives for the decommissioning.
3. Support the Radiation Protection Manager in implementing the Radiation Protection Program.
4. Ensure periodic status reports on the Radiation Protection Program are distributed to management.
5. Issue or rescind "stop work" orders, as required.
6. Oversee the Decommissioning Emergency Response Plan.

The PSC Facility Support Manager reports to the PSC Decommissioning Program Director and is responsible for implementation of laboratory, environmental monitoring, training, access control, emergency response and Radiation Protection Program activities. Major responsibilities related to the Radiation Protection Program include the following:

1. Ensure proper implementation of Fort St. Vrain Radiation Protection policy.
2. Interface with the Project Radiation Protection Manager.
3. Ensure adequate staffing, facilities and equipment are available to perform the functions assigned to Radiation Protection personnel.
4. Serve as the PSC Radiation Protection Manager responsible for oversight and direction of the Radiation Protection Program.
5. Issue or rescind "stop work" orders, as appropriate.
6. Ensure personnel at Fort St. Vrain have received job specific and general employee training.
7. Serve on the Decommissioning Safety Review Committee.
8. Serve as Co-chairman of the ALARA Committee.
9. Ensure proper disposal of radioactive solid, liquid and gaseous wastes.
10. Maintain and implement the Decommissioning Emergency Response Plan.
11. Coordinate revisions to the Radiation Protection Program.
12. Approve Radiation Protection training programs.
13. Ensure implementation of the Radiological Environmental Monitoring Program.
14. Review and approve training programs related to work in radiological areas or involving radioactive material.

The PSC Senior Health Physicists report to the PSC Facility Support Manager. Major responsibilities as related to the Radiation Protection Program include the following:

1. Coordinate the annual review of the Radiation Protection Program.
2. Serve as designated alternates to the PSC Radiation Protection Manager.
3. Evaluate Radiation Protection training programs.
4. Monitor collective exposure of various decommissioning activities.
5. Conduct inspections of work in progress to evaluate the adequacy of the implementation of the Radiation Protection Program.

6. Evaluate plant contamination control activities.
7. Support the decommissioning ALARA committee.
8. Assist in reviewing radiological occurrences to identify root cause and corrective actions for radiation protection incidents.
9. Issue "stop work" orders, as appropriate.
10. Evaluate the adequacy of the radioactive material disposal and shipping activities.
11. Evaluate the dosimetry and personnel exposure tracking system.
12. Evaluate bioassay and radiochemistry activities.
13. Evaluate the calibration of portable, stationary and laboratory radiation monitoring equipment.
14. Evaluate the adequacy of the Respiratory Protection Program.
15. Evaluate the Radiological Environmental Monitoring Program.
16. Participate in the Decommissioning Emergency Response Plan.

The PSC Project Assurance and Operations Managers' responsibilities as related to the Radiation Protection Program include the following:

1. Ensure personnel under their direction are properly trained in and comply with radiation protection requirements.
2. Support the PSC Facility Support Manager in overseeing the implementation of the Radiation Protection Program, including (but not limited to) performance of audits and surveillances of their areas of responsibility, and routine inspections of work areas where their personnel are involved.
3. Participate in the Decommissioning Emergency Response Plan.

The PSC Shift Supervisor reports to the PSC Operations Manager. Major responsibilities as related to the Radiation Protection Program include the following:

1. Ensure the safe operation of plant systems.
2. Ensure planned radiological effluent releases are properly performed.
3. Notify the Nuclear Regulatory Commission, as required.
4. Notify Radiation Protection personnel when changes in plant conditions could affect radiological conditions.
5. Ensure personnel under their direction comply with the requirements of the Radiation Protection Program.
6. Participate in the Decommissioning Emergency Response Plan.

The Westinghouse Project Director is responsible for conducting decommissioning operations in accordance with regulatory requirements related to radioactive materials and radiation exposure. Major responsibilities as related to the Radiation Protection Program include the following:

1. Ensure that all project personnel are properly trained in and comply with radiation protection requirements.
2. Ensure support for the ALARA program from all project personnel.
3. Participate in the selection of specific Radiation Protection goals and objectives for the decommissioning.
4. Support the Project Radiation Protection Manager in implementing the Radiation Protection Program.
5. Ensure periodic status reports on the Radiation Protection Program are distributed to project management.
6. Issue or rescind "stop work" orders, as appropriate.
7. Participate in the Decommissioning Emergency Response Plan.

The Westinghouse Site Operations Manager, Technical Services Manager and Project Control Manager report directly to the Westinghouse Project Director. Major responsibilities as related to the Radiation Protection Program include the following:

1. Ensure personnel under their direction are properly trained and comply with radiation protection requirements.
2. Support the Project Radiation Protection Manager in the implementation of the Radiation Protection Program.
3. Ensure that exposure and waste reduction techniques are incorporated into work plans and procedures.
4. Ensure radiation protection and ALARA principles are incorporated into project activities.
5. Ensure that requirements, methods, regulations and procedures for waste processing are specified.
6. Ensure that craft labor is provided for operation of the waste processing system, waste segregation and packaging.
7. Participate in the Decommissioning Emergency Response Plan.

The Westinghouse Project Radiation Protection Manager reports directly to the Westinghouse Project Director and is responsible for laboratory analysis, radiation protection training, radioactive waste management, dosimetry, respiratory protection, ALARA and radiation protection job coverage. Major responsibilities related to the

Radiation Protection Program include the following:

1. Ensure the implementation of the Radiation Protection Program policies and procedures.
2. Review and approve Radiation Protection procedures.
3. Provide an interface for the PSC Radiation Protection Manager and the Westinghouse Project Director.
4. Ensure adequate staffing, facilities and equipment are available to perform the functions assigned to Radiation Protection personnel.
5. Select and approve Radiation Protection staff members.
6. Ensure that adequate radiation protection coverage (minimum established ratio of workers to Radiation Protection Technicians) is provided for project personnel during all working hours.
7. Establish goals and objectives for the Radiation Protection Program.
8. Issue or rescind "stop work" orders, as appropriate.
9. Ensure that locations, operations, and conditions that have the potential for causing significant exposures to radiation are identified.
10. Review and approve training programs related to work in radiological areas or involving radioactive material.
11. Provide training for personnel to work at Fort St. Vrain including job specific General Employee Training.
12. Ensure proper disposal of radioactive solid, liquid, and gaseous wastes.
13. Provide Radiation Protection input to decommissioning planning.
14. Trend radiation work performance of project personnel including contamination and radiation exposure control.
15. Identify and review causes and corrective actions for incidents associated with radiation protection.
16. Ensure an effective ALARA Program.
17. Serve as a Co-chairman of the ALARA Committee.
18. Participate in the Decommissioning Emergency Response Plan.

The Westinghouse Project Radwaste Supervisor reports to the Project Radiation Protection Manager. Major responsibilities as related to the Radiation Protection Program include the following:

1. Coordinate radioactive waste minimization and disposal activities.
2. Classify radioactive waste material in accordance with 10 CFR 61 in preparation for disposal.

3. Monitor the packaging and preparation of radioactive material for shipment.
4. Schedule and complete shipments of radioactive material in accordance with Department of Transportation (DOT) and NRC regulations.
5. Make recommendations to the Project Radiation Protection Manager concerning site management issues that affect radwaste operations and shipping.
6. Provide training for radioactive waste management.
7. Participate in the Decommissioning Emergency Response Plan.

The Westinghouse ALARA Supervisor reports to the Project Radiation Protection Manager. Major responsibilities as related to the Radiation Protection Program include the following:

1. Review of work packages for ALARA consideration.
2. Establish ALARA person-Rem budgets for project tasks.
3. Coordinate pre-job briefings and mock-up training.
4. Track project exposure and prepare project person-Rem reports.
5. Serve as ALARA committee secretary.
6. Implement the ALARA suggestion program.
7. Coordinate the ALARA exposure history records management system.
8. Perform cost benefit analyses, as required.
9. Provide radiation protection training, as required.
10. Participate in the Decommissioning Emergency Response Plan.

The Westinghouse Radiation Protection Operations Supervisor reports to the Project Radiation Protection Manager. Major responsibilities as related to the Radiation Protection Program include the following:

1. Ensure that policies relating to personnel radiation exposures are established and enforced.
2. Ensure appropriate radiation and contamination surveys are performed to verify radiation levels and working conditions of the facility.
3. Ensure accountability of all byproduct material.
4. Train technicians to handle all phases of radiation protection work.
5. Review program effectiveness.
6. Issue "stop work" orders, as appropriate.
7. Coordinate the Respiratory Protection Program.
8. Control portable, stationary and laboratory radiation monitoring

equipment.

9. Assist in reviewing radiological occurrences to identify root causes.
10. Interface with the Westinghouse training group.
11. Prepare procedures for Radiation Protection operations.
12. Review dosimetry and bioassay results.
13. Act as ALARA Supervisor, as requested.
14. Ensure implementation of the Radiation Work Permit Program.
15. Participate in the Decommissioning Emergency Response Plan.
16. Evaluate potential radiological hazard situations.

The Westinghouse Technical Support Supervisor reports to the Project Radiation Protection Manager. Major responsibilities as related to the Radiation Protection Program include the following:

1. Ensure appropriate bioassay samples are taken and results reviewed at established intervals.
2. Ensure records of personnel exposures are maintained.
3. Ensure radiochemical analyses of solid, liquid, and gaseous samples taken from plant systems and plant environs are performed.
4. Maintain proper reagent preparation and control.
5. Ensure laboratory quality control.
6. Provide radiation protection training support.
7. Prepare procedures for radiochemistry operations.
8. Ensure proper calibration of stationary, portable and laboratory radiation monitoring equipment.
9. Assist Project Radiation Protection Manager in the review of program effectiveness.
10. Provide technical direction and oversight in the areas of radiological engineering, respiratory protection, Radiation Protection instrumentation and other areas of the Radiation Protection organization, as necessary.
11. Evaluate internal and external dosimetry results.
12. Evaluate programmatic deficiencies and prescribe corrective actions.
13. Participate in the Decommissioning Emergency Response Plan.
14. Assist in reviewing radiological occurrences to identify root causes.

The Westinghouse Radiation Protection Technicians report to a designated Radiation Protection Supervisor. Major responsibilities related to the Radiation Protection Program include the following:

1. Conduct radiation and contamination surveys and keep legible records.
2. Identify and post radiation, contamination, hot particle, airborne and radioactive material areas.
3. Prepare Radiation Work Permits to control access to and activities in radiologically controlled areas.
4. Monitor work to assure compliance with good radiological work practices.
5. Implement ALARA program requirements.
6. Maintain and calibrate portable monitoring instruments.
7. Issue "stop work" orders as appropriate.
8. Sample various process streams for radiochemical analysis.
9. Verify packaging of radioactive material.
10. Participate in emergency response activities as delineated in the approved Decommissioning Emergency Response Plan.

All Project Supervisors have major responsibilities related to the Radiation Protection Program including the following:

1. Ensure that personnel assigned to work with radioactive material attend required training.
2. Ensure personnel under their direction comply with radiation protection requirements.
3. Identify radiation work procedures and practices that need upgrading.
4. Assign tasks and ensure that workers are prepared for tasks in order to maintain doses ALARA.
5. Ensure that employees know the radiological hazards of their duties.
6. Ensure that assigned equipment and facilities are designed, installed and operated to minimize the radiological hazards to personnel.
7. Know the location and the radiological hazards in the work area.
8. Know the exposure status of those for whom they are responsible.
9. Provide information on projected work activities to the Radiation Protection organization.
10. Notify Radiation Protection personnel of any radiological problems encountered.
11. Assign tasks to distribute dose among exposed personnel to minimize the likelihood of overexposures and to maintain individual doses ALARA.
12. Ensure that workers are prepared for tasks with tools, equipment and training to minimize time spent in Radiation Areas.

All Project Workers have major responsibilities related to the Radiation Protection Program including the following:

1. Obey promptly "stop-work" and "evacuate" orders from Radiation Protection personnel.
2. Obey posted, oral and written radiological control instructions and procedures, including instructions on Radiation Work Permits (RWPs).
3. Wear TLDs and self reading/electronic dosimeters where required by postings or as directed by Radiation Protection personnel.
4. Immediately report unexpected exposure and lost or offscale dosimeter to Radiation Protection personnel.
5. Keep track of personal radiation exposure status to ensure that administrative dose limits are not exceeded.
6. Remain in as low a radiation area as practicable to accomplish work.
7. Do not loiter in radiation areas.
8. Do not smoke, eat, drink or chew in radiologically controlled areas.
9. Wear anti-contamination clothing and respiratory protection properly whenever required by postings or by Radiation Protection personnel.
10. Remove anti-contamination clothing and respiratory protection properly to minimize spread of contamination.
11. Monitor for contamination when leaving a contaminated area or a radiologically controlled area and notify Radiation Protection personnel if contamination is found.
12. Minimize the spread of contamination and promptly notify Radiation Protection personnel of any known or potential radioactive spills.
13. Do not unnecessarily touch a contaminated surface or allow clothing, tools or other equipment to do so.
14. Place contaminated tools, equipment and solid waste on disposable surfaces (e.g., sheet plastic) when not in use and inside plastic bags when work is finished.
15. Limit the amount of material that has to be decontaminated or disposed of as radioactive waste.
16. Notify Radiation Protection personnel of faulty or alarming Radiation Protection equipment.
17. Report the presence of open wounds to Radiation Protection personnel prior to working in areas where radioactive contamination exists and exit immediately if a wound occurs while in such an area.
18. Notify Radiation Protection personnel upon returning to the site after medical administration of radiopharmaceuticals.

19. Assure a mentally alert and physically sound condition for performing assigned work.
20. Ensure that work activities do not create radiological problems for others and be alert for possibilities that activities of others may change the radiological conditions to which the individual is exposed.
21. Do not touch or pickup material in RCA's without a prior survey.
22. Comply with the requirements of the Decommissioning Emergency Response Plan.

3.2.3.3 Radiation Protection Organization Staffing

The Radiation Protection organization will provide appropriate personnel and resources to verify a radiologically safe working environment. A sufficient number of Radiation Protection personnel will be present during the various decommissioning activities to ensure compliance with the Radiation Protection Program and implementing procedures. Projected Radiation Protection staffing levels are shown in Figure 3.2-1. The Project Radiation Protection Manager will establish guidelines for adequate Radiation Protection staffing based on radiological parameters and work scope.

Radiation Protection staffing levels will be periodically reviewed by the PSC and Project Radiation Protection Manager and the Radiation Protection Supervisors, as applicable to ensure that adequate staffing levels are maintained consistent with current and planned decommissioning activities. Specific work packages will be addressed on a case-by-case basis (e.g., by the Radiation Protection Operations Supervisor) to ensure adequate Radiation Protection Technician to worker ratios based on the guidelines provided by the Project Radiation Protection Manager.

Contingencies will be in place to adjust staffing levels during the project for routine functions and unanticipated radiological events. These staffing contingencies will ensure that all work is performed in a radiologically safe and timely manner. Staff adjustments will be implemented when needed, but only after review and recommendation of the PSC and Project Radiation Protection Managers and approval of the Westinghouse Project Director.

Continuous Radiation Protection coverage will be provided for decommissioning work activities that involve significant radiological hazards, such as the removal of unshielded, highly activated/contaminated components from the PCRV. For example, two Radiation Protection technicians would normally be assigned to the PCRV area during component removal and handling. Another example is that additional Radiation Protection technicians may be provided during PCRV concrete cutting operations, which are expected to run 24 hours a day.

Intermittent Radiation Protection coverage will be provided to decommissioning work activities that have a minimal potential for significant personnel exposure. The removal of balance of plant systems is an example of a work activity that will be monitored periodically by Radiation Protection Technicians.

3.2.3.4 Radiation Protection Program Manuals

The Radiation Protection Program will be integrated into all applicable decommissioning work activities. The Radiation Protection Program will be specifically defined and implemented using a program manual consisting of both administrative procedures and specific implementing procedures.

The Radiation Protection Program will incorporate four manuals:

1. Radiation Protection Manual
2. Radioactive Waste Manual
3. Radiation Protection Training Manual
4. Off-Site Dose Calculation Manual

The four (4) manuals will contain the administrative and implementing procedures, which will specify the standards and controls and define corporate and site objectives for the programs described in each manual. The Project Radiation Protection Manager will have the responsibility for the development and implementation of these manuals, following approval by the PSC Project Radiation Protection Manager.

The development and control of Radiation Protection procedures will be in accordance with the Quality Assurance Plan (Section 7 of this plan) and will incorporate the following procedural guidelines:

1. Clearly defined scope, applicability, limiting conditions and precautions.
2. Uniform procedure identification and status (titling or numbering, location, and status for page and revision identification).
3. Consistent format (for organization, instruction step format, instruction step designation, caution and note format, and page format.

4. Clearly understood text, using standard grammar, nomenclature and punctuation; concise instruction steps in a logical sequence.
5. "Hold points" for procedures with unique and/or high personnel risk.
6. Effective grouping of procedures and a clear table of contents for the procedure binder or manual to allow easy location of a particular procedure.
7. Review, approval, and issuance of temporary changes and permanent revisions.
8. Periodic review of procedures.
9. Controls to make procedure use as convenient as possible and to ensure that only approved copies are available.

Figure 3.2-2, "Radiation Protection Program Manual Structure", shows the hierarchy and organization of the Radiation Protection Program manuals and associated program elements.

3.2.3.5 Contracted Radiation Protection Services

Procurement of contracted Radiation Protection services will be provided in accordance with Section 7, the Quality Assurance Plan, the Radiation Protection Program, and bid specifications developed for the decommissioning project.

Westinghouse has been contracted to provide the operational radiation protection, radioactive waste management and final site release survey, either directly or through subcontractors. Examples of subcontracted services include: external dosimetry processing, primary instrument calibration and 10 CFR 61 program sample analyses.

3.2.4 Radiation Protection Training and Qualification

3.2.4.1 General Considerations

All decommissioning project workers will be provided instruction in radiation protection concepts commensurate with the radiological hazards they may encounter during the Fort St. Vrain decommissioning project. This training is recognized as essential in achieving high standards of performance in radiation protection.

The Project Radiation Protection initial training, qualification and retraining programs will be developed using applicable guidance contained in NUREG-0761 (Ref. 15), NRC Regulatory Guide 8.27, "Radiation Protection Training For Personnel At

Light-Water-Cooled Nuclear Power Plants", March 1981 (Ref. 22), NRC Regulatory Guide 8.13, "Instruction Concerning Pre-natal Radiation Exposure", (Ref. 23) November 1975 and NRC Regulatory Guide 8.29, "Instruction Concerning Risks From Occupational Radiation Exposure", (Ref. 24) July 1981. Guidance from these documents will be incorporated into a Radiation Protection Training Manual, which will include both administrative and implementing procedures.

Radiation protection training will be provided to three basic work groups: Non-Radiation Workers, Radiation Workers and Radiation Protection Personnel. Training for each work group will be organized as follows:

Non-Radiation Workers will receive, as appropriate:

1. Introduction to Radiation Protection
2. Non-radiation worker indoctrination

Radiation Workers will receive, as appropriate:

1. Radiation worker training
2. Specialized ALARA training
3. Respiratory protection training

Radiation Protection Personnel will receive as appropriate:

1. Radiation Protection technician training
2. Radiation Protection support staff training
3. Radiation Protection supervisor training
4. Radiation Protection Manager training
5. Radioactive waste management training

All classroom training will be conducted using lesson plans approved by the Project Radiation Protection Manager and the PSC Facility Support Manager. On-the-job training (OJT) will be administered by a qualification card or equivalent which is approved by the Project Radiation Protection Manager. Personnel assigned to perform Radiation Protection training will be qualified as instructors and/or evaluators in accordance with the Radiation Protection Training Manual.

3.2.4.2 Introduction to Radiation Protection

All project personnel, visitors and transients granted unescorted access to the Restricted Area will receive, as a minimum, annual instruction in elementary radiation effects and basic aspects of radiation protection during general employee orientation. This training will meet the requirements of 10 CFR 19.

The Radiation Protection orientation training, which will normally be given during General Employee Training, will include:

1. Instructions to not enter radiologically controlled areas, violate radiological postings or cross radiological boundaries.
2. Discussion of the decommissioning project.
3. Brief explanation of radioactivity and the biological effects of low-level radiation exposure.
4. Emergency response actions.

Personnel will be required to score 80% or above on a written examination. Personnel will be required to complete annual requalification training. The requalification training will give special attention to changes in radiation protection, emergency planning and management policy.

Personnel who require access to the Restricted Area to service and maintain equipment (e.g., vending machines, office equipment, etc.) or who have had unescorted access at other nuclear facilities within the last year, will be allowed to receive expedited project orientation training by:

1. Reading a copy of site specific information covering radiation protection, emergency response and access control procedure.
2. Signing a statement acknowledging their understanding of the information provided.

3.2.4.3 Non-Radiation Worker Indoctrination

All visitors who require access to radiologically controlled areas will receive indoctrination training. Visitor access to radiologically controlled areas will require approval of the Project Radiation Protection Manager or designee. This indoctrination training will include:

1. The requirement that the visitor remain with the escort at all times and follow directions of the escort.
2. A description of the radiological nature and required controls of the area to be entered.
3. The purpose and proper use of dosimeters, including how to read self-reading dosimeters.
4. Potential emergency situations and proper actions to take in such events.

3.2.4.4 Radiation Worker Training

Personnel requiring unescorted access to radiologically controlled areas will be required to attend, as a minimum, Radiation Worker training. This training will provide workers with the knowledge and skills needed to work safely in radiologically controlled areas including; radiation and high radiation areas, airborne radioactivity areas, radioactive material areas and contaminated areas. This training will be consistent with that outlined in NUREG 0761, Appendix A, "Example Qualification Standard for Radiation Work Training" (Ref. 15). Radiation Worker training will include:

1. Biological effects of radiation and the risks associated with radiation exposure.
2. Information needed to comply with Radiation Protection procedures and respond properly to warnings and alarms under both normal and emergency conditions.
3. Information needed to ensure that individuals can maintain their own exposure ALARA and ensure that ALARA considerations are appropriately reflected in decisions which affect the exposure of others.
4. Information needed to comply with Radiation Protection Program procedures.
5. Discussion of worker rights and responsibilities as identified in 10 CFR 19.
6. Discussion of NRC Regulatory Guide 8.13 "Instructions concerning Pre-natal Radiation Exposure" (Ref. 23).
7. Training in emergency response actions.
8. Discussion of radioactive and mixed waste minimization.

In addition to classroom training, each participant will be required to demonstrate their abilities in a practical factors session. This will include:

1. Properly don and remove a complete set of protective clothing (excluding respiratory protection equipment).
2. Read and interpret self reading dosimeters.
3. Read and interpret radiological survey maps.
4. Follow procedures to properly enter and exit a contaminated area, including use of proper frisking techniques.
5. Demonstrate understanding and compliance with a Radiation Work Permit.

Personnel will be required to score 80% or above on a written examination. Personnel who pass the written exam will be required to successfully complete the practical factors section. Personnel who fail exams will be evaluated to determine if additional training is needed, limited duty assignment is appropriate or disqualification is necessary. Radiation workers will be required to complete annual requalification training. The requalification training will give special attention to Radiation Protection Program changes, weaknesses observed in project personnel performance and lessons learned.

Significant changes in Radiation Protection policies, requirements, techniques, procedures and equipment, as determined by the Project Radiation Protection Manager, will be disseminated in a timely manner to affected personnel or organizations through periodic awareness presentations.

Radiation Protection procedures will be developed to allow the Project Radiation Protection Manager, on a case-by-case basis, to exempt personnel from Radiation Worker training. Exemptions will only be granted if the following conditions are met:

1. The individual is escorted by a qualified Radiation Worker or has documented proof of Radiation Worker training at another nuclear facility within the last year.
2. The exemption is valid only for the duration of the specific task for which access was approved.
3. The basis of the exemption and approval is documented.

3.2.4.5 Specialized ALARA Training

In addition to Radiation Worker training, separate and detailed instruction in advanced radiation work practices will be provided to those workers performing tasks that involve potential significant radiation exposure or quantities of radioactive material. This training will typically include workers involved in:

1. Operations which involve handling highly radioactive components that have the potential for creating a significant airborne hazard.
2. Operations which require work in contamination containment devices.
3. Grinding, cutting or similar operations on highly radioactive systems, components or piping.
4. Work activities that require the use of special tools and equipment for reducing exposures.
5. Special complex radiation work which involves skills and training beyond that covered in Radiation Worker training.

Specialized ALARA training may include mock-ups, dry runs, pre-job briefings and other special training classes. This training will normally be attended by all personnel involved with the task, including craft supervision and Radiation Protection Technicians. The need for specialized ALARA training will be identified during ALARA reviews and/or Radiation Work Permit preparation.

3.2.4.6 Respiratory Protection Training

Specialized respiratory protection training will be required for all personnel who use respiratory protection devices. Personnel using respirators in radiologically controlled areas will require Radiation Worker qualification.

Respiratory protection training will be conducted in accordance with 10 CFR 20, NRC Regulatory Guide 8.15 (Ref. 18) and NUREG-0041 (Ref. 19). Topics that will be addressed in respiratory protection training include, but are not limited to, the following:

1. Instructions that individuals are authorized to wear only the type of respirator for which they are fit tested and trained.
2. Discussion of the type of airborne contamination for which the respirators will provide protection.
3. Discussion of construction and limitations of respirator types.

4. Discussion of facial hair policy and use of approved eye wear.
5. Pre-use respirator inspection.
6. Instructions for proper donning and fit.
7. Emergency actions in the event of respirator failure including instructions to leave the area.
8. Practical demonstration of respirator inspection, donning and removal.

In addition to classroom training, each participant will be required to demonstrate their ability in a practical factor session that includes:

1. Inspection of a respirator.
2. Donning a respirator and performing a negative pressure test.
3. Removing a respirator.

Personnel will be required to score 80% or above on a written respiratory protection test. Personnel who pass the written exam and are medically qualified will be required to successfully complete the practical factors and fit test session. Respirator users will be required to complete annual requalification training.

3.2.4.7 Radiation Protection Technician Training and Qualification

Radiation Protection personnel will be selected, trained and qualified to ensure that they have sufficient knowledge and practical abilities to implement the Radiation Protection Program effectively. Qualification criteria and job descriptions will be developed for all positions within the Radiation Protection organization. This qualification criteria will contain the elements outlined in Appendix D of Draft NUREG-0761 (Ref. 15) and will be used to augment Radiation Protection Technician training.

All Radiation Protection Technicians will be required to participate in classroom and specific on-the-job training (OJT). The Radiation Protection Training Manual and implementing procedures will ensure that Radiation Protection personnel, who are selected, trained and qualified, have the knowledge and practical skills necessary to perform their work.

Radiation Protection Technician qualification and training will include the following:

1. Radiation Protection Training procedures that specify Radiation Protection personnel qualification criteria, job descriptions, and

responsibilities.

2. Review and verification of resumes by the Project Radiation Protection Manager to ensure that personnel have sufficient education and/or experience in the job functions which they will be assigned. Radiation Protection Technicians will be required to meet the education and experience levels specified in ANSI/ANS 3.1 (Ref. 21).
3. Testing of Radiation Protection Technicians to verify appropriate knowledge level in radiation protection theory, equipment, basic mathematics and recognizing unusual situations involving radioactivity. The test will include representative topics listed in Appendix E of Draft NUREG 0761 (Ref. 15).
4. Training in Radiation Protection procedures, the operation and limitations of survey and count room equipment and methods to ensure proper record documentation and traceability.
5. Review of revisions to 10 CFR 20 and their impact on radiation protection activities.
6. Training in emergency response duties.
7. Review of major decommissioning work activities and potential radiological hazards that may be encountered.

Radiation protection specialists (not qualified as ANSI/ANS-3.1 Radiation Protection Technician) performing unique radiation protection activities such as dosimetry, respiratory protection, bioassay, control point monitor, etc., will be provided specific task related training. This specialized classroom and/or on-the-job training will be commensurate with assigned duties and approved by the Project Radiation Protection Manager.

Upon completion of required classroom training, Radiation Protection personnel will complete on-the-job training in assigned duties. Successful completion of these duties will be documented by the responsible supervisor on the individual's qualification card. The responsible supervisor will ensure that training has been adequate by observation of on-the-job performance. Annual Radiation Protection Technician refresher training, using a structured program approved by the Project Radiation Protection Manager, will be conducted. This training will be documented and may include a written examination.

Additional training will be provided to Radiation Protection personnel if significant changes occur in Radiation Protection policy, requirements, techniques, procedures or equipment. This information will be disseminated to affected personnel or organizations through periodic awareness presentations and/or required reading.

3.2.4.8 Radioactive Waste Management Training

Personnel assigned to the task of packaging, loading and shipping radioactive materials will be required to attend annual training commensurate with their assigned duties. This training will be in conformance with NRC IE Bulletin 79-19, "Packaging of Low Level Radioactive Waste for Transport and Burial" (Ref. 25). The training will include instructions in all applicable Federal, State and local regulations and burial site requirements for classification, packaging, loading and shipping of radioactive materials.

3.2.4.9 Radiation Protection Supervisor Training and Qualification

All project Radiation Protection supervisors will be trained and qualified in their positions. Radiation Protection training procedures will include supervisor job descriptions which specify qualification criteria and responsibilities. This qualification and training program will include the following:

1. Review and verification of resumes by the Project Radiation Protection Manager to ensure that the supervisor has sufficient supervisory and technical experience in the area(s) for which they will be responsible. Supervisors designated as the alternate to the Project Radiation Protection Manager will meet the education and experience requirements established in NRC Regulatory Guide 1.8.
2. Training in Radiation Protection and decommissioning procedures associated with their area of responsibility.
3. Training in emergency response duties.
4. Periodic professional Radiation Protection training in the form of refresher courses, retraining, conferences or continuing education which enable Radiation Protection supervisors to keep abreast of current developments in the field.

3.2.4.10 Project Radiation Protection Manager Training and Qualification

The qualification and training program for the Project Radiation Protection Manager will include:

1. Verification of prior education and experience as required by NRC Regulatory Guide 1.8.
2. Orientation on specific decommissioning plans, management organization and decommissioning project procedures.
3. Orientation on the specific design, systems and radiological controls of the facility.
4. Training in emergency response duties.
5. Periodic professional Radiation Protection training in the form of refresher courses, retraining, conferences or continuing education which enable the Project Radiation Protection Manager to keep abreast of current developments in the field.

3.2.4.11 PSC Senior Health Physicist Training and Qualification

All PSC Senior Health Physicists will be trained and qualified in their positions. Radiation Protection training procedures will include job descriptions which specify qualification criteria and responsibilities. This qualification and training program will include the following:

1. Review and verification of resumes by the PSC Radiation Protection Manager to ensure that the Senior Health Physicists have sufficient technical experience in the area(s) for which they will be responsible. Senior Health Physicists designated as the alternate to the PSC Radiation Protection Manager will meet the education and experience requirements established in NRC Regulatory Guide 1.8.
2. Training in Radiation Protection and decommissioning procedures associated with their area of responsibility.
3. Training in emergency response duties.
4. Periodic professional Radiation Protection training in the form of refresher courses, retraining, conferences or continuing education which enable Senior Health Physicists to keep abreast of current developments in the field.

3.2.4.12 PSC Radiation Protection Manager Training and Qualification

The qualification and training program for the PSC Radiation Protection Manager will include:

1. Verification of prior education and experience as required by NRC Regulatory Guide 1.8.
2. Orientation on specific decommissioning plans, management organization and decommissioning project procedures.
3. Training in emergency response duties.
4. Periodic professional Radiation Protection training in the form of refresher courses, retraining, conferences or continuing education which enable the PSC Radiation Protection Manager to keep abreast of current developments in the field.

3.2.4.13 Radiation Protection Training Records

The Radiation Protection Training Manual will specify the types of Radiation Protection training records to be maintained. Records will be maintained in accordance with regulatory requirements and company procedures. These training records will typically include:

1. Final written examination grade.
2. Final practical factors evaluation results.
3. Description of training completed satisfactorily, references to pertinent lesson plans, course outlines, syllabuses and other subject-specific descriptive information.
4. Documents indicating qualification verification (i.e., qualification cards).

3.2.5 Dose Control

Radiation dose control is accomplished by controlling sources of radiation, controlling access to areas containing radioactive materials, measuring radiation exposures of workers, establishing exposure limits for workers and maintenance of an ALARA program. Specific elements of dose control include the following:

- ALARA Program
- Radiation Work Permits
- External dosimetry
- Internal dose control and monitoring
- Administrative dose control
- Area Definitions and Postings
- Respiratory protection

3.2.5.1 ALARA Program

All activities at Fort St. Vrain involving radiation and radioactive material shall be conducted such that radiation dose to employees, contractors, and the general public are maintained ALARA. Project management will establish specific goals and objectives for the Fort St. Vrain decommissioning project ALARA Program. The ALARA Program will be based on the guidance provided in Regulatory Guides 8.8 and 8.10 (References 16 and 17) to the degree applicable for decommissioning and dismantlement.

3.2.5.1.1 ALARA Program Organization and Responsibilities

The PSC Radiation Protection Manager and the Project Radiation Protection Manager are cooperatively responsible to coordinate ALARA Program development and implementation. Specific responsibilities of the PSC Radiation Protection Manager and the Project Radiation Protection Manager, including their ALARA Program responsibilities, are listed in Section 3.2.2.

The actual implementation of specific ALARA actions, as incorporated into daily work activities, will be the responsibility of each individual manager, supervisor and worker.

The ALARA Program will be supported by two levels of management providing oversight and direction. The working level of the ALARA Program organization will be the ALARA Committee and will be comprised of managers and representatives of various crafts at the supervisory level. Management oversight of the ALARA Program will be provided by the Decommissioning Safety Review Committee.

The primary responsibilities of the ALARA Committee will be to review decommissioning work activities for effective dose reduction techniques and conformance with the Radiation Protection Program policies and procedures. Additional responsibilities will include reviewing the methods used for decommissioning, providing guidance and solutions for dose reduction and the approval of special equipment and procedures used to reduce and maintain the overall project radiation dose ALARA.

The ALARA Committee will be co-chaired by the PSC Radiation Protection Manager and the Project Radiation Protection Manager. The other members of the committee will be designated managers and/or supervisors involved in the decommissioning project. Members will have the appropriate authority and responsibility necessary to implement an effective ALARA Program. The ALARA Supervisor will implement the ALARA Program, serve on the ALARA Committee as a non-voting member and hold the position of Committee Secretary.

ALARA Committee objectives will be as follows:

1. Ensure that ALARA policy, philosophy, commitments and regulatory requirements are integrated into all appropriate decommissioning work activities.
2. Establish overall ALARA Program goals for the decommissioning project.
3. Review and approve the ALARA budgets for specific project activities/tasks.
4. Review and evaluate individual and collective doses to determine the degree of success being achieved by the ALARA Program.
5. Initiate corrective actions, as necessary, to ensure accomplishment of ALARA Program objectives and goals.
6. Review and evaluate project activities/tasks that have dose estimates above specified action levels.
7. Ensure that necessary resources are provided to achieve the goals and objectives of the ALARA Program.
8. Coordinate efforts of various functional groups (e.g., engineering, operations, technical support and Radiation Protection) to maintain radiation dose ALARA.

The next higher level of management involvement in the ALARA Program will be the Decommissioning Safety Review Committee. This committee will review, evaluate and approve major decommissioning operations dealing with radioactive materials and radiological controls. This committee will also provide overall direction to the ALARA Committee for decisions involving financial solutions, administrative policy and decommissioning methods.

3.2.5.1.2 ALARA Training and Instruction

Commitment to the principles of ALARA will be reflected in all radiation protection training. Training courses will be evaluated by the Project Radiation Protection Manager and approved by the PSC Radiation Protection Manager to ensure that ALARA principles are incorporated into lesson plans.

3.2.5.1.3 Engineering Controls

Engineering controls is the term used for the general class of devices and associated methods used to reduce the exposure of personnel to radiation and radioactive material. Engineering controls typically include temporary shielding, engineering access controls, process instrumentation, control of airborne radiation sources, remote surveillance equipment, control of surface contamination, and other work improvement techniques.

"Temporary Shielding" will be evaluated during the planning phase for activities involving high dose rates, such as core component dismantlement and removal. The use of temporary shielding will continue to be evaluated during the implementation phase. The decision of whether to use temporary shielding will be based on considerations such as:

1. The effectiveness of providing shielding for the component (radiation source) or shielding between the source and the worker (shadow shields).
2. The effectiveness of providing partial shields such as for "radiation streaming", or "high level" sections of piping, drains, sumps, etc.
3. Estimated dose savings by the use of shielding.
4. Estimated dose expended during shielding installation.
5. Projected cost of installing and removing shielding, including the cost due to delay of project, if applicable.

"Engineered Access Control" will be evaluated and used to limit access to High Radiation Areas where it is not practical to provide continuous positive control (e.g., Radiation Protection Technician stationed at the ingress/egress point). Examples of engineered access controls include:

1. Inaccessible barriers
2. Locked gates or doors
3. Barriers with flashing light(s)
4. A combination of the above

"Process Instrumentation" for systems (e.g., the PCRV water filtration system, radwaste processing systems, etc.), will be reviewed by the Project Radiation Protection Staff for instrument location and layout, including such concerns as:

1. General accessibility and associated radiation exposure.
2. Potential radiation exposure due to operation of the system.
3. Potential radiation exposure due to servicing and maintaining the system/process.

"Control of Airborne Radiation Sources" will be considered for work activities that have the potential for producing airborne radioactivity (e.g., cutting and grinding operations). Engineering controls to confine and/or control the source will be evaluated. Examples of engineering controls for airborne radiation sources include:

1. Existing plant ventilation/filtering systems.
2. Auxiliary ventilation/filtering systems for contaminated components and for machining and grinding.
3. Contamination control containments.
4. Purification systems.
5. Decontamination equipment.
6. Wet handling of highly contaminated equipment, such as PCRV components.
7. Air sampling/monitoring instruments located to provide a quick indication of elevated airborne levels.

"Remote Surveillance Equipment" (e.g., TV monitors, audio equipment, "as-installed" photographs and radiation monitors) will be evaluated for use during decommissioning activities that have the potential for producing high radiation or airborne radioactivity areas. Such equipment, when used, will allow personnel to evaluate the radiation or airborne levels, the layout of the area and activities in the area without being exposed to the radiological conditions of the affected area.

"Control of Surface Contamination" will be evaluated and used to control and contain the spread of contamination and prevent the spread of radioactive materials to uncontrolled areas. Examples of methods used to control the spread of contamination include:

- Containments
- Surface decontamination
- Leak control
- Air curtains and plastic coverings
- Glove bags
- Drip pans
- Strippable coatings

Other engineering controls that may promote work efficiency and reduce radiation dose to workers will be evaluated. Examples of other engineering controls include:

- Adequate lighting
- Adequate ventilation
- Adequate working space
- Ease and quickness for installing/dismantling temporary equipment, such as scaffolding & insulation
- Means of accessibility, such as working platforms, cat walks, and fixed ladders
- Removal of components to remote areas, where shielding and special tools are available in low radiation areas

3.2.5.1.4 ALARA Program Goals

Each major task/activity during decommissioning will be assigned an ALARA (person-Rem) goal. Each goal will be established based on the anticipated person-hours, dose rates and dose saving methods employed. The goals will not be an estimate of the dose to be expended, considering the dose rates and person-hours, but will be a goal that requires planning and proper execution of dose-saving methods on the part of all personnel involved in the task.

The estimated dose from major tasks will be combined with minor and/or routine tasks (if necessary) to determine the annual and total dose goals for the Decommissioning Project.

Major activities/tasks will be evaluated during the planning phase. This will involve input from design engineers, the Project Radiation Protection Staff and implementing supervisors to determine an estimated ALARA goal for the task. ALARA goals will be adjusted as additional job reviews, ALARA reviews and task modifications are performed.

Prior to the start of specific activities/tasks, ALARA goals will be reviewed and approved by the ALARA Committee and the Decommissioning Safety Review Committee, as appropriate.

3.2.5.1.5 ALARA Job Reviews

ALARA job reviews will be conducted for each activity/task as an integral part of Radiation Work Permit preparation. (See Section 3.2.5.4) The scope and detail of the ALARA job review, and the individuals designated for review will depend on the complexity of the task, the expected radiological conditions and the estimated doses.

Cost benefit will be considered in ALARA job reviews where significant costs may be incurred to reduce the estimated dose. These costs may be incurred by such factors as temporary shielding, remote tools and/or surveillance, ventilation controls, decontamination, etc.

Pre-job briefings and mock-up training will be conducted for complicated or high dose jobs, as required by implementing procedures and/or the specific Radiation Work Permit.

In-progress ALARA reviews will be required if radiological conditions change significantly, are unexpected or if the projected accumulated dose differs significantly from the estimated value (e.g., greater than twenty-five percent).

Post-job ALARA reviews will be conducted at the completion of activities/tasks for which significant ALARA planning measures were required or accumulated person-Rem exceeded specified action levels.
Post-job reviews will encourage all personnel involved in the project activities to provide input regarding the effectiveness of methods used to perform the work. This input will be evaluated for future work activities to improve work conditions and maintain worker dose ALARA.

3.2.5.1.6 ALARA Work Practices

In order to complete each individual task and minimize personnel exposures, the following work practices, as a minimum, will be implemented:

1. Pre-job briefings will be held with craft and Radiation Protection personnel to assure that ALARA practices have been adequately factored into the work packages for completing tasks.
2. Personnel exposures will be monitored on a regular basis for potentially high exposure tasks to identify any irregularities that may indicate excessive personnel exposures. In the event that an

irregularity is found it will be investigated immediately and corrective actions implemented.

3. Tag lines will be attached and used when rigging and lifting high exposure rate components (e.g., steam generators) from the PCRV to keep workers as far from the source as possible.
4. Only essential personnel will be allowed on the refueling floor or work area when high exposure rate components are being removed. Casual observers will not be permitted.
5. Bagging techniques will be developed to minimize exposure.
6. Long-handled wipe tools will be used when appropriate to wipe down wet components removed from the PCRV.
7. Shadow shields (lead blanket curtains or equivalent) will be used, where appropriate, to reduce radiation fields at the work stations.

The radiation levels from activated structures inside the PCRV will be measured as segments of the reactor are dismantled. The measurement of exposure rates at the individual work stations will be performed and compared with calculation prior to commencing each individual task. Adjustments will be made in exposure projections as necessary. Temporary shielding will be used at the work stations to minimize personnel exposures based on actual exposure rate measurements.

3.2.5.1.7 Administrative Controls

During the Project planning phase, specific work packages and the project as a whole, will be reviewed by the Radiation Protection staff to ensure that adequate administrative controls and Radiation Protection hold points are included. The scope and detail of the controls and hold points will be a function of the estimated radiation dose rate levels and the complexity and duration of the work activities.

Work activities that have the potential for high exposure rates (e.g., greater than 500 mR/hr) or high estimated dose for the task (e.g., greater than 10 person-Rem) will be reviewed and approved by the ALARA Committee.

Work activities, that if not performed strictly in accordance with administrative controls could potentially produce personnel exposure in excess of regulatory limits, will require review and approval by the PSC Decommissioning Program Director and/or the Decommissioning Safety Review Committee.

3.2.5.1.8 ALARA Suggestion Program

An ALARA suggestion program will be developed to ensure that all personnel have the opportunity to participate in identifying potential ALARA concerns or recommendations to support the project's dose reduction efforts. All suggestions will receive review and response by the Radiation Protection staff to maintain open communications on ALARA issues.

ALARA Suggestion Program implementing procedures will address: submitting ALARA suggestions; reviewing, evaluating and approving ALARA suggestions; and implementing and tracking ALARA suggestions.

3.2.5.1.9 ALARA Program Evaluation and Appraisal

ALARA Program effectiveness will be monitored and evaluated on a continuing basis to determine appropriateness and effectiveness. A variety of feedback mechanisms will be in effect to provide information for these evaluations. These mechanisms will include pre-job, on-going and post-job reviews, and trending of Radiation Protection Performance Indicators.

ALARA Performance Indicators will be used to monitor and trend a variety of indicators to identify those areas where the ALARA program is performing effectively and also where problems may be occurring in the Radiation Protection Program. The need for additional ALARA Performance Indicators will be identified through the review of ALARA suggestions, radiological occurrences, radiological incidents, etc. Typical ALARA Performance Indicators include, but are not limited to:

- Respirator usage as compared to the number of entries to controlled areas
- Personnel contaminations
- Collective and individual doses
- Number of positive bioassay results

3.2.5.2 Occupational Exposure Estimate

The total cumulative occupational exposure for the entire decommissioning project is estimated to be 433 person-Rem, due almost entirely to PCRV dismantlement and associated waste handling activities. The estimated cumulative radiation exposure for each major activity where the potential for worker exposure exists is provided in Table 3.2-1. The estimate of Occupational Radiation Exposure (ORE) for the decommissioning of Fort St. Vrain was based on the tasks outlined in PDP Section 2.3.

The 433 person-Rem total exposure estimate will be used for planning purposes only and is not considered to be a restricting upper limit. Actual exposures will be controlled in accordance with ALARA principles (see Section 3.2.5.1). If projections indicate that the 433 person-Rem estimate may be exceeded during the project, written notification will be provided to the Decommissioning Safety Review Committee (See Section 2.4.9) for assessment.

3.2.5.2.1 Assumptions Used to Determine ORE

The scheduled task durations identified in PDP Section 2.3.5 formed the basis for estimating worker time spent in the radiation environments. The estimates of the radiation levels were based on calculated activities for each activated component inside the PCRV and on estimated plateout activities for contaminated components. In determining personnel exposures for dismantling the PCRV, it was assumed that approximately 50% of the task duration time would require workers to be in the radiation fields. In addition, the radiation fields are expected to vary for tasks performed during dismantlement of the PCRV after the water is removed from the PCRV. Consequently, "crew averaged" radiation fields were determined by distributing the total exposure estimated to complete the task uniformly among the crew.

The general area background dose rates associated with the BOP systems are expected to be less than 1 mR/hr. However, it is anticipated that individual components such as filter housing, valves and piping that process fluids from the PCRV may have radiation levels that exceed this dose rate. Therefore, the exposures estimated for the individual systems are based on the removal of some components that exceed 1 mR/hr and are expected to result in the exposures estimated for the individual systems as listed.

The radiation environments for packaging and shipping radioactive waste are expected to vary over the course of decommissioning operations. The use of shielded transfer containers, the HSF, long-handled tools and tag lines for handling radioactive materials and components will be among methods used to minimize worker exposures. In addition, shielded shipping containers will be used for packaging radioactive waste that exceeds dose limits for shipping. It is expected that worker exposures recorded for the packaging and shipping of radioactive waste will result from working extended periods in low radiation backgrounds. Consequently, personnel exposure estimates for BOP and radioactive waste processing are based on experience from similar nuclear industry projects rather than direct dose calculations.

Actual measurements of radiation levels at individual work stations will be performed prior to commencing each individual task. These measurements will determine the actual radiation environment and the ALARA practices required to complete the task. The design of the PCRV Sh[illegible] System and the design of tooling will provide flexibility in radiation prot[illegible] [illegible]justment of the PCRV water level and the use of underwater manu[illegible] and sem[illegible] [illegible]perating tooling will minimize personnel exposures.

3.2.5.2.2 ORE Calc[illegible]ology

The detailed breakdown of each major activity to the WBS level and the associated projected exposures are also provided in Table 3.2-1. The methods for calculating the ORE consisted of:

1. For PCRV operations only, the time workers spend at the work station radiation environment was assumed to be 50% of the time scheduled to complete the task. The total scheduled time was used in the BOP and radwaste handling areas since radiation levels are expected to be low in comparison to the PCRV internals.
2. The "crew averaged" radiation levels were determined by assuming the total exposures estimated for completing a task would be uniformly distributed among the crew.
3. The majority of graphite reflector blocks will be removed without the use of shielded transfer casks.
4. The highly activated components, such as boronated pins and large side reflector blocks, will be loaded into shielded containers under water and transferred to the HSF for processing.
5. The PCRV water level will be maintained such that the general area exposure rate on the work platform will typically be less than 2 mR/hr.
6. Personnel exposures for Health Physics (HP) and Quality Assurance (QA) coverage for PCRV decommissioning operations were assumed to be 10% (for HP) and 1% (for QA) of craft personnel exposures for

a total of 11%. An estimate of 10% (for HP) was assumed for BOP and radioactive waste packaging operations. Radiation exposure for QA coverage of BOP and radioactive waste operations was assumed to be minimal.

7. The "crew averaged" dose rate for BOP systems decommissioning is expected to be less than 1 mR/hr, resulting in minimal exposures. The exposures listed for each system are estimates based on the potential for worker exposure at work stations in proximity of the PCRV shield/pipe penetrations and contaminated components.
8. The estimate of exposures for radwaste handling were based on experience gained from packaging and shipping radwaste in other operating nuclear plants. The dose rates are expected to vary. Sources will be shielded to acceptable levels to meet shipping requirements.
9. The workers will be trained in ALARA principles to minimize occupational exposures.

3.2.5.3 Administrative Dose Control

Administrative radiation dose controls will be implemented to ensure personnel do not exceed regulatory dose limits, to ensure an equitable distribution of dose among project workers with similar jobs and to ensure that the collective dose to workers is ALARA.

The Radiation Protection Manual implementing procedures will detail administrative dose control requirements and activities. These procedures will include, but not be limited to, the following elements:

1. An approval system by various levels of supervision and management which controls both planned and actual doses to individuals as they progressively (incrementally) approach regulatory or established administrative limits.
2. Permission to exceed the lower administrative limits (e.g., 500 mRem/quarter and/or 1000 mRem/year whole body dose for adults) will require approval of the individual's supervision and the Project Radiation Protection Manager.
3. Permission to exceed the higher administrative limits (e.g., 2000 mRem/year whole body dose for adults) will require approval of the individual's supervision, the Project Radiation Protection Manager,

the PSC Radiation Protection Manager, and the PSC Decommissioning Program Director.

4. The Project Radiation Protection Manager's approval to exceed an administrative limit will be based on a determination that the dose to be received by the individual is ALARA.
5. Administrative controls will be in place and all personnel will be instructed and trained in these controls to ensure that any activity can be and will be stopped, if necessary, to re-evaluate the evolution and ensure no excessive doses are incurred.
6. Specific administrative limits and guidelines for exposure to the unborn, visitors, minors, etc.
7. Guidelines & policies governing emergency dose authorization and methods for handling overexposures.

3.2.5.4 Radiation Work Permits

Radiation Work Permits (RWPs) will be used for the administrative control of personnel entering or working in areas that have, or potentially have, radiological hazards present. RWPs will summarize the Radiation Protection controls established as part of job planning and will be detailed enough to deal with changing (or potentially changing) radiological conditions expected during the course of the work. RWPs will use current radiological survey information when establishing dose control measures and will specify any special survey requirements prior to, during and after the work activity.

An RWP will be required for the following:

1. Entry into or work in a radiologically controlled area.
2. Entry into Radiation, High Radiation, or Radioactive Materials Areas located outside a radiologically controlled area.
3. Activities involving equipment, controls, or instrumentation containing or suspected of containing radioactive material which are located outside a radiologically controlled area.
4. When determined by Radiation Protection that radiological controls in the form of an RWP are appropriate.

The RWP process will provide a systematic method to evaluate radiological conditions under which decommissioning work activities will be accomplished, specify radiation protection requirements and ensure that required worker briefings are given. Acceptable radiation work practices will be described and sufficient Radiation Protection Technician coverage assigned to assure worker protection and ensure that worker dose is maintained ALARA. RWPs will also provide a method to record doses for each individual by major job or task. The recorded RWP doses will also allow dose trend analysis and will frequently provide workers with their current dose status. The specific methods used for dose accountability and trending will be prescribed in the Radiation Protection Manual implementing procedures. Appropriate management approvals for RWPs involving significant projected total dose will be established in conjunction with the ALARA Program. RWP preparation and approval will be specified in Radiation Protection implementing procedures.

RWPs will typically provide the following information:

1. Description of job or activity to be performed.
2. Anticipated radiological conditions including, as applicable, contamination levels, radiation levels, airborne radioactivity levels.
3. Reference to, or a copy of, dose rate and contamination level survey maps.
4. Number and identification of personnel assigned to the job or activity (if appropriate).
5. Monitoring requirements during the job, such as constant radiation protection coverage, intermittent coverage, air monitoring, etc..
6. Special instructions and equipment to minimize exposure to radiation and contamination.
7. Protective clothing and equipment requirements.
8. Personnel dosimetry requirements (e.g., whole body, extremity).
9. Estimated exposure time and dose (person-Rem) to complete the task.
10. Actual exposure time, dose and other information obtained during the task.
11. ALARA pre-job briefing elements.

RWPs will normally be initiated by the group responsible for the job to be performed. The RWP request will typically include the following information:

1. Job description, work package number and if appropriate the purpose of the task.
2. Location(s) of work.
3. Estimated time to complete the job including, if appropriate, crew size and work location.

4. Exposure estimate.

RWPs will be documented in a legible and easy to comprehend format, and will be readily accessible for workers' review. All personnel assigned to a RWP will be required to read and sign the RWP verifying they will comply with its requirements. It will be expected that radiation workers be in strict compliance with RWP requirements. Willful or habitual disregard of RWP instructions will be cause for disciplinary action.

RWPs will be classified as Standing or Special, as determined by Radiation Protection Supervision. Standing RWPs will be used for the performance of routine activities such as observation, inspection, operator rounds or laundry operations where radiological conditions are stable. The Project Radiation Protection Manager will approve all Standing RWPs. Job specific RWPs will be used for the performance of a defined activity in specific locations.

Radiation Protection Manual implementing procedures will specify how RWPs will be maintained and retained. These records will typically include copies of RWPs, RWP sign-in logs and ALARA review documentation.

3.2.5.5 Area Definitions and Postings

Radiological postings will be provided at the entrance and boundaries of radiological areas to advise workers of radiological hazards. Methods will also be provided to clearly distinguish radioactively contaminated systems and indicate any special precautions required for work on such systems. Informational postings may also be used to provide additional radiological instructions to workers. It is the responsibility of each worker to observe the radiological postings and comply with the indicated requirements.

3.2.5.5.1 Radiological Postings

A Radiation Area is any area, accessible to personnel, in which there exists radiation, originating in whole or in part within licensed material, at such levels that a major portion of the body could receive in any one hour a dose in excess of 5 mRem, or in any 5 consecutive days, a dose in excess of 100 mRem. Radiation Areas will be posted "CAUTION -RADIATION AREA". Radiation area boundaries will be designated by the use of barriers, walls, ropes, markings and/or signs.

A High Radiation Area, as defined in the Decommissioning Technical Specification 5.8.1, is an area where whole body dose rates exceed 100 mRem/hr at 45 cm (18 inches) from the radiation source. These areas will be posted "CAUTION - HIGH RADIATION AREA". High Radiation Areas will be barricaded and conspicuously posted and entrances will be controlled by requiring a Radiation Work Permit. Personnel permitted to enter High Radiation Areas will be provided with or accompanied by one or more or the following:

1. A survey instrument which continuously indicates the area dose rate.
2. A radiation monitoring instrument which continuously integrates the radiation dose rate in the area and alarms when a preset cumulative dose is received (e.g., Digital Alarming Dosimeters (DADs)). Entry is permitted only after the area dose rate has been made known to personnel.
3. A Radiation Protection Technician equipped with a survey meter. The Radiation Protection Technician will be responsible for performing radiological monitoring at the frequency specified on the Radiation Work Permit and for providing positive control over the activities within the area.

As specified in the Decommissioning Technical Specifications, radiation areas accessible to personnel with radiation levels greater than 1000 mR/hr at 45 cm (18 inches) from the radiation source or from any surface that the radiation penetrates, in addition to the requirements for High Radiation Areas identified above, will be provided with locked enclosures to prevent unauthorized entry into such areas. Keys to such areas will be under the administrative control of Radiation Protection supervision. High radiation enclosures will remain locked except during periods of access by personnel under an approved RWP which will specify the dose rate levels in the immediate work area and the maximum allowable stay time for individuals in the area. In lieu of the stay time specification of the RWP, continuous Radiation Protection Technician surveillance (either direct observation or remote by use of closed circuit TV cameras) will be used to provide positive control over the activities within the area.

Certain areas accessible to personnel with radiation levels of greater than 1000 mR/hr may be located within larger areas where no enclosure exists or can be reasonably constructed for purposes of locking individual areas. In this case, the area will be roped off, conspicuously posted, and a flashing light will be activated as a warning device.

A Contamination Area is an area accessible to personnel with loose surface beta-gamma radioactivity in excess of 1000 dpm/100 cm^2 or loose surface alpha radioactivity exceeds 20 dpm/100 cm^2. Contamination Areas will be conspicuously posted with the radiation symbol and the words "CAUTION - CONTAMINATION AREA". Contamination Area boundaries will be designated by use of barriers, walls, ropes, markings, signs and/or step off pads.

An Airborne Radioactivity Area is an area where airborne radioactivity is present, at concentrations greater than MPC, or 10 MPC-hours over 40 hours. Airborne Radioactivity Areas will be conspicuously posted at the entrance with "CAUTION - AIRBORNE RADIOACTIVITY AREA". Airborne Radioactivity Area boundaries will be designated by use of barriers, walls, ropes, markings and/or signs.

A Radioactive Materials Area is an area or room in which radioactive material is used or stored in an amount exceeding 10 times (100 times for uranium and thorium) the quantity specified in 10 CFR 20. Radioactive Material Areas will be posted "CAUTION -RADIOACTIVE MATERIALS AREA". Radioactive Materials Area boundaries will be designated by the use of barriers, walls, ropes, markings and/or signs.

A Radiologically Controlled Area (RCA) is defined as any of the above defined areas, including a Radiation Area, High Radiation Area, Contamination Area, Airborne Radioactivity Area, or Radioactive Materials Area. RCA boundaries will be defined by the use of barriers, walls, walls, ropes, and markings. The boundaries will be clearly marked with posted signs that identify the type(s) of RCA within the boundaries, and entrance and exit points will normally be posted.

3.2.5.5.2 Informational Postings

A Hot Particle Area will be established to identify areas where discrete particles with high specific activity are located. Hot particle areas will be contained and posted within a contaminated area as "HOT PARTICLE AREA".

A Hot Spot is where localized dose rates near an item are much greater (e.g., five times) than the general area whole body dose rates. These locations are posted "CAUTION - HOT SPOT".

A Restricted Area is any area to which access is controlled for purposes of protection of individuals from exposure to radiation and radioactive material.

An Unrestricted Area is any area to which access is not controlled for purposes of protection of individuals from exposure to radiation and radioactive materials. Except as authorized per 10 CFR 20, radiation levels in "Unrestricted Areas" will not exceed levels that, if an individual were continuously present, would result in an individual receiving in excess of 2 mRem in any one hour or 100 mRem in any seven consecutive days.

A Low Dose Waiting Area (LDWA) is established to identify areas where dose rates are lower than other locations within the work area. When practical, workers should be directed to remain in a LDWA unless they are actually needed at the work location. LDWAs will be posted; "LOW DOSE WAITING AREA".

3.2.5.6 External Dosimetry

3.2.5.6.1 General Considerations

External radiation dose monitoring will be accomplished through the use of thermoluminescent dosimeters (TLDs) and self-reading dosimeters (SRDs) or digital alarming dosimeters (DADs). The official record of external dose to beta and gamma radiations will normally be obtained from TLDs. SRDs or DADs will be used as a means for tracking dose between TLD processing periods and may also be used as a back-up to the TLD. TLDs will be processed at a frequency to ensure personnel dose limits are not exceeded.

A contract dosimetry service will supply TLDs during the decommissioning project. The dosimetry laboratory will be accredited by the National Voluntary Laboratory Accreditation Program (NAVLAP) for the radiation type and energy expected to be monitored. The laboratory shall participate in a testing program as described in ANSI N13.11, "Criteria for Testing Personnel Dosimetry", 1983 (Ref. 26). Self-reading dosimeters will meet the requirements specified in NRC Regulatory Guide 8.4, "Direct-Reading and Indirect-Reading Pocket Dosimeters", (Ref. 27) February 1973.

3.2.5.6.2 Monitoring Whole Body Dose

All project workers will be required to wear external radiation monitoring devices whenever they enter radiologically controlled areas. SRDs or DADs will be read prior to their use and periodically thereafter by the wearer. If a SRD is off-scale or lost under conditions such that a high dose was possible, the individual's TLD will be promptly processed and the individual will be denied access to radiologically controlled areas. The TLD and SRD or DAD will normally be worn on the trunk of the body between the neck and waist in close proximity to each other. Under certain conditions, where the chest or trunk may not be the location of highest whole body dose, dosimetry devices may be relocated. Radiation Protection Manual implementing procedures will specify criteria for relocating whole body dosimetry.

The use of multiple whole body dosimetry will be evaluated whenever work is to be performed in a non-uniform radiation field and that portion of the body which will receive the highest dose is not easily determined. In these cases, multiple sets of dosimeters will be worn on those parts of the body expected to receive the highest dose. Guidance for conducting the evaluation and criteria for determining when multiple dosimetry is required will be provided in Radiation Protection Manual implementing procedures. RWPs will be used to communicate dosimetry requirements to the workers.

3.2.5.6.3 Monitoring Extremity Dose

Extremity monitoring devices will be used whenever is likely to receive a dose in excess of 25% of the quarterly extremity dose limit of 18.75 Rem. Guidance for evaluating the need for extremity monitoring will be provided in Radiation Protection Manual implementing procedures.

3.2.5.6.4 Monitoring Skin Dose

Monitoring of the skin of the whole body will normally be accomplished utilizing the whole body TLD. Calculation of skin dose due to contamination or "hot particles" will be performed in accordance with acceptable models and equations identified in NRC Bulletins, Regulatory Guides and in published technical literature. The methods for calculating and documenting skin dose due to contamination and "hot particles" will be provided in Radiation Protection Manual implementing procedures.

3.2.5.6.5 Dosimetry Quality Control

Periodic quality assurance checks of vendor supplied dosimetry will be conducted. These checks will be addressed in Radiation Protection Manual implementing procedures. In addition, SRD results will be compared to TLD results. Each discrepancy greater than 25% for doses over 100 mRem will be evaluated. The evaluation will include consideration of factors such as energy dependence of the device used, survey results, exposure times, doses of other personnel performing similar work, location of devices worn on the body and clerical errors.

3.2.5.7 Internal Dosimetry Control and Monitoring

3.2.5.7.1 General Considerations

Internal radiation dose is inherently more difficult to measure than external radiation dose, but is generally much easier to prevent. Therefore, the major emphasis will be placed on preventing internal radiation dose, provided it is consistent with the goal of keeping total effective dose ALARA.

The primary methods for controlling intake of radioactive material into the body will be identifying and minimizing sources of airborne radioactivity and applying engineering controls to reduce airborne radioactivity concentrations. The use of respiratory protection will serve as a secondary method of control. Administrative controls and limits will be established to minimize intakes of radioactive materials.

Radiation Protection Manual implementing procedures will be developed to conduct a routine bioassay program including criteria for the performance of bioassay, dose tracking and methods for data analysis and interpretation. The bioassay program will be based on NRC Regulatory Guide 8.26, "Application of Bioassay for Fission and Activation Products", (Ref. 28) September 1980, NRC Regulatory Guide 8.9, "Acceptable Concepts, Models, Equations and Assumptions for a Bioassay Program", (Ref. 29) September 1973 and NRC Regulatory Guide 8.32 "Criteria for Establishing a Tritium Bioassay Program", (Ref. 30) July 1988.

3.2.5.7.2 Whole Body Counting

Whole body counting will be the primary method used to determine the identity and quantity of gamma emitting isotopes in the body at any given time. Radiation workers will receive, as a minimum, a baseline and annual whole body count. In addition, personnel will receive a whole body count after a suspected intake of radioactive materials. Radiation Protection Manual implementing procedures will provide guidance on whole body counter operation, calibration and quality control.

3.2.5.7.3 Indirect Bioassay

Indirect bioassay (in-vitro) measurements will be made, as necessary, to monitor for alpha and beta emitting radioisotopes. This method of bioassay will typically be used only for isotopes which cannot be determined by whole body counting or when additional information on an intake is required. Urinalysis will be used to assess personnel intakes of tritium. Radiation Protection Manual implementing procedures will include criteria for indirect bioassay and methods for data analysis and interpretation.

3.2.5.8 Respiratory Protection Program

The Respiratory Protection Program will be established in accordance with 10 CFR 20 and consistent with the guidance of NUREG-0041 (Ref. 19). The primary objectives of the Respiratory Protection Program are personnel safety and limiting the inhalation of airborne radioactive materials. Engineering controls will be applied to minimize concentrations of radioactive materials whenever practicable. When engineering controls are not practicable, other controls such as increased surveillance, limitations of working times or use of respiratory protection equipment may be appropriate.

The Respiratory Protection Program will include the following elements:

1. A written policy statement and standard operating procedures.
2. Guidance on proper selection of equipment, based on the hazard.
3. Proper training and instruction to users.
4. Proper fitting, use, cleaning, storage, inspection, quality assurance and maintenance of equipment.
5. Appropriate surveillance of work conditions.
6. Regular inspection and evaluation to determine continued program effectiveness.
7. Program responsibility vested in one qualified individual.
8. An adequate medical surveillance program for respirator users.
9. Use of only Bureau of Mines/NIOSH - certified or NRC authorized equipment.
10. Maintenance of a bioassay program.

3.2.5.8.1 Program Administration

The Respiratory Protection Program will be administered by a Radiation Protection staff member designated by the Project Radiation Protection Manager. Qualifications of this individual will satisfy the requirements of ANS/ANSI 3.1. Program administrative responsibilities will typically include the following:

1. Provide overall program development, technical direction and the evaluation of program effectiveness.
2. Provide technical guidance for the control of airborne radiological contaminants.
3. Develop procedures, training materials and directives related to the program.
4. Conduct routine overviews of the program for compliance with policy, procedures and regulations.

3.2.5.8.2 Respirator User Qualification

Respirator user qualification criteria will include:

1. Annual examination by a physician to establish physical and psychological capabilities necessary to perform tasks using a respirator. A medical re-evaluation will be performed annually.
2. Successful completion of respiratory protection training as described in Section 3.2.4, "Radiation Protection Training and Qualification."
3. Successful quantitative fit test prior to the use of respirators requiring a facepiece-to-face seal on an annual basis.
4. No facial hair between the face and the sealing surface of the respirator and no facial hair interfering with valve function of the respirator.

3.2.5.8.3 Bioassay

Bioassay techniques will be used to determine the amount and type of radionuclides in the body as an evaluation of the effectiveness of the Respiratory Protection Program.

3.2.5.8.4 Respiratory Protection Equipment Description and Selection

The selection of respiratory protection equipment will be based on work area survey data and/or expected airborne contamination levels. The need for respiratory protection will normally be determined and prescribed by Radiation Work Permits. All work tasks in contaminated areas will be evaluated for respiratory protection requirements. Special attention will be given to the requirement for respiratory protection when the work activity/task involves any of the following operations:

- Thermal cutting
- Welding
- Concrete demolition
- Concrete scabbling
- Grinding

Respiratory protection equipment will be selected to provide a protection factor greater than that required for the expected peak concentration of airborne radioactive materials in the work area. Assigned protection factors will not exceed those specified in 10 CFR 20. If the selection of a respiratory protection device is inconsistent with the goal of keeping total effective dose ALARA, consideration will be given to alternative controls or respiratory protection equipment with a lower protection factor.

3.2.5.8.5 Supplied Air Respiratory Equipment

Breathing air may be supplied to respirators from compressed air cylinders, air compressors or the plant breathing air system. All sources of compressed breathing air will meet the requirements for Grade D breathing air as specified in ANSI/CGA G-7.1, "Commodity Specification for Air", (Ref. 31) 1989.

3.2.5.8.6 Equipment Inspection and Maintenance

Requirements and techniques for inspection and maintenance of respiratory protection equipment will be contained in Radiation Protection Manual implementing procedures. Inspection and maintenance will be performed in accordance with manufacturers' and regulatory requirements.

Respirators will be maintained and issued in a NIOSH certified configuration. The certification for a respirator will be automatically voided if the respirator is not the same in all respects as certified by NIOSH or if the respirator is not maintained in a certified condition.

Acceptable methods of cleaning respiratory equipment will be performed in accordance with manufacturers' specifications and Radiation Protection Manual implementing procedures.

3.2.5.8.7 Quality Assurance (QA)

Periodically, respirators will be randomly selected to verify they have been properly cleaned and inspected. Respirator users will also be randomly selected for whole body counts to verify program effectiveness. In addition, if there is an indication of equipment failure or improper use (e.g., positive nasal smear), the respirator user will be whole body counted.

3.2.5.8.8 MPC-Hour Tracking

Administrative and engineering controls will limit the intake of radioactive materials to levels that are ALARA. An administrative limit of 2 MPC-hours in any one day and 10 MPC-hours in any one week will be established. Radiation Protection Manual implementing procedures will provide guidance on MPC-hour determination and tracking.

3.2.6 Radioactive Material Controls

Radioactive material controls will be established to provide for control of radioactive material, prevent inadvertent release of radioactive materials to uncontrolled areas, ensure personnel are not unknowingly exposed to radiation from lost or misplaced radioactive material and minimize the amount of radioactive waste material generated during the decommissioning. Radioactive material is defined as material activated or contaminated by the operation or decommissioning of Fort St. Vrain and licensed material procured and used to support the operation or decommissioning of Fort St. Vrain (e.g., calibration sources, check sources and radiography sources).

The Radwaste Supervisor and the Radiation Protection Operations Supervisor will share the responsibility for the radioactive material controls.

Detailed radioactive material controls will be described and implemented by the Radioactive Waste and Radiation Protection Manual implementing procedures. Specific radioactive material controls include the following:

1. Receipt of radioactive material
2. Identification of radioactive material
3. Control and movement of radioactive material
4. Storage of radioactive material
5. Accountability and inventory of radioactive sources
6. Release of materials for unrestricted use
7. Control of materials entering radiologically controlled areas
8. Preparation of radioactive materials for shipment
9. Radioactive liquid and gaseous release

3.2.6.1 Receipt of Radioactive Material

Implementing procedures for the purchase and receipt of radioactive material will include, but not be limited to the following requirements:

1. Requests for radioactive materials will be submitted to the Project Radiation Protection Manager for license verification and inventory check.
2. Personnel who initiate purchase orders for radioactive materials will be required to specify that shipments be marked "Attention: Project Radiation Protection Manager".
3. Picking up, receiving and opening packages identified as containing radioactive material will be performed in accordance with 10 CFR 20. The Project Radiation Protection Manager, or designee, will be notified as soon as possible after receipt of any package. The external surface of the package will be inspected and surveyed. Shipping damages and other discrepancies will be documented and Radiation Protection Supervision notified.

3.2.6.2 Identification of Radioactive Material

Implementing procedures will be developed to specifically address the identification of radioactive material. Each container in which radioactive material is transported, stored, or used in quantities exceeding those given in 10 CFR 20, will bear a durable, clearly visible label, identifying the radioactive contents. This label will contain, as a minimum, the radiation caution symbol and the words; "CAUTION OR DANGER - RADIOACTIVE MATERIALS". The label will provide sufficient information to permit individuals handling or using the material, or working nearby, to take precautions to avoid or limit their exposure. Requirements for radioactive material labeling may be excepted if:

1. The material is uniquely identified for use as radiological protection equipment (e.g., respirators, protective clothing, etc.).
2. The material is under the direct control of personnel trained as radiation workers who are aware of the contents and the associated radiological hazards.
3. The material consists of radiological samples or sampling equipment in the custody of Radiation Protection personnel.
4. The material is packaged and labeled in accordance with DOT regulations while awaiting transport.
5. The material is contained in permanently installed equipment and/or potentially contaminated systems. Radiation level posting requirements shall remain applicable.

Radioactive material storage areas will be posted as "CAUTION - RADIOACTIVE MATERIAL AREA", in addition to postings required for radiation and contamination, as indicated in Section 3.2.5.5.

3.2.6.3 <u>Control and Movement of Radioactive Material in the Restricted Area</u>

Implementing procedures will be developed to specifically address the control and movement of radioactive materials within the Restricted Area. Radioactive material removed from contaminated areas will be contained, surveyed and labeled to allow appropriate control of radioactive material. Radioactive liquid samples or sources will be properly contained and will be transported by, or escorted by, Radiation Protection qualified personnel.

Materials which are to be prepared for shipment or storage will be packaged in containers suitable for shipping or storage, as applicable. The materials and packages will be surveyed for radiation and contamination levels and the package appropriately labeled to reflect those levels. External surfaces of containers or wrappings containing radioactive material will be surveyed to ensure that loose surface contamination levels meet the unconditional release criteria, unless specifically exempted by Radiation Protection Supervision.

Whenever material or equipment is transferred from one location to another location, it will meet the radiation and contamination limits of each area through which it passes or be under the control of Radiation Protection personnel.

Procedures for the control and movement of radioactive material will include, but not be limited to, the following provisions:

1. Guidelines for monitoring and handling radioactive material (e.g., quantities, geometries and estimated concentrations will be used to estimate radiation levels and container requirements).
2. Unique features will be used (e.g., yellow plastic bags, yellow and magenta tags, etc.) to clearly identify the physical and radiological parameters of the material.
3. Uncontaminated materials will be separated from contaminated materials and be labeled, as necessary.
4. Lifting and rigging equipment used for radioactive materials will be commensurate with the physical and radiological parameters of the material to ensure safe movement and ALARA practices.
5. Portable tools and equipment that are contaminated will be designated as such and will be stored in an area separate from uncontaminated tools.
6. Contaminated tools and equipment will be decontaminated and/or discarded when they reach designated fixed and loose contamination levels.

3.2.6.4 Control and Movement of Radioactive Material Outside the Restricted Area

Implementing procedures will be developed to specifically address the control and movement of radioactive materials outside the Restricted Area.

Radioactive material being transferred from a radiologically controlled area to another radiologically controlled area will be properly surveyed and contained and will be escorted by Radiation Protection personnel.

Radioactive materials removed from the Restricted Area to be shipped offsite will be packaged and labeled for shipment in accordance with DOT regulations. Radioactive materials removed from the Restricted Area that are not designated to be shipped will be:

1. Properly contained to minimize radiation levels and/or prevent spread of contamination.
2. Surveyed to determine radiation and contamination levels.

3. Labeled in accordance with 10 CFR 20 as radioactive materials, indicating the radiation and contamination levels. Adequate features and markings will be used to clarify the physical and radiological parameters of the material.
4. Inventoried (e.g., listed in a log indicating person responsible for material(s) and where material(s) will be located) prior to leaving the radiologically controlled area.
5. Controlled by Radiation Protection personnel (e.g., stored in a locked area and not used or moved without Radiation Protection personnel's permission and/or presence).
6. Radioactive material will not be stored outside of the Restricted Area unless specifically approved by the Project Radiation Protection Manager.

Radioactive material found uncontrolled and outside the Restricted Area will be brought to the immediate attention of Radiation Protection supervision. Action will be taken to ensure that the radioactive material is surveyed, labeled and properly dispositioned (e.g., returned to the Restricted Area). The incident will be investigated by the Project Radiation Protection Manager and corrective action(s) initiated.

3.2.6.5 Storage of Radioactive Material

Implementing procedures will be developed to specifically address storage of radioactive materials. Interim radioactive material storage and liquid processing areas will require a safety evaluation to ensure compliance with NRC Generic Letter 81-38.

Access to radioactive material storage areas located inside the Restricted Area will be controlled by Radiation Protection personnel. Storage and processing of materials will ' consistent with analyzed activities and radiation levels. Storage areas will be regu arly surveyed and inventoried.

Temporary radioactive material storage areas within the Restricted Area will be designated by Radiation Protection personnel and posted in accordance with Section 3.2.5.5. Consideration for establishing temporary radioactive material storage areas will include:

1. The number of temporary storage areas and length of storage time in these areas will be minimized.

2. Radioactive material storage areas and surrounding areas will be surveyed on a routine basis.
3. Radioactive material will not be stored outside except for short periods during transit, or if packaged in accordance with DOT requirements while awaiting shipment.

3.2.6.6 Accountability and Inventory of Radioactive Material

Implementing procedures will specifically address the accountability of radioactive materials. Radioactive material storage areas will be controlled and periodically surveyed. The status of radioactive material storage areas will be periodically reviewed and include:

1. A list of storage areas to evaluate the continued need for the storage areas and/or the materials and the types and radiological parameters of the areas (e.g., high radiation material, contaminated material, activated material, etc.).
2. Inspection of materials stored, to evaluate the status of materials and area controls (e.g., physical condition of containers, access control, posting, etc.).

Radioactive sources used for calibration, standardization and instrument checks will be received as indicated in Section 3.2.6.1. Implementing procedures will specifically address inventory and accountability requirements. Sources will be inventoried at least semiannually, taking into consideration: radioactive decay; comparison to Certificates of Calibration; and use and disposal of liquid and gaseous sources. The results will be documented and reported to Radiation Protection supervision.

Sealed sources will be controlled in accordance with 10 CFR 30 through 34. Sealed sources will be leak tested with the frequencies and criteria for results based on activity level and type of source. The test will be documented and will be capable of detecting a minimum of 0.005 microCurie of contamination. If leakage is detected based on established criteria, the Project Radiation Protection Manager will be notified and reports will be submitted as indicated in Section 3.2.10.

Sources will be maintained, locked or otherwise controlled when not in use. A source usage log will be maintained. If a source can not be accounted for during a periodic inventory or at any other time, actions will be taken to include the following:

1. Evaluate the physical and radiological characteristics of the missing source and evaluate potential hazards to radiation workers and the public.
2. Report the missing source as required by applicable implementing procedures and State and Federal regulations.
3. Initiate investigations to locate the source and/or to determine the reason for loss.
4. Prepare Radiological Occurrence report(s).

3.2.6.7 Special Controls

Special circumstances may arise during the decommissioning of Fort St. Vrain that will require special handling considerations for radioactive materials. Examples of radioactive materials requiring special handling are radiography sources and highly radioactive waste (e.g., greater than 10 R/hr gamma radiation levels).

Receipt of "special" types of materials/sources require the following actions:

1. Notification of the Project Radiation Protection Manager prior to bringing the radioactive material/source inside the Restricted Area.
2. Development and approval by the Project Radiation Protection Manager of a plan of action for control, safe storage and release of the radioactive material/source (e.g., use existing procedures, develop temporary procedures, etc.) prior to bringing it inside the Restricted Area.
3. Notification of the PSC Shift Supervisor prior to use of a source (e.g., radiography).

Special nuclear material, fissile material, and highly radioactive waste will be addressed on a case-by-case basis in accordance with administrative procedures and applicable regulations. Specific control, accountability and storage, if applicable, will be specified by the Project Radiation Protection Manager with the cognizance of the PSC Facility Support Manager. These details will be addressed by the Radiation Work Permit Program and/or temporary procedures and action plans, and will include the following considerations:

1. Use of special containers and/or shielding.
2. Use of special rigging and lifting devices for moving the radioactive

material/source including any containers as applicable.
3. Temporary evacuation of non-essential personnel and suspension of activities in the area.
4. Temporary implementation of additional security measures.
5. Other special considerations for ALARA purposes as indicated in Section 3.5.1.

3.2.6.8 Release of Materials for Unrestricted Use

Procedures for the release of materials and equipment from radiologically controlled areas will be developed. Material will not be released for unrestricted use if it contains detectable amounts of radioactive material. Instrumentation, counting times and survey techniques will be selected such that detection sensitivities are consistent with the applicable guidance of:

1. NRC Circular 81-07, "Control of Radioactively Contaminated Materials," (Ref. 32) for decontaminated items (e.g., tools and equipment) and scrap materials.
2. NRC IE Notice 85-92, "Surveys of Wastes Before Disposal from Nuclear Reactor Facilities" (Ref. 33) for monitoring of segregated dry active waste (DAW) prior to disposal to a sanitary landfill.
3. NRC Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors" (Ref. 34), for the loose and fixed surface contamination levels of items left on the site after decommissioning.
4. Colorado Department of Health, Radiation Controls Division, "Soil Contamination Guidance Policy," (Ref. 35).
5. 10 CFR 20 and the Decommissioning Technical Specifications for bulk liquids such as oil, glycol, etc..

3.2.6.9 Control of Materials Entering Radiologically Controlled Areas

Materials entering radiologically controlled areas will require the following controls:

1. Chemicals that may cause the generation of "mixed wastes" (e.g., chemicals that can potentially produce hazardous waste) will be controlled to prevent contamination with radioactive material.
2. Packing material and unnecessary items will not be allowed to accumulate in radiologically controlled areas.

3.2.6.10 Preparation of Radioactive Materials for Shipment

Packages prepared for shipment, which upon inspection do not meet DOT requirements, will be evaluated for repackaging and/or storage. Received packages which do not meet DOT requirements will be reported to the NRC as indicated in Section 3.2.10 and in accordance with DOT regulations.

Radioactive material will be packaged and transferred to, and received from, other facilities in accordance with applicable DOT requirements and implementing procedures. Radiological surveys will be conducted prior to shipping and when receiving radioactive materials to verify that the radiation and removable contamination levels are in compliance with regulatory requirements and are described on shipping labels and documentation. Examples of surveys that will be performed are:

1. Contamination surveys for packages received and packages shipped to ensure that they meet the DOT requirements for smearable contamination levels (e.g., external beta-gamma and alpha, and internal beta-gamma and alpha).

2. Radiation surveys (e.g., package contact, vehicle contact, specified distances from the package and the vehicle, and normally occupied positions in the vehicle cab) for the material and package and for the transport vehicle depending on the type of shipment (e.g., LSA, Exclusive Use LSA, etc.).

Additional elements described in the Radioactive Waste Manual implementing procedures will include, but not be limited to:

1. Sorting and segregation of materials and processing to an acceptable form.
2. Classification of the material in accordance with 10 CFR 61.
3. Receipt survey of vehicles used to transport radioactive waste.
4. Packaging, labeling and marking of material in accordance with 10 CFR, 49 CFR and Disposal Site Criteria.
5. Shipment of material in accordance with 49 CFR and 10 CFR
6. Disposal and off-site volume reduction arrangements.

Additional details on radioactive waste management can be found in Section 3.3.

3.2.6.11 Radioactive Liquid and Gaseous Release Control

Liquid and gaseous effluent releases will be monitored and controlled using installed plant equipment and guidance provided in the Decommissioning Technical Specifications and Offsite Dose Calculation Manual. Typical process controls will include:

- Sample and analyze the waste stream
- Calibrate and test instrumentation
- Monitor the waste stream
- Prepare a release permit
- Complete the release
- Record types and quantities of material(s) released

3.2.7 Surveillance

Radiological surveillance will be conducted routinely to identify radiation sources, determine radiological conditions, and comply with the requirements of 10 CFR 20. Special surveys will be scheduled by Radiation Protection Supervision as needed to evaluate radiological conditions in support of decommissioning activities. Elements of radiological surveillance program will consist of the following:

1. Routine surveys-general
2. Dose rate surveys
3. Surface contamination surveys
4. Airborne radioactivity surveys
5. Environmental sampling and analysis
6. Personnel contamination monitoring
7. Survey documentation and review

Detailed radiological surveillance requirements and activities will be described in the Radiation Protection Manual administrative and implementing procedures. These procedures will specify the types of instrumentation, survey methods, and actions required when abnormal radiological conditions are discovered.

Calibrated instrumentation will be available for the detection and measurement of alpha, beta and gamma radiation. Air sampling equipment will be available for general area and breathing zone air samples.

Survey and monitoring information will be used by the Radiation Protection staff and other support groups for:

1. Procedure development, as applicable
2. Decommissioning work packages development
3. Decommissioning engineering design criteria
4. RWP preparation
5. Radiation, contamination and airborne radioactivity trend analysis
6. Pre-job ALARA planning
7. Pre and post job briefings

Surveillance frequencies will be specified in implementing procedures with consideration given to hazards which may be encountered, potential for changing radiological conditions and frequency of occupation. Examples of surveys and associated frequencies include the following:

1. Active work areas where radiological conditions may change as a result of work being performed will normally be surveyed for radiation and contamination at least once per shift or more frequently if radiological conditions could change (e.g., upon opening a radioactive system).
2. Active exit points from contaminated areas will be surveyed for contamination at least daily and once per shift during frequent use.
3. Eating areas used by individuals who have worked in radiologically controlled areas will be surveyed for contamination at least weekly.
4. Storage areas for solid radioactive waste and irradiated/contaminated components and equipment will be surveyed weekly when material and/or personnel have entered the area.
5. All personnel and equipment exiting radiologically controlled areas will be monitored for contamination.
6. RWP's will normally specify the frequency of Radiation Protection technician coverage and surveys required (e.g., continuous, intermittent).

3.2.7.1 Routine Surveys-General

Routine radiation, contamination and airborne radioactivity surveys will be performed to evaluate radiological conditions and verify radioactive materials are being adequately controlled. Survey data will be used for job evaluations, trend analysis, ALARA pre-planning and informing personnel of radiological conditions. Action levels and associated responses will be established for abnormally high or unusual survey results. Survey results will be made available to workers entering radiologically controlled areas. Locations where routine surveys and monitoring will be conducted include, but are not limited to:

1. Active work areas where conditions may change as a result of the work being performed.
2. Entry and exit points of contaminated areas (e.g. step off pads).
3. Offices, trailers, shops and trash receptacles outside radiologically controlled areas.
4. Major pathways inside radiologically controlled areas
5. Radiation Area boundaries for verification of posting adequacy.
6. Storage areas for radioactive wastes.
7. Entrances to locked High Radiation Areas.
8. Radiation Protection and Radiochemistry laboratories.
9. Eating and break areas used by personnel who have been working in radiologically controlled areas.
10. Selected unrestricted areas, if appropriate.

Radiation Protection supervision will routinely review surveys with regard to necessity and frequency consistent with good radiological protection practices and regulatory requirements.

Routine surveys will not normally be conducted in High Radiation Areas except as directed by Radiation Protection supervision. These surveys will be coupled with, or prior to, planned work activities in those areas in order to maintain personnel exposure ALARA.

3.2.7.2 Dose Rate Surveys

Dose rate surveys will be performed to provide specific radiological information on beta and gamma radiation dose rates. These surveys will normally be performed with portable, hand held survey instruments. Dose rate information may also be obtained through the use of fixed radiation monitors. Dose rate surveys will be performed to:

1. Assess changing radiological conditions in radiologically controlled areas which are frequently occupied.
2. Identify localized hot spots.

3. Provide data for pre-job ALARA planning and RWP preparation.
4. Establish "Low Dose Waiting Areas".
5. Monitor the receipt of radioactive materials.
6. Support the packaging/shipping of radioactive waste.
7. Ensure proper release of materials and equipment for unrestricted use.
8. Monitor unanticipated spills or spread of radioactive materials.
9. Assess radiological conditions during decommissioning work (e.g., breaching of a radioactive system, PCRV dismantlement etc.).
10. Provide data for environmental monitoring.
11. Support emergency response activities.
12. Establish and verify radiation area boundaries and postings.
13. Monitor laundered/decontaminated personnel protective equipment (e.g., protective clothing, respirators) prior to reuse.

Dose rate radiation survey instruments will be calibrated to the radiation (beta, gamma) being detected to assure an accurate, consistent, reliable and predictable response to radiation levels.

3.2.7.3 Surface Contamination Surveys

Contamination surveys will be performed to provide specific radiological data on the levels of beta-gamma and alpha contamination, and will be performed to:

1. Monitor personnel and equipment exiting radiologically controlled areas to prevent the inadvertent release of radioactive materi
2. Establish boundaries of contaminated areas.
3. Support the radioactive source accountability program (e.g source leak tests).
4. Monitor the receipt of radioactive materials.
5. Support the radwaste packaging/shipping program.
6. Ensure the proper release of materials and equipment for unrestricted use.
7. Provide data for pre-job ALARA planning and RWP preparation.
8. Determine radiological conditions during coverage of jobs with changing radiological conditions (e.g., welding, grinding radioactive system opening).
9. Provide data for environmental monitoring.
10. Support decommissioning emergency response.
11. Assess conditions following the discovery of a spill or spread of

radioactive materials.

12. Survey TLD's prior to processing.
13. Detect and control "Hot Particles".
14. Monitor decontaminated personal protective equipment (e.g., respirators) prior to reuse.
15. Monitor applicable areas, such as clean waste dumps and landfills, salvage areas, warehouses, tool storage areas and contractor buildings.
16. Assist in personnel decontamination by monitoring for adequate decontamination techniques.

3.2.7.4 Airborne Radioactivity Surveys

Airborne radioactivity will be measured in areas where personnel may be exposed to airborne particulates and tritium. Representative air sampling will be performed to provide measurements during work which has the potential for the generation of airborne radioactivity. Continuous air monitors, breathing zone air samples and grab air samplers will be used for obtaining air samples. Airborne radioactivity surveys will typically be performed:

1. During work operations known or suspected to cause airborne radioactivity (e.g., grinding, welding, burning, cutting, hydrolazing, vacuuming, sweeping or use of compacting equipment).
2. During work that involves the breach of a radioactive system.
3. Upon initial entry and periodically thereafter into any area known or suspected to contain airborne radioactivity concentrations in excess of 25 percent of MPC.
4. Immediately following the discovery of a significant spill or spread of radioactive materials or whenever airborne radioactivity levels are suspected to have changed.
5. Periodically in radiologically controlled areas where the potential for airborne radioactivity exists.
6. Any time respiratory protection devices or MPC-hr accounting are used to control internal radiation exposure.
7. When continuous air monitoring is performed, high volume grab samples or breathing zone air samples will be periodically taken to verify that continuous air monitoring of the work area is representative of the breathing zone (This surveillance will also be performed for Tritium).

8. Periodically to verify the effectiveness of the Respiratory Protection Program.

Air sample counting equipment will be available to measure alpha, beta and gamma emitting radionuclides. Collection efficiencies for air sampling media will be determined. The minimum detectable activity (MDA) for air sampling equipment will be at least one (1) MPC in one (1) hour for the radioisotopes most likely to be present. Air sampling equipment will be calibrated using guidance in NRC Regulatory Guide 8.25 "Calibration and Error Limits of Air Sampling Instruments for Total Volume of Air Sampled", (Ref. 36) August 1980.

Periodic samples will be collected and analyzed to verify the adequacy of engineering controls that are used to minimize airborne radioactivity. Typical controls that will be verified are:

- Room ventilation systems
- Portable ventilation systems
- Air locks
- Ventilation hoods
- Containment devices (e.g., tents, glove boxes, etc.)

3.2.7.5 Environmental Sampling and Analysis

Environmental sampling and analysis will be conducted during decommissioning. The current PSC Radiological Environmental Monitoring Program (REMP) will be continued, in part, specifically tailored to determine the effect on radiological conditions of the environment due to decommissioning activities.

In addition, the Offsite Dose Calculation Manual (ODCM) will provide the methodologies to assure compliance with Fort St. Vrain Decommissioning Technical Specifications related to liquid and gaseous radioactive effluents. This program will demonstrate compliance with 10 CFR 20, 10 CFR 50 Appendix A (GDC 64) and Appendix I and 40 CFR 190.

Specific sample types and locations will be addressed in the REMP and ODCM. Typical environmental monitoring techniques that will be utilized, include:

- Area TLDs
- Soil sample analysis
- Water sample analysis
- Vegetation sample analysis

3.2.7.6 Personnel Contamination Monitoring

Adequate personnel contamination monitoring instrumentation will be available to control the spread of contamination and hot particles. Radiation Protection Manual implementing procedures will require monitoring upon exiting radiologically controlled areas and will establish acceptable methods for performing personnel frisking. Whole-body contamination monitors (e.g., Eberline PCM-1B) will be used at radiological controlled area exits, as appropriate. Sensitivities of these instruments will be set to detect contamination levels equal to or better than conventional hand frisking methods (e.g., 5000 dpm/100 cm^2).

In areas where whole-body contamination monitors are not available, a hand-held frisker will be used to monitor personnel contamination. Typical frisking techniques that will be required include:

1. Maintain frisking speed of less than 2 inches per second.
2. Maintain detector to body distance at less than 1/2 inch.
3. Pause (approximately 5 seconds) at the nose and mouth area to check for indications of inhalation/ingestion of radioactive material.
4. Pay particular attention to feet (shoes), elbows, knees or other areas with a high potential for contamination..
5. Ensure a total frisking time of greater than 2 minutes to cover at least 10% of the body.
6. Maintain background for frisking at less than 300 cpm.

When background levels are unacceptable (e.g., greater than 300 cpm) for personnel frisking, actions will be taken that include one or more of the following:

1. Move the whole body frisker and/or the hand-held frisker (and the contamination control point) to an area that has an acceptable background level (e.g., around the corner, behind a column, etc.).
2. Shield the frisking area and equipment to reduce background.
3. Frisk for gross contamination levels in the high background area, but locate the equipment for final frisking at a remote area, and provide contamination control for the passage to the remote frisking location.

3.2.7.7 Survey Documentation and Review

Radiation Protection supervision will review completed survey documentation to ensure appropriate, adequate and complete information is recorded. The supervisor reviewing the survey will ensure that the recorded results are legible in accordance with Radiation Protection Manual implementing procedures and consistent with anticipated levels and will determine the reason for any variances. Information that will typically be included on survey maps or forms is:

- Date and time of survey
- Location of survey
- A sketch or description of the area or component surveyed
- Instrument type and serial numbers
- Instrument calibration due date
- Name and signature of surveyor

The results of evaluations will be documented on approved survey forms which will be made available to personnel entering radiologically controlled areas. Survey data will contain enough detail to provide personnel with adequate information concerning radiological conditions existing in the area surveyed. Survey maps will include, as applicable:

1. Contact and general areas dose rates
2. Contamination levels
3. Airborne radioactivity levels, if applicable
4. Identification of specific hazards (i.e., hot spots)
5. Location of radiological boundaries

Personnel contamination detected on hair or skin will be promptly removed under the supervision of trained Radiation Protection personnel. Personnel skin and clothing contaminations will be documented and evaluated to help improve contamination controls.

Personnel contamination forms will include such items as:

1. Names of individuals involved
2. Survey results
3. Decontamination methods
4. Results of decontamination

5. Body locations where contaminated
6. Areas worked
7. Radiation Work Permit number
8. Corrective action to help prevent recurrence of contamination

Survey records will be filed and maintained so that previous radiological conditions can be determined. All original survey records will be maintained and retained in accordance with 10 CFR 20 and Fort St. Vrain Decommissioning Technical Specifications.

3.2.8 Instrumentation

A sufficient inventory and variety of operable and calibrated portable, semi-portable and fixed radiological instrumentation will be maintained to allow for effective measurement and control of radiation exposure and radioactive material and to provide back-up capability for inoperable equipment. Equipment will be appropriate to enable the assessment of sources of gamma, beta, and alpha radiation including the capability to measure the range of dose rates and radioactivity concentrations expected. Installed process and effluent monitors will be set up and operated using Offsite Dose Calculation Manual implementing procedures. Calibration procedures for process and effluent monitors will be implemented and maintained.

Accuracy requirements, remote read-out utilization, alarm set points and conditions, and types of surveying or monitoring to be performed will be specified in Radiation Protection Manual implementing procedures. Remote and special monitoring equipment will be obtained and calibrated per approved procedures if required during the decommissioning.

Counting instrumentation is located in multiple laboratory facilities providing back-up capability. Methods to perform manual calculations as a backup to computerized systems will be contained in implementing procedures.

The Radiation Protection Manual will contain administrative and implementing procedures for the following activities:

1. Instrument inventory and control
2. Instrument calibration
3. Instrument operating procedures

3.2.8.1 Instrument Inventory and Control

Radiation Protection Manual implementing procedures will ensure that instruments are calibrated at the required frequency, functioning properly, issued to appropriate personnel and returned when necessary. Special use or dedicated instruments will be marked to ensure they are not used for other purposes. Adequate instruments will be available for radiation surveillance and associated radiation protection measurements, taking into consideration:

1. Number of personnel and numbers of separate work areas requiring surveillance.
2. Frequency and types of surveys or measurements required to support decommissioning activities.
3. Allowance for repair and calibrations.
4. Efforts to minimize delays in personnel access and egress from radiologically controlled areas.
5. Dedicated instruments (if any) that will be required for emergency response.

A minimum instrument inventory level will be established to ensure that decommissioning activities will not be limited due to inadequate survey capability. Table 3.2-2, "Typical Fort St. Vrain Decommissioning Radiation Monitoring Instruments" lists typical equipment which will be available.

Instruments that are broken or require calibration will be tagged out of service by Radiation Protection personnel. The out-of-service instruments will be separated from operable instruments and placed in a designated location until they can be repaired and/or calibrated.

A whole body counter will be maintained onsite and will be capable of identifying approximately 10% of the maximum permissible organ or body burden from those gamma emitting isotopes likely to be encountered (e.g., Co-60, Cs-137).

3.2.8.2 Instrument Calibration

Procedures for calibration and response checks of radiation monitoring equipment and air sampling equipment will be prepared consistent with guidance provided in the following documents:

1. NRC Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operation)", (Ref. 37).
2. NRC Regulatory Guide 8.25 "Calibration and Error Limits of Air Sampling Instruments for Total Volume of Air Sampled", (Ref. 36).
3. ANSI N13.1-1969, "American National Standard Guide to Sampling Airborne Radioactive Material in Nuclear Facilities", (Ref. 38).
4. ANSI N42.14-1978, "Calibration and Usage of Germanium Detectors for Measurement of Gamma-Ray Emission of Radionuclides", (Ref. 39).
5. ANSI N42.3-1969, "American National Standard and IEEE Standard Test Procedure for Geiger-Mueller Counters", (Ref. 40).
6. ANSI N320-1979, "Performance Specifications for Reactor Emergency Radiological Monitoring Instrumentation", (Ref. 41).
7. ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration", (Ref. 42).
8. ANSI/IEEE Std 325-1986, "IEEE Standard Test Procedures for Germanium Gamma-Ray Detectors", (Ref. 43).

The primary calibration frequency for commonly used portable radiation monitoring instruments and portable air sampling equipment will be every 6 months, after repairs or modifications or when malfunctions are suspected. Semi-portable and fixed instrumentation will be calibrated at least annually, after repairs or when malfunctions are suspected. Instrument performance checks (source checks) will be conducted in accordance with ANSI N323 as prescribed in Radiation Protection Manual implementing procedures. At least annually, a review of historical maintenance and calibration trends will be performed for each instrument type. The review will evaluate instrument performance, and the adequacy of calibration frequencies.

Calibration procedures will typically include the following:

1. Instrument specification and limitations
2. Frequency of calibration
3. Description of operating settings/parameters
4. Environmental limitation (if appropriate)
5. References (e.g., instruction manuals, other related procedures, regulatory guidance, etc.)
6. Required equipment for calibration (e.g., sources, tools, jigs, test equipment, etc.)
7. Applicable drawings and schematics

8. Calibration data forms (including as-found/as-left settings, instrument and source identification, charts, etc.)

Laboratory analysis equipment will be calibrated using National Institute of Standards and Technology traceable sources of appropriate geometries and energies. The radiochemistry laboratory will participate in an interlaboratory cross-check program. Documentation of calibrations and cross-checks will be maintained as quality records in accordance with the Fort St. Vrain Quality Assurance Program. Audits of radiation monitoring and air sampling equipment will also be performed in accordance with PDP Section 7, the Fort St. Vrain Quality Assurance Plan.

3.2.8.3 Instrument Operating Procedures

An operating procedure will be prepared for each type of instrument in use, including emergency and special use instruments. Different models of equipment from the same manufacturer with similar features and performance characteristics may be combined into a single procedure, if the operating characteristics are essentially the same, (e.g., Eberline RO-2 and RO-2A). Functional checks of portable radiation monitoring equipment will normally be performed daily or prior to use on the scale(s) expected to be used. Each scale not function checked will be clearly labeled to prevent its use.

Operating procedures will typically include:

1. User responsibilities
2. Instrument and detector description
3. User instructions (including battery check, meter zero, range identification, etc.)
4. Precautions and limitations
5. Identification of proper check sources and associated jigs
6. Performance of source check and/or operational checks

3.2.9 Review and Audit

To ensure the Radiation Protection Program is effectively implemented and maintained, an organized system of review and audits will be implemented in accordance with the Quality Assurance Plan as defined in Section 7.0, "Decommissioning Quality Assurance Plan". Reviews and audits will be conducted by various project organizations and include the following components:

1. Radiation Protection Self Assessments and Reviews
2. Radiation Protection Corporate Oversight and Reviews
3. Quality Assurance Group Audits

3.2.9.1 Radiation Protection Self Assessment and Review

The Project Radiation Protection Manager will be responsible for the quality of work performed by Radiation Protection personnel. The Project Radiation Protection Operations Supervisor will review for adequacy and approve completed radiation survey documentation on a day-to-day basis.

In order to further assure the quality of the Radiation Protection program, Radiation Protection Supervisory Reviews will be planned and conducted by all Project Radiation Protection Supervisors (including the PSC and Project Radiation Protection Manager) on a routine basis. These self assessment/reviews will include in-plant walk downs to directly observe the effectiveness of the Radiation Protection Program including, but not limited to, the following:

1. Radiation protection staff effectiveness
2. Facilities and equipment allocation and use
3. Worker radiological work practices
4. Compliance with Radiation Protection procedures, policies and specifications
5. Compliance with Radiation Work Permit and ALARA programs
6. Conformance with project goals such as person-Rem dose, radioactive waste minimization, etc.

Deficiencies and other findings will be documented and addressed in accordance with Section 3.2.10, Radiation Protection Performance Analysis.

3.2.9.2 Radiation Protection Corporate Oversight and Review

The PSC Facility Support Manager and the PSC Senior Health Physicists are responsible for overseeing the Radiation Protection Program to ensure proper implementation.

Periodic reviews, audits and monitoring of the Radiation Protection Program will be performed to ensure the following:

1. The Radiation Protection Manual and implementing procedures are adequate to meet the Radiation Protection Program as described in Decommissioning Plan.
2. The Radiation Protection Manual and implementing procedures are being followed.
3. The Radiation Protection Manual and implementing procedures are adequate to meet the applicable regulations.
4. The Radiation Protection Program objectives are met.
5. The Radiation Protection Program is being effectively implemented and maintained.
6. The work completed is in accordance with the Fort St. Vrain Project Quality Plan.

3.2.9.3 Quality Assurance Group Audits

The PSC Quality Assurance group and the Westinghouse Quality Assurance organizations will conduct planned audits, reviews and assessments of the Radiation Protection Program in accordance with the Fort St. Vrain Project Quality Plan and in compliance with applicable items of PDP Section 7.

3.2.10 Radiation Protection Performance Analysis

The Radiation Protection staff will establish methods to identify radiological incidents and radiological deficiencies in order to determine root causes and correct errors that cause radiological performance problems. Detailed performance monitoring requirements and activities will be described in and implemented by the Radiation Protection Manual which will consist of administrative and implementing procedures.

3.2.10.1 Radiological Occurrence Reports

Radiological Occurrence Reports will be classified as either a "Deficiency" or an "Incident". Principle elements of the reporting program will include, but not be limited to:

1. A Radiological Occurrence Report may be completed by anyone identifying a radiological occurrence. The report will include pertinent information relating to the occurrence (e.g., date, time, individual reporting occurrence, location, observations, etc.).
2. Radiological Occurrence Reports will be submitted to Radiation

Protection Supervision for review, and classification.

3. The Project Radiation Protection Manager and the PSC Facility Support Manager will approve corrective actions and implement disciplinary actions, when applicable for designated classes of occurrences.
4. A root cause evaluation for designated types and levels of occurrences will be used,as applicable, to determine the circumstances and causes of the event and to develop short-and long-term corrective actions to prevent recurrence. The evaluations will be conducted by the cognizant first line supervisors and managers with assistance from the Radiation Protection staff.
5. A tracking system for Radiological Occurrence Reports and corrective actions will be implemented. The reports will be trended and evaluated periodically to integrate lessons learned, licensee experience and experience from others into Radiation Protection program improvement. Records will be maintained in accordance with regulatory requirements and company procedures.

3.2.10.2 Radiological Deficiencies

Radiological "Deficiencies" are occurrences involving poor radiological work practices with relatively minor consequences, but require supervisory action for proper resolution. Examples of occurrences attributable to Radiological Deficiencies include, but are not limited to, the following:

1. Failure to comply with radiological posting.
2. Failure to comply with Radiation Protection procedures.
3. Lost dosimetry.
4. Improper frisking.
5. Personnel contamination instances above a designated level.
6. Poor radiological work practices.
7. Improper use of, or problems with, respiratory protection equipment.
8. Eating, drinking, smoking, or chewing in the radiologically controlled area.
9. Failure to comply with Radiation Work Permit requirements.
10. Unnecessary generation of radioactive or mixed waste.
11. Operation and maintenance of equipment in a radiologically unsafe manner.

These types of occurrences will be evaluated for possible deficiencies in areas such as training, procedures, equipment and human performance. Appropriate corrective action and follow up will be required by the Project Radiation Protection Manager or designee.

3.2.10.3 Radiological Incidents

Radiological "Incidents" are occurrences that have, or could have the potential for, violating Federal Regulations and Fort Saint Vrain Decommissioning Technical Specifications or involve a serious breakdown in the effectiveness of the Radiation Protection Program. Examples of occurrences that would be considered Radiological Incidents include, but are not limited to the following:

1. Radiation exposures exceeding federal limits.
2. Radiation exposures exceeding administrative limits without previous authorization.
3. Radioactive body burdens in excess of 25% Maximum Permissible Organ Burden.
4. Unplanned exposures of individuals to airborne radioactivity in excess of 2 MPC-hours per day or 10 MPC-hours in any seven consecutive days.
5. Significant spills or spread of radioactive materials that affect decommissioning activities.
6. Lost radioactive materials or radioactive materials found in uncontrolled areas.
7. Flagrant violations of dosimetry procedures, such as failure to wear or improperly wearing required dosimetry.
8. Lack of or improper access control for High Radiation Areas.
9. Improperly posted areas, especially high radiation areas.
10. Failure to follow instructions and "stop work" orders.
11. Damaged or leaking radioactive material shipments.
12. Flagrant violation of Radiation Protection Procedures.

Incidents that are required to be reported in accordance with NRC Regulations will be addressed in accordance with the PSC Licensee Event Report Program. Radiological Occurrence Reports involving Radiological Incidents will be investigated and critiqued by a team assigned by the PSC Radiation Protection Manager or the Project Radiation Protection Manager. The team will normally consist of a PSC Senior Health Physicist, a Project Radiation Protection Staff Member, and the affected organization. Appropriate corrective action will be required to prevent recurrence. Completed Radiological Occurrence Reports and investigations will be reviewed by the ALARA committee and the Decommissioning Safety Review Committee, as appropriate, depending on the type of occurrence and the severity.

3.2.11 Radiation Work Practices

Standardized radiation work practices and engineering controls will be located in the Radiation Protection Manual administrative and implementing procedures. Radiation work practices and engineering controls will also be incorporated into work specifications, engineering designs and work packages involving radiation exposure or handling of radioactive materials as indicated in Section 3.2.5.1. Typical radiation work practices that will be addressed, include:

1. Radiation exposure reduction methods
2. Radiation work performance methods
3. Use of temporary shielding
4. Contamination control equipment
5. Work area ventilation
6. Decontamination processes
7. Liquid and solid waste processing
8. Control system for contaminated tools
9. Use of protective clothing

3.2.11.1 Radiation Exposure Reduction Methods

Specific work activities/tasks with the potential for moderate or high radiation exposure will require that radiological controls be incorporated into planning and scheduling development, written instructions be prepared, and pre-job briefings be conducted prior to commencing work and post-job debriefings be conducted for lessons learned. Radiological conditions that will be considered include:

1. Presence of radioactive liquids.
2. Potential for high activity sources or contamination (PCRV disassembly).
3. Potential for creating Hot Particles (PCRV pool work).
4. Transient high radiation levels (e.g. PCRV disassembly).
5. Airborne radioactivity (e.g. opening a system).
6. Specific radiological evaluations upon occurrence of unusual events

(e.g., notify Radiation Protection for radiation monitor alarms).

7. Reminder of the need to follow the Radiation Work Permit which may have special controls associated and therefore longer lead time for Radiation Protection preparation.
8. Precautions for work when systems are in unusual status or configuration.
9. Changing of system status which may affect radiological conditions (e.g., starting and stopping the PCRV water purification system).

Engineering Controls

Radiation Protection engineering controls considered during ALARA reviews and RWP preparation. Examples of engineering controls will include, but will not be limited to, the following:

- Temporary shielding
- Specialty and remote handling tools
- Contamination control containments
- HEPA ventilation systems
- Decontamination equipment and techniques
- Remote surveillance systems

3.2.11.2 Radiation Work Performance Methods

Planning for radiological work is an essential element in assuring an efficient use of resources, maintaining control of radioactive material, and keeping worker exposure ALARA. An objective of planning will be to provide adequate time for each affected department to prepare for radiological work. Planning will typically include the following considerations:

1. Provide adequate time for work area preparation, including removal of hazards, in addition to radiological hazards, to provide a safe working environment.
2. Decontaminate work areas to increase worker efficiency.
3. Install systems to contain radioactive materials.
4. Provide workers with specialized training and other identified ALARA requirements.
5. Incorporate previous experience on similar jobs.

3.2.11.3 Use of Temporary Shielding

Temporary shielding will be used to reduce dose rate levels near "hot spots" and in the general area where work is to be performed. Determination as to the type and amount will be evaluated by Radiation Protection personnel. An implementing procedure will be used for the control and use of temporary shielding. Additional details on temporary shielding is covered in Section 3.2.5, Dose Controls.

3.2.11.4 Contamination Control Equipment

Contamination will be controlled by employing a variety of engineering controls including HEPA ventilation, enclosures, strippable paint, and area/component decontamination. Examples of contamination control methods that will be used, include:

1. The PCRV will be filled with water to control radioactive particulates that would normally be released when handled in air.
2. Containment or enclosures of appropriate size, equipped with HEPA ventilation, will be used as necessary to prevent the spread of contamination while contaminated graphite blocks and other components are being removed from the PCRV or otherwise handled.
3. A work platform will be installed on the PCRV after the PCRV head has been removed. The platform will be equipped with a HEPA-filtered ventilation system that will exhaust air from beneath the work platform. This airflow will minimize the spread of contamination.
4. A debris collection system will be used in concrete cutting operations to minimize the spread of contamination.
5. Strippable paint or other suitable enclosures will be applied to some radiologically clean components or areas to prevent cross-contamination.

Additional contamination control methods will be considered during job planning and work package review. Isolation containments may be used to minimize the spread of contamination if the surrounding work area is uncontaminated or is much cleaner than the work area.

Rad' ion Protection Manual implementing procedures will provide guidance on the application and use of contamination control equipment. Examples of equipment include, but are not limited to:

- HEPA ventilation
- Containments
- Glove bags
- HEPA vacuums
- Strippable paint
- Sheeting (e.g. plastic, herculite)

3.2.11.5 Work Area Ventilation

Portable HEPA ventilation units will be used in work areas for the control of airborne contaminants during work activities that have the potential for airborne contamination generation (e.g., burning, welding, grinding). Periodic tests will be conducted to assure air flows are from areas of low potential airborne contamination to areas of higher potential contamination. Containments or tents may also be used in conjunction with HEPA ventilation to control airborne contamination. Radiation protection implementing procedures will provide instruction on the use and control of portable HEPA ventilation units.

3.2.11.6 Decontamination Processes

Various decontamination processes will be employed during decc missioning to prevent the spread of contamination, minimize the potential for internal uptake and reduce the associated radiation levels for ALARA purposes. Examples of decontamination processes which will be used, include:

- Scabbling
- Hydrolazing
- Strippable coatings
- Chemical cleaning
- Abrasive blasting
- Ultrasonic cleaning
- HEPA vacuuming
- Hands on decontamination

3.2.11.7 Liquid and Solid Waste Processing

Process controls will be applied to the identification, collection, processing, packaging and disposal of radioactive waste to ensure compliance with state and federal applicable regulations. Radioactive waste processing and controls are addressed in Section 3.3.

3.2.11.8 Control System For Contaminated Tools.

Storage areas and hot tool cribs will be identified for the project, and will be used for the storage of reusable contaminated tools, components, equipment and materials. This designated storage will help to prevent the spread of contamination and maintain radiation doses ALARA. Implementing procedures will include the control and use of contaminated tools and equipment.

3.2.11.9 Area Posting.

Supplemental postings will be used to provide additional information to workers. These postings will be used in conjunction with the required posting and may contain the following types of information/instructions.

1. Contact Radiological Protection for Entry
2. Hot Particle Controls Area
3. Frisk Hands and Feet Prior to Exiting
4. Potentially Contaminated Area (e.g., in overheads)
5. Internal Contamination (e.g., inside electrical panels)
6. "Keep Out" Radiography in Progress
7. Radiation Work Permit Required for Entry

3.2.11.10 Description and Functions of Protective Clothing.

Protective clothing will be provided for personnel working in contaminated areas and will be required as specified on RWPs. Selection and use of protective clothing will be based on known and expected contamination levels in the work area, as well as the expected working conditions. Protective clothing requirements will be specified on Radiation Work Permits. To ensure the proper control and use of radiological protective clothing, they will be used as indicated by Radiation Work Permits. Instructions for the proper donning and removal of protective clothing will be addressed as part of Radiation Worker Training.

Containers for the disposal of used protective clothing will normally be placed at the exits of contaminated areas. Used protective clothing will be treated as potentially contaminated and handled as such.

Implementing procedures will be developed for the control and laundering of contaminated protective clothing. Reusable protective clothing will be used whenever possible. Laundry will be monitored for acceptable residual contamination levels prior to reuse.

TABLE 3.2-1
OCCUPATIONAL RADIATION EXPOSURE (ORE) ESTIMATES

(PCRV DISMANTLEMENT ACTIVITIES)

DESCRIPTION OF WORK ACTIVITY	SCHEDULED WORK TIME (Per-Hrs)	WORKER EXPOSURE TIME[1] (Per-Hrs)	CREW AVG. RADIATION FIELDS (Per-Hrs)	WORKER EXPOSURE (Per-Hrs)
PCRV INITIAL PREPARATION/DISASSEMBLY				
Modify Main Crane	682	341	0.1	0.03
Detension PCRV Tendons	25,590	12,795	0.1	1.28
Remove Core Elements with FHM				
PCRV Region Constraint Devices	2,208	1,104	1.7	1.88
Remove Metal Clad & CRD Blocks	12,267	6,134	0.4	2.45
Helium Purification Component Wells	2,013	1,007	1.0	1.00
SUBTOTAL		21,381		6.64
SHIELDED ACCESS TO PCRV				
Seal PCRV Cooling Tubes & Tendon Conduits	4,110	2,055	1.0	2.06
Center Access Penetration	1,190	595	1.1	0.65
PCRV Shield Water System	4,980	2,490	1.0	2.49
Airborne Contamination Control System	3,633	1,816	0.3	0.54
Cut PCRV Top Head	21,660	10,830	1.1	11.91
Flood PCRV	180	90	0.6	0.05
PCRV Cavity Shielded Work Platform	1,325	663	1.0	0.66
SUBTOTAL		18,539		18.36
DISMANTLE PCRV CORE COMPONENTS				
Defueling Elements	16,683	8,342	1.7	14.18
Replaceable and Permanent Hex Reflector Blocks	16,683	8,341	3.7	30.86
Large Side Reflector Blocks	27,782	13,891	3.6	50.00
Boronated Spacer elements	16,683	8,342	1.9	15.85
Hastelloy Can Hex Reflector Blocks	8,341	4,170	6.8	28.36
Core Support Blocks and Posts	2,780	1,390	1.8	2.50
SUBTOTAL		44,476		141.75

[1] - Exposure work time (worker efficiency) is estimated to be 50% of scheduled work time for PCRV tasks where the potential for radiation exposure exists.

TABLE 3.2-1 (Continued)
OCCUPATIONAL RADIATION EXPOSURE (ORE) ESTIMATES

(PCRV DISMANTLEMENT ACTIVITIES)

DESCRIPTION OF WORK ACTIVITY	SCHEDULED WORK TIME (Per-Hrs)	WORKER EXPOSURE TIME[1] (Per-Hrs)	CREW AVG. RADIATION FIELDS (Per-Hrs)	WORKER EXPOSURE (Per-Hrs)
CORE BARREL, INSULATION & CSF D/D				
Core Barrel and 24 Outer Keys	4,913	2,456	9.2	22.59
24 Core Barrel to Graphite Lower Key Removal	952	476	13.3	6.33
24 Core Barrel to Graphite Upper Key Removal	1,624	812	10.0	8.12
Core Support Floor	7,762	3,881	12.5	48.51
Top CSF Insulation	1,350	675	11.2	7.56
SUBTOTAL		8,300		93.11
PCRV LOWER PLENUM D/D				
12 Steam Generator Primary Modules	14,688	7,344	0.8	5.88
12 Steam Generator Secondary Modules	7,594	3,797	4.7	17.85
4 Helium Circulator Primary Modules	1,056	528	11.1	5.86
4 Helium Circulator Secondary Modules	1,144	572	3.5	2.00
CSF Columns, Lower Plenum Floor, and Supports	1,144	572	22.2	12.70
PCRV Inside Top, Bot. & Side Insulation/Plates	3,388	1,694	5.7	9.66
SUBTOTAL		14,507		53.95
FINAL PCRV DISMANTLE, DECON & CLEANUP				
Remove Beltline Activated Concrete	17,284	8,642	1.7	14.52
Decon Lower PCRV Liner	984	492	0.8	0.39
PCRV Wall & Liner Penetrations;	7,404	3,702	0.2	0.79
PCRV Safety Valve Instrumentation & Piping				
Demobilize and Cleanup Area	1,440	720	0.3	0.22
Decon PCRV for Final Release Survey	1,440	0	0.0	0.00
SUBTOTAL		13,556		15.92
HP & QA COVERAGE (11%)		13,283		36.26
GRAND TOTAL - PCRV ORE		134,042		366.00

[1] Exposure work time (worker efficiency) is estimated to be 50% of scheduled work time for PCRV tasks where the potential for radiation exposure exists.

TABLE 3.2-1 (Continued)
OCCUPATIONAL RADIATION EXPOSURE (ORE) ESTIMATES

(BOP DISMANTLEMENT ACTIVITIES)

DESCRIPTION OF WORK ACTIVITY	SCHEDULED WORK TIME (Per-Hrs)	WORKER EXPOSURE TIME[1] (Per-Hrs)	CREW AVG. RADIATION FIELDS (Per-Hrs)	WORKER EXPOSURE (Per-Hrs)
RADIOLOGICAL CHARACTERIZATION	7,279	7,279	<1	0.25
BOP DISMANTLEMENT OPERATION				
System 13 Fuel Handling System	4,648	4,648	<1	0.22
System 14 Fuel Storage Wells	3,742	3,742	<1	0.10
System 16 HSF, ATC and ESWs	4,477	4,477	<1	0.10
System 23 Helium Purification System	5,448	5,448	<1	0.23
System 46 Reactor Plant Cooling Water	1,500	1,500	<1	0.06
System 47 Purification Cooling Water	250	250	<1	0.02
System 61 Decontamination System	3,493	3,493	<1	0.10
System 62 Liquid Waste System	10,610	10,610	<1	0.25
System 63 Gas Waste System	9,948	9,949	<1	0.13
System 72 Reactor Building Drain	4,577	4,577	<1	0.02
System 73 Reactor Plant Ventilation	1,694	1,694	<1	0.02
System 93 I & C Piping, Instrumentation, & Structure External to PCRV	1,370	1,370	<1	0.02
Contaminated Laundry Facility & Radwaste Compactor	930	930	<1	0.01
HP coverage (10%)		5,997		0.15
SUBTOTAL BOP		65,963		1.68
RADWASTE PROCESSING AND SHIPPING	30,050	30,050	VARIOUS	59.43
HP Coverage (10%)		3,005		5.94
SUBTOTAL		33,055		65.37
GRAND TOTAL - PCRV, BOP, RADWASTE PKG		233,060		433.06

[1] - Exposure work time (worker efficiency) is estimated to be 100% of scheduled work time for BOP and Radwaste tasks where the potential for radiation exposure exists.

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TABLE 3.2-2
TYPICAL FORT ST. VRAIN
DECOMMISSIONING MONITORING INSTRUMENTS

MANUFACTURER	MODEL	NAME	RANGE	SENSITIVITY	RADIATION DETECTED
DOSIMETERS					
DCA	N/A	Self-reading dosimeter	0 - 200 mR	5 mR	Gamma
D[illegible]	N/A	Self-reading dosimeter	0 - 200 mR	5 mR	Gamma
PORTABLE SURVEY METERS					
Eberline	RO-2 RO-2A	Air ion chamber with beta window, battery powered	0-5 to 0-5000 mR/hr 0-5 to 0-50,000 mR/hr	0.5 mR/hr minimum, 80 keV to 3 MeV ±20%	Gamma Dose rate beta dose rate
Eberline	RO-5A/D	Air ion chamber with beta window, battery powered	0.1 to 1999 mR/hr & 0.01 to 199.9 R/hr	0.5 mR/hr minimum, 80 keV to 3 MeV ±20%	Gamma dose rate beta dose rate
Eberline	RO-7 RO-7BH RO-7LD RO-7BM	Air ion chamber with remote detector (to 500 ft) with beta window, battery powered	0 to 20,000 R/hr	Varies based on probe	Gamma dose rate
Eberline	Teletector 6112B	Portable high range gamma dose rate instrument with extending probe and two energy compensated GM detectors	Five nonlinear ranges to 1000 R/hr	80 keV to 3 Mev ±20%	Gamma dose rate
LOW LEVEL CONTAMINATION METERS					
Eberline	E-520/ HP-190A	GM survey meter, 1.4 to 2.0 mg/cm^2 1-inch end window uncompensated GM detector	1 to 24,000 cpm	Approximately 6% for 1-inch Tc-99 plated soucre	Beta
Eberline	PAC-4G-3/ AC-21	Alpha survey meter; four decade lin-log (tm) meter with alpha gas flow proportional detector	0 to 500,000 cpm	50% of 2 pi for distributed plated alpha source	Alpha only
Eberline	PAC-4S/ AC-3	Alpha survey meter; four decade lin-log (tm) meter with alpha scintillation detector	0 to 2,000,000 cpm	20 to 30% of 2 pi for a distributed plated alpha source depending on window thichness	Alpha only

TABLE 3.2-2 (Continued)
TYPICAL FORT ST. VRAIN
DECOMMISSIONING MONITORING INSTRUMENTS

MANUFACTURER	MODEL	NAME	RANGE	SENSITIVITY	RADIATION DETECTED
LOW LEVEL DOSE RATE METERS					
Ludlum	Model 19 μR meter	Portable gamma rate meter with internal NaI scintillation detector	0-25 to 0-5000 μR/hr in 5 ranges	Energy dependent	Gamma only
PERSONNEL FRISKERS					
Eberline	RM-14	Frisker, pancake GM, with alarm, AC or battery operation	0-500 to 0-50,000 cpm	5000 dpm/100 cm^2	Beta (10%), gamma (1%)
Eberline	PCM-1B	Contamination monitor	N/A	3000 - 5000 dpm/100 cm^2	Beta, gamma
IRT	PM-6	Portal Monitor	N/A	Varies with bkg and mode of operation	Beta, gamma
Eberline	RM-15	Single channel count rate meter, GM pancake probe, with alarm, AC or battery operation	0-500 to 0-500,000 cpm	5000 dpm/100 cm^2	Beta (10%) Gamma (1%)
AIR SAMPLERS					
RaDeCo	H-809V1	Portable AC powered air sampler	3 ft^3/min	N/A	N/A
Buck	Buck SS Pump	Portable battery powered air sampler	600 - 5000 cc/min	N/A	N/A
Eberline	PING-1A	Airmonitor	10 - 10^6 cpm	Cs-137 5 cpm/hr for 1x10^{-11} μCi/cm^3 3.67 cpm/hr for 1x10^{-11} μCi/cm^3	Beta particulate
RASP	Low Volume	Air sampler	0.1 to 5 ft^3/min	N/A	N/A
Staplex	High Volume	Air sampler	10 ft^3/min	N/A	N/A
AREA MONITORS					
Various	Various	Area Monitor	Variable based on probes	40 keV to 1.3 MeV - 20%	Gamma dose rate

TABLE 3.2-2 (Continued)
TYPICAL FORT ST. VRAIN
DECOMMISSIONING MONITORING INSTRUMENTS

MANUFACTURER	MODEL	TYPE OF DETECTOR
SAMPLE ANALYSIS AND CALIBRATION LABORATORY EQUIPMENT		
Harshaw	TASC-12 A6	Solid State Detector
Tennelec	LB 5100	Gas flow proportional
Eberline	BC-4	GM detector
Canberra	Spectrum F Series	GeLi Detector
Beckman	3801	Liquid Scintillation
Beckman	Shadow Chair	Sodium Iodide Detectors or equivalent
Various	Various	Air sampler calibrators
MDH/RADCA	2025	Radiation Monitor used as a transfer instrument
Various	Various	Radiation sources with traceability to NIST
J.L. Sheperd	89-1	Shielded calibration sources

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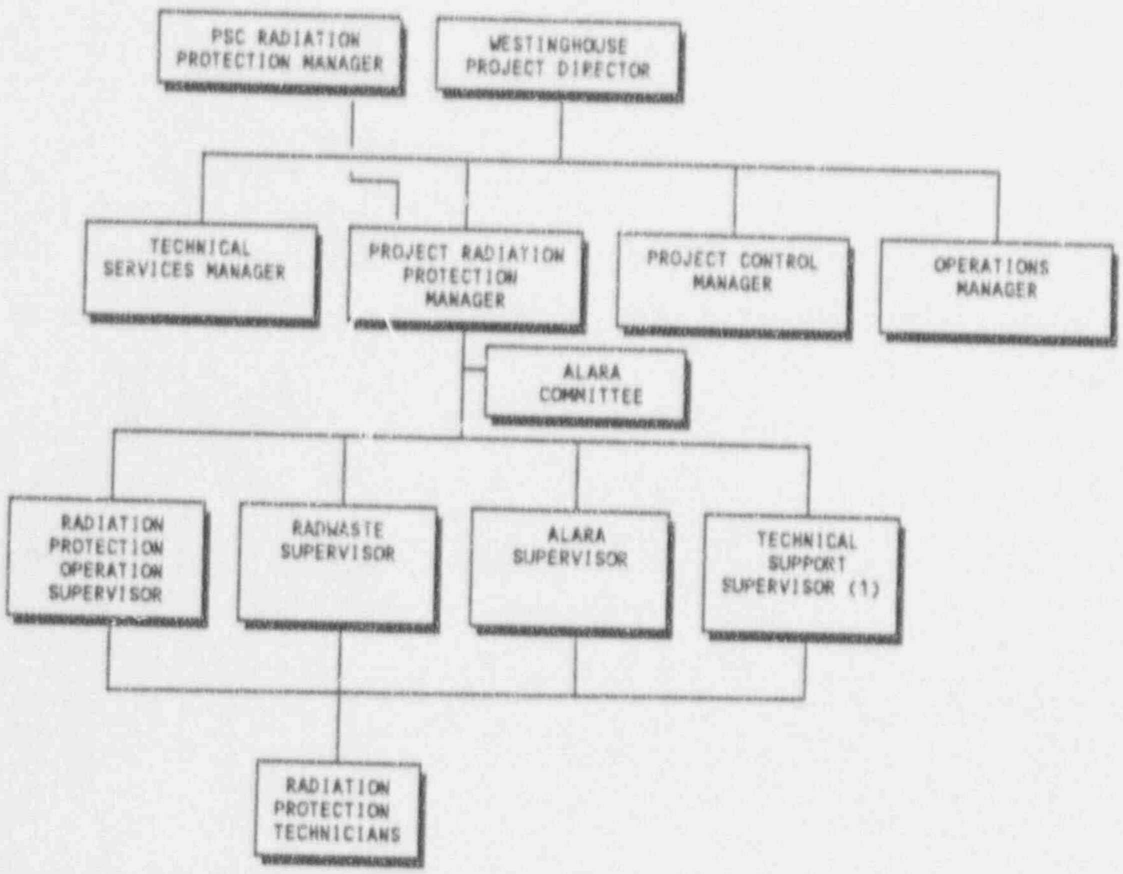

Figure 3.2-1 Westinghouse Team Radiation Protection Organization Chart

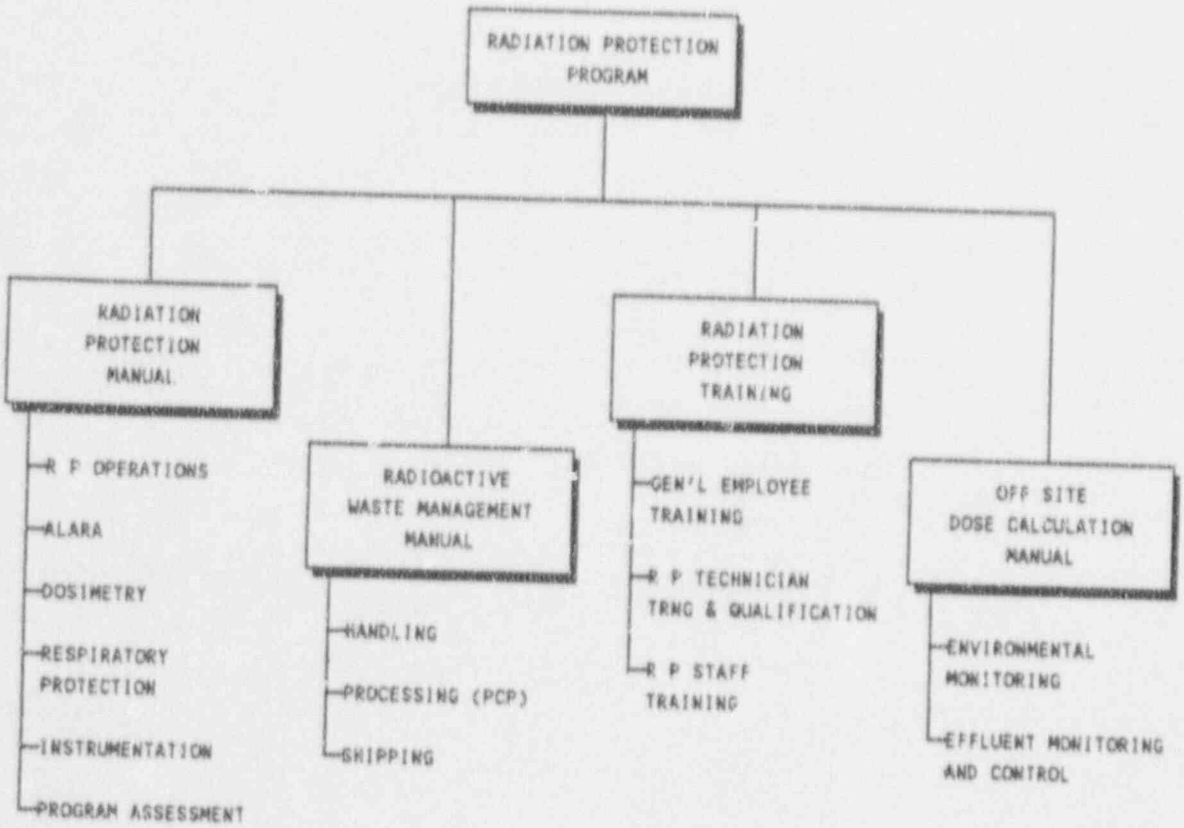

Figure 3.2-2 Radiation Protection Program Manuals Structure

3.3 RADIOACTIVE WASTE MANAGEMENT

This section addresses the technologies, equipment, and procedures to be implemented for the management of radioactive waste during the Fort St. Vrain (FSV) decommissioning project. These technical approaches are based upon experience and address facets of planning, decontamination, packaging, storage, transportation, volume reduction or beneficial reuse, and final disposition of the waste materials, while minimizing secondary wastes.

In developing the Radioactive Waste Management Program, many elements were considered, including the following:

1. End use of the facility
2. Location and availability of disposal facilities
3. Potential for offsite release during D/D operations
4. Preventing contamination of uncontaminated areas
5. Use of existing buildings to support the waste packaging operations
6. Methods of approach related to waste type, waste class, and impact on safety
7. Cost effectiveness
8. Logical approach to the D/D operations
9. Ensuring that the occupational exposures are maintained as low as reasonably achievable (ALARA)
10. Minimizing the impact on the health and safety of the general public
11. Maintaining flexibility for waste management to allow for unexpected wastes and changes in available technology
12. Effective implementation of a Process Control Program for radioactive wastes

This section contains a description of the following activities associated with the radioactive waste management program:

- Spent fuel disposal (3.3.1)
- Radioactive Waste processing (3.3.2)
- Radioactive waste disposal (3.3.3)
- Disposal of non-radioactive wastes (3.3.4)

3.3.1 Defueling to the Independent Spent Fuel Storage Installation

Although not related to proposed decommissioning plans, the following information is provided on the ultimate disposition of the Fort St. Vrain spent fuel.

Due to the uncertainty of shipping of spent fuel to Idaho or other DOE facilities, PSC pursued an alternate plan to license, construct and operate an Independent Spent Fuel Storage Installation (ISFSI) in accordance with 10 CFR 72. The NRC issued PSC an Environmental Assessment of No Significant Impact for the ISFSI on February 1 1991 (Ref. 44), and PSC commenced construction on the same date.

The ISFSI facility is located immediately adjacent to the current site. The actual location is outside the plant's existing Protected Area, approximately 1500 feet northeast of the Reactor Building. The ISFSI, using the Modular Vault Dry Store (MVDS) System, is designed to store up to 1482 fuel elements, up to 37 metal clad reflector blocks (MCRB's) and up to 6 neutron sources.

Following review of PSC's application, the NRC granted PSC a 10 CFR 72 license on November 4, 1991 (Ref. 45). PSC commenced defueling to the ISFSI on December 26, 1991. Defueling to the ISFSI is on schedule to allow completion of defueling by mid 1992, which will allow decommissioning to commence not later than mid 1992.

3.3.2 Radioactive Waste Processing

3.3.2.1 Program Description

For materials that may contain licensed radioactive material, radiological surveys will be performed to determine the extent of the contamination or activation. Based on these results, options for decontamination or disposal, packaging, and processing will be determined.

Onsite packaging or processing of radioactive waste prior to transportation will be performed in areas appropriate for these activities. Examples of such areas are the Hot Service Facility (HSF), the gas waste compressor rooms (Reactor Building level 1, el. 4740'), the Compactor Building, and the Fuel Storage Building.

Items not considered for decontamination or items that, following decontamination, are considered to have too high a specific activity for offsite volume reduction, will be packaged and shipped directly for disposal at a licensed burial facility. Greater than Class C (GTCC) wastes, if any, will be packaged for onsite storage and subsequent shipment to a designated storage or disposal facility.

Radioactive wastes are expected to be categorized as follows:

1. Potentially contaminated or requiring minor spot decontamination: These include potentially contaminated materials that: 1) appear to be uncontaminated; 2) all surfaces are easily accessible; and 3) have a small surface area-to-weight ratio will be surveyed to determine if the material can be released for unrestricted use without decontamination or with minor decontamination effort. For example, a small surface area with only spot and/or smearable contamination can easily be decontaminated by such means as wiping, grinding, or removing the hot spot.
2. General contamination with accessible surfaces and a low area-to-weight ratio: Materials with readily accessible surfaces for purposes of surveying and decontamination, and that possess a low surface area-to-weight ratio may be shipped directly to a licensed offsite processing facility for decontamination of the surfaces and final disposition.
3. General contamination/inaccessible surfaces/high surface area-to-weight ratio: Smaller metallic scrap or metals with inaccessible surfaces for performing surveys (e.g., previously sheared material) will be assumed to be contaminated and be packaged for shipment for further processing at a licensed facility or shipped directly to burial.
4. Activated: Activated materials and high specific activity materials (primarily concrete, metals and graphite components), will either be packaged and shipped direct for disposal or to a licensed facility for further processing and volume reduction.

Radioactive materials as categorized above will be evaluated to determine the optimum method for release, decontamination, or shipment offsite for further processing or for burial. The following onsite and offsite methods will be considered.

1. Onsite processing of liquid wastes.
2. Onsite processing, release and disposal options for tritiated liquid |

wastes.

3. Onsite filtration of airborne wastes.
4. Onsite decontamination.
5. Onsite waste volume reduction.
6. Onsite packaging.
7. Offsite decontamination.
8. Offsite volume reduction.
9. Offsite repackaging/consolidation for disposal.

3.3.2.2 Onsite Processing of Liquid Wastes

During the Fort St. Vrain decommissioning project, contaminated water will be generated through several processes (such as diamond wire cutting, flooding of the PCRV, rinsing of contaminated components removed from the PCRV) and through decontamination operations. Flooding the PCRV will put into solution radionuclides that exist in the PCRV as a result of activation and plateout. Of primary concern are tritium and the gamma-emitting isotopes Cs-137 and Co-60. Expected releases of tritium from graphite components into the PCRV shield water is discussed in PDP Section 3.1.5. Tritium processing, release and disposal options are discussed in the following section (Section 3.3.2.3).

Releases of PCRV Shield Water will be processed through the PCRV Shield Water System where filters and demineralizers will substantially reduce the concentration of radionuclides, with the exception of tritium. As shield water is released, it will be replaced with clean water.

Initially, water to be released will be transferred to a liquid waste holdup tank in the existing Radioactive Liquid Waste System (System 62) for sampling and analysis. After the water in the PCRV has been processed to the extent that the concentrations of Co-60, Cs-137 and Fe-55 in the entire PCRV water volume are less than approximately 1.0% of the 10 CFR 20 MPC limits, the water will be sent directly to the discharge line, where it will be diluted with blowdown flow and released. Liquid effluent is diluted by a minimum factor of 110 before discharge to the Goosequill Ditch. The liquid waste holdup tank will not be used. At that time, the entire PCRV will be considered a process tank and releases will be made directly to the dilution point, as long as no activities are in progress inside the PCRV that could stir up additional contaminants.

Operating simplicity of this system will minimize the radwaste movement, handling and personnel exposure. Spent resins and filter media requiring stabilization will be processed in accordance with the Process Control Program (PCP). The PCP shall contain the current formulas, sampling, analyses, tests, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61, and 71, 49 CFR 100, State regulations, disposal site burial requirements, and other requirements governing the disposal of solid radioactive waste. When possible, this will be done inside the disposal package or liner to minimize additional waste handling prior to disposal.

3.3.2.3 Tritium Processing, Release and Disposal Options

A. Tritium Release Alternatives

Since tritium cannot be removed from the water by processing, it must either be diluted to releasable levels or disposed of as radioactive waste. The release option was chosen for the low tritium concentrations expected in the PCRV Shield Water System. The PCRV Shield Water System, discharging to the existing Fort St. Vrain plant liquid effluent stream, was selected as the best possible release path for tritium in the PCRV shield water. In addition, occupational and public doses from effluent discharge operations are the lowest of all the alternatives evaluated. This effluent discharge path was fully analyzed in the Fort St. Vrain FSAR and the original Supplement to the Environmental Report (Ref. 46), and the impacts during normal plant operations were determined to be acceptable to the NRC. Moreover, the PSC environmental monitoring program, which complies with the Regulatory Guide 1.21 (Ref. 47), has confirmed no significant impacts to the environment due to discharges of tritiated water over the last fifteen years of operation.

The current tritium discharge pathway is modeled by the Fort St. Vrain Offsite Dose Calculation Manual (ODCM) from this release pathway. This pathway currently has adequate measuring and monitoring capabilities for the anticipated discharge level (both water quantity and curie content). This pathway provides adequate water to dilute the anticipated quantity of tritium to below 10 CFR 20 limits.

In summary, the discharge of tritium to the existing Fort St. Vrain liquid effluent stream provides the most advantageous method for tritium release during decommissioning. In addition, it is an accepted and demonstrated safe method that will minimize both occupational and public doses.

B. Solidification of Highly Tritiated Water

In the unlikely event that the amount of tritium entering the water greatly exceeds the expected levels, and the effluent discharge release method cannot be used, alternate disposal methods are available. In this case, after tritium pickup by the water is complete and suitable containers are in place, a feasible contingency plan is to remove the water from the PCRV in its entirety and solidify it for disposal. An acceptable solidification process would be to use Aquaset, which has a solidification efficiency of 45 gallons in a 55 gallon drum and requires about 1 hour per drum.

Appropriate radiological controls would be implemented during the solidification of the tritiated water to maintain external and internal radiation exposures ALARA. Because of the increased costs and inability to continuously improve water quality, the solidification method would not be used unless the tritium level greatly exceeds expected levels. Solidification of highly tritiated water is discussed here to demonstrate that suitable technology is currently available, and to establish a bounding cost for disposal should the preferred method not be suitable.

C. Tritium Release and Monitoring

The PCRV will be filled with approximately 325,000 gallons of water. No discharge will be made until the trend of tritium concentration is determined. The initial concentration of tritium in the PCRV (approximately 5 days after fill) is estimated to be less than 0.40 μCi/ml, based on 500 Ci of tritium diluted in 325,000 gallons of water.

The Decommissioning Technical Specifications require that the PCRV water be sampled and analyzed daily for tritium concentrations during the initial fill of the PCRV. Sample frequency may be reduced to weekly after the tritium concentration has decreased to less than 0.1 μCi/ml. Limits have been established in the Decommissioning Technical Specifications to assure that tritium activity concentrations in the PCRV Shield Water System will not exceed those postulated in the decommissioning accident analyses.

Once the trend of tritium concentration in the PCRV is established, discharge will begin. Water from the PCRV will be processed through the PCRV Shield Water System and a side stream will be transferred to a liquid waste holdup tank in the existing plant Radioactive Liquid Waste System (System 62). The tank will be sampled for tritium and other principal radionuclides. Based on sample results and the limits prescribed in the Fort St. Vrain Offsite Dose Calculation Manual (ODCM) (Ref. 48), an allowable release rate will be determined. This method of redundant monitoring will ensure that the desired discharge concentration (less than MPC) is not exceeded. Tritium in liquid effluent will be released within the following limits:

1. EPA Safe Drinking Water Standards in 40 CFR 141 (20,000 pCi/l average concentration), at the downstream sampling location located approximately 5 miles downstream of the effluent discharge location.
2. 10 CFR 50 Appendix I limitations on doses to individual members of the public (1.5 mRem whole body per quarter, 3 mRem whole body per year).
3. 10 CFR 20 MPC limits on concentrations in effluents released to unrestricted areas.

Administrative controls will be implemented to ensure that the above limits are met. The above standards also ensure compliance with the 40 CFR 190 EPA public dose limits of 25 mRem per year.

After sampling, the liquid in the liquid waste holdup tank will be initially discharged at a rate from 1.4 - 10 gpm and diluted by the cooling tower blowdown flow prior to release to the surrounding surface water. The minimum cooling tower blowdown flow of 1100 gpm defined in the ODCM will ensure a dilution factor of more than 100. Figure 3.3-1 shows a representative decrease in PCRV tritium concentration assuming a discharge of up to 10.9 Curies per day (2000 gpm cooling tower blowdown discharge) until tritium concentrations drop below levels where this rate can be maintained without requiring dilution to meet 10 CFR 20 limits. Tritium concentration will continue to be reduced, and after approximately 3 months of effluent discharge operations, the PCRV water tritium concentrations will be low enough to allow direct discharge to the environment (i.e., less than 10 CFR 20 MPC limits). Discharge at a slower rate (1100 gpm, resulting in a release rate of 6 Curies/day or less) would extend the time to reach the 10 CFR 20 concentration limits.

Water consumption requirements to support the dilution of the vessel water may range from the minimum flow rate of 1100 gallons per minute to a flow rate of more than 2000 gallons per minute. Existing site capacity can accommodate these requirements and no additional water sources are required. Makeup water is obtained from ditch water diverted from the South Platte River and St. Vrain Creek and is supplemented by water from a system of six shallow wells.

The cooling water blowdown line (normal discharge path) flows to a diversion box from which the flow can be directed to the South Platte River via the continuation of Goosequill irrigation ditch or to the St. Vrain Creek via a slough. Further downstream from the plant, the Goosequill irrigation ditch flows into the Jay Thomas irrigation ditch and the combined stream flows into a 25 acre farm pond. The overflow from this pond flows into the South Platte River close to its confluence with the St. Vrain Creek. The drainage path via Goosequill ditch and the pond is normally used.

3.3.2.4 Release of Airborne Contamination

Plant gaseous effluent filtration and monitoring systems will be operated and maintained as described in the Decommissioning Technical Specifications and the Offsite Dose Calculation Manual.

The HEPA filter penetration and bypass acceptance limits in the Technical Specification surveillances are applicable based upon a HEPA filter efficiency of 95%. The HEPA filter bank will be tested using the test procedure guidance in Regulatory Position C.5.a and C.5.c of Regulatory Guide 1.52 (Ref. 49), with a flow rate of at least 17,100 cfm to verify that the filter penetration and bypass leakage test acceptance criteria of 1% is met.

The replacement frequency of the HEPA filters in the existing Reactor Building ventilation exhaust system is also identified in Decommissioning Technical Specifications, and is based upon either high exhaust radiation readings (or alarm) in the ventilation exhaust duct, or upon exceeding the maximum allowable pressure differential (which indicates that the filters are filled with dust).

Effluent monitoring of the reactor building exhaust will be accomplished and reported using installed plant equipment and established procedures. Supplemental effluent air monitoring in the form of air samples for areas or operations remote from the Reactor Building with air discharge capabilities will be maintained. Monitoring capabilities include beta/gamma radiation measurement of samples.

3.3.2.5 Onsite Decontamination Techniques

Onsite decontamination techniques will normally be used for processing and volume reduction of solid wastes. Solid wastes will be processed in accordance with written procedures. A general plan for solid waste processing is to initially identify the waste at the point of generation as to the type of material and exposure rate, and segregate the material to allow for decontamination onsite or packaged for shipment to an offsite vendor for volume reduction or to an approved disposal site.

Standard industry decontamination techniques will be used and may include the following:

1. Strippable Coatings: Strippable coatings may be used to lift particulates from contaminated surfaces. A strippable coating is applied "wet" to a surface in a manner similar to painting a surface. Additives in the coating are designed to attract and combine chemically with radioactive contaminants. Once the coating is dry, the contaminant is locked in the dried coating. The dried coating is easily "peeled" to allow stripping of the film containing the contamination. The stripped film can then be packaged and buried as a solid waste. Strippable coating may also be used to protect surfaces from becoming contaminated.
2. Chemical or Solvent Decontamination: Chemical decontamination is utilized principally for batches and is best used on a production basis for large volumes of similar materials, but may result in a hazardous radiologically contaminated mixed waste. Chemicals used for decontamination will be evaluated for hazardous constituents using 40 CFR and Material Safety Data Sheets (MSDS). Decontamination chemical wastes could possibly include acids, caustics, detergents and non-hazardous solvents. The specific chemical for a particular application will depend on the material to be decontaminated. Acids or bases may be neutralized and solidified or used for water chemistry control in the PCRV water clean-up system. Detergents and other water based solvents will generally be associated with damp rags or wipes. If a mixed waste stream is identified, a treatability study will be performed to determine if it can be made non-hazardous. At this time, no mixed wastes have been identified. Furthermore, no processes are planned to be used during decommissioning that will create a non-treatable mixed waste.

3. Dry Abrasive Impingement: Dry abrasive impingement (e.g., sandblasting) is effective for removing heavy or tightly adhering oxide films.
4. Fixatives: The application of fixatives may be used to fix transferable contamination prior to cutting or packaging.
5. Vacuum Cleaning: HEPA filtered vacuum cleaners may be used in areas of high gross transferable contamination.

3.3.2.6 Onsite Radioactive Waste Volume Minimization

Project management and performance level personnel will incorporate radioactive waste minimization practices into work procedures. Performance indicators will be developed to track total radioactive waste generated during decommissioning. The actual volume of waste generated for an evolution will be compared to the pre-job estimate for that task. Radioactive waste volume reduction and minimization techniques discussed below will be used as appropriate.

1. Personnel Training. Affected personnel will receive Radiation Worker training. This training will identify work techniques to prevent unnecessary contamination of areas and equipment, practices for reuse of materials, and policies to prevent the unnecessary generation of mixed or radioactive wastes.
2. Prevention of Waste. Unnecessary generation of radioactive and mixed wastes will be controlled by procedures established to evaluate and control chemicals brought onsite, and prevent unnecessary packaging, tools and equipment from entering radiologically controlled areas.
3. Reuse of Materials. Typical materials reused during the decommissioning include contaminated tools, equipment and clothing. Contaminated tool and equipment storage and issue areas will be maintained. Protective clothing and collection bags will be laundered, repaired and made available for reuse.
4. Segregation and Packaging. Waste material after collection will be identified at the point of generation as to type of material, exposure rate and contamination levels, if known. At the segregation/packaging facilities, the waste will be further segregated as to form and expected end process. Liquid wastes will be separated from solid wastes.

3.3.2.7 Onsite Waste Packaging

Radioactive waste packaging at Fort St. Vrain will be performed in areas that minimize radiation exposure to personnel, control the spread of contamination, and are adequate for packaging activities. Examples of potential onsite waste packaging areas are:

- Reactor Building refueling floor
- Hot Service Facility
- Compressor rooms (Reactor Bldg., El. 4740')
- Fuel Storage Building
- Temporary facilities designated for waste packaging

Waste packages will be selected for each waste stream that meet the requirements for transportation and disposal. Examples of the waste containers that may be used are drums (52-gallon, 55-gallon), boxes (2'x4'x6', 4'x4'x5'), liners, high integrity containers (HIC's), sea/land containers, shielded casks, and other specialty containers. The capacity and weight limitations of each container are governed by the activity levels, form and classification of the enclosed materials. The waste container to be used will be determined by the size, weight, classification, and activity level of the material to be packaged. Guidance for selection of appropriate packaging will be provided in radioactive waste procedures. In all cases, packaging selected will comply with requirements specified by 49 CFR, 10 CFR 71, and the Disposal Facility Site Criteria, as
applicable.

To the maximum extent practicable, voids in disposal containers will be filled with other decommissioning debris. This will reduce the total volume of waste for disposal. Therefore, since voids in packages are filled with wastes that would otherwise be packaged separately for burial, a superior waste form is produced, efficiency is maximized, and project cost, disposal site allocation usage, and transportation risk are minimized. Alternatively, the onsite use of a mobile super compactor may be a cost effective means of volume reduction. After appropriate waste segregation and packaging have occurred, the waste will be transported directly for disposal or transported to an offsite licensed facility for further processing and final disposition.

3.3.2.8 Offsite Shipments of Radioactive Materials for Further Processing

Cost benefit analyses will be performed to determine if it is more cost efficient to process certain radioactive materials at an offsite facility specializing in the treatment of these materials. Based on the results of these analyses, a significant amount of radioactive material generated during the decommissioning project may be shipped to a licensed volume reduction facility.

Methods described below are examples of volume reduction processes that may be employed.

1. Incinerable material may be transferred to a licensed incinerator facility for burning. This may include such materials as paper, certain plastics, lubricating oils and solvents. When required by regulations, EPA characteristic tests (or other analyses) will be performed to verify acceptability of a material for incineration.
2. Low specific activity metals may be transferred to suitably licensed facilities for either melting and consolidation, or decontamination and release. A variety of decontamination options exist including abrasive (grit blasting), chemical and ultrasonic cleaning methods.
3. Volume reduction by compacting or super-compacting.

Waste packages sent to offsite facilities will primarily be sea/land containers selected to meet the requirements of transportation and receipt at the offsite processing facility. Voids in transport containers are not a critical concern. However, efficient management of transportation resources will be an important consideration to minimize project costs and reduce the total number of shipments made. Only radioactive materials that are acceptable according to the individual license(s) of the receiving facility will be transported to that offsite processing facility.

Radioactive material control and accountability procedures to accurately track material originating from Fort St. Vrain during receipt, sorting, processing, and packaging for disposal will be developed and implemented. Only offsite processing facilities which provide adequate radioactive material control and accountability procedures will be selected to perform decontamination, volume reduction or waste processing services.

3.3.3 Radioactive Waste Disposal

3.3.3.1 Program Description

The radioactive waste disposal program will follow 10 CFR 20 and 10 CFR 61, the disposal site criteria, and other applicable Federal and State regulations. Radioactive waste processing, packaging, and shipping activities at Fort St. Vrain will be performed in accordance with written procedures. Similar operations performed at offsite facilities will be controlled as directed by local requirements and specific facility licenses. Radioactive waste may be stored onsite, subject to approved safety evaluations, storage and separation criteria established in Section 3.4 and 10, and applicable State or NRC guidance.

Negotiations are currently underway between the Rocky Mountain Compact (RMC) Board and the Northwest Compact Board that will allow access for LLRW generated from RMC member states to the existing Northwest Compact disposal facility beginning in January 1993. The proposed contract for disposal access is still under review by the Northwest Compact Board and has not yet been signed.

GTCC waste, if any, will be stored in the adjacent ISFSI or in a structure which meets the design requirements to handle GTCC waste. The waste will be stored until such time as it can be transported to a facility licensed to accept the GTCC waste.

3.3.3.2 Projected Radioactive Waste Generation

Tables 3.3-1 and 3.3-2 identify the radioactive wastes that may be shipped for further processing. The pre-volume reduction totals and estimated number of waste containers are delineated on Tables 3.3-3 and 3.3-4.

The initial estimate of the processed and volume reduced radioactively contaminated waste for disposal is 100,072 cubic feet, with 99,219 cubic feet from the PCRV and associated operations, and 853 cubic feet from the balance of plant (BOP). The waste from the PCRV consists of activated concrete, graphite blocks, other activated components, miscellaneous equipment and piping, and concrete rubble. PCRV waste is contaminated principally with Fe-55, tritium, and Co-60. The waste from the BOP consists of tanks, pumps, HVAC filters, and miscellaneous equipment and piping. There may also be radioactively contaminated asbestos. After processing and volume reduction, it is estimated that the volume of radioactive waste will be segregated into the following categories:

CLASS	VOLUME (CUBIC FEET)
A	70,768
B	28,293
C	1,011

Due to uncertainties in the analysis, as much as 400 cubic feet of Class C wastes may be reclassified as GTCC. Waste volume estimates will change as ongoing planning and decommissioning operations proceed.

3.3.3.3 Classification of Radioactive Wastes

Classification of radioactive waste is required by 10 CFR 20, 10 CFR 61, and disposal site requirements.

A Waste classification compliance program will be developed and implemented to assure proper classification of waste for disposal. This program will ensure that a realistic representation of the distribution of radionuclides in waste is known and that waste classification is performed in a consistent manner. Any of the following basic methods, used individually or in combination, will be used to achieve this goal: materials accountability (including process knowledge and activation analysis), classification by source, gross radioactivity measurements, and measurement of specific radionuclides.

3.3.3.4 Transportation Plan

Packages and packaging for radioactive materials and waste will meet all applicable regulations and requirements.

Before packaging waste for shipment from Fort St. Vrain, each package will be inspected to ensure it meets all applicable design and/or certification requirements and that it is not damaged or impaired. A bar code capable of being read by computerized scanners will typically be affixed to the container and the corresponding lid as an aid to inventory and to track individual containers.

The majority of radioactive material and waste shipments performed during the decommissioning project will be done by truck. In some cases, approved shielded casks will be employed due to radiation levels or limits for quantities of radioactivity in a package. Tables 3.3-3 and 3.3-4 provide preliminary estimates for the number of packages anticipated during the decommissioning project. Tables 3.3-5 and 3.3-6 provide preliminary estimates for the types of packages anticipated during the decommissioning project.

Special shielded shipping containers may be used for the steam generator primary assemblies. The removal process and shipping container are described in Section 2.3 of this plan. It is anticipated that the shipping container with the steam generator and grout will be shipped by rail for disposal at the Richland burial site.

Transportation surveys and documents will be prepared prior to any shipment offsite. To determine isotopic inventory and concentration for classification, onsite personnel will assess each loaded shipping container prior to transport.

The actual routing of shipments may vary with weather and highway conditions. Additionally, local and state restrictions pertaining to radioactive material transport may affect some route selections, particularly in congested metropolitan areas. The carrier is responsible for selecting the appropriate route, which must conform to applicable federal, state, and local shipping, in accordance with DOT and NRC regulations.

3.3.3.5 Mixed Waste Contingency Plan

Except for lead shielding, no sources of mixed waste are known to exist onsite. No chemicals or other substances are anticipated to be used during decommissioning operations that may become hazardous wastes. It will be necessary for project management to authorize the use of any chemical or other substance that may become hazardous waste. If mixed waste is identified, it will be classified and stored onsite until regulations allow declassification or disposition.

If mixed wastes are generated, they will be managed according to Subtitle C of RCRA to the extent it is not inconsistent with NRC handling, storage and transportation regulations.

If technology, resources and approved processes are available, PSC and the Westinghouse Team will evaluate the processes for rendering mixed waste "non-hazardous" to determine its adaptability to Fort St. Vrain decommissioning activities. PSC does not intend to petition the EPA to delist any mixed waste.

However, if PSC determines it is necessary to delist any mixed waste, the procedures outlined in 40 CFR 260.20 and 260.22 will be used to exclude that waste form from regulations.

3.3.3.6 Waste Storage Facilities

Waste storage facilities planned for use during decommissioning activities include:

1. The Independent Spent Fuel Storage Installation (ISFSI) may be used for greater than Class C wastes (GTCC), if any, pending approval of an appropriate disposal site. (No GTCC wastes are currently expected.)
2. The Fuel Storage Building may be used as a processing and storage area for dry low level wastes.
3. The Compactor Building may be used as a processing and storage area for dry and dewatered low level wastes.
4. The Reactor Building may be used for the storage of liquid and solid wastes.
5. Trailers and sea/land containers may be stored and used onsite to house dry and solidified low level waste.
6. Selected yard areas may be used for short term storage of packaged waste staged for transport.

The activity levels of wastes stored in these areas will be controlled to levels as evaluated in an accident analysis.

Safety evaluations have been performed that assess and permit storage of low level radioactive waste on the Fort St. Vrain site consistent with the guidelines of NRC Generic Letter 81-38 (Ref. 50) and the Standard Review Plan (NUREG-0800), Appendix 11.4-A (Ref. 51). The Fort St. Vrain Technical Specifications permit possession and use of byproduct, source, and special nuclear material in quantities as required pursuant to 10 CFR 30, 40 and 70.

Due to the building seismicity and other drainage and collection requirements for the storage of wet radwaste, PSC does not intend to store wet/liquid radwaste outside the Reactor Building. The Reactor Building was designed and built with drainage systems that route spillage to collection points/sumps that are monitored for radioactivity and properly processed. Other forms of radwaste may also be stored in the Reactor Building without significant concern, due to the building's additional features relative to fire detection and suppression, and its filtered ventilation system.

The Compactor Building is a steel building constructed on a concrete foundation, with its own "wet pipe" fire suppression and fire detection systems. This building has two concrete basins that may be used to store barrels of dewatered wastes, consistent with the recommendation of NRC Generic Letter 81-38 (Ref. 50). Other dry and solidified wastes may be stored in this building in amounts consistent with limitations of the decommissioning accident analyses. A radwaste compactor, with a self-contained HEPA-filtered ventilation system, is also housed in this building.

The Fuel Storage Building will also be used to store packaged dry and solidified low-level radwaste. A safety evaluation has determined that no increase in an accident probability will result from radwaste storage in this location. As stated in the decommissioning accident analysis, a fire detection system will be provided before combustible radwaste can be stored in the Fuel Storage Building.

Trailers and sea/land containers have been evaluated to house dry and solidified radwaste. Accident scenarios have been postulated and the total allowable activity levels for storage are controlled accordingly. Yard fire hydrants are available for use if necessary.

Certain large radioactive components (such as helium circulators packaged for shipment) may be stored outside within the protected area while awaiting shipment offsite. Tie-down systems will be considered for components stored outside, and will be installed when needed. Steps will be taken to protect containers from external corrosion as required.

3.3.4 Disposal of Non-Radioactive Waste

Non-radioactive wastes will be disposed of by release to appropriate disposal facilities such as land fills, scrap yards and scrap recovery facilities. Materials that are inappropriate for surface surveys, such as resin fines, will be sampled and appropriately analyzed. Materials found to be non-contaminated will be disposed of as non-radioactive waste.

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TABLE 3.3-1
PCRV WASTE CLASSIFICATION AND VOLUME REDUCTION

COMPONENT	A	B	C (1)	STABILIZE	INCINERATE	COMPACT	MELT	OVERFILL
Region constraint devices	X					X		
RCD Pins			X	X				
Metal C[illegible] Reflectors			X	X				
Metal [illegible]		B		X				
[illegible]	X				X	X		
[illegible] blocks	X							
[illegible] graphite [illegible]	X							
[illegible] graphite [illegible]	X							
[illegible]		X		X				
[illegible]		X		X				
Upper reflector keys	X					X	X	
Side spacer blocks w/boron pins								
Boron Pins		X		X				
Blocks with pins removed	X					X		
Bottom ref. blocks w/Hastelloy cans								
Hastelloy cans			X	X				
Blocks without Hastelloy cans	X							
Lower reflector keys		X		X				
Core support blocks	X					X		
Core support posts	X				X	X		
CSF support columns	X					X	X	
Metal on large side reflector	X					X	X	
Misc steel beneath CSF	X					X	X	
Core barrel	X						X	
Lower plenum insulation	X					X		
Silica Blocks	X					X		
Concrete - Top	X							
- CSF	X							
- side	X							
- Rubble	X							X
Misc. Inconel parts (CSF)	X					X		
Concrete cutting debris	X					X		
Helium purifiers (PCRV head)	X					X		
Helium diffusers	X					X		X
Helium circulators	X					X		
He Circ Shutoff valve assembly	X					X		
Helium bellows	X					X		
Steam Generators	X							
Lower Floor/appurtenances	X					X	X	
Platform/ tools /jib cranes	X					X	X	
Crane cable/drum/3 bucket inverters	X					X		
Resins	X			X				
Miscellaneous soft waste	X					X		
Reactor Isolation valve	X					X	X	

(1) Due to uncertainties in the analysis, some Class C wastes may be reclassified as Greater Than Class C wastes.

TABLE 3.3-2
CONTAMINATED BOP WASTE CLASSIFICATION AND VOLUME REDUCTION

COMPONENT	A	B	C	STABILIZE	INCINERAT	COMPACT	MELT	OVERFILL	DECON @ SITE	DECON @ WSEG
Miscellaneous soft waste	X					X				
Reactor Isolation Valves	X					X	X			
Refueling sleeves	X					X	X			
Refueling sleeve sand	X							O/F		
Sand from FSWs	X							O/F		
ATC	X								X	
ATC sand	X							O/F		
FSW sand	X							O/F		
Hot Service Facility	X								X	
HSF sand	X							STAB.		
Core Support Vent filters	X					X				
Gaseous Waste surge tanks	X									X
Gaseous waste surge tank sand	X							O/F		
Liquid drain tank	X									X
Gas waste vacuum tank	X									X
Gas waste vacuum tank sand	X							O/F		
Gas waste compressors	X					X				
Gas waste compressor sand	X							O/F		
Liquid monitor tank	X									X
Liquid waste monitor tank	X							O/F		
Liquid waste demineralizers	X					X				
Liquid waste receivers	X									X
Liquid waste receivers sand	X							O/F		
Liquid waste sump sand	X							O/F		
Liquid transfer pumps	X					X				
Liquid waste sump pumps	X					X				
Liquid waste resins	X							O/F		
Liquid waste filters	X			X						
Decon solution tank	X									X
Decon solution tank sand	X							O/F		
Decon recycle pump	X					X				
Decon chemical supply pump	X					X				
Purified helium filters	X				X					
Helium removal filter	X					X				
Helium getter units	X					X				
HVAC filters	X					X				
Small & large bore piping	X					X	X			
FHM	X								X	
FHM components	X					X				
FHM sand	X							O/F		
Solid waste compactor	X					X				
System 21 Components	X					X	X			
System 24 Components	X					X	X			
System 46 Components	X					X	X			
System 47 Components	X					X	X			
System 73 Components	X					X	X			

TABLE 3.3-3
PCRV WASTE VOLUME ESTIMATES

COMPONENT	CLASS	R/hr CONTACT	LSA	NUMBER	VOLUME (FT³)**	NO. OF CONTAINERS
Region constraint devices	C	70	No	84	235	2
RCD Pins						
Metal Control Rod Reflectors	C	300	No	37	401	3
Metal Block - Non-control rod	B	300	No	276	2025	13
Defueling Elements	A	Contam.	Yes	1482	7200	75
Top reflector graphite blocks	A	0.5	No	1215	1515	8
Bottom reflector graphite blocks	A	0.5	No	1215	1414	8
Radial reflector graphite blocks	A	0.5	No	480	1903	9
Large side reflector blocks	B	<30	No	312	12600	50
Half-size reflector blocks	B	<30	No	312	2160	8
Upper reflector keys	A	0.1	No	24	192	2
Side spacer blocks w/boron pins		30		1152		
Boron Pins	B	60	No	309792		
Blocks with pins removed	A	<3	No	1152	2393	10
Bottom ref. blocks w/Hastelloy cans		300		276		
Hastelloy cans	C	10000	No	20061		
Blocks without Hastelloy cans	A	0.5		276	816	14
Lower reflector keys	B	1000	No	24	180	1
Core support blocks	A	<0.1	Yes	61	1468	15
Core support posts	A	<0.1	Yes	183	174	2
CSF support columns	A	<0.1	Yes	12	636	7
Metal on large side reflector	A	<0.1	Yes	24	96	1
Misc steel beneath CSF	A	<0.1	Yes		960	10
Core barrel	A	0.02	Yes	1	1400	31
Lower plenum insulation	A	<0.1	Yes		940	10
Silica Blocks	A	0.5	Yes		503	12
Concrete - Top	A	<0.2	Yes		3744	9
- CSF	A	<0.015	Yes		6240	15
- side	A	<0.01	Yes		18720	45
- Rubble	A	<0.015	Yes		706	16
Misc. Inconel parts (CSF)	A	0.4	No		415	5
Concrete cutting debris - top	A	<0.2	Yes		210	
- CSF	A	<0.015	Yes		200	8
- side	A	<0.01	Yes		325	
Helium purifiers (PCRV head)	A	0.15	Yes	10	480	5
Helium diffusers	A	<0.1	Yes	4	1752	4
Helium circulators						
He Circ Shutoff valve assembly	A	<0.1	Yes	4	192	2
Helium bellows	A	<0.1	Yes	12	1560	12
Steam Generators	A	2	Yes	12	20736	12
Thermocouples & guide tubes	B	50	No		105	1
Lower Floor/appurtenances	A	<0.01	Yes		1200	42
Platform/ tools /jib cranes	A	<0.01	Yes		576	6
Crane cable/drum/3 bucket inverters	A	<0.01	Yes		512	5
Miscellaneous Containers	A	<0.01	Yes		288	3
PCRV Water System	A	<0.01	Yes		2080	2
Resins - solidify, ship, bury	A*	15	No	20	2720	20
Miscellaneous soft waste	A	<0.01	Yes		12000	125
PCRV TOTALS					113,972	628

TABLE 3.3-4
BOP WASTE VOLUME ESTIMATES

COMPONENT	CLASS	R/hr CONTACT	LSA	NUMBER	VOLUME (FT^3)**	NO. OF CONTAINERS
Reactor isolation valves	A	<0.01	Yes	5	960	10
Refueling sleeves	A	<0.01	Yes	2	192	2
Sand from FSWs	A	<0.01	Yes		750	Note 1
ESW Sand	A	<0.01	Yes		225	Note 1
Helium regeneration pit sand	A	<0.01	Yes		135	Note 1
ATC sand	A	<0.01	Yes		15	Note 1
HSF	A	<0.01	Yes		384	4
HSF sand	A	<0.01	Yes		500	Note 1
Core support vent filters	A	<0.01	Yes		[illegible]5	2
Gas waste surge tanks	A	<0.01	Yes		2646	2
Gas waste vacuum tank	A	<0.01	Yes	1	980	1
Gas waste compressors	A	<0.01	Yes	2	2058	2
Liquid drain tank	A	<0.01	Yes	1	20	1
Liquid waste monitor tank	A	<0.01	Yes	1	576	1
Liquid waste demineralizers	A	<0.01	Yes	2	192	2
Liquid waste receivers	A	<0.01	Yes	2	1152	2
Liquid transfer pumps	A	<0.01	Yes		23	Note 1
Liquid waste sump pumps	A	<0.01	Yes	2	96	1
Liquid waste filters	A	<0.01	Yes	2	5	Note 2
Decon solution tank	A	<0.01	Yes	2	15	2
Decon recycle pump	A	<0.01	Yes	1	366	1
Decon chemical supply pump	A	<0.01	Yes	1	2	Note 3
Purified Helium filters	A	<0.01	Yes	2	14	Note 3
Helium removal filter	A	<0.01	Yes	1	96	1
Helium getter units	A	<0.01	Yes	2	4	Note 4
HVAC filters	A	<0.01	Yes		1030	1
FHM	A	<0.01	Yes		192	2
FHM sand	A	<0.01	Yes		420	Note 1
Small and large bore piping	A	<0.01	Yes		576	6
Reactor Building Drain system	A	<0.01	Yes		125	1
Instrumentation & controls	A	<0.01	Yes		225	2
System 21 Components	A	<0.01	Yes		1,080	2
System 24 Components	A	<0.01	Yes		13,000	3
System 46 Components	A	<0.01	Yes		9,000	10
System 47 Components	A	<0.01	Yes		200	2
System 73 Components	A	<0.01	Yes		1,600	2
BOP TOTALS					38,871	65

* - Pre-volume reduced quantities

Notes:
1. Will be used as overfill
2. Will be packaged with liquid transfer pumps
3. Will be packaged with Decon solution tank
4. Will be packaged with helium removal filter

TABLE 3.3-5
PCRV WASTE CLASS AND CONTAINER TYPE

COMPONENT	A	B	C	LSA STD	LSA NON-STD	TYPE A	TYPE B	CASK	SHIELDED VAN
Region constraint devices	X			X					
RCD Pins			X			X		X	
Metal Control Rod Reflectors			X				X	X	
Metal Block - Non-control rod		X				X		X	
Defueling Elements	X			X					
Top reflector graphite blocks	X			X					X
Bottom reflector graphite blocks	X			X					X
Radial reflector graphite blocks	X			X					X
Large side reflector blocks		X				X		X	
Half-size reflector blocks		X				X		X	
Upper reflector keys	X			X					
Side spacer blocks w/boron pins									
Boron Pins		X				X		X	
Blocks with pins removed	X			X					
Bottom ref. blocks w/Hastelloy cans									
Hastelloy cans			X			X		X	
Blocks without Hastelloy cans	X			X					X
Lower reflector keys		X				X		X	
Core support blocks	X			X					
Core support posts	X			X					
CSF support columns	X			X					
Metal on large side reflector	X			X					
Misc steel beneath CSF	X			X					
Core barrel	X			X					
Lower plenum insulation	X			X					
Silica Blocks	X			X					X
Concrete - Top	X				X				
- CSF	X				X				
- side	X				X				
- Rubble	X			X					
Misc. Inconel parts (CSF)	X			X					
Concrete cutting debris	X			X					
Helium purifiers (PCRV head)	X				X				
Helium diffusers	X				X				
Helium circulators	X				X				
He Circ Shutoff valve assembly	X			X					
Helium bellows	X				X				
Steam Generators	X				X				
Lower Floor/appurtenances	X			X					
Platform/ tools /jib cranes	X			X					
Crane cable/drum/3 bucket inverters	X			X					
Resins	X				X				
Miscellaneous soft waste	X			X					
Reactor Isolation valve	X			X					
Refueling Sleeves	X			X					

TABLE 3.3-6
BOP WASTE CLASS AND CONTAINER TYPE

COMPONENT	A	B	C	LSA STD	LSA NON-STD	TYPE A	TYPE B	CASK	SHIELDED VAN
Miscellaneous soft waste	X			X					
Reactor isolation valves	X			X					
Refueling sleeves	X			X					
Refueling sleeve sand	X			X					
FSW sand	X			X					
ATC sand	X			X					
ESW sand	X			X					
HSF	X			X					
HSF sand	X			X					
Core support vent filters	X			X					
Gas waste surge tanks	X			X					
Gas waste surge tank sand	X			X					
Gas waste vacuum tank	X			X					
Gas waste vacuum tank sand	X			X					
Gas waste compressors	X			X					
Gas waste compressor sand	X			X					
Liquid drain tank	X			X					
Liquid waste monitor tank	X			X					
Liquid waste monitor tank sand	X			X					
Liquid waste demineralizers	X			X					
Liquid waste receivers	X			X					
Liquid waste receiver sand	X			X					
Liquid waste sump sand	X			X					
Liquid transfer pumps	X			X					
Liquid waste sump pumps	X			X					
Liquid waste resins	X			X				X	
Liquid waste filters	X					X			
Decon solution tank	X				X				
Decon solution tank sand	X			X					
Decon recycle pump	X				X				
Decon chemical supply pump	X				X				
Purified helium filters	X				X				
Helium removal filter	X			X					
Helium getter units	X			X					
HVAC filters	X			X					
Small and large bore piping	X			X					
FHM components	X			X					
FHM sand	X			X					
Solid waste compactor	X			X					
System 21 components	X			X					
System 24 components	X			X					
System 46 components	X			X					
System 47 components	X			X					
System 73 components	X			X					

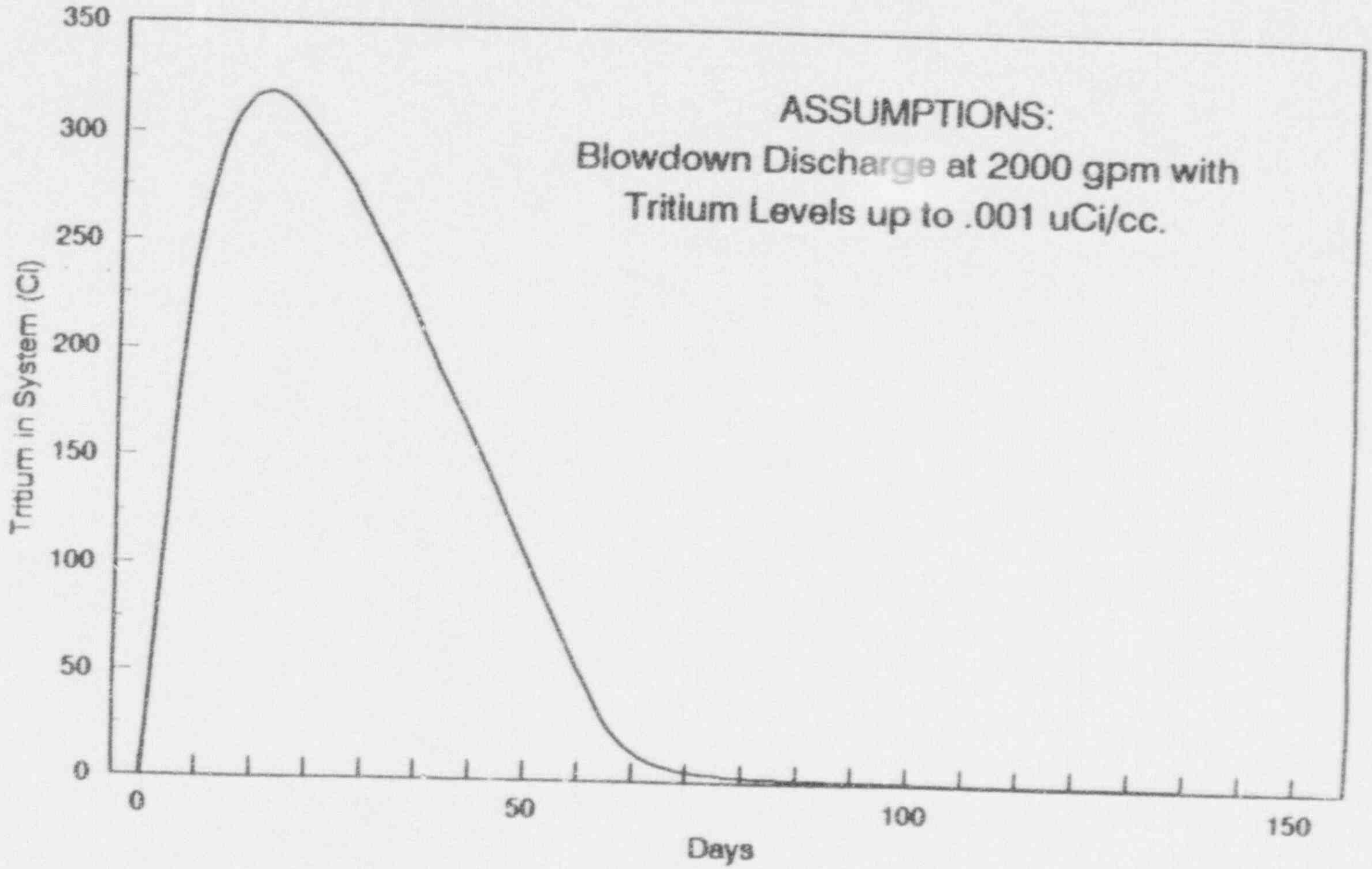

Figure 3.3-1 Estimated Tritium Inventory in PCRV Water System

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3.4 ACCIDENT ANALYSIS

3.4.1 Introduction and Description of Decommissioning Accidents

The purpose of this section is to evaluate the impact of potential Fort St. Vrain decommissioning accidents on the health and safety of the public. The activities, equipment and circumstances associated with decommissioning are different from those evaluated in the Fort St. Vrain Final Safety Analysis Report (Ref. 52) for power operations and refueling. Therefore, accidents analyzed for decommissioning are different from those evaluated for power operations and refueling.

The risk of accidents resulting in a radiological release during decommissioning activities is considerably less than during plant operation, due to the removal of irradiated fuel from the Reactor Building. Since the reactor will be defueled prior to the commencement of decommissioning operations and all fuel will be removed from the Reactor Building, only non-reactor accident scenarios will be evaluated in this section. The focus of these decommissioning accident analyses will be on public health and safety.

The following postulated accident scenarios have been analyzed, considering activation levels and isotopic composition of components to be processed, and the anticipated dismantling activities:

1. Dropping of contaminated concrete rubble
2. Conversion construction near PCRV dismantlement
3. Heavy load drop
4. Fire
5. Loss of PCRV shielding water
6. Loss of Power
7. Natural disasters
8. Dropping of a Steam Generator Primary Module

The components with the highest activation levels were used in the accident analyses. Therefore, accidents that were analyzed bound the radiological consequences from other postulated accident scenarios. In evaluating the postulated accidents, conservative assumptions were made when data or knowledge to support more realistic analyses were lacking. Conservatism in this context is defined to mean that the radiological consequences from the postulated accidents will be overestimated rather than underestimated.

A frequency-consequence diagram (Ref. 52) is shown in Figure 3.4-1; this figure defines three regulatory regions which are bounded by consequence limits established in 10 CFR 50 Appendix I, 10 CFR 100, and the EPA Protective Action Guidelines (Ref. 54). Postulated accidents are assigned to one of the regions on the basis of their predicted consequences. The three regions are defined as follows:

1. Anticipated Operational Occurrences (AOOs) - events that are expected to occur once or more in a plant's lifetime and whose dose consequences are analyzed in the plant's Safety Analysis Report (SAR) to demonstrate compliance with 10 CFR 50 Appendix I criteria.

2. Design Basis Events - events which are not expected to occur in the lifetime of the plant but may occur in a large population of plants. These events are analyzed in the SAR to demonstrate compliance with criteria established in 10 CFR 100.

3. Emergency Planning Basis Events - events that are not expected to occur in the lifetime of most plants. The consequences of these events are analyzed in the EPA Protective Action Guidelines (Ref. 54) to establish criteria for emergency planning and environmental protection assessments.

As shown in Figure 3.4-1, the decommissioning accidents or events analyzed in this section are generally calculated to fall in the regions of the Design Basis and Emergency Planning Basis Events, due to the relatively low probability of the decommissioning accidents.

A capsule summary of the accident scenarios is given in Table 3.4-1. A summary of postulated accident dose consequences is presented in Figure 3.4-2. The doses to an individual located at the decommissioning Emergency Planning Zone (a minimum of 100 meters from the Reactor Building, the Fuel Storage Building, and the Radioactive Waste Compactor Building, as defined in Section 9 of this plan) from these scenarios are presented in Table 3.4-2. From this table, the limiting accident is a fire resulting in a whole body dose of 121 mRem and a dose of 215 mRem to the organ (lung). These doses are well within the 25 Rem whole body dose and 300 Rem to any specific organ guidelines established by 10 CFR 100. These doses are also a small fraction of the one Rem whole body dose and five Rem to any specific organ guidelines cited in EPA Protective Action Guidelines (Ref. 54).

The following natural disasters were considered in the accident analyses and are discussed in Section 3.4.9.

External Event	Mitigating Feature	Radiological Consequence
Earthquake	Low Probability of Occurrence	Not postulated; See Section 3.4.9
High Winds, Hail	Bounded by Tornado	See analysis in Section 3.4.9
Rainfall, Flood	Site Location	No release
Range Fire	Plant buffer	No release

The activity concentrations of the various components used in the following accident analyses were derived from the detailed neutron activation analysis (Ref. 2), described in Section 3.1.4 and provided in Appendix II. Where chemical impurities were involved in neutron activation reactions, the maximum impurity levels permitted by the pertinent specifications were conservatively assumed to exist. For impurities not governed by specifications, nuclides of interest were assumed to be present in the graphite in concentrations that were considered to be conservative. With the exception of tritium concentrations, the radioisotope concentrations of interest used in the accident analyses have been taken directly from the activation analysis.

Tritium concentrations predicted by the activation analysis were considered extremely unrealistic for the following reasons:

1. In the activation analysis, the dominant source of tritium was from activation of lithium impurities. The activation analysis assumed that no tritium formed by lithium activation migrated out of the graphite into the primary coolant. The lithium concentration assumed to be present prior to irradiation in the graphite blocks was based on the maximum concentration permitted by the specifications. In actuality,

lithium is relatively volatile and tends to migrate out of the graphite during the high temperature graphitization process. Therefore, it is considered probable that the lithium impurity concentrations in the graphite used to form the large side reflectors and side spacer blocks were an order of magnitude lower than the maximum specification limit.

2. The large graphite side reflectors and side spacer blocks were exposed to relatively low temperatures (300° - 500° C) during reactor operations. These low temperatures preclude a significant amount of tritium from being chemically absorbed in the graphite and retained. Since tritium has a small atomic radius, it is likely that tritium formed by activation of lithium (Li-6 and Li-7) will migrate out of the graphite. Due to this temperature dependence of chemical absorption, it is considered that tritium concentrations are two or three orders of magnitude below those predicted by the activation analysis.

3. In the presence of moisture, hydrogen atoms from water molecules compete with and replace tritium atoms at active carbon sites in the graphite matrix, releasing tritium from the graphite. During FSV reactor operation, a number of moisture ingress events occurred, in which measured tritium levels in the primary coolant increased significantly. This was probably caused by exchange of hydrogen in the water with tritium in the graphite. Before the graphite blocks are removed from the PCRV, they will be submerged under water when the PCRV is flooded. Exposure of the irradiated graphite to moisture, both during reactor operation and after core defueling, is expected to result in the release of a small but noticeable portion of the total tritium.

Based on the effects noted above, it is considered that a value of 10 μCi/g of tritium represents a conservative estimate of tritium concentration in the large side reflector and side spacer blocks (Ref. 55). While this concentration is a factor of approximately 40 below that projected in the activation analysis for these blocks, it provides a more realistic representation of the tritium concentration of the graphite blocks after they are removed from the PCRV. Therefore, a tritium concentration of 10 μCi/g in the large side reflector and side spacer blocks is assumed for the postulated decommissioning accident scenarios, with the exception of the loss of PCRV shielding water accident. The loss of PCRV shield water accident analysis conservatively assumed the graphite blocks contained the levels of tritium predicted by the activation analysis, and that all of this tritium (nearly 100,000 Curies) migrated out of the graphite into the PCRV shield water.

3.4.2 Assumptions

The following are the major assumptions used in the analysis of postulated accidents which may occur during the dismantling activities:

1. The reactor is defueled and all irradiated fuel is removed from the Reactor Building.
2. Since all fuel is removed from the reactor, there will be no need for shutdown/cooldown systems such as decay heat removal.
3. The Reactor Building ventilation system will remain operable, providing filtration of effluents to the environment, while the potential exists for drop of an activated graphite block.
4. The analyses for some of the accidents conservatively assume a Curie content that exceeds allowable Curie contents for a Low Specific Activity (LSA) Type A-2 waste container, as specified in Table A-1 of 10 CFR 71.
5. A worst case atmospheric dispersion factor of 3.53 E-2 sec/m^3 has been calculated and is used in the accident analyses, with the exception of the tornado accident, which utilizes an atmospheric dispersion factor of 4.59 E-4 sec/m^3. These atmospheric dispersion factors were calculated using the guidelines presented in Regulatory Guide 1.145 (Ref. 56) and are based on a minimum distance to the decommissioning EPZ of 100 meters. The atmospheric dispersion factor of 4.59 E-4 sec/m^3 represents the annual average dispersion factor for Fort St. Vrain, and is considered to be conservative in the event of a tornado.
6. All releases to the environment are assumed to be ground level releases.

3.4.3 Dropping of Contaminated Concrete Rubble Accident

3.4.3.1 Identification of Cause

After the majority of the PCRV top head concrete is removed in large pieces by diamond wire cutting, a thin wafer of concrete (two to three inches of concrete just above the PCRV top head liner) will be removed by utilizing a mechanical breaker to break up the concrete as described in Section 2.3.3.7. This accident scenario assumes that radioactivity is released from the drop of the rubblized concrete produced from this activity and prepared for shipment in a transport container. The drop of the transport container occurs due to a faulty crane or operator error.

3.4.3.2 Accident Description

An activation analysis performed for Fort St. Vrain (Ref. 2) shows that the highest concentration of radioactivity in the PCRV concrete is in the six inch increment of the PCRV top head immediately above the top head liner as shown in Table 3.4-3. The values in Table 3.4-3 are based on three years decay, the approximate time frame in which the dismantling work is expected to take place. The percentage contribution of activation products within this concrete is given in Table 3.4-4. As shown, nearly 100 percent of the total activity is accounted for by the nuclides listed.

Only two to three inches of concrete will remain adjacent to the PCRV top head liner when it is being removed. However, six inches of concrete were conservatively assumed to remain for ease of determining concentration of activation products, since the activation analysis evaluated concrete in six inch increments. A portion of this concrete will be rubblized to enable access to the PCRV liner for thermal cutting. It is conservatively assumed that 10% (approximately 7,500 lbs.) of the concrete on top of the PCRV top head liner is rubblized and packaged in a transport container that is then dropped in the Reactor Building. The resulting impact is assumed to cause 1% of the activity in the concrete to be released to the Reactor Building atmosphere.

Iron and cobalt are trace constituents in cements and aggregates. Therefore, the activation products Fe-55 and Co-60 will occur in the concrete of the PCRV, although in much smaller concentrations than in the steel rebar. However, none of the activation products embedded in the rebar is assumed to be released in this postulated accident since the rebar, unlike the concrete, would remain intact upon impact. Of the entire PCRV, 5.8% by weight (2% by volume) is rebar. Based on the Activation Analysis (Appendix II of this plan), 32.83 Curies of Fe-55 and 1.43 Curies of Co-60 are contained within the concrete of the six inch thick concrete wafer adjacent to the PCRV top head liner. The remaining activity, shown in Table 3.4-4 (excluding the Co-60 and Fe-55) comprise 8% of the total activity in this 6 inch wafer (7.86 Curies). It was conservatively assumed that the remaining activity was 9.83 Curies (10% of total), and that 60% of this activity was Eu-154 and 40% tritium, since tritium comprises approximately 40% of the activity and Eu-154 has the highest dose conversion factor of all the other isotopes involved.

The airborne activity was calculated to be 32.8 milliCuries of Fe-55, 1.43 milliCuries of Co-60, 3.93 milliCuries of tritium, and 5.90 milliCuries of Eu-154. No credit was taken for particulate filtration by the Reactor Building ventilation system. The major exposure pathway was assumed to be air inhalation by an adult standing at the EPZ (100 meters minimum) and was assumed to occur over a two hour period. The dose conversion factor used for tritium was 1.58 E-07 mRem/pCi inhaled for whole body and lung, which received the highest organ dose. The dose conversion factors used for Eu-154 were 6.48 E-05 mRem/pCi for whole body dose and 5.84 E-04 mRem/pCi for the lung. The dose conversion factors used for Fe-55 were 4.93 E-07 mRem/pCi for whole body dose and 9.01 E-06 mRem/pCi for lung. The dose conversion factors used for Co-60 were 1.85 E-06 mRem/pCi for whole body dose and 7.46 E-04 mRem/pCi for lung. These dose conversion factors were taken from NUREG-0172 (Ref. 57). The adult breathing rate was 3.47 E-04 m^3/sec (Ref. 52, Section 14.12).

3.4.3.3 Analysis of Effects and Consequences

The whole body and lung doses to an individual standing at a point on the EPZ 100 meters from the Reactor Building were calculated to be 4.92 mRem and 58.9 mRem, respectively. The whole body dose was 0.01 mRem from tritium, 4.68 mRem from Eu-154, 0.20 mRem from Fe-55, and 0.03 mRem from Co-60. The lung dose was 0.01 mRem from tritium, 42.2 mRem from Eu-154, 3.6 mRem from Fe-55, and 13.1 mRem from Co-60.

3.4.4 Conversion Construction Accident Near PCRV Dismantlement

3.4.4.1 Identification of Causes

1. Crane Failure: An evaluation was performed on the potential impact of a construction crane toppling which would impact the Reactor Building. Due to the proximity of the planned new steam generator building to the Reactor Building, it will be possible for a crane boom to strike the Reactor Building above the refueling floor level.

A crane boom is relatively light and fragile. An impact with the Reactor Building is not expected to cause structural damage to the building. Additionally, LSA containers outside the Reactor Building will be protected if they are stored within the fall radius of the construction cranes. At worst, the crane boom could drape over the reactor siding. No radiological impact is expected from such an accident. This accident is bounded by the heavy load drop (Section 3.4.5) and tornado (Section 3.4.9).

2. Explosion/Fire Due to Natural Gas Line Leak: There are plans to repower Fort St. Vrain with a natural gas-fired boiler. Accidents can be postulated during decommissioning activities involving a natural gas line leak resulting in an unconfined vapor explosion or fire, or an explosion of the gas-fired boiler itself. The decommissioning and repowering schedules have been reviewed. There are over three years between completion of the removal of highly radioactive components (graphite blocks) from the PCRV and introduction of natural gas on site to supply the gas boiler. In the event of a slippage in the dismantling schedule, administrative controls will be implemented to prevent charging the gas-fired boiler natural gas line on site concurrent with handling of the activated graphite blocks from the PCRV. Therefore, given the actual schedule and administrative controls, an explosion or fire due to a natural gas line leak associated with the Fort St. Vrain conversion project is not credible during the decommissioning process.

Natural gas wells and collection pipeline facilities are located in the vicinity of Fort St. Vrain. In 1991, extensive analyses were performed to determine potential effects of accidents involving natural gas releases on the Reactor Building. These analyses, which are documented in References 58 through 63, concluded that worst case postulated detonations of unconfined natural gas vapor clouds resulting from pipeline ruptures would not affect the structural integrity of the Reactor Building, and the Reactor Building blowoff panels would remain in place. The NRC also arrived at this conclusion, as documented in the NRC safety evaluation contained in Reference 64.

As a result of the concerns associated with natural gas facilities in the vicinity of Fort St. Vrain Decommissioning Technical Specifications contain a restriction on the introduction of new natural gas sources into the vicinity of Fort St. Vrain. This restriction precludes the introduction of natural gas to supply the conversion boiler, or any other new natural gas source, within 0.5 miles of the location where activated graphite blocks are stored without prior NRC approval. PSC shall submit an analysis of any proposed new natural gas source demonstrating that the new source will not present an unacceptable hazard to the activated graphite blocks or to the equipment or systems needed to protect the activated graphite blocks.

Accidental release of activity caused by a postulated explosion of a container of flammable gas, such as those used to support decommissioning (e.g., propane or acetylene tank or bottle), was taken into consideration. Flammable liquids and gases will be administratively controlled during decommissioning and conversion to prevent use or storage of substantial quantities of flammable liquids or gas near areas containing highly activated wastes. However, even if it were postulated that an explosion did occur near radioactive waste containers, this event would not produce consequences exceeding those analyzed in this section for a heavy load drop, tornado or fire. This conclusion is based on the relatively small size of the missiles resulting from such a postulated explosion, and the relatively large amounts of activity postulated to be released in the above mentioned accidents.

3.4.5 Heavy Load Drop Accident

The dismantling of the PCRV will be accomplished with the aid of three types of hoist systems. These systems include the main Reactor Building bridge crane, the auxiliary 17-1/2 ton hoist on the bridge crane, and three 1-1/2 ton jib cranes on the refueling floor level. The Reactor Building crane will be re-reeved to allow the 170 ton main hook to travel from the refueling floor to ground level. An elevation view of the PCRV work area is shown in Figure 3.4-3. There will be many heavy loads removed during the dismantling process. These lifts include:

1. Large side reflector blocks.
2. Large concrete sections
3. Steam generators.
4. Helium diffusers.
5. Concrete Core Support Floor or CSF sections

The accident scenarios developed for heavy load drops in nuclear power plants consider the dropping of a heavy load (e.g., fuel shipping cask) on a very large radionuclide inventory such as fuel or spent fuel (Ref. 65). In the case of Fort St. Vrain, all fuel will have been removed from the Reactor Building prior to commencement of dismantling operations. Therefore, the full spectrum of heavy load drop accidents is much less severe than in an operational nuclear power plant.

The most severe heavy load drop accident is postulated to consist of dropping the component containing the largest inventory of dispersible radioactive material. Table 3.4-5 has been compiled to show the various components and their respective radioactive inventories. Sampling will be performed prior to waste movement to determine and verify the radionuclide composition and total Curie content. Review of this table indicates that the large side reflector blocks contain the largest dispersible radioactive inventory. The use of an entire large side reflector for this accident analysis is conservative since the predicted activity inventory exceeds the LSA Curie limit specified in 10 CFR 71, Table A-1, for Type A-2 waste containers.

The drop of a heavy load onto a highly radioactive component was evaluated and determined not to represent the worst case scenario. For instance, the dropping of one of the 312 large side reflector blocks back into the PCRV might crush portions of adjacent reflector blocks. However, since all highly radioactive components are kept under water unless they are being removed, the debris and its attendant activity would remain in the water. This activity would be cleaned up in the PCRV Shield Water System, described in Section 2.3.3.6 of this plan. Any "slosh" created by the block drop would drain back to the PCRV cavity or drain down inside the Reactor Building, eventually to the Reactor Building sump and keyway, which have a capacity of approximately 350,000 gallons. These accident scenarios are bounded by the Loss of PCRV Shielding Water accident described in Section 3.4.7.

As discussed in Section 2.3.3.10, the 270-ton concrete CSF will be removed from the PCRV by ra[illegible] the entire CSF to the top of the PCRV with specially installed high capacity jacks. Since the activated graphite blocks would have been removed from the PCRV prior to removal of the CSF, and since the CSF concrete is predicted to contain only 6 Curies of activity, a heavy load drop during this operation does not have the potential for release of significant quantities of radioactivity. If the entire CSF is raised by high capacity jacks, drop of the CSF is not considered credible since such an accident would require multiple jack failures.

3.4.5.1 Identification of Cause

A heavy load drop accident is a relatively low probability event. A failure of the hoisting cable could cause a drop of the load. In accordance with Reference 65, the probability of this event is on the order of 1.0E-5 to 1.0E-6 per demand (hoist lift). The loss of the crane brakes could be due to mechanical failure, operator error, or an incorrect maintenance operation. Since the Fort St. Vrain Reactor Building bridge crane does not qualify as a Single-Failure-Proof crane in accordance with NUREG-0554 (Ref. 66) guidelines, the loss of crane brakes is postulated as a credible failure mode.

3.4.5.2 Accident Description

For this accident it is postulated that the Reactor Building bridge crane is hoisting one of the 312 large side reflector blocks. These blocks vary in size from 522 lbs. to 2030 lbs., and the largest (2030 lbs.) was assumed to be involved in this accident. It is currently planned to section these reflector blocks into smaller pieces for packaging in LSA shipping containers. However, it is conservative to assume that a single reflector block may be transported intact in its own shipping container.

After appropriate radiation surveys and removal of any surface contamination, the container with the single unsectioned side reflector block is lowered down the enlarged equipment hatch. Failure of the crane is postulated at this point. This results in the side reflector block container falling approximately 100 feet to the level of the truck loading bay. The shipping container ruptures, spilling its contents on the truck loading bay floor. Administrative controls will be in place that will prevent the tractor of the tractor trailer from being in the loading bay during lowering of the container, and will ensure that all the truck loading bay doors are closed. It is conservatively assumed that one percent of the activity of the largest reflector block is dispersed from the drop. The dust is postulated to remain airborne and will escape the immediate area through the Reactor Building ventilation exhaust. Credit is taken for decontamination afforded by the Reactor Building ventilation system.

The Fort St. Vrain activation analysis (Ref. 2) indicates that the major contributors to the activity in these large side reflector blocks are Fe-55, tritium, and Co-60. The total activity in an average large side reflector block has been calculated to be 1477 Curies, as shown in Table 3.4-5, with the largest block containing 2250 Curies. A one percent release for this scenario results in 22.5 Curies becoming airborne in the Reactor Building. Of this amount, 22.24 Curies are Fe-55, 0.09 Curies are tritium and 0.17 Curies are Co-60. These activities are based on a three year decay period. Credit is taken for a 95 percent filter efficiency for Fe-55 and Co-60. Tritium is released unfiltered (Ref. 52, Section 14.12). The major exposure path was assumed to be air inhalation to an adult standing at a point on the EPZ 100 meters from the Reactor Building.

The dose conversion factors in mRem per picoCurie inhaled were obtained from Regulatory Guide 1.109 (Ref. 67) and are as follows:

ISOTOPE	TOTAL BODY	LUNG
Tritium	1.58 E-07	1.58 E-07
Fe-55	4.93 E-07	9.01 E-06
Co-60	1.85 E-06	7.46 E-04

3.4.5.3 Analysis of Effects and Consequences

The whole body and lung doses to an individual standing at a point on the EPZ 100 meters from the Reactor Building were calculated to be 7.10 mRem and 202 mRem, respectively. The whole body dose was 0.18 mRem from tritium, 6.72 mRem from Fe-55 and 0.20 mRem from Co-60. The lung dose was less than 1 mRem from tritium, 123 mRem from Fe-55, and 79 mRem from Co-60.

3.4.6 Fire

3.4.6.1 Identification of Cause

During decommissioning and repowering activities, there are many possible fire initiators that could result in a release of radioactive materials. These possible fire initiators include:

1. Fires started from cutting torches.
2. Fires associated with component processing activities on the refueling level.
3. Electrical fires.

The most likely initiator has been determined to be a cable tray fire started from a spark during PCRV tendon cutting operations. The fire would be quickly extinguished by the fire watch on duty for the tendon cutting operations. The radiological consequence of this accident would be negligible since the cable trays contain virtually no radioactivity contamination.

The release of activity from a fire involving a contamination control tent was considered. However, potential consequences from this accident would be much less than those associated with a fire involving activated graphite blocks. The materials that will be used for these tents (typically "Herculite") will be fire retardant and not propagate flames, and the activity collected on the surface of a contamination control tent would not be expected to approach the activity inventory of activated graphite blocks, discussed below.

The postulated fire accident involves a fire enveloping LSA waste containers. The greatest exposure for a fire accident to occur is during the approximate six month period when the highly radioactive large side reflector blocks and side spacer blocks are being removed from the PCRV.

Controls will be implemented prior to the storage of the LSA containers. LSA containers will be limited to groupings with activity levels limited such that the dose consequences resulting from a fire involving a single group of LSA containers will not exceed those identified in Section 3.4.6.3, using the same assumptions as those used in Section 3.4.6.2. Sufficient spatial separation will be imposed to preclude fire propagation to an adjacent group of LSA containers. The packaging of these boxes and/or drums is planned to be completed inside the Reactor Building. Temporary storage or staging of these containers prior to shipment is also expected. It is assumed that interim radioactive material storage will be available for up to 15 LSA boxes and 200 drums in the former Fort St. Vrain Fuel Storage Building.

Fire detection capability will be installed in the LSA container storage area prior to the storage of the LSA containers. There will be no uncontrolled combustible materials in this building. The controls defined above will be implemented prior to the storage of the containers to limit the grouping of LSA packages containing combustible materials. These controls will ensure sufficient spatial separation is available to preclude fire propagation to an adjacent group of LSA containers and precludes the possibility of a fire with consequences greater than that which is analyzed.

3.4.6.2 Accident Description

For the fire accident it is postulated that a tractor trailer begins to transport packaged waste from the Reactor Building truck loading bay to an off-site burial ground/processing facility. The shipment is conservatively postulated to consist of 230 side spacer blocks with their boron pins removed. There are 1152 side spacer blocks to be removed during the decommissioning process.

It is postulated that an engine fire develops on the transport tractor and the fire spreads to the tractor's diesel fuel tanks.Based on work at the Waste Isolation Pilot Plant the frequency of an unsuppressed truck fire is in the range of 1.0 E-4 to 1.0 E-5 per year (Refs. 68, 69). The tractor diesel fuel tanks may contain a combined capacity of up to 300 gallons of fuel. The fuel tanks are postulated to rupture from the heat and engulf the entire tractor trailer and the LSA containers in a diesel fuel pool fire. It is conservatively assumed that graphite side spacer blocks are enveloped by the diesel fuel fire.

A fire involving 300 gallons of diesel fuel spilled onto a relatively flat surface will burn out within thirty minutes. The resultant fire temperature will be bounded by the ASTM-E119 (Ref. 70) standard fire curve. Most of the graphite will be exposed to temperatures well below the fire temperatures due to insulation provided by adjacent graphite blocks and some protection afforded by the shipping containers.

Under these conditions, it is conservative to assume that 50 percent of the graphite inventory on a shipping trailer is oxidized during the 30-minute fire. It is assumed that all of the tritium in the oxidized fraction (50 percent of the total tritium inventory), is released. In addition to tritium release, it is assumed that 0.015 percent of the balance of the radionuclide inventory is released in the form of particulates (Ref. 71). The accident is assumed to occur at ground level immediately outside of the Reactor Building truck loading bay. The radioactive inventory for the 230 graphite side spacer blocks is calculated to be 3,706 total Curies. This total inventory consists of 3556 Curies of Fe-55, 122 Curies of tritium and 28 Curies of Co-60. Fifty percent of the tritium is assumed to be released (approximately 61 Curies). The additional release of the remaining radionuclides will be 0.534 Curies of Fe-55 and 0.004 Curies of Co-60. The atmospheric dispersion factor, breathing rate and dose conversion factors are the same as those used for the heavy load drop analysis.

3.4.6.3 Analysis of Effects and Consequences

The whole body and lung doses to an individual standing at the EPZ were calculated to be 121 mRem and 215 mRem, respectively. As described in Section 9 of this plan, the EPZ is a minimum of 100 meters from the Reactor Building, the Fuel Storage Building, and the route planned for transport of activated graphite blocks between the Reactor Building and the Fuel Storage Building. Therefore, these doses are applicable at the EPZ, whether the graphite block fire is postulated to occur in the Reactor Building or its truck bay, or in the Fuel Storage Building or on the transport route anywhere between these two buildings. The whole body dose was 118 mRem from tritium, 3 mRem from Fe-55, and less than one mRem from Co-60. The lung dose was 118 mRem from tritium, 59 mRem from Fe-55, and 38 mRem from Co-60.

3.4.7 Loss of PCRV Shielding Water Accident

3.4.7.1 Identification of Causes

During a portion of the Fort St. Vrain decommissioning, the PCRV cavity will be flooded with water. This water will be circulated and purified by the PCRV Shield Water System (Section 2.3.3.6) to gradually decrease the radioactivity in the water. This system is expected to be in operation during the period when the PCRV internals are being removed.

This accident scenario assumes that there is a leak or rupture of the PCRV Shield Water System piping resulting in a liquid release due to a mechanical impact or a mechanical failure of a weld or flange.

3.4.7.2 Accident Description

This accident scenario assumes that a mechanical failure of the PCRV Shield Water System piping to the PCRV cavity occurs, resulting in a pipe rupture. Tritiated water with dissolved cesium, iron and cobalt would be spilled into the Reactor Building sump and keyway. Assuming the worst case (complete emptying of the PCRV), calculations indicate that 423,500 gallons could fill the Reactor Building sump/keyway, and flood the basement floor to a height of two feet. This water would be 49 feet below grade and would be contained by the Reactor Building sump/keyway and walls. No credit is taken for the Reactor Building ventilation system for this accident scenario.

In order to conservatively maximize the consequences of this accident, an extremely large amount of water was assumed for the PCRV inventory, reflecting the PCRV full of water and empty of most of its contents, including the core. This assumption results in overflow of the Reactor Building sump/keyway to the Reactor Building basement, thereby increasing the surface area of water available for evaporation by approximately a factor of five.

Since the non-gaseous activities will be retained in the spilled water, tritium (released through evaporation) is the only significant activity available. This will be evaporated from the surface area of the spilled water in the Reactor Building basement.

The PCRV liquid release will not seep through the sump concrete seams as the water table is well above the 49 foot below grade level. To date, no known in-leakage of ground water has been observed into the Reactor Building sump.

The Reactor Building is approximately 120 feet long and 76 feet wide, which conservatively provides (neglecting equipment) a surface area for the spilled water of 9120 square feet (848 square meters). From Westinghouse Report WCAP 11002

(Ref. 72), the best fit evaporation rate at 70 percent relative humidity and wind speed of 1 m/sec is 0.046 g/m2-sec or 0.046 cc/m2-sec (assuming 1 gram = 1cc of water). It is predicted that tritium levels in the PCRV water will be less than 1000 Curies. However, for this analysis, it is conservatively assumed that the theoretical maximum amount of tritium is transferred to the PCRV shielding water from the graphite blocks, which is approximately 1 E+5 Curies. Therefore, the tritium concentration in the spilled water is calculated to be 62.4 μCi/cc.

With an evaporation rate of 0.046 cc/m2-sec and a tritium concentration of 62.4 μCi/cc, the tritium release rate is about 2.5 mCi/sec over the 848 square meters of surface area. Over a two hour period, 18 Curies would be released. For offsite dose analysis resulting from this quantity of tritium release, the same breathing rate, atmospheric dispersion factor and dose conversion factors as stated previously are used.

3.4.7.3 Analysis of Effects and Consequences

Since the dose conversion factor for tritium is the same for whole body and lung doses, the dose to an individual standing at a point on the EPZ 100 meters from the Reactor Building was calculated to be 34.8 mRem for a two hour period.

3.4.8 Loss of Power

During the plant decommissioning, power will be normally supplied by off-site sources. No backup power is assumed available during a loss of power. The primary machinery using power during the decommissioning is identified in the following table.

Pumps: Deionized Water System Fire Water Pumps Service Water Pumps Water Treatment PCRV Cleanup Water Pump	Demolition Tools: Plasma Arc Torch Diamond-Wire Cutter Water Jet Cutter Drills Mobile Laundry PCRV Work Platform
Lighting: Underwater Lighting Building Plant Area	HVAC: Ventilation Fans HEPA Filters/Fans HEPA Vacuums/ Portable Cleaners
Cranes	

3.4.8.1 Identification of Causes

This accident postulates the loss of off-site power due to weather related events. Such events could include downed power lines due to strong winds or heavy icing conditions. The likelihood of this occurrence is remote since off-site power can be supplied to the site through six separate lines.

3.4.8.2 Accident Description

Loss of power would result in the loss of plant ventilation (HVAC) systems, lighting, plant water systems, and demolition power. Decommissioning activities would cease until power is restored.

Loss of power to the PCRV Shield Water System pumps will not result in a radioactive release since the flow of bleed water from the PCRV will be stopped (see Section 3.3.2.2 for a description of this process). While loss of ventilation will force personnel from radiological control areas, no off-site consequences are anticipated.

The postulated accident scenario is the loss of power to the HVAC while a large side reflector block has been removed from the PCRV for cutting. These graphite blocks will be grappled and hoisted by a jib crane to the HSF or a refueling floor work station where the blocks will be cut into sections in preparation for packaging into

LSA containers. The loss of power is assumed to occur after the cutting/cleaving operation.

It is assumed that these processing operations (kerfing debris) are performed in a local containment on the refueling floor, and will release 1.5 percent of the total activity of a single large side reflector block. It is conservatively judged that the combination of radiological controls in place at the work station (e.g., confinement through tenting) and the confinement function provided by the Reactor Building itself will result in retention of 99 percent of the Fe-55 and Co-60 kerfing debris in the Reactor Building. It is therefore assumed that one percent of the Fe-55 and Co-60 in the kerfing debris and 100 percent of the tritium in the kerfing debris are released at ground level from the Reactor Building. No credit is taken for the Reactor Building ventilation system.

The total activity in an average large side reflector block has been calculated to be 1477 Curies, as shown in Table 3.4-5. A release of 1.5 percent of the radioactive material is assumed from the kerfing debris in a single block. Of that amount, one percent of the Fe-55 and Co-60, and 100 percent of the tritium is released, resulting in a total of 0.31 Curies released to the environment. This total release consists of 0.219 Curies of Fe-55, 0.091 Curies of tritium and 0.002 Curies of Co-60. These activities are based on a three year decay period.

The major exposure path was assumed to be air inhalation to an adult standing at a point on the EPZ 100 meters from the Reactor Building. The atmospheric dispersion factor, breathing rate, and dose conversion factors are the same as those used previously.

3.4.8.3 Analysis of Effects and Consequences:

The whole body and lung doses to an individual standing at a point on the EPZ 100 meters from the Reactor Building were calculated to be 1.54 mRem and 40 mRem, respectively. The whole body dose was 0.18 mRem from tritium, 1.32 mRem from Fe-55, and 0.04 mRem from Co-60. The lung dose was 0.2 mRem from tritium, 24.2 mRem from Fe-55 and 15.6 mRem from Co-60.

3.4.9 Natural Disasters

For the effects of natural disasters, the following external initiating events were considered:

1. Earthquake: The Reactor Building is designed to withstand the Design Basis Earthquake of 0.10 g horizontal ground acceleration at the site without unsafe damage or failure to function. For decommissioning, it is required that the Reactor Building continue to perform its confinement function following a seismic event. The seismic qualification of the Reactor Building will be maintained during decommissioning. No other new or existing systems or equipment are required to function during or following an earthquake.

The most severe event which could result from a large earthquake is considered to be a drop of a radioactive waste container holding a highly activated graphite block (see heavy load drop accident). However, the simultaneous occurrence of an earthquake and the hoisting of a heavy load is not considered credible (a probability of less than 1 E-6 per year, from Ref. 65). The consequences of this simultaneous earthquake and heavy load drop scenario were not analyzed due to the low probability of such an event.

2. Tornado and Wind Effects: From Reference 52, Section 14.1.2, the basic design wind velocity for the plant is 100 mph. The equipment and structures exposed to wind load are designed to support design wind load combined with functional loads within the specified allowable stresses.

The tornado danger at the plant site is extremely remote. However, the Reactor Building was designed to withstand wind loadings developed by a tornado of 202 mph (total horizontal wind velocity) without exceeding yield stresses in the basic building structure. The Reactor Building was also designed to withstand a maximum tornado of 300 mph (total horizontal wind velocity) acting on the full area of all structures and a drop in atmospheric pressure of 3 psi within a period of 3 seconds, without exceeding ultimate stress levels in the main structural members. Above the 202 mph wind speed, the siding on the Turbine and Reactor Buildings above the turbine deck and refueling floor levels may be carried away, but the basic building structure will not collapse.

3. Floods: From Reference 52, Section 14.1.3, the plant site is protected from excessive runoff and flood by design of the yard drainage system. Grade level is approximately 17 feet above the highest observed flood level, and from 10 to 13 feet above the maximum probable flood level. The walls of the structures extending below grade level are watertight, and buoyancy effects were taken into account in their construction. Therefore, there will be no further consideration of accidents due to flooding during decommissioning activities.

4. Range Fire: The Fort St. Vrain site is located in an area of Weld county devoted to agriculture. The site itself is mostly surrounded by corn fields. Within the plant exclusion area is a fire buffer area consisting of maintained grass and ornamental landscaping. A 20 foot wide concrete pad rings the site. Therefore, a brush or range fire is not a credible accident during decommissioning activities.

3.4.9.1 Identification of Causes

The risks from a tornado at Fort St. Vrain during decommissioning are quite low for two reasons. First, the probability that a tornado will strike the site is diminishingly small. Second, the plant specific vulnerability to a tornado and its consequences are also small. Unlike an operating nuclear power plant with active safety systems to contain large quantities of radioactive materials at high energy levels, all spent fuel will be removed from Fort St. Vrain and the PCRV will essentially be a passive container of radioactive material. Possible loss of power, which could be caused by a tornado, is specifically analyzed in Section 3.4.8.

The Reactor Building roof and siding above the refueling floor are designed to withstand a tornado with a wind speed up to 202 mph. The probability of experiencing a tornado with wind speeds above 202 mph during decommissioning is extremely low based upon information and methodology provided in the draft Individual Plant Examination of External Events (IPEEE), NUREG-1407 (Ref. 73).

Based on the work of Abbey and Fujita (Ref. 74), the continental United States was broken down into 20 distinct tornado hazard regions. These regions were generalized into 4 broad areas shown in Figure 3.4-4, ranging from a highest risk in region A to the lowest risk in Region D. The Fort St. Vrain site is classified into Region C.

Reference 75 is used to establish the occurrence rate for different classifications of tornadoes. The National Severe Storms Forecast Center (NSSFC) national database for the years 1950 - 1978 was used as the basis for the occurrence rate analysis. The NSSFC data are categorized by Fujita intensity scales (F-scales). To predict the probability that a tornado with maximum windspeed will strike a nuclear power plant requires adjusting the F-scales for: tornado reporting trends, F-scale classification errors, path length intensity variation, and occurrence rates and windspeed relationships adjusted for intensity variation. The adjusted, or updated, tornado scales are denoted by "F'". Tornado wind velocities for the F- and F'- scales are compared as follows:

F-SCALE	MAXIMUM WINDSPEED INTERVAL (MPH)	F'-SCALE	MAXIMUM WINDSPEED INTERVAL (MPH)
F0	40 - 72	F'0	40 - 73
F1	73 - 112	F'1	73 - 103
F2	113 - 157	F'2	103 - 135
F3	158 - 206	F'3	135 - 168
F4	207 - 260	F'4	168 - 209
F5	261 - 318	F'5	209 - 277

The following evaluation demonstrates the low probability of occurrence of a tornado with wind velocity exceeding 202 mph at Fort St. Vrain, by comparing the frequency of occurrence of tornadoes in Weld County with the NSSFC data. The occurrence rate of a F'4 tornado is 3.4 E-6/square mile/year (Ref. 75). According to the National Weather Bureau's historical data for Weld County from 1950 through 1987, there was only one tornado in the F3 range. That single F3 tornado is the only tornado in the vicinity of Fort St. Vrain of the 256 tornadoes recorded by NSSFC for all of Region C that had estimated windspeeds greater than 158 mph (Ref. 75). Based on this sample from the population, it can be inferred that the probability of a tornado at Fort St. Vrain in the F3 range is much less than 3.4 E-6/square mile/year.

The occurrence rate for a F'5 tornado in Region C is 3.5 E-7/square mile/year (Ref. 75). The National Weather Bureau's Weld County data show no tornado occurrence with intensity of F4 or greater. Thus, the 56 F4 and nine F5 tornadoes recorded by

NSSFC all occurred outside the Fort St. Vrain area.

From this data, it can be concluded that the probability of occurrence of an F4 or greater tornado is less than 3.5 E-7/mi2/yr. According to the draft IPEEE "Plants Designed Against NRC Current Criteria", these events pose no significant threat of a severe accident because the current design criteria for wind are dominated by tornadoes having a frequency of exceedance of about 1 E-7. The following section contains a specific accident analysis for a postulated tornado with winds less than 202 mph.

3.4.9.2 Accident Description

Temporary storage or staging of radioactive waste containers prior to shipment is expected. It is assumed that interim radioactive material storage will be available for 15 LSA boxes and 200 drums in the Fort St. Vrain Fuel Storage Building (Section 2.2.1.3). Calculations demonstrate that neither forces generated by 202 mph wind loading, nor the impact from the tornado-driven design basis missile, will result in breach of the walls or roof of this building.

In this scenario, it is assumed that a 202 mph tornado strikes the Fort St. Vrain site. At this lower wind level, the walls of the Reactor Building enclosing the PCRV will remain intact.

The tornado-driven design basis missile is a 12 foot x 12 inch x 4 inch thick fir plank, weighing 105 pounds, which impacts and penetrates the Reactor Building above the refueling floor level. It is assumed that this missile strikes and ruptures a container with 46 graphite side spacer blocks. It is conservatively assumed that one percent of the activity in the container is dispersed and released to the environment. No filtration credit is assumed.

The total radioactivity inventory for the 46 side spacer blocks is approximately 741 Curies. This total inventory is comprised of 711 Curies of Fe-55, 24.4 Curies of tritium and about 5.5 Curies of Co-60. Assuming a one percent release results in 7.41 Curies released to the environment. These activities are based on a three year decay period. The major exposure path was assumed to be air inhalation to an adult standing at a point on the EPZ 100 meters from the Reactor Building.

The atmospheric dispersion factor used was an annual average Fort St. Vrain dispersion factor of 4.59 E-4 sec/m^3, calculated for 100 meters (the minimum distance to the EPZ), and assuming ground level release. This is considered very conservative, since during a tornado or in the wake of a tornado the atmospheric dispersion factors would be much more favorable. The dose conversion factors and breathing rate used are the same as those stated previously.

3.4.9.3 Analysis of Effects and Consequences

The whole body and lung doses to an individual standing at a point on the EPZ 100 meters from the Reactor Building were calculated to be 0.58 mRem and 16.8 mRem, respectively. The whole body dose was 0.006mRem from tritium, 0.558 mRem from Fe-55, and 0.016 mRem from Co-60. The lung dose was less than 0.01 mRem from tritium, 10.2 mRem from Fe-55 and 6.6 mRem from Co-60.

3.4.10 Dropping of a Steam Generator Primary Module

3.4.10.1 Identification of Cause

As stated in Section 3.4.5.1, a heavy load drop is a relatively low probability event. A failure of the hoisting cable could cause a drop of the load. In accordance with Reference 65, the probability of this event is on the order of 1.0 E(-06) per demand (hoist lift). The loss of the crane brakes could be due to mechanical failure, operator error, or an incorrect maintenance operation. Since the Fort St. Vrain Reactor Building crane does not qualify as a Single-Failure-Proof crane in accordance with NUREG-0554 (Ref. 66) guidelines, the loss of crane brakes is postulated as a credible failure mode. The dropping of the component with the largest inventory of dispersible radioactive material, the large side reflector blocks, was postulated and analyzed in Section 3.4.5. Credit is taken for decontamination of the particulate afforded by the Reactor Building Ventilation Exhaust System. However, no credit has been taken for the Reactor Building ventilation exhaust system in a postulated steam generator primary module drop accident. Therefore, this accident scenario assumes that radioactivity is released from the drop of a steam generator primary module due to the loss of the crane brakes.

3.4.10.2 Accident Description

It is postulated that the Reactor Building crane is hoisting one of the steam generator primary modules. After appropriate radiation surveys, the steam generator primary module is lowered into the enlarged equipment hatch. Failure of the crane is postulated at this point. This failure results in the steam generator primary module falling approximately 100 feet to the level of the truck loading bay, and possibly into the Reactor Building basement, should it break through the truck loading bay floor slab. It is conservatively assumed that one percent of the activity plated out on the surface of a single steam generator primary module is dispersed from the drop. The activity is postulated to remain airborne and escape the Reactor Building unfiltered.

In order to conservatively estimate the activity levels of radionuclides that are present on the surfaces of the steam generators, the plateout levels predicted by the revised FSV Plateout Analysis for Decommissioning Study (Ref. 11) were used. The projected plateout levels on the reheater, superheater, economizer and evaporator tube bundles of all 12 steam generator modules are presented in Table 3.1-5.

Table 3.1-5 identifies projected plateout levels of six key radionuclides that are either fission products or come from fission products (Sr-90, Te-127m, I-129, I-131, Cs-134 and Cs-137). In addition to the six key radionuclides associated with fission products discussed above, it is also necessary to consider activation products which may have accumulated on the steam generator surfaces, such as Mn-54, Fe-55, Co-60, Ni-63, etc. While it is not presently feasible to obtain samples from the surfaces of the steam generator tube bundles, surface concentrations of activation products can be estimated based on samples taken from the surfaces of helium circulators, which are in the primary coolant flow stream.

Although measured surface concentrations of Co-60 were a factor of 15 lower than those measured for Cs-137 on a helium circulator, it was conservatively assumed that the Co-60 inventory on a steam generator module was equal to the Cs-137 inventory that is predicted by the revised FSV Plateout Analysis for Decommissioning Study to be on a steam generator module. The ratio of the surface concentrations of remaining activation products to Co-60 was assumed to be identical to those measured on the surfaces of a helium circulator (Ref. 76). Based on these assumptions, the inventory of various radionuclides plated out on the surfaces of a steam generator module were derived and are shown in Table 3.4-6.

It was then conservatively assumed that none of the activity on the surfaces of the steam generator modules is removed while the steam generators are underwater. It was also assumed that 1% of the total surface activity inventory of one steam generator module becomes airborne as a result of the postulated drop accident. Furthermore, a three year decay period was assumed, although the steam generators are not scheduled for removal until about two years into decommissioning, or about 5 years after reactor shutdown. The radionuclides assumed to be released as the result of a postulated drop accident are thus 1% of the values presented in the 3 year decay column of Table 3.4-6. No credit is taken for particulate filtration by the Reactor Building ventilation system. The major exposure pathway was assumed to be air inhalation by an adult standing at the EPZ (100 meters minimum) and was assumed to occur over a two hour period. The dose conversion factors were taken from NUREG-0172 (Ref. 57).

3.4.10.3 Analysis of Effects and Consequences

The whole body and organ doses to an individual standing at a point 100 meters from the Reactor Building were calculated to be 8.3 mRem whole body and 90.7 mRem to the maximum organ (lung). A breakdown of the doses produced by individual radionuclides is presented in Table 3.4-7.

3.4.11 Summary

The results of the preceding accident scenarios, postulated for Fort St. Vrain decommissioning activities, indicate that the radiation exposures to the general public will be very low. These evaluations have determined that, in all cases, the radiological consequences at the EPZ (100 meters minimum) are well within the 10 CFR 100 guidelines of 25 Rem whole body dose and 300 Rem to any specific organ. These doses are also a small fraction of the one Rem whole body dose and five Rem to any specific organ guidelines cited in the EPA Protective Action Guidelines (Ref. 54).

These scenarios are considered to have a low probability of occurrence and their radiological consequences bound other less severe accidents scenarios. Therefore, it is concluded that the Fort St. Vrain decommissioning activities do not pose any undue risk to the health and safety of the general public.

TABLE 3.4-1
SUMMARY OF ACCIDENT SCENARIOS

ACCIDENT	DESCRIPTION
Dropping of Contaminated Concrete Rubble	Rubble from PCRV top head concrete is dropped during processing
Conversion Construction Near PCRV Dismantlement	Natural gas explosion/crane falling.
Heavy Load Drop	Container drop to loading bay.
Fire	Truck diesel fuel pool fire.
Loss of PCRV Shielding Water	Pipe rupture in the PCRV Shield Water System.
Loss of Power	Release of graphite cutting debris from refueling floor work station.
Natural Disasters	Tornado-generated missile striking LSA waste container.
Dropping of Steam Generator Primary Module	Drop of Steam Generator primary module to loading bay during handling.

TABLE 3.4-2
DOSES TO AN INDIVIDUAL AT THE EPZ (100 METER MINIMUM) DUE TO POSTULATED ACCIDENTS

ACCIDENT	2-HOUR DOSE (mRem)	
	WHOLE BODY DOSE	ORGAN DOSE
Dropping of Concrete Rubble	4.92	58.9 (lung)
Heavy Load Drop	7.10	202 (lung)
Fire	121	215 (lung)
Loss of PCRV Shielding Water	34.8	34.8 (lung)
Loss of Power	1.54	40 (lung)
Natural Disaster (Tornado)	0.58	16.8 (lung)
Dropping of Steam Generator Primary Module	8.30	90.7 (lung)

TABLE 3.4-3
CURIE TOTALS IN ACTIVATED PCRV CONCRETE

(3 YEARS DECAY-DATA FROM REFERENCE 2)

LOCATION	DEPTH	CURIES
Top Head Axial Up	1st 6 inches	9.83 E+1
	2nd 6 inches	2.56 E+1
	3rd 6 inches	2.52 E+0
	4th 6 inches	2.70 E-1
	5th 6 inches	3.68 E-2
	6th 6 inches	6.35 E-3
	7th 6 inches	1.31 E-3
	8th 6 inches	2.85 E-4
Radial	1st 6 inches	8.89 E+0
	2nd 6 inches	3.13 E+0
	3rd 6 inches	3.66 E-1
	4th 6 inches	4.10 E-2
	5th 6 inches	5.94 E-3
	6th 6 inches	1.08 E-3
	7th 6 inches	2.31 E-4
	8th 6 inches	5.22 E-5
Core Support Floor Axial Down	1st 6 inches	5.69 E+0
	2nd 6 inches	3.80 E-1
	3rd 6 inches	3.33 E-2
	4th 6 inches	3.60 E-3
	5th 6 inches	4.66 E-4
	6th 6 inches	7.67 E-5
	7th 6 inches	1.42 E-5
	8th 6 inches	3.08 E-6
	9th 6 inches	6.69 E-7
	10th 6 inches	1.25 E-7

TABLE 3.4-4
PERCENTAGE CONTRIBUTION OF ACTIVATION PRODUCTS IN FIRST 6 INCHES OF TOP HEAD CONCRETE

(3 YEARS DECAY-DATA FROM REFERENCE 2)

SIGNIFICANT NUCLIDES	PERCENT OF TOTAL
H-3	2.89
Ca-41	0.05
Ca-45	0.18
Fe-55	89.29
Co-60	3.43
Cs-134	0.24
Eu-152	3.51
Eu-154	0.36
TOTAL	99.95

98.3 Curies total in 1.44 E+7 cc of top head concrete.

TABLE 3.4-5
WAST[illegible] VOLUME/ACTIVITIES ESTIMATES FOR THE PCRV

(B[illegible] [illegible] 3-YEAR DECAY PERIOD)

[illegible] SY	NUMBER	TOTAL CURIES	CURIES/ ITEM
R[illegible] Device [illegible]	84	122	1.4
Metal Clad Reflector B[illegible]	37	23100	624
Metal clad reflector block [illegible]	270	173000	640
Defueling blocks	1482	<0.01	/
Top reflector graphite blocks	589	2700	4.58
Bottom reflector graphite blocks	902	4000	4.43
Radial reflector hex graphite blocks - removable and permanent	396	3300	8.3
Large reflector blocks	312	354500*	1477*
Half-size reflector blocks	96	83700	872
Upper reflector keys (carbon steel)	24	0.02	<0.01
Side spacer blocks (no rods)	115[illegible]	18550*	16.[illegible]
Boron rods	309792	36800	0.12
Lower reflector keys (Hastelloy)	24	470	19.6
Core support blocks	61	120	2.0
Core support posts	183	36.5	0.2
Core support floor columns	12	1	0.08
Misc. steel from beneath CSF		2	/
Metal on large side reflectors	24	0.02	<0.01
Core Barrel	1	8.4	8.4
Lower Plenum insulation		<0.01	/
Silica blocks (25,000 lbs)		250	
Concrete - top		130	
Concrete - CSF		6	
Concrete - side		12	
Misc. Inconel parts on CSF		15	

* These values are different than those values computed in the activation analysis (Ref. 2), as explained in PDP Section 3.4.1

TABLE 3.4-5 (Continued)
WASTE VOLUME/ACTIVITIES ESTIMATES FOR THE PCRV

(BASED ON A 3-YEAR DECAY PERIOD)

ITEM/SYSTEM	NUMBER	TOTAL CURIES	CURIES/ ITEM
Hastelloy cans	20061	3800	0.19
Concrete cutting debris - top		15	
Concrete cutting debris - CSF		0.45	
Concrete cutting debris - side		0.44	
Helium purifiers in PCRV head	10	0.9	0.09
Helium diffusers	4	20	5
Helium circulator shutoff valve assy	4	2	0.5
Helium bellows	12	20	1.66
Thermocouples & guide tubes		0.9	
Steam generators	12	52.1	4.34
Lower floor appurtenances		2	
Platform/handling tools/jib cranes		<0.01	
Crane cable/drum/3 bucket inverters		<0.01	
Helium circulators	5	0.13	0.03
Orifice valves	37	415	11.2
Control rod drive assembly	44	233	5.3
Control rod absorber assembly	88	2.8	0.03
CSF Kaowool & Cover plates		90	90
CSF liner		142	142
Radial PCRV liner		10	10
Top cover plates		5.7	5.7
Top Kaowool		<0.01	<0.01
Top head liner		105	105

TABLE 3.4-6
INVENTORY OF RADIONUCLIDES ON ONE STEAM GENERATOR MODULE[1]

ISOTOPE	INITIAL ACTIVITY (μCi)	HALF-LIFE (years)	3 YEAR DECAY ACTIVITY (μCi)
Mn-54	1.74 E+05	8.55 E-01	1.53 E+04
Fe-55	5.20 E+06	2.70 E+00	2.41 E+06
Co-60	5.71 E+05	5.26 E+00	8.48 E+05
Ni-63	9.31 E+04	9.20 E+01	9.10 E+04
Sr-90	3.94 E+04	2.81 E+01	3.66 E+04
Y-90*	1.68 E+05	64 Hours	1.41 E+05
Ru-106	1.47 E+04	1.01 E+00	1.88 E+03
Ag 110m	1.83 E+05	6.90 E-01	9.00 E+03
Cs-134	2.34 E+05	2.06 E+00	8.53 E+04
Cs-137	5.71 E+05	3.01 E+01	[illegible].33 E+05
Ce-144	2.18 E+05	7.78 E-01	1.50 E+04
Pm-147	1.83 E+05	2.62 E+00	8.42 E+04

* - Y-90 continues to be produced from the radioactive decay of Sr-90

(1) - Nuclides that contribute at least 0.1% to the offsite radiological consequences (Whole body or maximum organ)

TABLE 3.4-7
CONTRIBUTION TO OFFSITE RADIOLOGICAL CONSEQUENCES

SIGNIFICANT ISOTOPE	WHOLE BODY DOSE (mRem)	MAXIMUM ORGAN DOSE - LUNG (mRem)
Mn-54	1.47 E-3	3.28 E-1
Fe-55	1.46 E-1	2.66 E+0
Co-60	1.92 E-1	7.75 E+1
Ni-63	2.02 E-2	2.49 E-1
Sr-90	3.42 E+0	5.38 E+0
Y-90	1.21 E-4	3.66 E-1
Ru-106	2.50 E-4	2.68 E-1
Ag-110m	8.20 E-4	6.38 E-1
Cs-134	9.51 E-1	1.27 E-1
Cs-137	3.49 E+0	6.14 E-1
Ce-144	4.22 E-2	1.79 E+0
Pm-147	3.30 E-2	6.80 E-1
Other	<0.01	0.10
TOTALS	8.30	90.7

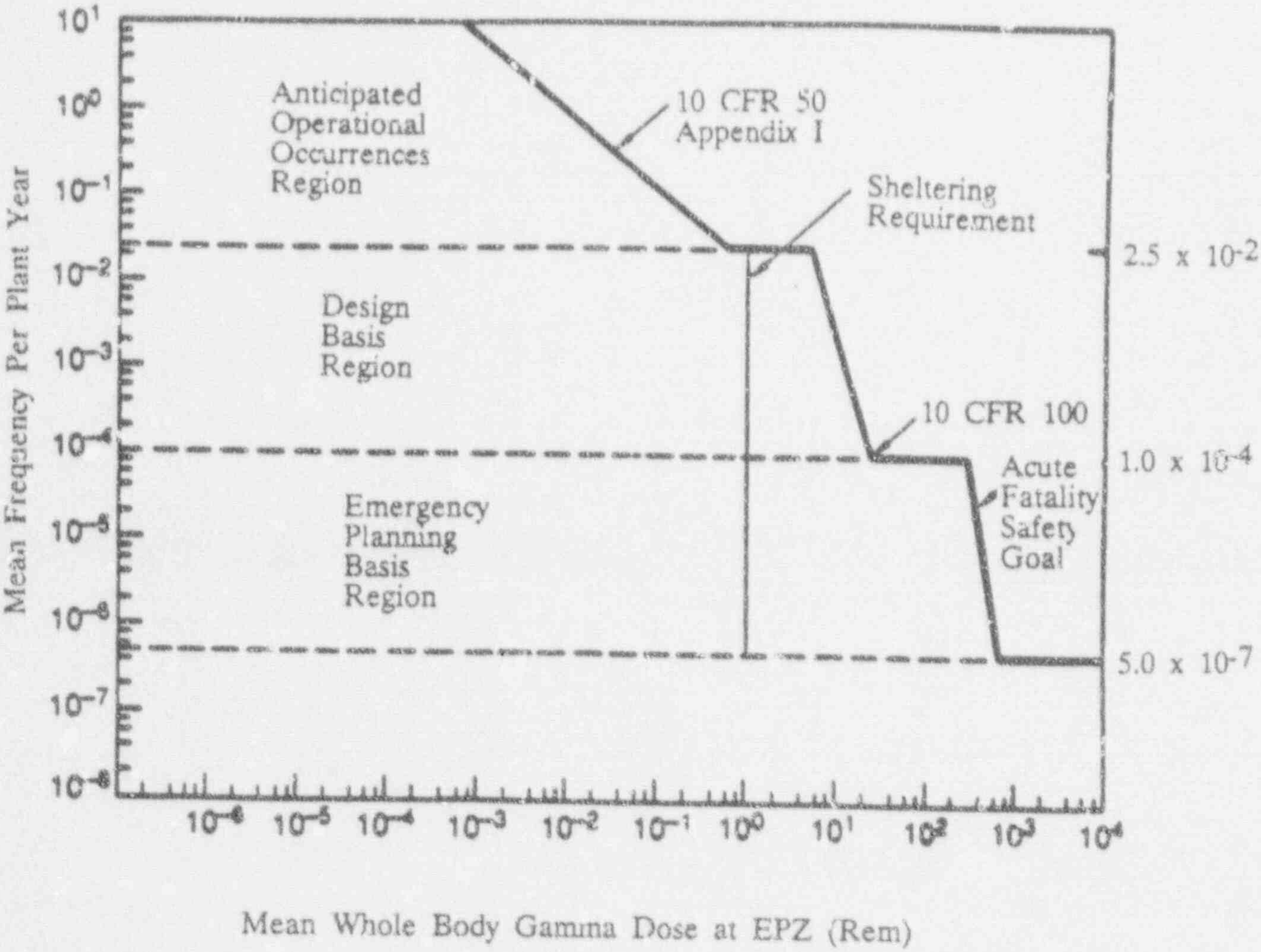


Figure 3.4-1 Whole Body Exposure Guidelines at the Emergency Planning Zone (EPZ)

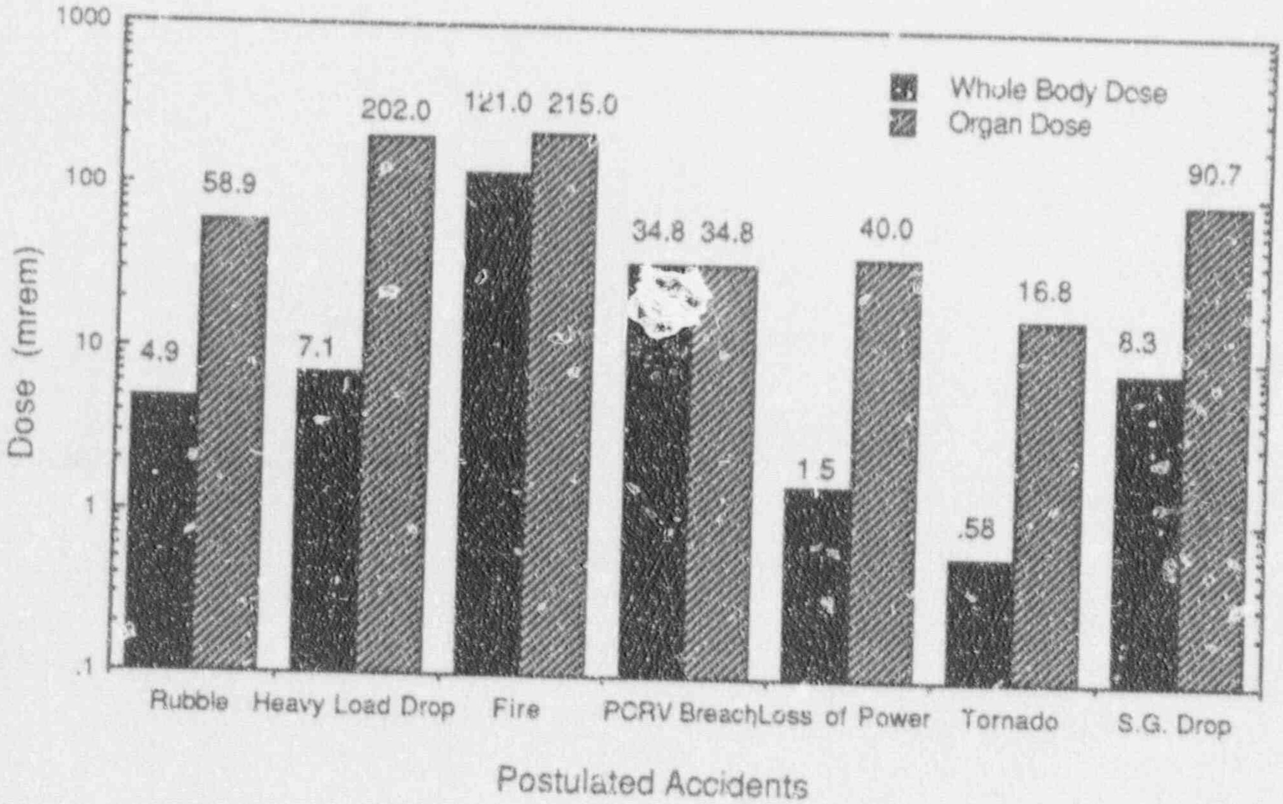


Figure 3.4-2 Dose Consequences from Fort St. Vrain Postulated Accidents

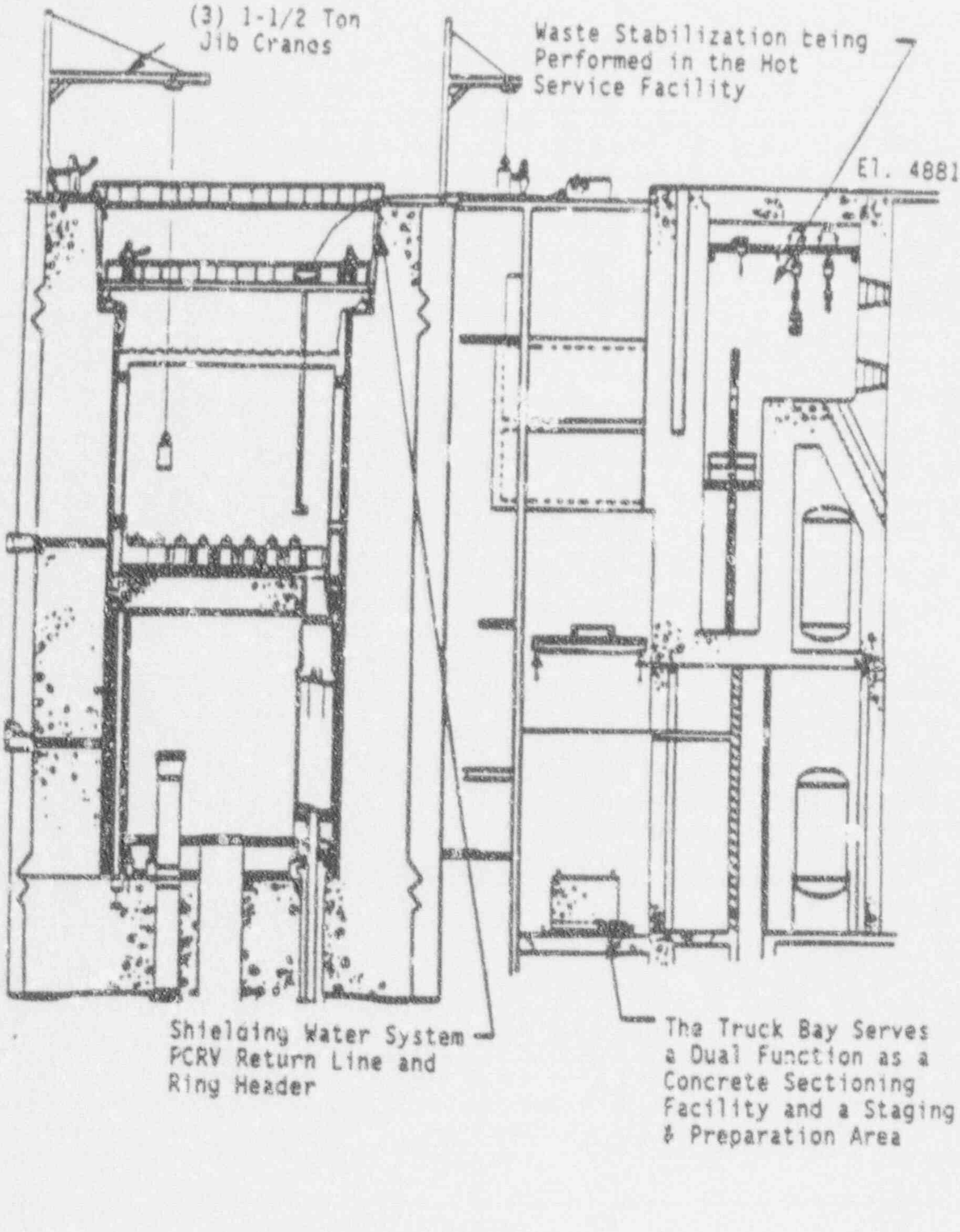
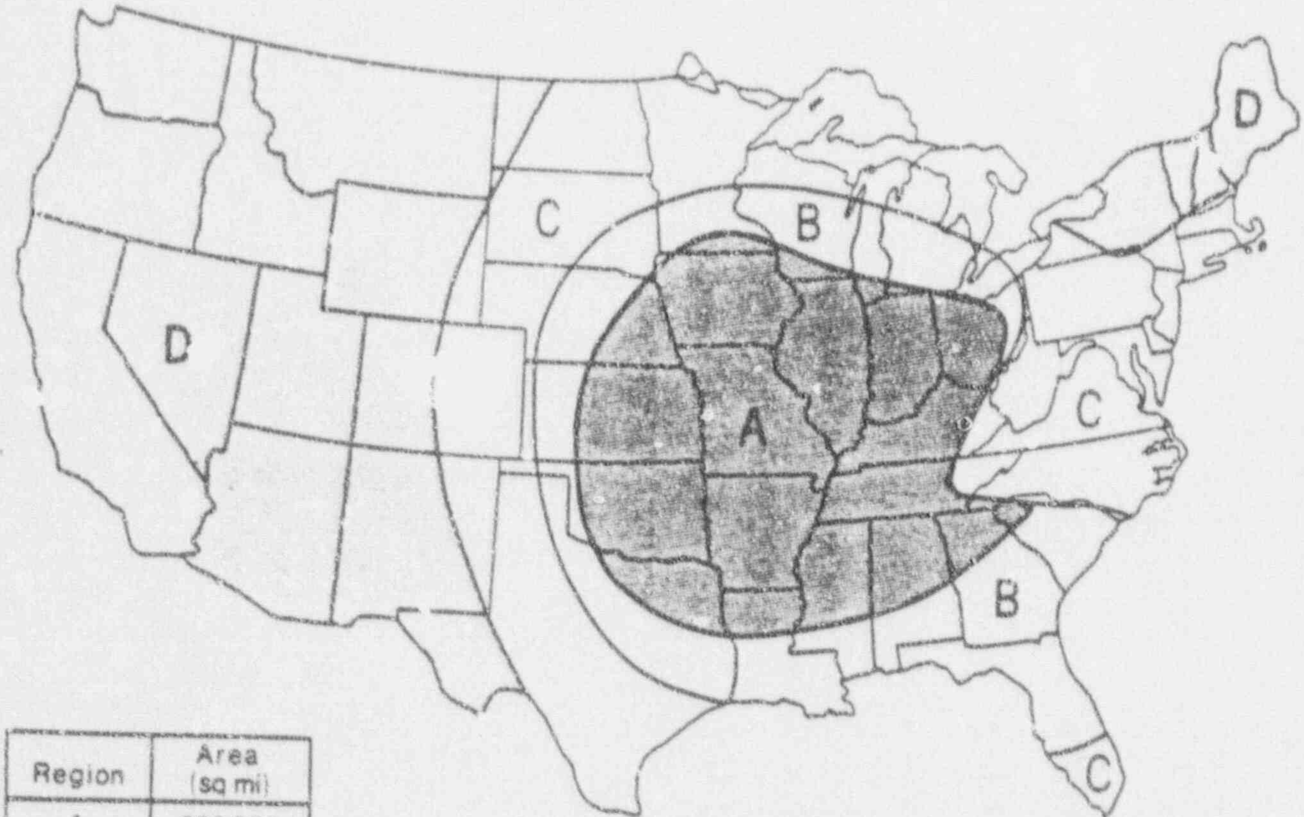


Figure 3.4-3 PCRV Work Area - Elevation View



Region	Area (sq mi)
A	625,628
B	365,180
C	775,569
D	1,205,117

Figure 3.4-4 Large Scale Regionalization for Tornado Risk Analysis

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SECTION 4
FINAL RADIATION SURVEY PLAN

4.1 INTRODUCTION

The purpose of the final radiation survey will be to demonstrate the effectiveness of the decommissioning and to provide documentation that contaminated materials, structures, areas and components have been successfully removed/decontaminated to acceptable levels to permit release for unrestricted use. The final radiation survey to release the Fort St. Vrain site, facilities and installed equipment for unrestricted use will be performed following the completion of the decontamination and dismantlement activities. Materials and equipment determined to be free of radioactive contamination will be unconditionally released on an on-going basis.

All radiological surveys will be conducted in accordance with approved procedures using techniques that determine the effectiveness of a particular dismantlement and/or decontamination effort. These surveys will indicate when no further decontamination is needed and indicate that the equipment, area or structure has been prepared for unrestricted release.

This section describes the proposed methodology and criteria that will be used in performing the final surveys. This includes definition of residual radioactivity limits (including background evaluation), radiation survey methods, material release criteria and site release criteria.

4.2 FINAL RELEASE CRITERIA

The release of the site, facilities and materials remaining on site will be based on proper application of surface contamination, soil/water concentrations and exposure rate release criteria. While each criterion introduced below has been derived in a manner unique to its radiological category (concentrations, contamination or exposure), the basis for each criterion is the same as the objective of the decommissioning effort itself, to insure that the final disposition of Fort St. Vrain will not pose a significant threat to the general health and safety of the public and can be released for unrestricted use.

1. Limits for Loose and Fixed Surface Contamination: Criteria to allow release for unrestricted use for both loose and fixed surface contamination have been established in NRC Regulatory Guide 1.86 "Termination of Operating Licenses for Nuclear Reactors" (Ref. 1). These limits for acceptable surface contamination levels were established in 1974 and are currently accepted as practical criteria

when considered in light of the maximum sensitivity of commercially available portable radiation survey equipment. All final surveys for surface contamination on materials, equipment and structures at Fort St. Vrain to be released for unrestricted use shall be based on this criteria.

2. <u>Limits for Direct Exposure</u> While no formal criteria exist that establish an acceptable level of direct exposure, the NRC has provided interim guidance which directs licensees to use a limit of 5 μR/hr above background for reactor-generated gamma emitting isotopes as a limiting level for direct exposure from "residual" radioactivity (Ref. 2, 3, 4). This recommended limit of 5 μR/hr is also consistent with statements within NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" (Ref. 5).

   While this criteria will be of use for certain unique evaluations, it is expected that the NRC Regulatory Guide 1.86 criteria will be the most restrictive for the majority of material, equipment and facility release for unrestricted use.

3. <u>Limits for Total Concentrations in Soil and Water:</u> In February 1990, the NRC released NUREG/CR-5512 "Residual Radioactive Contamination from Decommissioning" (Ref.6) for comment. In this report, a generic pathway model is used to derive the potential total effective dose equivalent (TEDE) to an individual in a given population group from unit radionuclide concentrations of residual contamination. In consideration of this document, the effective criteria for the total concentrations of radioactive materials above background in soil and water will be based upon those established in NUREG/CR-5512. The use of these concentrations (or methodology used to obtain these concentrations) will ensure an average total effective does equivalent of less than 10 mRem/yr to an individual in a given population group.

4. <u>Limits for Unrestricted Release of Decontaminated Items:</u> Equipment and materials found to be free of radioactive contamination as described in NRC Circular 81-07 (Ref. 7), "Control of Radioactively Contaminated Materials" and NRC IEN 85-92 (Ref. 8), "Surveys of Wastes before Disposal from Nuclear Reactor Facilities" will be

unconditionally released. Equipment and material that are found to be contaminated and cannot be decontaminated will be handled as radioactive waste. These contaminated materials will be packaged and shipped in the most cost-effective way to a radwaste volume reduction facility or to a burial site for final disposition.

4.3 SURVEY METHODOLOGY

The survey methodology provides the framework for the design of survey techniques and procedures to accomplish the objective of demonstrating that the Fort St. Vrain site meets all applicable radiological criteria prior to its release for unrestricted use.

The final radiation survey will be performed after dismantlement/ decontamination have been completed and will be based on categorizing portions of the plant and site into areas where a high, medium or low probability will exist of finding measurable amounts of residual radioactivity.

Areas with a high probability of residual activity will include such areas as the PCRV, fuel storage facility, HSF and radwaste compacting building. Surfaces in these areas will be systematically surveyed.

Statistical methods, described in NUREG/CR-2082, "Monitoring for the Compliance with Decommissioning Termination Survey Criteria" (Ref. 9), will be used to determine systematic, stratification or random survey techniques. The initial site characterization survey (See Section 3.1.5), decontamination surveys during decommissioning, and routine health physics surveys will be used to determine those plant areas in which there will be a high, medium, or low probability of finding residual radioactivity.

Areas with a medium probability of residual activity will typically include balance of plant areas (where contaminated equipment had been removed), ventilation systems, and contaminated equipment storage. A stratification survey technique will be used in these areas. Floors and walls up to two meters above the floor will be surveyed systematically. Surveys of the ceiling and remaining wall surfaces will employ random survey techniques, since the entire area will have been previously decontaminated and will have a low probability of being contaminated.

Areas with a low probability of residual activity will include such areas as the ground and structures outside the reactor building, roof, and walls of the reactor building above the operating floor, and other working areas inside the plant. Surveys of these areas will employ random survey techniques.

4.3.1 Preliminary Survey

The elements of a preliminary survey program have been incorporated into the site characterization study (See Section 3.1.5). Data obtained from the site characterization study, reviews of historical radiological data and on-going radiological surveys will be utilized to develop the final radiation survey plan. This approach will provide sufficient data to preclude the necessity of developing a separate preliminary survey.

This approach will provide the level of detail necessary to determine the appropriate surveys, analyses and logical division of the site into separate survey units or grids (See Section 4.3.3).

4.3.2 Background Determination

Background levels of radiation will be determined principally by taking radiological measurements at an area (or areas) remote enough to be beyond any detectable influence of the plant, but close enough to the plant to be representative. Background measurements will include both "instrument background" and naturally occurring radioactive materials including enhanced background radiation levels due to fallout. Efforts will be made to find a site and structure that meet the above conditions and approximate the physical characteristics of Fort St. Vrain. The sampling scheme (sample locations, number of samples, etc.) will be based on guidance from NUREG/CR 2082 (Ref. 9).

The sampling methodology to be used when determining the independent radiological background will be based upon collecting multiple samples of soil and direct instrument readings. Since background levels may vary from point to point, each type of background sampling will be statistically analyzed to determine if a single numerical representation of the background type will be valid. For example, it is expected that background gamma dose rates at all elevations inside buildings will be statistically equivalent to the background gamma dose rates at ground level in the buildings. If statistical differences in background levels are found at some elevation (or area), different background levels will be assigned to those areas. Statistical analyses of data, including treatment of anomalies, will be performed based on the guidance of NUREG/CR 2082 (Ref. 9).

Radiological background types that will be evaluated include:

1. Direct surface beta, gamma and alpha contamination.
2. Direct gamma exposure rate readings on contact with the surface.
3. Direct gamma exposure rate readings at a fixed distance (one meter) from the surface.
4. Surface soil contamination.
5. Sub-surface soil contamination.

As part of the background characterization study, the minimum detectable activity (MDA) of the instrumentation will also be evaluated to ensure that the instrumentation is sensitive enough to respond to levels as specified in the final release criteria. NRC Circular 81-07, "Control of Radioactively Contaminated Materials" (Ref. 7) and NRC IEN 85-92, "Surveys of Wastes before Disposal from Nuclear Reactor Facilities" (Ref. 8) provide guidance for the determination of the MDA of the survey instrumentation.

The effects of concrete and other shielding (building geometry) within the Fort St. Vrain facility that lower the background dose rate relative to the remote area readings will also be addressed and evaluated. Water and soil samples will also be taken at the remote location(s) for background evaluation.

Results of this study will be documented and the formal report and final interpretation will be the basis for background baselines.

4.3.3 Grid Survey Technique

To assure that all areas of a surface are adequately surveyed, a rectangular or other appropriate geometric grid will be superimposed on all surfaces being surveyed. The grids may be physically marked on the surfaces or, as a minimum, the grid corners will be labeled. The primary purpose of the grid is to aid in repeatability of measurements in the event that further evaluation of data is necessary.

The grid dimensions will vary from one to three meters on a side per grid for indoor areas and certain outdoor areas (such as rooftops) and from three to fifty meters on a side per grid for soil and equipment lay-down areas. The soil grid will be laid out using stakes as markers to define grid patterns. Radiation survey maps will be developed and included in the procedures for radiological survey.

Detailed development of grid survey techniques and procedures will be based upon guidance from NUREG/CR-2082 (Ref. 9).

4.3.4 Special Surveys

Final survey plans are typically based on the assumption that the majority of the original equipment will be removed as part of the decommissioning project. Decommissioning of Fort St. Vrain is unique in that the final survey program will include the release for unrestricted use large amounts of equipment and materials that will be re-used following the conversion of the facility or left in place. Electrical conduits, pipes, drains, equipment, and associated support equipment will require different survey methodology than a formal grid survey methodology. For these types of surveys, special techniques will be developed.

Due to the large amount of equipment and materials planned to remain in place in the Reactor Building, special surveys will not encompass 100% of all piping, conduits or systems on site. For most secondary systems, this approach will be warranted due to the operational history of the facility and past operational surveys. In general, the number and type of measurements will be based on the accessibility and the probability of contamination for a particular area, system, or equipment. It is expected that the site characterization survey and on-going surveys during the decommissioning will define the extent of special surveys.

Techniques and procedures will be developed to ensure proper surveys of all equipment and material types (motors, vessels, piping, etc.). Equipment or material found to be above the release criteria levels specified in Section 4.2 will be decontaminated or dismantled for disposal.

4.4 INSTRUMENTATION

Instrumentation to be used for the final site survey will be of such types and ranges to ensure that measurements can be performed within the final release criteria limits.

Portable field instruments will be chosen for their sensitivity, durability, ease of use, accuracy, and portability. This class of instruments will typically include:

1. Ratemeters with thin window GM tube detectors ("pancake" Type) sensitive to gross beta radiation.
2. Ratemeters with scintillation or air proportional detectors sensitive to gross alpha radiation.
3. μR meters sensitive to gross gamma radiation.
4. Ratemeters with scintillation detectors sensitive to gross gamma radiation.
5. Portable multichannel analyzer with HPGe or GeLi detector for field gamma spectral analysis.
6. Portable scaler(s) with detectors sensitive to alpha, beta and or gamma radiation.

Laboratory instruments will also be chosen for their sensitivity, durability, ease of use, accuracy, and stability. This class of instruments will typically include:

1. Multichannel analyzer with HPGe or GeLi detector(s) for gamma spectral analysis.
2. Liquid scintillation counter with adjustable window(s).
3. Scaler(s) with scintillation or gas flow proportional detector sensitive to gross alpha radiation.
4. Scaler(s) with GM or gas flow proportional detector sensitive to beta-gamma radiation.

Instruments will be calibrated, maintained and repaired in accordance with procedural requirements. Calibration sources to be used for calibration of both field and laboratory instrumentation will be traceable to National Institute of Standards and Technology (NIST) or equivalent standards. Procedural guidance will also be provided for a quality assurance and control program for all instruments used as part of the final survey plan.

4.5 DOCUMENTATION

Survey data will be presented in a manner that will allow the final radiological condition of the site to be completely and accurately depicted. This will allow parties to ascertain the radiological condition of the site without further analysis of the data. Clear and accurate documentation will be provided to ensure acceptable agreement between the final survey, independent verification survey (Section 4.7), and the NRC confirmatory survey.

4.5.1 Survey Documentation

Procedures will be developed to provide guidance in the documentation of measurements and analytical results. Survey maps will be used when considered appropriate, or survey information will be documented on survey forms. Information that will typically be included on the survey maps or forms is:

1. Location of the measurement or sample.
2. Date and time of the measurement or sample.
3. The name of the surveyor, sampler or analyst.
4. Description and purpose of survey or sample.
5. Description of sampling equipment, including calibration dates.
6. Analysis date and time (if applicable).
7. The analytical error (if applicable).
8. Units of measurement or analysis.
9. Unique conditions pertaining to the survey or analysis.

All original survey data shall be retained and placed in PSC archives at the termination of the project.

4.5.2 Radiological Survey Report

At the completion of the decommissioning effort, a radiological survey report will be developed to document the findings and conclusions of the final survey. This report will provide the basis for securing approval for the termination of the 10 CFR 50 license.

The radiological survey report will contain an overview of the radiological condition of the site and structures, a detailed presentation of the data in the form of tables and figures, and interpretation of results relative to the decommissioning release criteria. It will also describe the residual radioactivity in the remaining structures and systems to characterize the final facility and site radiological condition.

4.6 QUALITY ASSURANCE

The objective of quality assurance, as applied to the final radiation survey plan, will be to ensure confidence in the sampling, analysis, interpretation and use of the data generated from the final survey. Quality assurance for the final radiation survey plan will be an integral part of the overall decommissioning QA plan and will be governed

1

IMAGE EVALUATION TEST TARGET (MT-3)

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

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1

IMAGE EVALUATION TEST TARGET (MT-3)

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6"

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

by Section 7 of this plan.

4.7 INDEPENDENT VERIFICATION

A third-party independent verification of the final survey will be performed as an audit of the final survey plan. This independent verification will include selected measurements, sampling and analysis as required to confirm validity of the final survey.

The independent verification program will also require formal program development to remove possible judgmental factors and prevent skewing of the final results. The independent verification program will be of similar structure (although on a smaller scale) as the final survey plan.

4.8 REFERENCES FOR SECTION 4

1. NRC Regulatory Guide 1.86: "Termination of Operating License for Nuclear Reactors." June 1974.

2. NRC Memorandum P.B. Erickson (NRC) to Seymour H. Weiss (NRC); Subject: "Summary of Meeting with Public Service Company of Colorado (PSC) To Discuss Preliminary Decommissioning Plan of June 30, 1989," dated August 24, 1989.

3. NRC letter, John F. Stolz (NRC) to Dr. Roland A. Finston (Stanford), dated March 17, 1981.

4. NRC letter, James R. Miller (NRC) to Dr. Roland A. Finston (Stanford), dated April 21, 1982.

5. NUREG-0586: "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities." August, 1988.

6. NUREG/CR-5512: "Residual Radioactive Contamination from Decommissioning." Draft Report. January, 1990

7. NRC Circular 81-07: "Control of Radioactively Contaminated Material." May, 1981.

8. NRC Information Notice 85-92: "Surveys of Wastes Before Disposal from Nuclear Reactor Facilities." December, 1985.

9. NUREG/CR-2082: "Monitoring for Compliance with Decommissioning Termination Survey Criteria." (ORNL/HASRD-95). June, 1981.

SECTION 5
DECOMMISSIONING FIXED PRICE CONTRACT AND FUNDING PLAN

5.1 INTRODUCTION

The Decommissioning Cost Estimate (Ref. 1) and this Funding Plan were developed to provide the NRC with assurances that suitable financial guarantees are in place to successfully fund the decommissioning of Fort St. Vrain. Section 5.2 provides a description of the fixed price contract between PSC and the Westinghouse team to accomplish the decommissioning activities, reference to the detailed decommissioning cost estimate provided to the NRC in Reference 1, and an update to the decommissioning cost estimate (Section 5.2.3) to account for adjustments that have become necessary due to the delay in defueling the reactor core.

Section 5.3 provides details of the financial instruments, agreements and trust funds that will be implemented to support the Fort St. Vrain decommissioning efforts. Section 5.4 identifies those funding instruments available to PSC that may be used to actually fund the decommissioning efforts, separate from the financial guarantees required by 10 CFR 50.75(e) and NRC Regulatory Guide 1.159, as identified in Section 5.3 of this section. Section 5.5 identifies the criteria that PSC will use as the basis to update the Decommissioning Cost Estimate and Funding Plan.

The NRC has completed its review of this Funding Plan (Ref. 2). In completing their review, the NRC staff noted that the funding assurance mechanisms are acceptable and in compliance with 10 CFR 50.75(e)(1)ii and iii.

5.2 DECOMMISSIONING CONTRACT AND DETAILED COST ESTIMATE

As noted in Section 2.1, PSC has selected the DECON option for early decontamination, dismantlement, and decommissioning of the radioactive portions of the Fort St. Vrain Nuclear Generating Station. In order to accomplish this project, PSC released a Request for Proposal to several highly qualified companies for the purpose of receiving competitive bids on the project. Four qualified bids were received and, based on a thorough evaluation for technical and financial acceptability, PSC selected a project team of Westinghouse and MK Ferguson to decommission Fort St. Vrain, with Westinghouse as the lead contractor. PSC and the Westinghouse team have reached agreement on a final contract to perform the decommissioning work.

The selection of the Westinghouse team as a result of the competitive bid process resulted in a total cost estimate of $137,129,000, which includes the Westinghouse contract price of $100,460,000 for the decommissioning of Fort St. Vrain. This decommissioning cost is inclusive of escalation and PSC expected costs and was based on commencing physical decommissioning activities in January 1992. A detailed cost estimate was prepared which provides a detailed breakdown of these costs. This detailed cost estimate was submitted to the NRC in Reference 1. Figure 1.3-1 of Reference 1 provides a summary of the project costs based on the major decommissioning activities.

The use of a firm fixed price contract greatly reduces the level of uncertainty in the decommissioning cost. By use of the competitive bid process, an accurate method has been utilized to determine the real cost for decommissioning, based on the identified scope of work and assumptions. The bid process and resulting contract commits both PSC and the Westinghouse team for the project scope and cost.

Certain restrictions and limitations exist when only a cost estimate has been prepared as a basis for evaluating decommissioning costs and as a basis for the decommissioning funding plan. A cost estimate is limited in that it is only a study to determine reasonable estimates of individual costs and involves no commitment on the part of the cost estimator to meet the estimate during the actual performance of the work. A firm fixed price contract goes beyond this phase, in that a contractor is bound under a contractual obligation to perform this established scope of work at the price they have bid.

Receiving bids from four qualified bidders was equivalent to receiving four independent cost estimates. Since each bid used a different decommissioning methodology, this approach exceeds any regulatory guidance for financial assurance and is beyond that required by the Decommissioning Rule.

In evaluating the four bids, detailed assessments of the actual decommissioning work and methodology were conducted to ensure that the bidders had adequately identified and accounted for the work to be performed. Detailed evaluations and cross comparisons were also conducted to ensure that the bidders had adequately addressed technical support requirements, project management and control, radiological waste handling, radiation protection, facilities and support requirements, quality assurance and project documentation and closeout. Areas of uncertainty were identified and clarified with the bidders, including evaluations of pricing contingencies regarding waste volumes, contamination levels, etc. The use of this competitive bid process, the high quality of the responses received, and the detailed bid evaluations that were conducted, provides significant confidence in the cost estimate as well as the overall decommissioning approach and the work scope. Therefore, PSC is confident that all major tasks have been identified and included within the Westinghouse team fixed price contract.

5.2.1 Major Assumptions, Bases, and Scope of Fixed Price Contract

The following information is provided to identify the basis of the fixed price contract between PSC and the Westinghouse team to decommission Fort St. Vrain. A detailed breakdown of the Westinghouse team proposed scope of work is provided in Appendix I of this plan. The following major work activities and necessary support activities will be performed:

1. Decontaminate in place, and/or remove and decontaminate, and/or remove and dispose of the contaminated and activated materials inside the PCRV and those that form the PCRV structure.
2. Decontaminate in place, and/or remove and decontaminate, and/or remove and dispose of the contaminated portions of the plant systems outside of the PCRV.
3. Survey and cleanup the site as required, including the evaporation ponds and effluent blowdown flow paths.

Decontamination and decommissioning activities will be performed to the extent necessary to decontaminate all radioactive portions of the plant to the final release criteria specified in Section 4.2 of this plan. All other materials remaining as part of the PCRV structure, in the systems outside of the PCRV and on the site after the final radiation survey will be confirmed to be below these release limits and will remain on-site.

As noted in Section 2.4, PSC is responsible for overall project management and licensing interface with the NRC. Major PSC responsibilities include:

1. Overall control of the project
2. Access control
3. Oversee radiation protection activities
4. Oversee quality assurance activities
5. Licensing coordination
6. Operation and maintenance of required plant systems

7. Responsibility for the final independent radiation survey
8. Engineering configuration control overview

The following are major assumptions included in the basis of the firm fixed price and the detailed cost estimate:

1. The current facility design and layout is as described in Section 2.2 of this plan and as shown in Figure 2.2-1, and no major modifications are anticipated.
2. Radionuclide inventories, activation analyses, and estimated dose rates are as described in Section 3 of this plan.
3. PSC will supply utilities to the contractor, including electric power and water, and the cost for these utilities is included in the cost estimate.
4. No mixed waste or contaminated asbestos exists.
5. Burial charges are based on the current disposal rates in effect at the Beatty, Nevada, disposal site until the end of 1992. A contingency has been added for burial of radioactive waste at the Richland, Washington, disposal site after 1992.
6. No cost allowances were included for major schedule delays caused by uncontrollable and unforeseen events. Appropriate contingencies are included to account for project uncertainties.
7. Existing plant equipment will be utilized when determined to be cost effective and technically sound to operate and maintain.
8. Steam generators will be shipped offsite and disposed as complete units.
9. No radioactive contamination exists on site work areas outside the reactor building. This is being verified by site radiological characterization. Contingencies have been included for cleanup of any radioactively contaminated soil or radioactivity in the ponds, ditches and sewage lagoons.
10. Costs associated with plant closure activities are not included in the cost of decommissioning activities.
11. The cost and Curie estimates contained in Reference 1 represent PSC's best estimate. However, an increase by an order of magnitude in dose rates will not affect the work planned or the decommissioning cost estimate.
12. The contingency includes escalation in accordance with the estimate for Consumer Price Index for All Urban Consumers (CPIU) for all

materials, labor, disposal costs, and services through March 1995.

PSC and the Westinghouse team will continue to validate these assumptions during the planning phase. Where necessary, appropriate contingency plans will be identified.

5.2.2 Decommissioning Cost Breakdown

As a part of the fixed price contract, the Westinghouse team detailed cost estimate was derived in conjunction with preparation of the detailed Work Breakdown Structure. Figure 1.3-1 of the Fort St. Vrain Decommissioning Cost Estimate (Ref. 1) summarizes the upper tier of tasks developed for the decommissioning project for both Phase I and II. The tasks are categorized into two phases, as described in Section 1.2.5 of this plan. Phase I includes all of those actions associated with the planning and engineering of the project. Phase II includes those actions involved with implementation of the work. The specific activities involved in each phase may overlap in calendar time. Each of the specific activities involved in a task is outlined in Appendix I and is discussed in detail in Section 2.3.

Consistent with the guidance of Regulatory Guide 1.159 (Ref. 3), waste disposal costs are summarized in Figure 3.2-1 of Reference 1. The volumes of these materials can be found in Section 3.3. Burial costs are based on waste burial at Beatty, Nevada and reflect current rates for that facility. Within the overall cost estimate, PSC has included those additional costs that will result due to waste disposal at the Richland, Washington, disposal site, following closure of the Beatty, Nevada, disposal site.

5.2.3 Update to the Decommissioning Detailed Cost Estimate

Due to problems with defueling, the start of physical decommissioning activities has been delayed from January 1992 until August 1992. As a result of this delay and other cost adjustments, the Decommissioning Cost Estimate has been increased from \$137,129,000 to \$157,472,700. As of September 30, 1991, decommissioning expenditures have totalled approximately \$10,542,000. Other pertinent assumptions remain as outlined in Section 5.2.1 above. Major adjustments to the decommissioning cost are identified in Table 5-1 and justification for these adjustments is provided in the following paragraphs.

(1) Project Delay Costs: The original PSC/Westinghouse team contract price was \$100,460,000 and was based on a decommissioning start

date of January 1992. Westinghouse has proposed an additional fee of $5,309,200 to accommodate the delay in decommissioning start date until August 1992. This delay cost will provide funding for proposed Phase I planning activities, as well as extending Westinghouse team resources during this extended planning period. PSC will also recognize increased costs for decommissioning staff during this delay period. PSC costs associated with this delay period are estimated to be approximately $383,100. In addition, PSC has approved one contract scope change modification for an additional $210,000 for Westinghouse team efforts in the preparation of the detailed Decommissioning Cost Estimate (Ref. 1).

(2) Letter of Credit Fees: The original Decommissioning Cost Estimate did not account for any fees and expenses associated with a financial guarantee. Based on a declining balance, four year term, irrevocable letter of credit in the amount of $125 million, the total fees and expenses associated with this financial facility are estimated to be approximately $2,000,000.

(3) Cost Adjustments for LLRW Disposal: The original Decommissioning Detailed Cost Estimate assumed a LLRW volume of 127,964 ft^3 (See Ref. 1, Figure 3.2-1). The LLRW cost estimate also identified approximately 2035 ft^3 of this volume that will be used as overfill in other disposal packages as void space fill material. The remaining volume of 125,929 ft^3 may be processed (including volume reduction), packaged, and shipped for disposal at a licensed LLRW disposal facility. Based on this volume, the original Reference 1 cost estimate for LLRW disposal was: $7,878,219 for curie and weight surcharges, cask handling fees, and disposal costs; $2,022,827 for transportation costs; and $1,924,827 for disposal container purchase and cask rentals. These costs are future value dollars, escalated to the date of expenditure, and based on disposal fees currently in effect at the Beatty, Nevada, disposal site.

Assuming the access contract with the Northwest Compact (identified in PDP Section 3.3.2) is executed and PSC gains access to the LLRW disposal site at Richland, Washington, an adjustment to the cost estimate has been included to account for any increased costs that may result. A contingency of $12,441,400 has been added to the Reference 1 LLRW cost estimate to account for possible increases in waste disposal costs. Included in the contingency are assumptions for a fee to be paid ($1,300,000) to the Richland, Washington, facility by the RMC, and allowance for an expected step increase in the base disposal fee (to $19,019,600, based on an allowance of up to $140/ft^3) anticipated in 1993 when the final provisions of the LLRW Policy Act Amendments of 1985 are scheduled to take effect, and then escalated at a rate of 10% per year for the duration of the decommissioning. The estimated costs for container rental and drum/box container costs are not expected to be affected by these increases. Additionally, the increase in transportation distance from Beatty, Nevada, to Richland, Washington, (120 miles) is relatively small and has been accounted for previously (See Section 5.2.1, Assumption No. 5). This adjustment increases the total estimated LLRW disposal cost (plus contingency) to $24,267,300 in future value dollars escalated to the date of expenditure.

5.3 DECOMMISSIONING FUNDING AND FUNDING GUARANTEES

Financial assurance to support these decommissioning costs will be provided by a combination of assurances, including the following:

(1) Use of the existing external decommissioning trust fund, with a balance of approximately $28.0 million as of September 30, 1991;

(2) Use of a guarantee method (an irrevocable Letter of Credit in the amount of $125 million) authorized by 10 CFR 50.75(e)(3)(iii) for the unfunded balance of the decommissioning costs.

These funding assurance mechanisms are discussed in the following paragraphs.

5.3.1 Decommissioning External Trust Fund

PSC has set aside funds for decommissioning in external trust accounts that had a combined value of approximately $28.0 million as of September 30, 1991. Representative trust agreements for the external trusts were forwarded to the NRC in Reference 4 and have been included in Appendix III. No funds remain to be collected from ratepayers.

5.3.2 Decommissioning Irrevocable Letter of Credit

In order to provide suitable funding assurance for the unfunded balance of the decommissioning costs identified in Table 5-1, PSC has entered an agreement to obtain an irrevocable Letter of Credit in an amount not to exceed $125 million. In Appendix III, a copy of the form of the irrevocable Letter of Credit is provided, as well as the Letter of Commitment that binds the institution issuing the facility to sign the irrevocable Letter of Credit when the NRC issues its final approval of the Proposed Decommissioning Plan and the satisfaction of other conditions as set forth in the Letter of Commitment. The commitment to issue the Letter of Credit expires on November 14, 1992, or is subject to renegotiation after that date. PSC has reviewed the qualifications of the lending institution, and has verified that they are in compliance with the criteria of Section 2.3.3 of Regulatory Guide 1.159 (Ref. 3).

Specific terms of the facility include the following:

(1) Declining balance during physical decommissioning activities, based upon the contractor milestone payment schedule. Use of the declining balance approach is consistent with NRC treatment of Part 50 licensees that use decommissioning external trust funds and with NRC treatment of Part 72 licensees.
(2) Effective date of agreement is dependent upon final NRC approval of the Proposed Decommissioning Plan.
(3) PSC is the obligor of the facility.
(4) The NRC is the beneficiary of the facility. A draw on the Letter of Credit facility requires signatures by both the NRC and PSC and may occur only in the event that (1) PSC is in default in the performance of the Decommissioning Plan; or (2) if the Letter of Credit is scheduled to expire within 60 days and the NRC has not received a satisfactory financial assurance in substitution for the Letter of Credit.

An engineering evaluation was performed by an independent third party engineering organization at the request of the facility issuer to validate PSC assumptions, conclusions, and estimated costs for decommissioning.

5.3.3 Decommissioning Standby Trust Agreement

As required by Section 2.4 of Regulatory Guide 1.159 (Ref. 3), PSC has also entered an agreement that will establish a "Standby" Trust Fund to receive funds from the irrevocable Letter of Credit, should it become necessary to execute the Letter of Credit. A copy of the unsigned Standby Trust Agreement is also provided in Appendix III, as well as its corresponding Letter of Commitment. The Letter of Commitment binds PSC and the institution that will administer the standby trust fund to sign the Standby Trust Agreement when the NRC issues its final approval of the Proposed Decommissioning Plan. PSC is the beneficiary of the Standby Trust Agreement. In the event of a default by PSC under the Standby Trust Agreement, the NRC is authorized to administer the Standby Trust Agreement.

5.4 DECOMMISSIONING FUNDING INSTRUMENTS
(Submitted for Information Only)

PSC intends to meet its cash payment requirements under the Proposed Decommissioning Plan through any or a combination of the following: (1) issuance of first mortgage bonds; (2) medium term notes; (3) sale of assets to PSC Colorado Credit Corporation; (4) issuance of short term unsecured debt; and (5) sale of PSC preferred and/or common stock.

PSC has substantial financing resources available, including a "shelf" registration statement and a secured medium-term note program filed with the Securities and Exchange Commission pursuant to which PSC may offer up to $300 million in first mortgage bonds and $108 million in medium-term notes, respectively. It also has regulatory authority to issue up to $300 million of short-term debt, which includes $150 million immediately available and $150 million available on a 5-day notice under a committed $300 million credit facility. This facility would be available to fund its requirements on a short-term basis. In addition, PSC may sell approximately $150 million of assets to PS Colorado Credit Corporation. All necessary regulatory approvals for the issuance of these bonds and the sale of assets have already been obtained. PSC also has access to the equity markets and can sell preferred and common stock.

The approximate additional amount of each type of equity security that may be issued as of this date is as follows:

Preferred stock	Par value -$100.00	$145 million
Preferred stock	Par value -$25.00	$ 65 million
Shares of Common stock (authorized and unissued at July 31, 1991)	Par value -$5.00	84,544,221

The issuance of the equity securities requires the authorization of PSC's Board of Directors and the Colorado Public Utilities Commission, but PSC does not foresee any impediments to obtaining necessary approvals by the Effective Date. PSC is presently issuing approximately $45 million per year of its common stock under its dividend reinvestment and stock purchase plans.

PSC's outstanding first mortgage bonds are rated BBB+ and Baa1 by Standard & Poor's and Moody's, respectively. PSC's securities are not on "credit watch" and no downgradings are anticipated at this time. Based on PSC's recent experience in the credit markets and its view of the equity markets, PSC does not anticipate any difficulty in obtaining the funds necessary to meet its external financing requirements.

5.5 UPDATES TO THE DECOMMISSIONING FUNDING PLAN

Per the requirements of Regulatory Guide 1.159 (Ref. 3), PSC and the Westinghouse team will review the projected cost for decommissioning once a year. The decommissioning cost will be adjusted for any changes in projected inflation rates, as well as any changes in or effects of force majeure events on project scope which may revise the overall cost of decommissioning. Adjustments to the decommissioning cost due to technological and status changes, or major project scope changes will be made according to the changes experienced. Based on these annual reviews of decommissioning cost, the decommissioning funding plan will also be reviewed and revised accordingly.

Since the project is scheduled for completion within 39 months after commencement of physical dismantlement and decommissioning activities, adjustments will be made as frequently as deemed necessary for successful funding of the project. The NRC will be informed of any changes exceeding 15 percent (plus or minus) to the decommissioning cost.

5.6 REFERENCES FOR SECTION 5

1. PSC letter, Crawford to Weiss, dated June 6, 1991 (P-91198); Subject: "Fort St. Vrain Decommissioning Cost Estimate".

2. NRC letter, Weiss to Crawford. dated January 27, 1992 (G-92015); Subject: "Fort St. Vrain - Decommissioning Funding Plan".

3. USNRC Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," August 1990.

4. PSC letter, Crawford to Weiss, dated February 15, 1990 (P-90039).

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TABLE 5-1
UPDATED DECOMMISSIONING COST ESTIMATE

(Future Value Dollars, Escalated to Date of Expenditure)

1. COST OF PHYSICAL DECOMMISSIONING ACTIVITIES:	
Westinghouse Contract Cost (Ref. 1)	$100,460,000
Westinghouse Delay Costs	5,309,200
Westinghouse Scope Changes	210,000
PSC Decommissioning Cost (Ref. 1)	$ 36,669,000
PSC Delay Costs	383,100
2. LETTER OF CREDIT FEES:	$ 2,000,000
3. LLRW DISPOSAL COSTS:	
Revised LLRW Disposal Cost	$24,267,300
Less Original LLRW Disposal Cost	11,825,900
INCREASE IN LLRW DISPOSAL COSTS	$ 12,441,400
TOTAL COST OF DECOMMISSIONING	$157,472,700
TOTAL DECOMMISSIONING EXPENSES TO DATE	($10,542,000)
REMAINING COST OF DECOMMISSIONING	$146,930,700
DECOMMISSIONING GUARANTEED FUNDING	
1. EXTERNAL TRUST FUND BALANCE (9/30/91)	$ 28,000,000
2. IRREVOCABLE LETTER OF CREDIT	125,000,000
TOTAL AVAILABLE FUNDING	$153,000,000

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SECTION 6
DECOMMISSIONING TECHNICAL AND ENVIRONMENTAL SPECIFICATIONS

6.1 INTRODUCTION

The Decommissioning Technical Specifications (DTS) applicable to the Fort St. Vrain decommissioning effort were originally prepared and submitted to the NRC on December 21, 1990 (Ref. 1). Following review, the NRC provided PSC with a Request for Additional Information related to the DTS in Reference 2. PSC provided responses to the NRC questions in Reference 3. A complete revision of the original DTS was provided to the NRC on August 31, 1991, in Reference 4 to incorporate the PSC commitments and responses made in Reference 3. A further revision to the DTS was forwarded to the NRC in Reference 5. These Decommissioning Technical Specifications (DTS) include environmental specification requirements, consistent with the guidance provided in DG-1005 (Ref. 6) and 10 CFR 50.82(b)(5).

The Fort St. Vrain DTS have been proposed as an amendment to the Fort St. Vrain Operating License, DPR-34, in accordance with the provisions of 10 CFR 50.90. When approved by the NRC, the DTS will supersede (upon completion of defueling and approval of this decommissioning plan), in their entirety, the existing technical and environmental specifications that are currently provided as Appendices A and B to the Fort St. Vrain Operating License.

6.2 DTS LIMITS AND CONTROLS

The DTS address activities related to Fort St. Vrain decommissioning after all fuel has been removed from the Reactor Building. During decommissioning, the primary concerns are containment of radioactive materials and control of public and occupational exposures.

With no fuel in the reactor building, there are no requirements for reactivity control or decay heat removal. Accordingly, the DTS do not retain any of the following requirements that are currently included in the Fort St. Vrain Operational Technical Specifications:

- Reactivity control
- Primary or secondary core cooling
- Plant protective systems
- PCRV integrity
- Auxiliary electric power
- Fuel handling

The decommissioning accident analyses provided in Section 3.4 identify the equipment and procedural controls relied upon to minimize radiological exposure to workers and the public. These controls, such as assuring appropriate levels of Reactor Building confinement integrity and radiation monitoring during handling of certain contaminated and activated materials, are reflected in the DTS, as appropriate. Minimum equipment functional capabilities and performance levels have been identified, together with periodic surveillance requirements.

The DTS also include Administrative Controls to ensure that required programs are implemented during decommissioning. The key elements of the Administrative Controls include the following:

1. Organization
2. Decommissioning Safety Review Committee
3. Programs and procedures, including a Radioactive Effluent Controls Program and a Radiological Environmental Monitoring Progra . to replace the current environmental specifications
4. Reporting
5. Records retention

6.3 REFERENCE FOR SECTION 6

1. PSC letter, Crawford to Weiss, dated December 21, 1990 (P-90367); Subject: "Decommissioning Technical Specifications".

2. NRC letter, Erickson to Crawford, dated June 7, 1991 (G-91121); Subject: "Fort St. Vrain Proposed Decommissioning Plan - Request for Additional Information".

3. PSC letter, Crawford to Weiss, dated July 30, 1991 (P-91248); Subject: "Response to Request for Additional Information - Decommissioning Technical Specifications and Representative Cost Estimate".

4. PSC letter, Crawford to Weiss, dated August 30, 1991 (P-91278); Subject: "Decommissioning Technical Specifications".

5. PSC letter, Crawford to Weiss, dated March 19, 1992 (P-92115); Subject: "Decommissioning Technical Specifications".

6. "Standard Format and Content for Decommissioning Plans for Nuclear Reactors," Draft Regulatory Guide DG-1005, September 1989.

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SECTION 7
DECOMMISSIONING QUALITY ASSURANCE PLAN

7.1 POLICY STATEMENT

Public Service Company of Colorado (PSC) will establish and implement a Quality Assurance Plan for the Fort St. Vrain (FSV) Decommissioning Project.

This Quality Assurance Plan is based on the requirements of 10 CFR 50 Appendix B as they apply to decommissioning activities and is responsive to other applicable regulatory requirements, and industry codes and standards. The goals of the Quality Assurance Plan are to provide protection of the health and safety of the project personnel and the public, and to comply with regulations and commitments made to the NRC, including the control of personnel exposure to radiation, control of radioactive material, control of radioactive material shipment, and final radiological survey.

Project procedures shall provide for compliance with appropriate regulatory, statutory, and license requirements. Specific quality assurance requirements and organizational responsibilities for implementation of these requirements shall be specified.

Compliance with this plan and project procedures is mandatory for personnel with respect to Fort St. Vrain decommissioning activities which may affect quality and the health and safety of project personnel and the general public. Personnel shall, therefore, be familiar with the requirements and responsibilities of the plan that are applicable to their individual activities and interfaces.

7.2 INTRODUCTION

This Quality Assurance Plan is applicable to and is structured to assure that the regulatory requirements as identified in the Proposed Decommissioning Plan, the requirements of the Decommissioning Technical Specifications (DTS), the requirements of the Radiation Protection Program, the packaging and shipping of radioactive materials, and the final radiation survey are conducted in a controlled manner.

7.3 ORGANIZATION

7.3.1 General

The Quality Assurance organizations of PSC and the Westinghouse team have the authority and organizational freedom to identify quality problems; to take action to stop unsatisfactory work and control further processing, delivery, installation or use of nonconforming items; to initiate, recommend, or provide solutions; and to verify implementation of solutions. The persons and organizations performing quality assurance functions report to a management level that assures the required authority and organizational freedom are provided, including sufficient independence from cost and schedule. The individuals assigned the responsibility for assuring effective execution of any portion of the Quality Assurance Plan have direct access to the levels of management necessary to perform quality assurance functions.

7.3.2 PSC Organization

The PSC Organization is explained in Section 2.4 of this decommissioning plan. Section 2.4 provides organizational charts, together with a summary of the authority and duties of key decommissioning staff members. PSC has overall responsibility for the Quality Assurance (QA) Plan implementation, and is responsible for verifying the effective execution of the plan. PSC performs oversight of the Westinghouse team implementation of the plan through reviews, audits and monitoring activities (surveillances).

7.3.3 Westinghouse Team Organization

7.3.3.1 Quality Assurance

The Westinghouse Nuclear and Advanced Technology Division (WNATD) Quality Assurance Manager has direct access to the Energy Systems Business Unit Vice President and General Manager to ensure the independence of the QA function. The Quality Assurance Manager reports to the Westinghouse Project Director for administrative direction and implementation of the Quality Assurance Plan. The Quality Assurance Manager and the Project Director are responsible for assuring effective execution of the Quality Assurance Plan. MK-Ferguson personnel will work under the WNATD QA Plan during decommissioning activities and therefore the WNATD QA organization will apply. Westinghouse Scientific Ecology Group (WSEG) will implement their NRC approved 10 CFR 71, subpart H, QA Plan, which includes a completely independent QA organization, for packaging and transporting radioactive material.

7.3.3.2 Key Decommissioning Staff Members

The Westinghouse decommissioning staff is explained in Section 2.5 of this decommissioning plan. Section 2.5 provides organizational charts, together with a summary of the authority and duties of key members.

7.4 QUALITY ASSURANCE PLAN

7.4.1 General Requirements

1. The Quality Assurance Plan shall be:
   a. Documented by written procedures.
   b. Carried out throughout the decommissioning project in accordance with those procedures.
2. The plan shall include identification of the following:
   a. The structures and activities to be covered.
   b. The major organizations participating in the plan, together with the designated functions of these organizations.
3. The plan shall provide control over activities affecting quality and the health and safety of project personnel and the general public.
4. Activities affecting quality shall be accomplished under suitable controlled conditions. Controlled conditions include the use of appropriate equipment, suitable environmental conditions for accomplishing the activity, and assurance that all prerequisites for the given activity have been satisfied.
5. The plan shall take into account the need for special controls, processes, test equipment, tools, and skills to attain the required quality, and the need for verification of satisfactory implementation.
6. The plan shall provide for indoctrination and training of personnel performing activities affecting quality to assure that suitable proficiency is achieved and maintained.
7. The adequacy and status of the plan shall be regularly reviewed.
8. Management of those organizations participating in the plan shall regularly review the status and adequacy of that part of the plan which they are implementing.
9. The plan will be implemented for the final radiological survey to

assure confidence in the sampling, analysis, interpretation, and use of data generated. It will apply to all aspects of the survey plan, from personnel qualifications to sampling and field measurements, handling and storing samples, sample reduction, reporting, and records turnover.

7.4.2 General Description

1. This Decommissioning Quality Assurance Plan has been established to govern those activities that may affect the quality of the project, including the health and safety of the project personnel and the general public.
2. This Decommissioning Quality Assurance Plan shall utilize the following documents to meet its objectives.
   a. The Westinghouse Fort St. Vrain Decommissioning Project Quality Assurance Plan which provides the details of the Quality Assurance Plans and procedures that will be utilized by each Westinghouse organizational team member.
   b. Westinghouse required procedures at the project implementing level.
   c. PSC oversight process and procedures

7.4.3 Westinghouse FSV Decommissioning Project Quality Plan

1. The plan shall define the QA plans and procedures that will be used by each Westinghouse organizational team member.
2. The plan shall be issued and approved by Westinghouse and PSC.
3. All changes to the Project Quality Plan shall be governed by measures commensurate with those applied to the original issue.

7.4.4 Training

Training programs shall be established for those personnel performing activities affecting quality such that they are knowledgeable in the quality assurance documents and their requirements, and proficient in implementing these requirements. These training programs are described in Section 2.6 of this decommissioning plan.

7.5 DESIGN CONTROL

Consistent with Section 7.2, when operating systems required for decommissioning/dismantling activities, waste packaging activities, or shipping activities require design or modification of existing design, controls shall be applied commensurate with regulatory requirements and the potential impact on quality, and the health and safety of project personnel and the general public.

Appropriate provisions of design control shall include the specifying of design input, the correct translation of input in design documents, the verification of design by persons other than the originator, and the assurance that changes to the design are properly reviewed, controlled, and documented.

7.6 PROCUREMENT DOCUMENT CONTROL

Consistent with Section 7.2, measures shall be established to assure that applicable regulatory requirements, design bases, and other requirements that are necessary to assure adequate quality are included or referenced in the documents for procurement of material, equipment, and services, whether purchased by PSC or by its contractors or subcontractors. To the extent necessary, procurement documents shall require contractors or subcontractors to provide a Quality Assurance Plan consistent with the contractor's potential impact on quality and the health and safety of project personnel and the general public.

7.6.2 Technical and Quality Requirements

1. The Quality Assurance Plan shall contain provisions for controlling procurement of material, equipment, components, and services.
2. Procurement documents shall contain specific technical and quality requirements, as appropriate.
3. Procurement documents shall contain provisions that establish the right of access to vendor facilities and records for source inspection and audits as appropriate.
4. Procurement documents for processing, packaging and transporting of radioactive materials shall specify the license, certificate, or other NRC approval authorizing use of the package. The procurement documents shall specify the documentation requirements referenced in the license, certificates, or other NRC approvals as applicable that relate to the use and maintenance of the packaging and to the actions

to be taken prior to shipment.

7.6.3 Review and Approval

Documents, and changes thereto, initiating procurement of equipment, components, or services shall be approved by appropriate management personnel and shall be subject to a quality review to ensure applicable regulatory requirements, design bases, quality assurance, and other requirements are adequately satisfied prior to release.

7.7 PROCEDURES AND DRAWINGS

7.7.1 General Requirements

1. Procedures, and drawings of a type appropriate to the circumstances, shall be provided for the control and performance of activities which are important to quality, health, and safety.
2. Procedures and drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

7.7.2 Procedures

1. Procedures of a type appropriate to the circumstances shall be provided for the performance of activities which affect quality, health and safety, or regulatory requirements.
2. The following typical procedures shall be provided as appropriate. This list includes procedures whose implementation is subject to oversight in the QA plan and procedures for executing QA functions.
    a. Calibration procedures.
    b. Radiation protection procedures.
    c. Special process procedures.
    d. Work packages that provide work instructions accompanied with pertinent technical data to perform a specific task.
    e. Radioactive material processing, packaging and transporting procedures.
    f. Audit procedures.
    g. QA surveillance/monitoring procedures.
    h. Administrative control procedures.
    i. Emergency response procedures.

j. Inspection procedures.
k. Training/qualification/certification procedures.
l. Procurement procedures.
m. Design and design document control procedures.
n. Nonconformance/corrective action procedures.
o. Quality Records procedures.
p. Access control procedures.
q. Material/equipment control procedures.
r. Final site survey procedures.
s. Fire prevention/protection procedures.

7.7.3 Drawings and Technical Manuals

Controlled drawings and technical manuals of a type appropriate to the circumstances may be used as procedural documents.

7.8 DOCUMENT CONTROL

7.8.1 General Requirements

1. Measures shall be established to control the is[illegible]e of documents, such as procedures, drawings and specification[illegible]ding changes, that prescribe activities affecting quality.
2. These measures shall assure that documents, including changes, are reviewed for adequacy and approved for release by authorized personnel, and distributed to and used at the location where the prescribed activity is performed.

7.8.2 Procedure Control

1. Procedures shall be controlled to assure that current copies are made available to personnel performing the prescribed activities. Procedures shall be independently reviewed by a qualified person and shall be approved by a management member of the organization responsible for the prescribed activity.
2. Significant changes to procedures shall be reviewed and approved in the same manner as the original.

7.8.3 Radioactive Shipment Package Documents

All documents related to a specific shipping package for radioactive material shall be controlled by appropriate procedures. All significant changes to such documents shall be similarly controlled.

7.9 CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES

7.9.1 General Requirements

1. Consistent with Section 7.2, measures shall be established to assure that purchased material, equipment and services conform to the procurement documents. These measures shall include provisions, as appropriate, for vendor evaluation and selection, objective evidence of quality furnished by the vendor, surveillance at the vendor source, and inspection of products upon delivery.
2. The effectiveness of the control of contractor services shall be assessed at intervals consistent with the importance of the service.

7.9.2 Vendor Evaluation and Verification

The adequacy of vendor's Quality Assurance Plan specified in procurement documentation shall be verified prior to use when appropriate. Vendor adherence to their Quality Assurance Plan shall also be verified as appropriate.

7.9.3 Receipt Inspection

1. Commensurate with potential adverse impacts on quality or health and safety, material and equipment shall be inspected upon receipt at the plant site prior to use or storage to determine that procurement requirements are satisfied.
2. Material, parts, and components that are to be utilized for packaging and transporting of radioactive materials shall be inspected upon receipt to assure that associated procurement document provisions have been satisfied.
3. Measures shall be established for identifying nonconforming material, parts and components.

7.10 IDENTIFICATION AND CONTROL OF MATERIALS, PARTS AND COMPONENTS

1. Consistent with Section 7.2, measures shall be established for the identification and control of critical materials, parts, components, and equipment.
2. These identification and control measures shall be designed to prevent the use of incorrect or defective material, parts, components, and equipment.

7.11 CONTROL OF SPECIAL PROCESSES

7.11.1 General Requirements

Measures shall be established to assure that spe processes, including welding and nondestr ctive examination, are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements.

7.11.2 Welding Procedures

Welding activities shall be performed in accordance with qual fied procedures. Such procedures shall be qualified in accordance with applicable codes and standards and shall be reviewed to assure their technical adequacy.

7.11.3 Welder Qualification

Measures shall be established to assure welding is performed by qualified personnel.

7.11.4 NDE Procedures

Nondestructive examinations (NDE) shall be performed in accordance with procedures formulated in accordance with applicable codes and standards and shall be reviewed to assure their technical adequacy.

7.11.5 NDE Personnel Qualification

Measures shall be established to assure nondestructive examinations (NDE) are performed by personnel qualified in accordance with applicable codes and standards.

7.12 INSPECTION

7.12.1 General Requirements

1. Measures shall be established for inspection of appropriate activities to verify conformance with the documented procedures and drawings for accomplishing the activity.
2. An inspection hold point requires witnessing or inspection. Associated work shall not proceed beyond a hold point without prior consent. The specific hold points shall be indicated in appropriate work documents.

7.12.2 Radioactive Material Packages

Measures shall be established which assure that packages utilized to ship licensed radioactive material offsite are inspected in accordance with the applicable requirements.

7.12.3 Inspection Procedures

Required inspections shall be performed in accordance with appropriate procedures. Such procedures shall contain a description of objectives, acceptance criteria, and prerequisites for performing the inspections. These procedures shall also specify any special equipment or calibrations required to conduct the inspection.

7.12.4 Personnel Qualification

Personnel performing required inspections shall be qualified based upon experience and training in inspection methods. Required inspections shall not be performed by individuals who performed the activity or directly supervised the activity.

7.13 TEST CONTROL

Measures shall be established to assure that tests necessary to assure quality, health and safety are controlled and accomplished in accordance with approved procedures.

7.14 CONTROL OF MEASURING AND TEST EQUIPMENT

Measures shall be established to assure that appropriate tools, gauges, instruments and other measuring and testing devices used in activities important to quality, health and safety are properly controlled, calibrated and adjusted at specified periods to maintain accuracy within necessary limits, and maintain traceability to National Institute of Standards and Technology (NIST) or other known standards.

7.15 HANDLING, STORAGE, SHIPPING

7.15.1 General Requirements

Measures shall be established to control the handling, storage, and shipping of radioactive materials.

7.15.2 Radioactive Material Storage

1. Areas shall be provided for storage of radioactive material that assure physical protection, as low as reasonably achievable radiation exposure to personnel, and control of the stored material.
2. Handling, storage, and shipment of radioactive material shall be controlled based upon the following criteria:
    a. Established safety requirements concerning the handling, storage, and shipping of packages for radioactive material shall be followed.
    b. Shipments shall not be made unless all tests, certifications, acceptances, and final inspections have been completed.
    c. Procedures shall be provided for handling, storage, and shipping operations.

7.15.3 Shipping and Packaging

Shipping and packaging documents for radioactive material shall be consistent with pertinent regulatory requirements.

7.16 INSPECTION, TEST, AND OPERATING STATUS

7.16.1 Radioactive Material and Systems Configuration Controls

1. Appropriate controls shall be established for the control of radioactive material, systems configuration, as well as personnel exposure.
2. Inspection, test, and operating status of equipment and components associated with radioactive material, system configuration, and personnel exposure shall be established based upon the following criteria:
   a. Inspection, test, and operating status for radioactive material, system configuration, and personnel exposure shall be indicated and controlled by established procedures.
   b. Status shall be indicated by tag, label, marking or log entry.
   c. Status of nonconforming items or packages shall be positively maintained by established procedures.

7.17 NONCONFORMING MATERIALS, PARTS OR COMPONENTS

1. Consistent with Section 7.2, measures shall be established to control materials, parts, or components that do not conform to requirements in order to prevent their inadvertent use or release for shipment. These measures shall include, as appropriate, procedures for identification, documentation, segregations, disposition, and notification to affected organizations.
2. Nonconformance items shall be reviewed and accepted, rejected, repaired, or reworked in accordance with documented procedures.

7.18 CORRECTIVE ACTION

1. Measures shall be established to assure that conditions adverse to quality, health and safety are promptly identified and corrected.
2. In the event of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined, and corrective action taken to preclude repetition. These conditions shall be documented and reported to appropriate levels of management.

7.19 QUALITY ASSURANCE RECORDS

1. Sufficient records shall be maintained to furnish evidence of activities important to safe decommissioning as required by code, standard, specification or project procedures. Typical records would include:
   a. Proposed Decommissioning Plan
   b. Procedures
   c. Reports
   d. Personnel qualification records
   e. Radiological and environmental site characterization records, including final site release records
   f. Dismantlement records
   g. Inspection, surveillance, audit and assessment records
2. Records shall be identifiable, available, and retrievable.
3. Requirements shall be established concerning record collection, safekeeping, retention, maintenance, updating, location, storage, preservation, administration, and assigned responsibility. Such requirements shall be consistent with the potential impact on quality, radiation exposure to the workers and the public, and applicable regulations.
4. Records shall be reviewed to ensure their completeness and ability to serve their intended function.

7.20 AUDITS

7.20.1 General Requirements

A system of planned audits shall be carried out to verify compliance with appropriate requirements of the Quality Assurance Plan and to determine the effectiveness of the plan. The audits shall be performed in accordance with written procedures or checklists by trained and qualified personnel not having direct responsibility in the areas being audited.

7.20.2 Audit Reports

1. Reports of the results of each audit shall be prepared. These reports shall include a description of the area audited, identification of individuals responsible for implementation of the audited provisions and for performance of the audit, and identification of discrepant

areas.

2. Audit reports shall be distributed to the appropriate level of management and to those individuals responsible for implementation of audited provisions.

7.20.3 Audit Corrective Action

1. Measures shall be established to assure that discrepancies identified by audits are resolved. These measures shall include notification of the manager responsible for the discrepancy, and verification of satisfactory resolution. Discrepancies shall be resolved by the manager responsible for the discrepancy. Higher levels of management shall resolve disputed discrepancies.
2. Followup action, including re-audit of deficient areas, shall be taken where indicated.

SECTION 8
DECOMMISSIONING ACCESS CONTROL PLAN

8.1 BASIS FOR ACCESS CONTROL PROGRAM

The Fort St. Vrain Decommissioning Access Control Plan is based on the requirements of 10 CFR 20.105 and NRC Regulatory Guide 1.86 (Ref. 1). The Fort St. Vrain Access Control Plan is necessary to be responsive to the following requirements:

1. Prevent unauthorized access to restricted radiological areas and during radiological events or emergencies.
2. Contact local law enforcement and emergency service organizations to respond to:
   a. fire or explosions;
   b. personnel disturbance;
   c. acts of sabotage or perceived threat;
   d. civil disturbance;
   e. medical emergencies

This Access Control Plan identifies those controls and procedures related to access to the decommissioning site. Access control requirements for radiologically controlled areas within the decommissioning site are addressed in Section 3.2 Radiation Protection Program.

This Access Control Plan has been developed to provide an adequate Industrial Security Program to prevent sabotage (intentional or unintentional) to internal or external decommissioning systems or radioactive waste storage, and to prevent theft of company or contractor materials.

8.2 SITE ACCESS CONTROL ORGANIZATION

Access control personnel will be properly trained and demonstrate understanding of decommissioning area access control requirements and responsibilities. Access control personnel will be unarmed and equipped for continuous onsite and offsite communications. The PSC Facility Support Manager is responsible for site access control which includes (1) decommissioning area access control (gatehouse and vehicle access) and (2) emergency, medical and fire reporting.

Local law enforcement authorities will receive familiarization briefings on procedures and plant layout, and arrangements will be made for their services if needed.

8.3 ACCESS CONTROL PHYSICAL SECURITY MEASURES

The decommissioning area will be surrounded by a continuous permanent fence that will provide a physical barrier to prevent unauthorized access to restricted areas. Access control personnel will normally be located in the personnel access gatehouse.

Personnel access gatehouses will be located at the main plant entry for the decommissioning area or other suitable access points. A vehicle access gate will be located in the immediate vicinity of the personnel access gatehouse at the main plant entry. Use of the vehicle gate will also be controlled by access control personnel.

Access will be controlled within the Fort St. Vrain decommissioning project and permitted only to those authorized by the PSC Decommissioning Program Director, the Westinghouse Project Director, or their authorized representatives. Lists of individuals with authorized access will be prepared and will be controlled.

Access for decommissioning workers will be controlled through positive identification (e.g., picture badges, positive identification, controlled access lists or other means) to ensure access to the decommissioning site restricted area is provided only to authorized individuals.

Access to the restricted area does not guarantee access to radiological controlled areas. The radiation protection staff will continue to administer the radiological controlled area access control program, as was done during operations and defueling. Specific requirements that must be met prior to accessing radiologically controlled areas are identified in Section 3.2.

All persons passing through the gatehouses will be required to demonstrate valid access authorization. All other plant gates associated with the controlled decommissioning area will be required to be kept locked or continuously monitored. Locks and keys for the decommissioning area gates will be controlled.

Visitor access to the decommissioning area must be approved by the PSC Decommissioning Program Director, the Westinghouse Project Director, or their designated representatives.

Repairs to physical barriers and equipment will accomplished in a timely manner.

8.4 COMMUNICATIONS

Telephone service will be available at the main plant entry personnel access gatehouse to contact local law enforcement authorities and other local emergency services. Radio communications will be available between the plant control room and access control personnel, in the event it becomes necessary to limit access to the decommissioning area or if it becomes necessary to contact local emergency services.

8.5 PROCEDURES

Written procedures will be prepared and implemented to provide the access control personnel guidance for the following routine occurrences:

1. Personnel access control
2. Vehicle access control
3. Communications equipment and routine testing requirements
4. Surveillance/inspection of decommissioning area physical barriers
5. Record keeping requirements

Written procedures will be prepared and implemented to provide the access control personnel guidance for the following abnormal occurrences:

1. Fire or explosion
2. Site evacuation
3. Site radiological emergencies
4. Personnel disturbance
5. Acts or perceived threat of sabotage
6. Civil disturbance
7. Suspected or confirmed intrusion sabotage attempt
8. Breached security area barrier
9. Unidentified person in security area
10. Medical Emergencies
11. Theft of material

The content of these procedures will include (1) criteria for identifying abnormal conditions within the decommissioning area; (2) access control personnel actions; and (3) required notifications.

8.6 REFERENCES FOR SECTION 8

1. Regulatory Guide 1.86: "Termination of Operating License for Nuclear Reactors". June 1974.

SECTION 9
DECOMMISSIONING EMERGENCY RESPONSE PLAN

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SECTION 10
DECOMMISSIONING FIRE PROTECTION PLAN

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FORT ST. VRAIN
ACTIVATION ANALYSIS

Prepared by:	Valerie E Walker	3/12/92 Date
	Russell Sherman	3/12/92 Date
Verified by:	G.D. Schmalz	3/23/92 Date
Approved by:	W.E. Neiloff	3/24/92 Date

APPENDIX II

FORT ST. VRAIN ACTIVATION ANALYSIS

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FORT ST. VRAIN ACTIVATION ANALYSIS

I. INTRODUCTION

This report summarizes the results of the activation analysis performed for the Fort St. Vrain (FSV) Pre-stressed Concrete Reactor Vessel (PCRV) and internals. This analysis determines the isotopic composition, magnitude, and extent of residual radioactivity in the PCRV and internals which would be present after operation through 232 Effective Full Power Days (EFPD) in Cycle 4. The information provided in this report is for use in decommissioning planning activities. The results presented in this report include dose rates inside the PCRV at various times after shutdown, and the curie inventory for individual components and for the overall PCRV.

II. BACKGROUND

The FSV generating station ceased operations on August 18, 1989. Defueling of the reactor core to the Fuel Storage Wells has commenced. To date, twenty-five regions have been defueled and replaced with boronated refueling blocks. The fuel is currently being stored on site in the FSV Independent Fuel Storage Installation (ISFSI). Final disposition of the fuel has not been determined. The fuel may be sent to Idaho National Engineering Laboratory (or another DOE facility), or may remain in the ISFSI until a high level waste repository is available.

In order to accurately plan activities for decommissioning, an estimate of the extent and isotopic composition of residual radioactivity must be predicted. In early 1988, Public Service Company enlisted the services of Ebasco's Advanced Technology Group to develop a computer model for the FSV reactor and train PSC personnel on model development and the use of all computer codes associated with the activation analysis.

The necessary computer codes were installed on PSC's IBM mainframe by PSC personnel. PSC personnel worked with Ebasco in the development of the models used to analyze the PCRV. Additionally, Ebasco gave several training sessions covering the topics listed in Table 1.

III. ANALYSIS METHODOLOGY

A. Code Descriptions

The computer codes installed on the IBM 3090 included transport, activation, and radiation shielding codes. In addition to these codes, several utility codes to handle data sets and output were developed by PSC personnel. Table 2 lists the computer codes and data libraries that were installed on the IBM mainframe.

ANISN and DOT are multi-group, one- and two- dimensional discrete ordinates computer codes with anisotropic scattering. REBATE is an activation code for the calculation of activation product production rates for one- or two- dimensional multi-group neutron flux distributions. ORIGEN is an isotope generation and depletion code which calculates the buildup, decay, and processing of radioactive materials using only a single point thermal neutron flux input and spectrum modifiers to account for the higher energy flux distribution. ISOSHLD is a point kernel integration code which performs gamma ray shielding calculations for radioactive sources in a wide variety of source and shield configurations. Volume 1 of Appendix A includes user's manuals, sample problems, and installation problems/comments pertaining to PSC's IBM version of the codes.

Four utility codes were developed by PSC for data handling. SITEREB processed REBATE output into a format which provided the isotopic inventory of the activation products for each component. SRCEDOS1 also processes REBATE output to develop the gamma source input for ANISN. SRCEDOS2 reads ANISN output and calculates dose rates within the PCRV. POSTREB processes the REBATE output to a more readable format.

B. Calculational Sequence

The analysis was divided into three models: Radial, Axial Up, and Axial Down. The calculation sequence was similar for all three models.

The calculational sequence involved the use of the ANISN, REBATE, SITEREB, SRCEDOS1, and SRCEDOS2 codes. Figure 1 shows a flow chart for the activation analysis process. Volume 2 of Appendix A details the analysis steps and computer files used.

The first step in the calculational sequence was to determine the neutron flux throughout the reactor core and the PCRV. The BUGLE-80 cross section data library was collapses to 16 group cross sections, using the COMMAND code. These 16 group cross sections were used as input to ANISN. Neutron fluxes taken from the GATT fuel accountability were used in setting the proper neutron source input to ANISN (Ref. 1). The spatial neutron flux in the reactor through the 1014 GATT regions, over six layers, was searched for the blocks on the edge of the core with the highest flux. A radial traverse from core center line to the maximum flux block was used to set fuel nuclide number densities to the radial ANISN model. This same method was used to determine the fuel number density inputs to ANISN for the Axial Up and Axial Down analyses.

The 16 group neutron fluxes were normalized to match the 4 group GATT fluxes. This was accomplished by collapsing the ANISN flux output to 4 groups for comparison with the GATT results. The group structure of the neutron source ANISN input was then redefined (if necessary) and the process repeated until the GATT and ANISN (4 group) fluxes were within a factor of 2. Figure 2 shows the agreement between fluxes for the radial case. The flux ratios for the axial cases are shown in Figures 3 and 4.

The final 1-D neutron flux for all three cases is shown in Figures 5 through 7. Further details of the ANISN neutron flux calculations can be found in Volume 2, Section 1 of Appendix A.

The second step in the analysis was to determine the activation of the selected PCRV components due to the neutron flux previously calculated. The activation of PCRV internal components and concrete was calculated with the REBATE code and some auxiliary utility routines. The input to REBATE included the neutron fluxes from ANISN, material number densities of the components, power history of the reactor, and geometry of the components. The details of the REBATE model are discussed in Volume 2 of Appendix A.

The material number densities for the components are discussed in Section III.D of this report.

The actual and projected power history of the reactor was used to determine the input neutron flux pulse. A 70% power pulse was input for a time equivalent to operation through 232 EFPD in Cycle 4 (corresponding to the August 18, 1989 shutdown date). All internal components were conservatively assumed to have resided in the PCRV for the entire reactor operating lifetime (890 EFPD).

The total curies of each component were calculated from the REBATE output using the SITEREB post processing utility code. This code processed the REBATE output to determine the activity of each component as a function of time.

The third step in the analysis included the computation of dose rates inside the PCRV. The REBATE gamma flux output was processed with the SRCEDOS1 code to an acceptable format for the ANISN gamma ray transport calculation. This calculation required the use of the ANISN code for the determination of the spatial gamma ray flux resulting from the radioactive decay of the activation products in the various components left within the confines of the PCRV. The SRCEDOS2 code transformed the 11 group gamma ray fluxes as a function of space into radiation dose rates within the PCRV.

The TSO data sets used in the activation analysis and some users notes are included in Attachment 1.

C. <u>Computational Models</u>

The analysis was performed using three 1-D models: Radial, Axial Up, and Axial Down. The Radial neutron flux model extended from the fuel outward through the PCRV concrete. The Axial Up and Axial Down neutron flux models contained components from the fuel through the top head, and from the fuel through the core support floor, respectively. The neutron activation models originally assumed that all fuel and removable reflectors had been removed from the PCRV, and that air had replaced the helium within the PCRV. Volume 2 of Appendix A details each model, input variables, and assumptions used in the analysis. Revisions to the activation models were performed to include removable reflector blocks. The major components modeled for the activation analyses in all three directions were:

Radial	Axial Up	Axial Down
Side Removable Reflectors	Upper Removable Reflectors	Lower Removable Reflectors
Permanent Reflectors	Metal Clad Blocks	Core Support Blocks/Posts
Boronated Spacer Blocks	Region Constraint Devices	(Helium Plenum)
Core Barrel	Lower Orifice Valve Assembly	Silica Block Insulation
(Helium Plenum)	(Helium Plenum)	CSF Cover Plates/Kaowool Insulation
Cover Plates/Insulation	Cover Plates/ Kaowool Insulation	CSF Liner/Cooling Tubes
PCRV Liner/Cooling Tubes	PCRV Liner/Cooling Tubes	CSF Concrete/Rebar
PCRV Concrete and Rebar	Top Head Concrete/Rebar	
Reflector Keys		

Radial Model

The Radial model consists of eight basic components listed above. The removable side reflector hexagonal elements are located just outside of the active fuel. These blocks are constructed of H451 or H327 graphite. A typical block is approximately 31 inches in height, and 14 inches across the flats.

Beyond the hexagonal removable reflectors are the large permanent graphite (HLM) side reflector blocks. These blocks are irregular in shape (see Figure 8), having average approximate volume of 3.358E+05 cc each.

Between the large reflectors and the core barrel are the boronated side reflector spacer blocks (Figure 8). These blocks are constructed of HLM graphite and contain boronated stainless steel rods which were designed for neutron shielding during power operations. The number of rods varies with core location of the spacer blocks.

The core barrel (Figure 8) is located just beyond the boronated spacer blocks and serves as lateral restraint of the fuel and reflectors. The barrel is constructed of carbon steel, consists of three sections varying in thickness from 2.25 inches to 2.75 inches, and is approximately 29 feet in height. The core barrel is modeled in two sections because the upper 12 feet is constructed of a slightly different material than the bottom two sections.

Class A kaowool insulation and cover plates (Figure 9) cover the inside of the PCRV liner. The insulation is a ceramic fiber material and the cover plates are constructed of carbon steel.

The PCRV liner (Figure 9) is a 3/4-inch carbon steel plate vessel in the form of a right circular cylinder, 31 feet inside diameter, and 75 feet in height. Carbon steel cooling tubes are welded to the outside (concrete side) of the liner. These tubes provided cooling to the concrete during power operations. The liner and cooling tubes were modeled homogeneously for the activation analysis.

The PCRV concrete serves as the primary containment of the coolant. It varies in thickness from 9 feet to 15-1/2 feet, and is approximately 106 feet high. The PCRV is modeled as a homogeneous mixture of concrete and rebar.

Two final components modeled are the carbon steel side reflector block keys (Figure 8) which connect the core barrel to the large side reflectors and the carbon steel metal shell for the top-most, large side reflectors (half-length reflectors).

Axial Up Model

The Axial Up model includes seven basic components. Adjacent to the fuel are two layers of removable graphite reflectors (including removable reflectors in a control rod column). The keyed metal plenum elements or metal clad blocks (MCB) were analyzed. The blocks are located on the top-most level of the core area (see Figure 8) and provide structural stability and neutron shielding during power operations. All MCB blocks are hexagonal in shape, approximately 15 inches in height, and 14 inches across the flats. The central column MCB (Figure 10) is constructed of stainless steel. The side MCBs, with and without coolant holes (Figure 11), are constructed of carbon steel.

The region constraint devices, RCDs, (Figure 12) provide restraint of fuel regions during power operations. The RCDs are located on top of the MCBs, keying together fuel columns between regions. The triangular main body of the device is made of carbon steel, approximately 5 inches thick. The "legs" of the device are approximately 7 inches in length and are composed of inconel.

The orifice valve assembly (Figure 13) is located just above the central column MCB (or keyed control rod element). The lower portion of this assembly, primarily composed of carbon steel, is modeled as part of the Axial Up model.

The final three components (kaowool/cover plates, PCRV liner/cooling tubes, and PCRV concrete/rebar) are modeled as previously discussed in the Radial model.

Axial Down Model

The Axial Down model includes five components. Directly beneath the active core, there are removable bottom reflectors (Figure 14). These include hexagonal graphite reflectors, graphite reflectors containing boronated Hastelloy-X cans, and graphite transition reflectors which channel coolant to the core support blocks. The core support blocks and core support posts (Figure 14) are permanent components which lie directly below the removable reflectors and act as support for the fuel and reflectors. Three layers of Class C silica insulation (blocks) are located above the cover plate/kaowool which are just above the CSF liner (Figure 15). The CSF liner is a 3/4-inch carbon steel liner covering the 5-foot thick concrete/rebar core support floor.

D. Material Compositions

The material compositions of the components were taken from a variety of sources. In most cases, the material composition and densities were taken from component drawings which referenced the standard specification (AISI, ASTM, ASME, etc). Information on the trace element material composition of reactor components was difficult to obtain. Reference 2 was used in the assumptions of trace elements for concrete. Hand calculations for material compositions and document references are located in Attachment 2. The material composition data base is included in Appendix B.

In general, the reactor internals are made of carbon steel and graphite. Very few components are composed of stainless steel. The presence of trace elements (such as cobalt, niobium, and europium) in steels and concrete could have a large effect on long-term dose rate of PCRV components. Assumptions for these and other trace elements in various materials are discussed below.

<u>Stainless Steels</u>

Reference 2 indicated from LWR samples that in stainless steel components, the Co-60 ranges widely, more than an order of magnitude. Nb-94 samples also had a wide variability, but the average concentration was an order of magnitude below that of Co-60. For this analysis, it was assumed that any stainless steel component had a cobalt concentration of 0.2%. This assumption was based on information from previous activation studies (Ref. 3).

The two components modeled that were constructed of stainless steel were the center column metal clad blocks and the boronated rods in the spacer blocks. In each case, the cobalt level was assumed to be 0.2%. A comparison of this value (Attachment 3) was made with sample data from Reference 2. NUREG/CR-3474 showed that the cobalt range for type 304 stainless steel ranged from 229 to 2[illegible]0 ppm with an average of 1414 ppm. The 0.2% cobalt value in the analysis equated to approximately 2000 ppm. Therefore, the assumption of 0.2% cobalt for stainless steel was assumed adequate.

The niobium level in stainless steel was specified for the metal clad blocks in the material standard. The niobium level for the boronated rods in the spacer blocks is not listed in the material specification and was assumed to be negligible. Since NUREG/CR-3474 indicated the possibility of high levels of niobium in stainless steel, a separate analysis was performed to verify this assumption. The average niobium concentration specified in NUREG/CR-3474 was used as the concentration level. The analysis showed (see Attachment 4) that at 5 years after shutdown, the curie concentration of Nb-94 was six orders of magnitude less than Co-60, and 3 orders of magnitude less at 60 years. Europium was not included as a trace element in the stainless steel because NUREG/CR-3474 indicated that its presence in stainless steels was very low.

Inconel

The pins on the region cons' aint devices were the only components modeled that were constructed of inconel. Both the cobalt (1.0%) and niobium (5.13%) levels were specified in he ASME material standard and used in the analysis.

Carbon Steels

The cobalt level in carbon steels was assumed to be 0.02% (Ref. 3). Similar comparisons as performed with the stainless steel were performed (Attachment 3). In carbon steels, the cobalt range was for 93 to 151 ppm with an average of 122 ppm. The analysis for the PCRV liner and core barrel used approximately 200 ppm. Therefore, the assumptions of 0.02% cobalt for carbon steel were conservative. Niobium and europium traces were considered negligible for carbon steel.

Concrete

The major material constituents for the concrete and rebar were taken from FSAR values. Since no sample data was available to determine trace element abundancies, average values from NUREG/CR3474 sample values were used. Europium was included as a trace element in the concrete with a C.55 ppm abundancy.

Graphite

Activation of graphite components was considered to be due to irradiation of impurities only. Table 3 lists the impurities used in the analysis. Cobalt was also assumed to be present. Its concentration (ppm) was assumed to be 0.01% of the iron content for HLM graphite, or 0.20 ppm. Removable reflector graphite was assumed to have the highest impurity level for H327 or H451 graphite. The cobalt level was assumed to be 0.1 ppm for removable reflector graphite. These assumed Co-60 impurity levels in the HLM graphite, and the H-327 or H-451 graphite, were based upon recommendations of Mr. Farvin Lippincott of Westinghouse Electric Corporation.

Kaowool and Silica Insulation

Material compositions for the Kaowool and Silica block insulation were taken from the FSAR and material reference documents.

IV. RESULTS

The results of the activation analysis are presented in two sections: dose rates in the PCRV with various components removed, and the activity (CURIE inventory) for the specified components.

A. PCRV Dose Rates

Radiation dose rates due to activated material within the PCRV were calculated for a variety of scenarios in which various components were removed. These dose rates are for an individual "standing" in the very center of the reactor cavity after the fuel and removable reflectors have been removed. Since the calculations were performed using three 1-D models, the total dose is the sum of the dose rates from all three directions. The dose rates were calculated for a time 5 years after shutdown, and 60 years after shutdown.

After the defueling and removal of the defueling blocks, the components which remain in the radial direction extend from the large side reflector through the concrete: in the Axial Up direction from the cover plate/kaowool through the top head concrete, and in the Axial Down direction from the core support blocks through the core support floor.

Tables 4 and 5 indicate the contribution of each direction at 5 and 60 years after shutdown. With all the components remaining in the PCRV, the major contribution at both 5 and 60 years is from the radial direction. This is due to the high dose rate from the boronated spacer blocks.

The large side reflectors provide shielding from the boronated spacers. If the large reflectors are removed, the radial dose rate is as high as 230 R/hr at 5 years, and 0.16 R/hr at 60 years. This clearly indicates that dismantlement must be entirely performed remotely at 5 years, and portions performed remotely at 60 years.

The dose rate in the PCRV reactor volume is dominated by the dose contributions from the radial components until the boronated spacer blocks are removed. If the spacer blocks are removed (leaving the core barrel), the radial dose rate drops to 0.02 R/hr (at 5 years) and to .009 R/hr if the core barrel, cover plates, and insulation are removed.

The Axial directions do not have major contributions to the total dose rate until the liner/concrete is exposed in all directions (i.e. the spacers, core barrel, cover plates/insulation, and core support) are removed.

In the Axial Down direction, the core support posts and blocks shield the reactor space from a higher dose rate due to the core support floor liner, cooling tubes, and concrete. The dose rate at 5 years with the CSB remaining is about 0.06 R/hr, but with only the liner and concrete remaining, the dose is about 0.25 R/hr. The Axial Up contribution when the coverplates/insulation are removed is approximately 0.44 R/hr.

A. Residual Limits

No formal limits on activation exist for unrestricted release. Informal guidance by the NRC suggests that a dose of below 5.0 micro R/hr would be an acceptable limit. Table 4 and 5 indicate the approximate depth of concrete in each direction which would require removal to obtain this limit.

B. Component Curie Inventory Summary

The analysis determined the total activity (curies) of each component described in Section III.C. Table 6 summarizes the total isotopic and curie level for each permanent component and the entire core. Appendix C contains a more detailed curie inventory by isotope for each component.

In the large side reflectors, the activation products are due to the impurities in the graphite. Few high energy gamma emitters are present in the large side reflectors. The total activity is composed primarily of tritium, Co-60, Ca-41, Fe-55, and Ca-45 (short term). In the dose rate from the PCRV liner and cooling tubes, Co-60 is the primary contributor to dose at 5 and 60 years. In the long term, Fe-59 and Ni-63 become more important.

The metal shell for the large side reflectors is located only at the top of the core. Typical isotopes for metals are present. Co-60 is again the dominant gamma emitter, and Fe-55 contributes to the total activity.

The spacer blocks are the primary contributors to the dose rate in the PCRV. This is due to the high amount of Co-60 in the boronated rods and the large number of rods. Co-60 is the major gamma emitter at both 5 years and 60 years after shutdown. Stainless steel may potentially have niobium as a trace element. Niobium was not originally included as a trace element in the boronated rods, but a separate analysis shows that when an average value for niobium is included (see Material Composition section), its concentration is negligible in terms of dose rate and total activity. Other contributors to the total activity are Ni-59, Ni-63, Fe-55, and C-14, all of which are beta emitters. Ni-63 has the highest concentration and, due to its long half life, will be a major constituent in long-term waste disposal.

The core barrel is divided into three sections of different thicknesses. The top portion is constructed of a slightly different type of carbon steel than the bottom and middle sections, and was therefore modeled separately. In the upper section of the core barrel, the dose is from Co-60 with some contributions from Mn-54 at 5 years. Co-60 is primary dose and activity contributor for the upper core barrel at both 5 and 60 years. Other contributors include Mn-53 and Fe-55, and Fe-59 in the short term. In the lower section of the core barrel, Co-60 is again the dominant gamma emitter at both 5 and 60 years after shutdown. Fe-55, Mo-93, and Nb-94 make minor contributions to dose and activation in both the short and long term.

The cover plate/kaowool mixture is considered together since the cover plates and insulation are layered in most places in the PCRV and would be removed simultaneously. The dose rate from the cover plate/kaowool mixture in the upper portions of the PCRV is dominated by the Co-60 in the cover plates. The mixture also contains Ca-41, Fe-55, Ni-63, and C-14 which may dominate in long-term disposal considerations.

The PCRV concrete/rebar mixture contains many activation products due to the trace elements in the concrete. Reference 2 lists potential problem beta and gamma emitters. The major gamma emitters listed are Co-60, Eu-152, Eu-154, Ag-108m, and Ba-133. At 5 years after shutdown, the concentrations of Co-60 and Eu-152 are relatively close. Together, they dominate the total dose. Co-60 is the primary dose contributor in the short-term since it has higher energy gammas. In the long term, the Eu-152 will dominate. At 5 years, the concentration of Eu-154, Nb-94, Ag-108m, and Ba-133 are at least an order of magnitude below that of Co-60 and Eu-152. Ba-133 is not included in the REBATE library, but an ORIGEN2 run was performed by Ebasco (Attachment 5) to determine its concentration relative to Co-60.

Beta emitters listed in Reference 2 were H-3, Be-10, C-14, Ni-63, and Tc-99. Tritium has the highest concentration at 5 years. Although not mentioned in the reference, Ar-39 has the next highest concentration. The other beta emitters listed are several orders of magnitude less than the tritium.

Isotopes decaying by electron capture are also listed: Ni-59, Mo-93, and Ca-41. Of these three, Ca-41 is the most abundant. The PCRV concrete also has a high concentration of Fe-55. Mo-93 and Ni-59 are several orders of magnitude less than Ca-41 and Fe-55.

The Hastelloy-X cans located in the lower reflector blocks contain Co-60 as the primary dose contributor.

The core support blocks (PGX graphite) are very similar in material composition to the large permanent reflectors. H-3, Ca-41, and Fe-55 are again the dominant isotopes in the long and short term. Ca-45 again has a relatively high concentration at 5 years but decays rapidly, such that very little remains after 60 years.

The three layers of silica blocks are located just above the cover plate/kaowool on the core support floor. Fe-55 is abundant in large quantities at 5 years, and Ni-63 at 60 years. C-14, Ca-41, and Ni-59 are also present in traces. Co-60 is the dominant gamma emitter.

The central column metal clad blocks contain high concentrations of Ni-63, Co-60, and Fe-55 at 5 years. Other isotopes present in the MCBs are Mn-54, Ni-59, and Nb-94.

The surrounding MCBs are constructed of a different material than the center column. They are high in Co-60 and Fe-55, but have low concentration of Nb-94 relative to the center column.

The orifice valve lower section has a relatively low activity level. Co-60 is the primary gamma emitter.

The RCDs contain fairly high concentrations of Co-60, Fe-55, and Ni-59 at 5 years. Primary dose contribution is from Co-60 in both the long and short term.

V. CONCLUSIONS

The primary dose contributor in the PCRV is Co-60. Cobalt is present in the majority of components. Other gamma emitters such as Nb-94 and Eu-152 contribute to the dose, as well. In the PCRV concrete, Eu-152 becomes the dominant gamma emitter in the long term.

The total activity of the PCRV and internal components is on the order of 8.0E5 curies at 3 years after shutdown, as shown in Table 6. The large graphite reflector contributes approximately 65% of the activity. Tritium, Co-60, and Fe-55 (short term) are the dominant nuclides in the reflectors. Ni-63, Ni-59, Ca-41, Ar-39, and Mo-93 contribute in varying degrees to the total activity. Long-term disposal considerations will be affected by the long-lived nuclides.

The results of this analysis show that the dismantlement of the reactor and internals without the use of remote techniques is impossible at 5 years after shutdown. The high doses from the boronated spacer blocks prevent human access for even short periods of time. Dose rates from the spacer blocks are approximately 230 R/hr when no shielding is provided by the large reflectors. If the spacers are removed, the dose rate from the top would limit access since dose rate ranges from 0.4 - 0.2 R/hr (dependent on remaining components).

The depth of concrete requiring removal to meet the 5 micro R/hr limit is about twice as high at 5 years as at 60 years after shutdown. Approximately 2' would require removal in the Radial and Axial Down directions, and 3' from the top head at 5 years after shutdown.

If the PCRV were dismantled after the 60-year SAFSTOR period, dose rates of approximately 0.2 R/hr would allow the use of remote techniques with very limited access during the removal of the spacer blocks. Once the spacer blocks are removed, the maximum total dose rate would be on the order of 0.5 mR/hr, allowing access into the PCRV.

The required depth of concrete removal at 60 years would be approximately 6"-8" in the Radial and Axial Down directions. The top head would require 16"-18" of concrete to be removed.

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VI. REFERENCES

1. GA Fuel Accountability, GATT Flux Tape, EOC3.

2. NUREG/CR-3474, "Long-Lived Activation Products in Reactor Materials", published August,1984.

3. "Fort St. Vrain Nuclear Generating Station, Unit No. 1, Decommissioning Cost Study," April 12, 1982, Revised September 15, 1982.

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REV. B

TABLES

TABLE 1

Topics of Instructional Sessions

Session	Topic
1	Nuclear Data Libraries
2	Transport Equation, Multigroup Library, AMPX Modular Code System; Activation Data and Radioactive Decay Data
3	ANISN and its Input Data Preparation; Activation Calculation Sequence; DOT 4.3. Options
4	Activation Analysis
5	ORIGEN and its Input Data Preparation; ISOSHLD and its Input Data Preparation

TABLE 2

List of Nuclear Codes and Data Libraries

Code No.	Code Title	Type of Code
CCC-254 CCC-429	ASISN DOT IV Version 4.3	Major Nuclear Codes for Radiation Transport
PG-2561 CCC-371	REBATE ORIGEN	Activation Analysis, Isotope and Activity Generation Codes
CCC-79	ISOSHLD	Radiation Shielding Code
PSR-63	AMPX-II	Nuclear Data Utilities
PSR-110	DOQDP	Angular Quadrature Sets
DLC-75	BUGLE-80	Nuclear Data Library

TABLE 3

Graphite Impurities

	PGX	ATJ	H451	H327	HLM
Bulk Density (g/cc)	1.76 ± 0.06	1.73	1.74 ± 0.025	1.77 ± 0.04	1.8 ± 0.04
Mean Impurity Level (ppm)*					
Ash	4900	0.158%	100	130	4200
B	2	1.25	2	1	3
Fe	1900	10.1	9	20	2000
Va	14	8.25	7		42
Ti	28	14.75	6		39
Ca	190	290		30	95
Si	62	60	35		65
Al	66	28.5			45
Ba	34	50			25
S	310	3.3	3	3	58
Li	2	<0.001%	0.036	0.1	2
Cu		1.5			
Mg		1.5			
Mo		1.25			
Ni		0.75			
Ag		0.5			
Zr		1.3			

* All impurities in ppm except for Ash and Li in ATJ which are in (%).

References:

1. For PGX, H451, H327, and HLM: "Graphite Design Manual," GA Document GA906374, Issue A, August 1984 (proprietary)

2. Ash and Li for ATJ: Industrial Graphite Engineering Handbook, Union Carbide, 1970 edition

3. Rest of ATJ: "Mechanical and Chemical Properties Changes of ATJ Gruphite After Oxidation in He/Steam Mixture", GA Document DAD14526, Karl Koyama et al, October 1977

TABLE 4

PCRV Dose Rates at 5 Years After Shutdown

Radial	Gamma Dose Rate (R/Hr)
All components (Lg. Reflector through concrete)	9.7E + 1
No large reflectors (Spacers Concrete)	2.3E + 2
Core Barrel - Concrete	2.1E - 2
Liner + Concrete	8.8E - 3
Concrete Only	4.5E - 3
Minus 22" Concrete	6.3E - 6
Minus 24" Concrete	3.4E - 6
Axial Up	
All components (Kaowool Concrete)	1.7E - 1
Liner & Concrete	4.4E - 1
Concrete Only	1.7E - 1
Minus 34" Concrete	4.4E - 6
Minus 36" Concrete	2.6E - 6
Axial Down	
All Components (CSB CSF)	6.1E - 2
Liner + Concrete	2.5E - 1
Concrete	1.8E - 2
Minus 20" Concrete	5.3E - 6
Minus 22" Concrete	2.7E - 6

TABLE 5

PCRV Dose Rates at 60 Years After Shutdown

Radial	Gamma Dose Rate (R/Hr)
All Components (Lg. Reflector - Concrete)	6.9E - 2
No large reflectors (Spacers - Concrete)	1.6E - 1
Core Barrel - Concrete	1.4E - 5
Liner + Concrete	6.2E - 6
Concrete Only	1.1E - 5
Minus 6" Concrete	6.6E - 6
Minus 8" Concrete	3.5E - 6
Minus 10" Concrete	1.7E - 6
Axial Up	
All Components (Kaowool - Concrete)	1.2E - 4
Liner + Concrete	3.1E - 4
Concrete Only	4.5E - 4
Minus 16" Concrete	4.1E - 6
Minus 18" Concrete	2.0E - 6
Axial Down	
All Components (CSB - CSF)	4.3E - 5
Liner + Concrete	1.8E - 4
Concrete	6.6E - 5
Minus 4" Concrete	1.0E - 5
Minus 6" Concrete	4.3E - 6
Minus 8" Concrete	1.8E - 6

TABLE 6

ACTIVATION ANALYSIS RESULTS
(Total Curies Three Years After Shutdown)

Fixed Components:	H-3	C-14	Ca-41	Ca-45	Mn-54	Fe-55	Fe-59	Co-60	Ni-59	Ni-63	Nb-94	Ag-110	Eu-152	Eu-154	Others	Curies
1. Core Barrel	-	-	-	-	0.11	7.28	<0.01	1.03	-	-	<0.01	-	-	-	0.01	8.43
2. CSF Liner	-	-	-	-	<0.01	139.98	<0.01	2.27	<0.01	0.04	<0.01	-	-	-	<0.01	142.29
3. PCRV Liner	-	-	-	-	0.08	110.34	<0.01	4.34	<0.01	0.03	<0.01	-	-	-	<0.01	114.79
4. CSF/Kaowool Insulation & Cover Plates	-	<0.01	<0.01	-	<0.01	87.20	<0.01	2.24	<0.01	0.08	-	-	-	-	<0.01	89.52
5. CSF Silica Blocks	-	<0.01	<0.01	-	<0.01	246.54	<0.01	6.33	<0.01	0.22	-	-	-	-	<0.01	253.09
6. PCRV Kaowool Insulation & Cover Plates	-	<0.01	<0.01	-	0.01	5.57	<0.01	0.44	-	-	-	-	-	-	0.01	6.03
7. Metal Shell-Large Side Reflector	-	-	-	-	<0.01	0.01	<0.01	<0.01	-	-	-	-	-	-	<0.01	0.01
8. Large Side Reflector and Permanent Hexagonal Blocks	82557.70	-	20.11	77.44	0.30	441114.00	<0.01	3446.24	-	-	-	-	-	-	.21	527216.00
9. Core Support Blocks	47.19	-	<0.01	0.01	<0.01	69.15	-	0.54	-	-	-	-	-	-	<0.01	116.89
10. Reflector Keys	-	-	-	-	<0.01	0.01	<0.01	<0.01	-	-	-	-	-	-	<0.01	0.01
11. Boronated Spacer Blocks	11531.50	1.02	0.81	3.12	<0.01	47208.60	<0.01	7097.13	2.81	392.45	-	-	-	-	0.26	66237.76
TOTAL																5[illegible]4,184.76
Removable Components:																
1. Metal Clad Block-CR	-	-	-	-	0.06	18451.70	<0.01	4342.78	2.08	290.39	0.18	-	-	-	0.01	23087.20
2. Metal Clad Block-NCR	-	-	-	-	0.52	169668.20	<0.01	2786.29	-	-	<0.01	-	-	-	<0.01	172455.01
3. Region Constraint Device	-	-	-	<0.01	0.07	71.85	<0.01	48.93	0.01	1.27	0.01	-	-	-	<0.01	122.14
4. Orifice Valve	-	-	-	-	0.17	299.25	<0.01	115.56	-	-	-	-	-	-	<0.01	414.98
5. Hastelloy Cans	-	-	-	<0.01	0.07	300.94	<0.01	3407.45	0.67	88.35	<0.01	-	-	-	<0.01	3797.48
6. Removable Graphite Reflector	3208.53	-	4.34	16.99	0.13	6034.36	<0.01	2483.61	-	-	-	-	-	-	<0.01	11747.96
TOTAL																211,624.77

TABLE 6 (Continued)

Component/Isotope	H-3	C-14	Ca-41	Ca-45	Mn-54	Fe-55	Fe-59	Co-60	Ni-59	Ni-63	Nb-94	Ag-110	Eu-152	Eu-154	Others	Total
Concrete Radial:																
1st Six Inches	0.26	<0.01	<0.01	0.02	<0.01	7.93	<0.01	0.31	<0.01	<0.01	<0.01	<0.01	0.31	0.03	0.03	8.89
2nd Six Inches	0.09	<0.01	<0.01	<0.01	<0.01	2.81	<0.01	0.10	<0.01	<0.01	<0.01	<0.01	0.11	<0.01	0.02	3.13
3rd Six Inches	0.01	<0.01	<0.01	<0.01	<0.01	0.33	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	0.37
4th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04
5th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
6th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
7th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TOTAL																12.44
Concrete - Top Head:																
1st Six Inches	2.84	<0.01	0.04	0.18	0.01	87.79	<0.01	3.37	<0.01	<0.01	<0.01	0.01	3.45	0.35	0.28	98.32
2nd Six Inches	0.73	<0.01	0.01	0.05	<0.01	22.95	<0.01	0.79	<0.01	<0.01	<0.01	<0.01	0.90	0.08	0.04	25.55
3rd Six Inches	0.07	<0.01	<0.01	<0.01	<0.01	2.26	<0.01	0.08	<0.01	<0.01	<0.01	<0.01	0.09	0.01	0.01	2.52
4th Six Inches	0.01	<0.01	<0.01	<0.01	<0.01	0.24	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.27
5th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04
6th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
7th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TOTAL																126.71
Concrete - CSF:																
1st Six Inches	0.16	<0.01	<0.01	0.01	<0.01	5.12	<0.01	0.17	<0.01	<0.01	<0.01	<0.01	0.20	0.02	0.01	5.69
2nd Six Inches	0.01	<0.01	<0.01	<0.01	<0.01	0.34	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	0.39
3rd Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03
4th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
5th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
6th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
7th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
9th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
10th Six Inches	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TOTAL																6.10

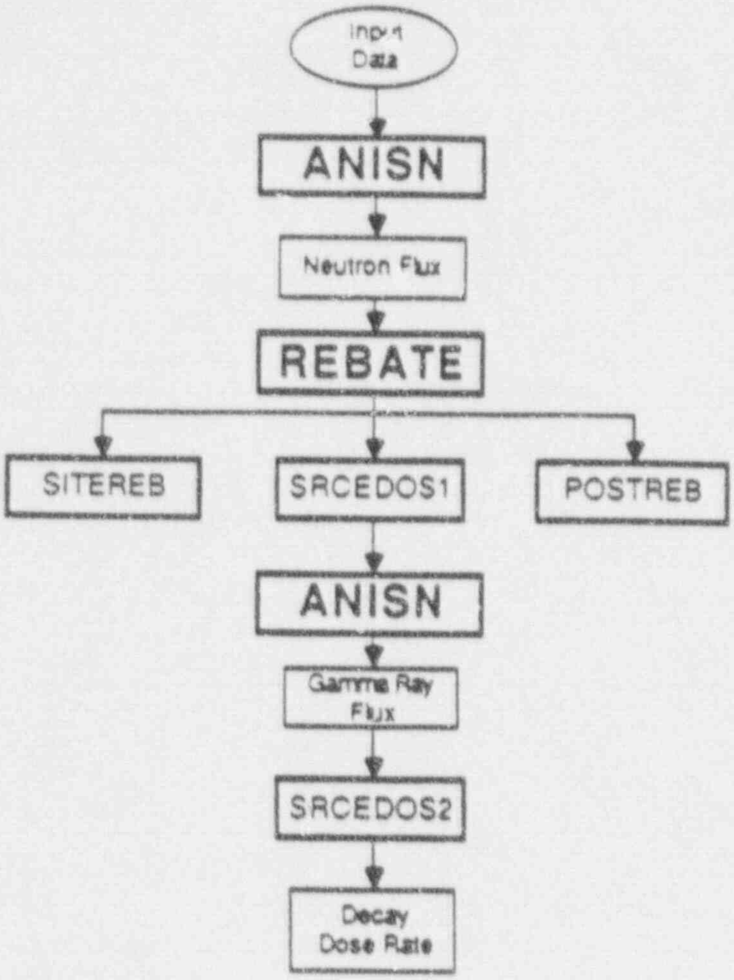
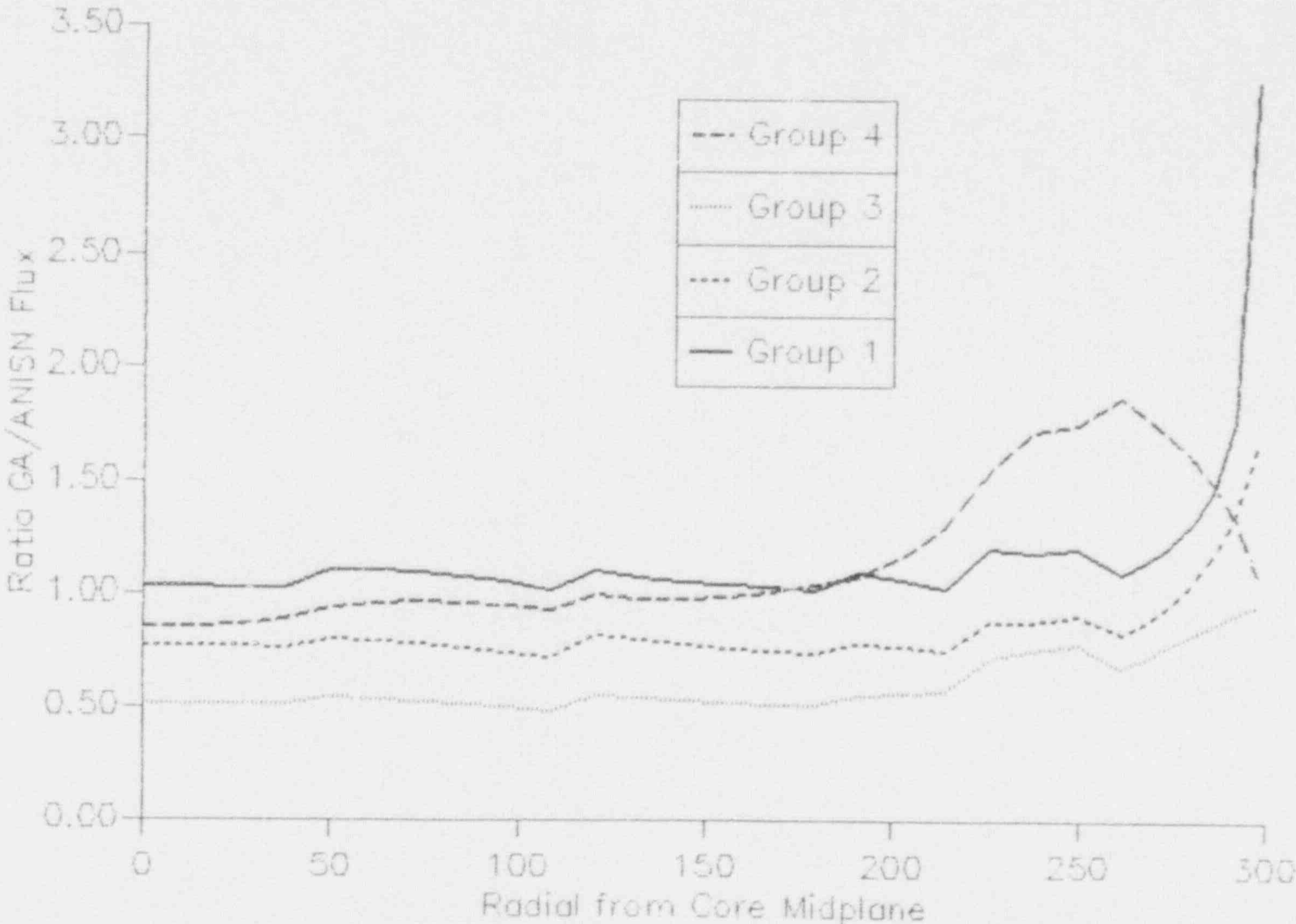


Figure 1
Calculational Sequence Flow Chart

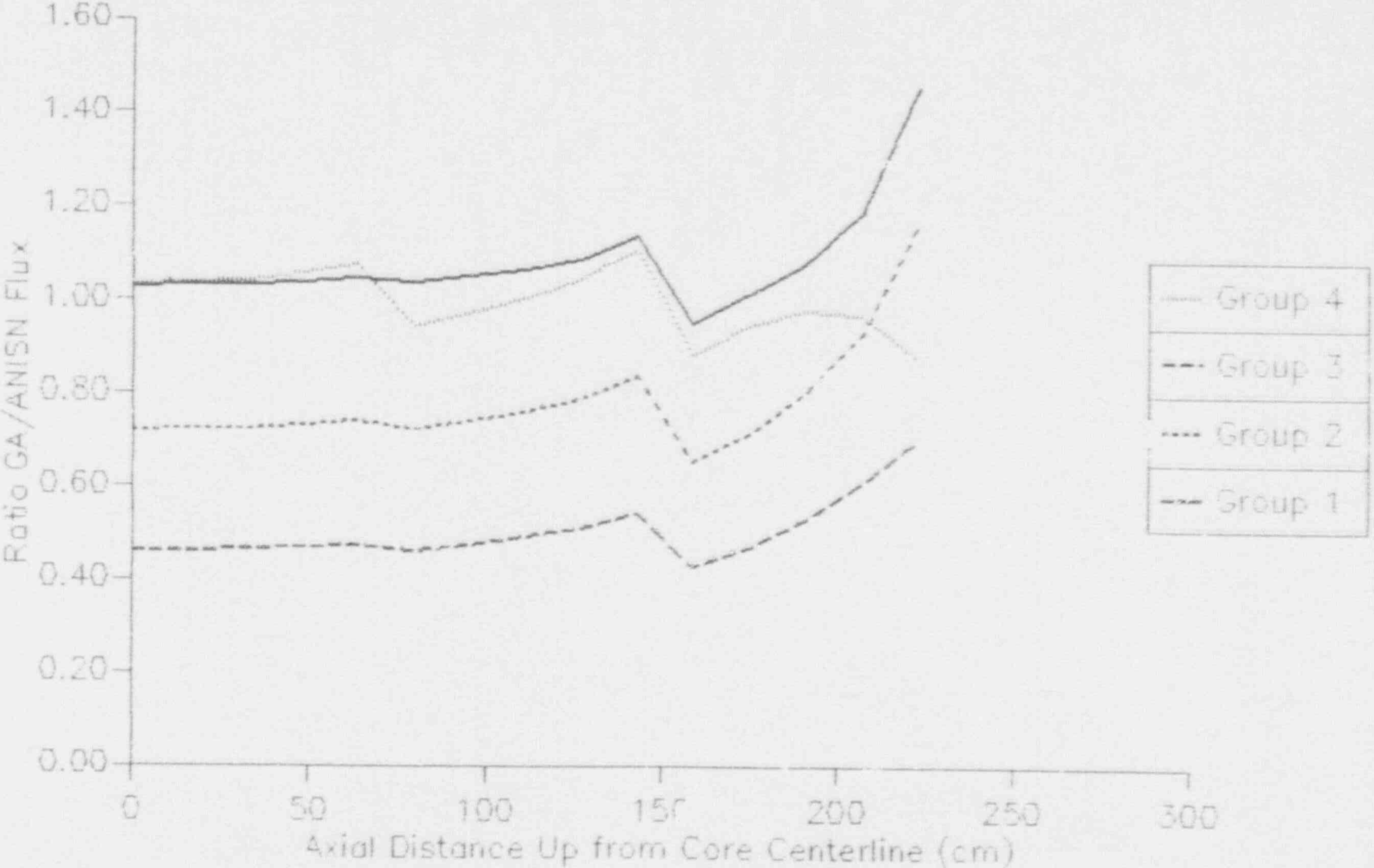
ICU File: T6284(R/.IOR04)

Figure 2
Radial Flux Ratios



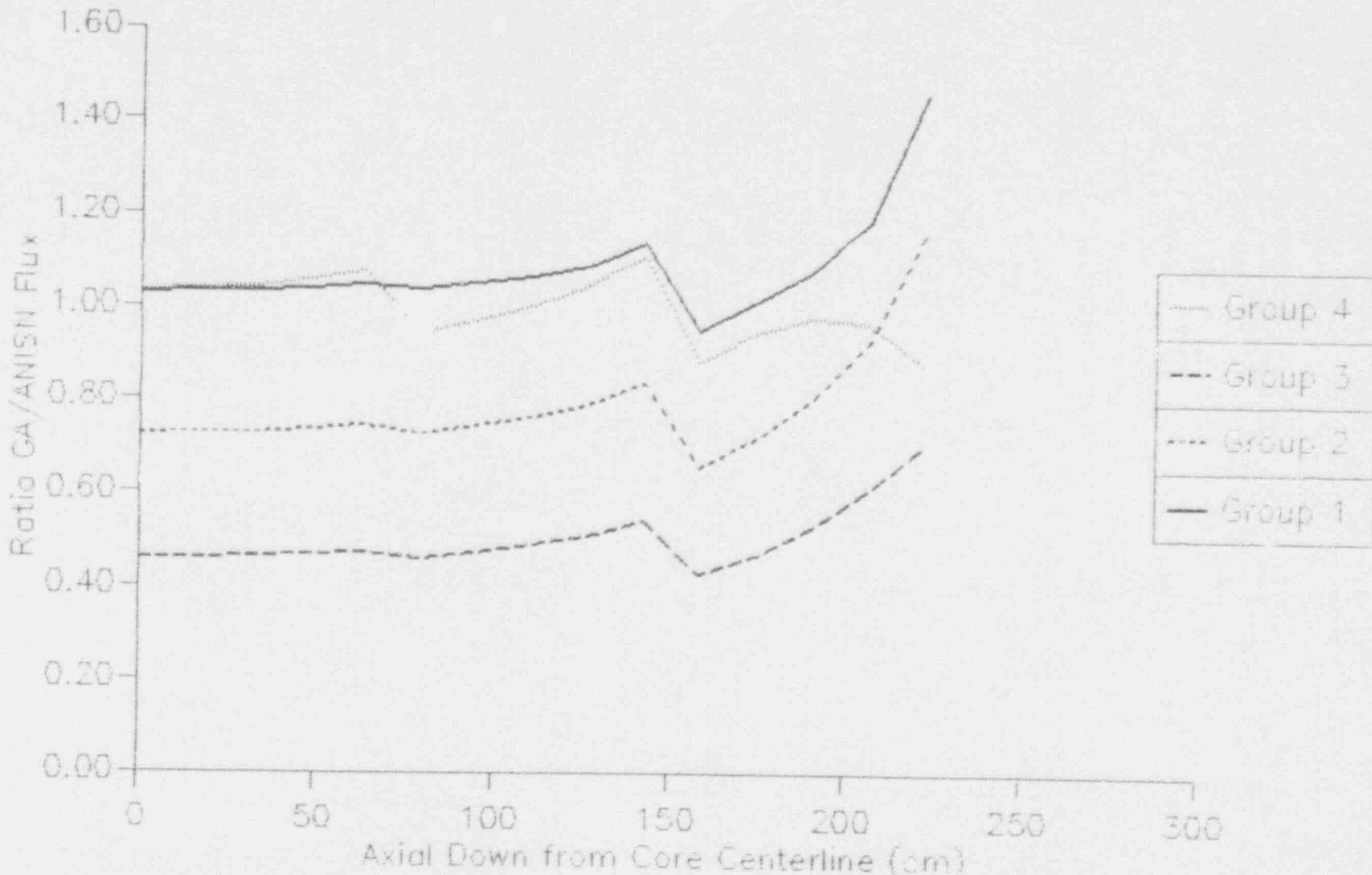
ICU File: TB284(RATIOUP4)

Figure 3
Axial Up Flux Ratios



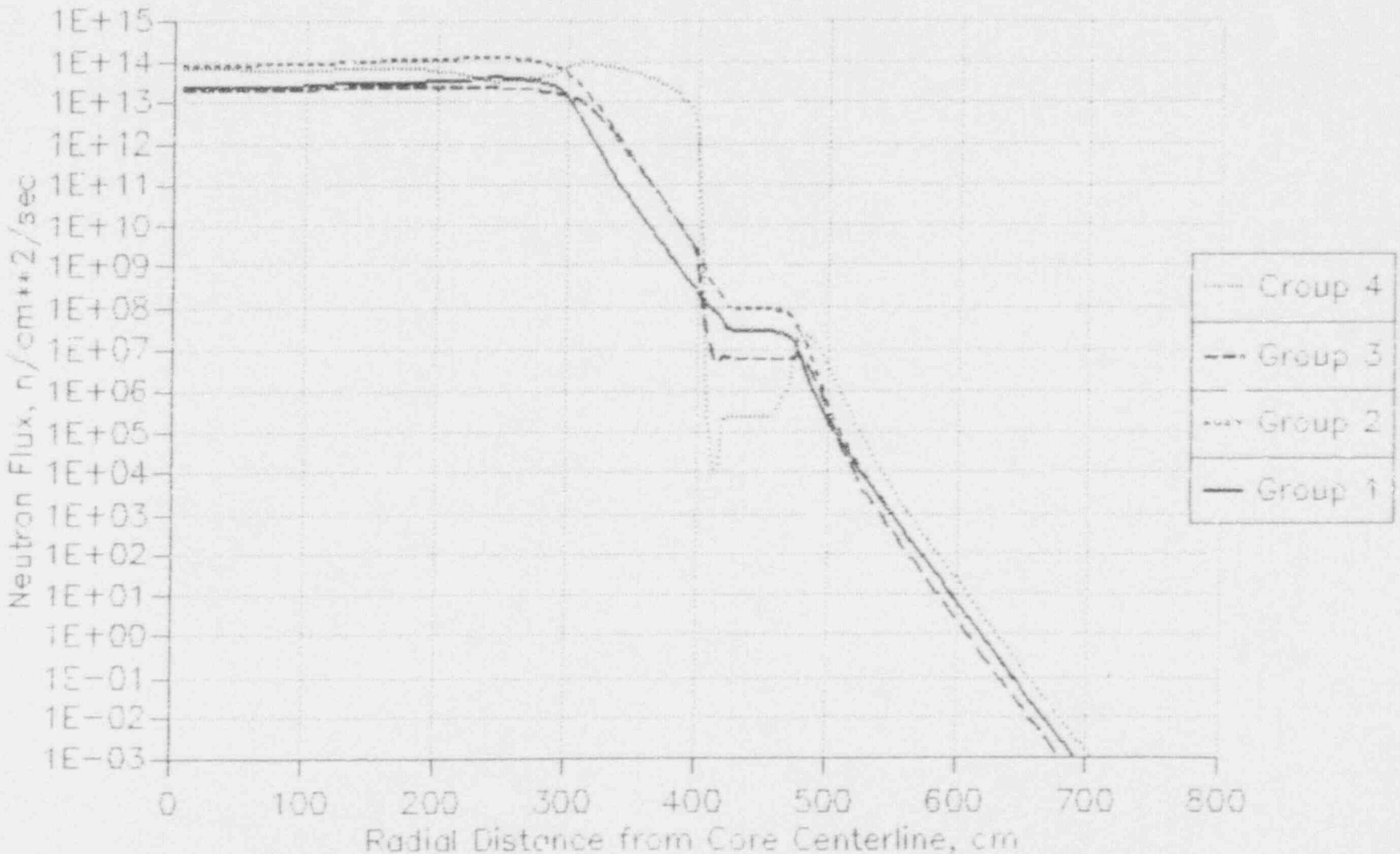
ICU File: T8284(RATIODN4)

Figure 4
Axial Down Flux Ratios



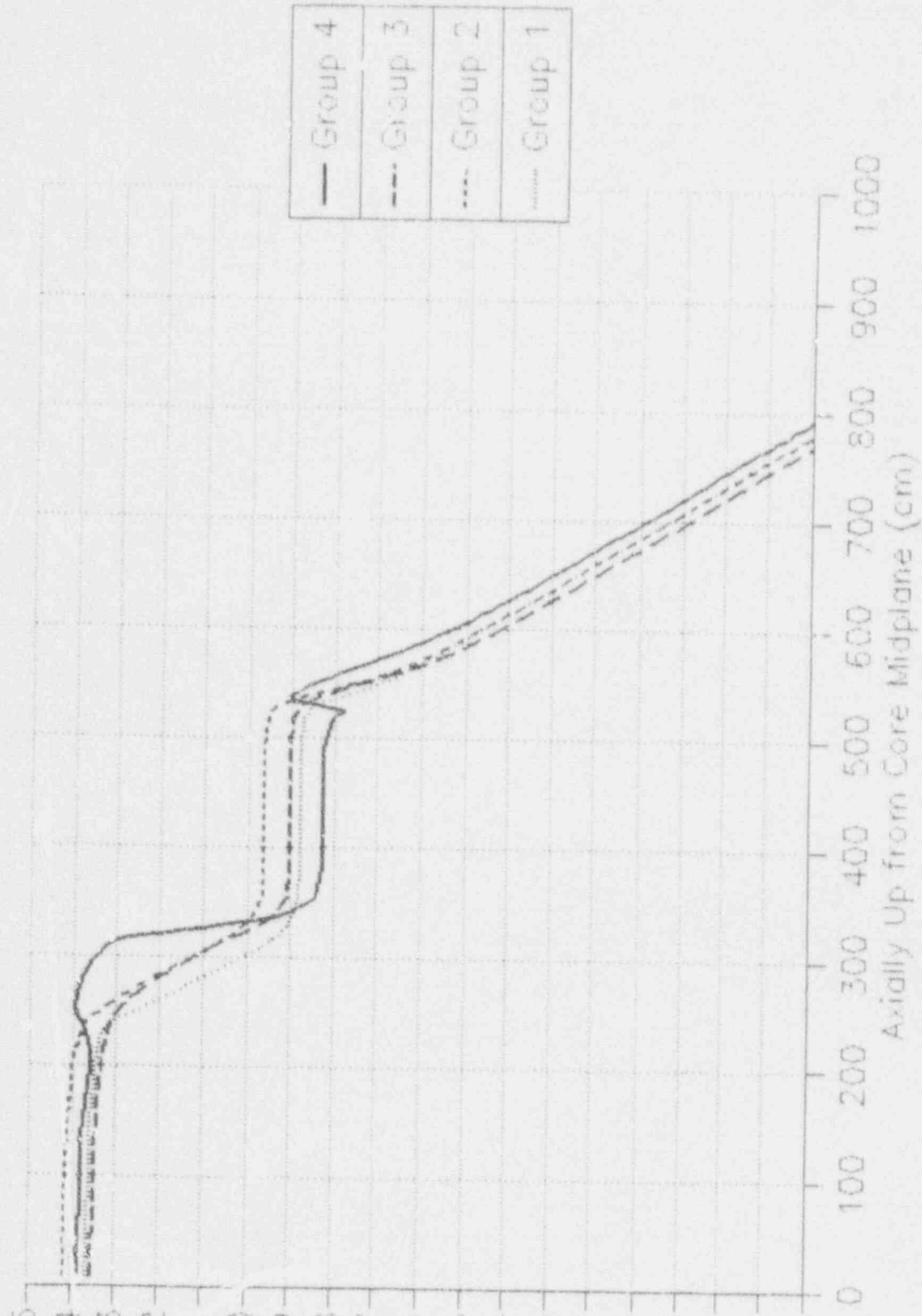
ICU File: T8284(FLUXRA04)

Figure 5
Radial Flux Traverse



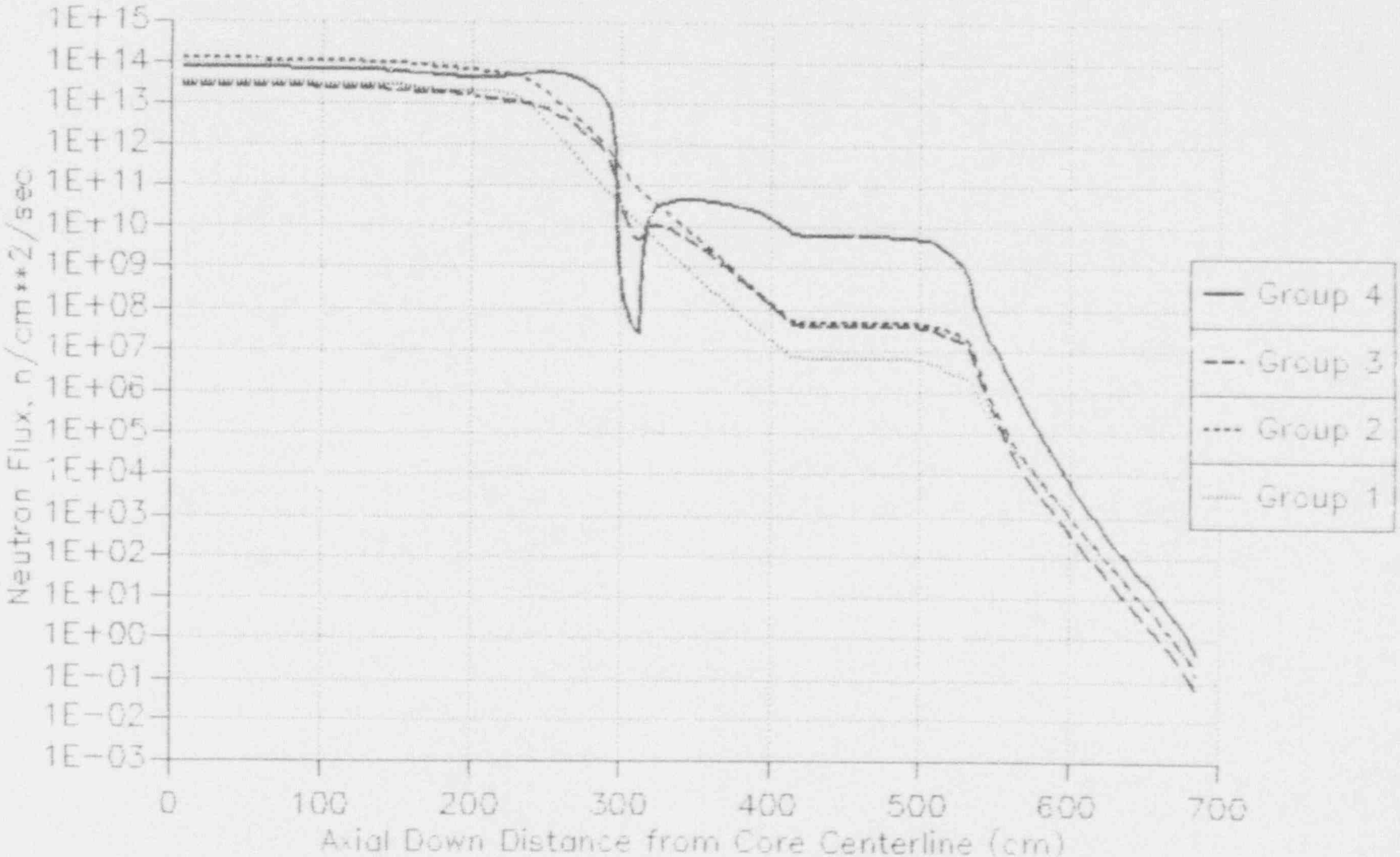
KCU File: T8284/FcGRUP4)

Figure 6
Axial Up Flux Traverse



KU File: T8284(FLUXDWN4)

Figure 7
Axial Down Flux Traverse



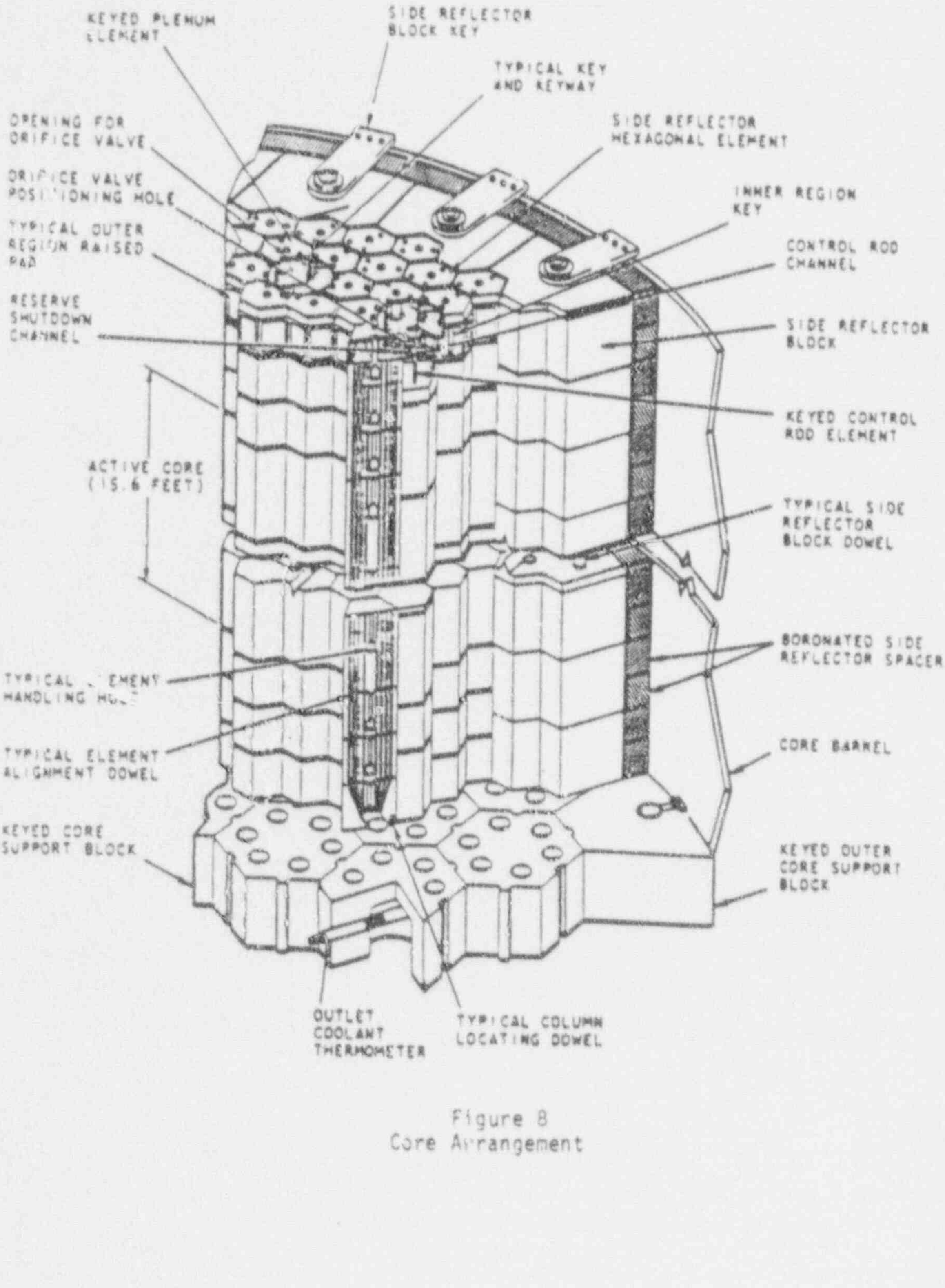


Figure 8
Core Arrangement

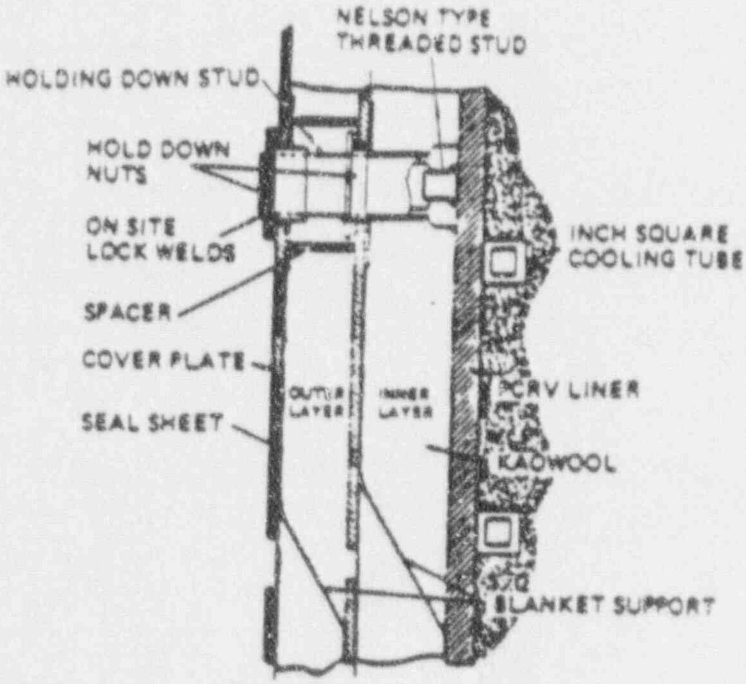


Figure 9
Class A Insulation

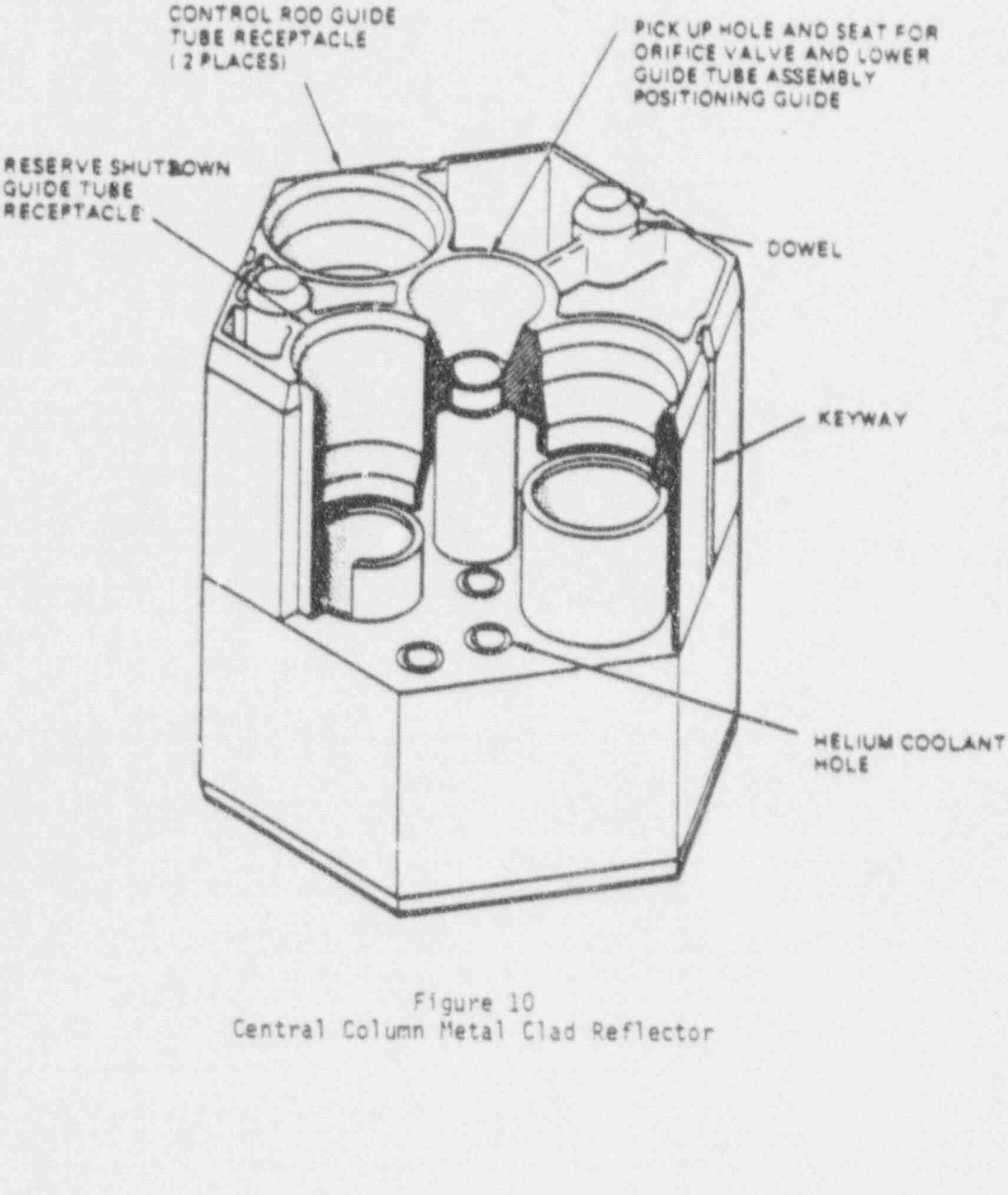


Figure 10
Central Column Metal Clad Reflector

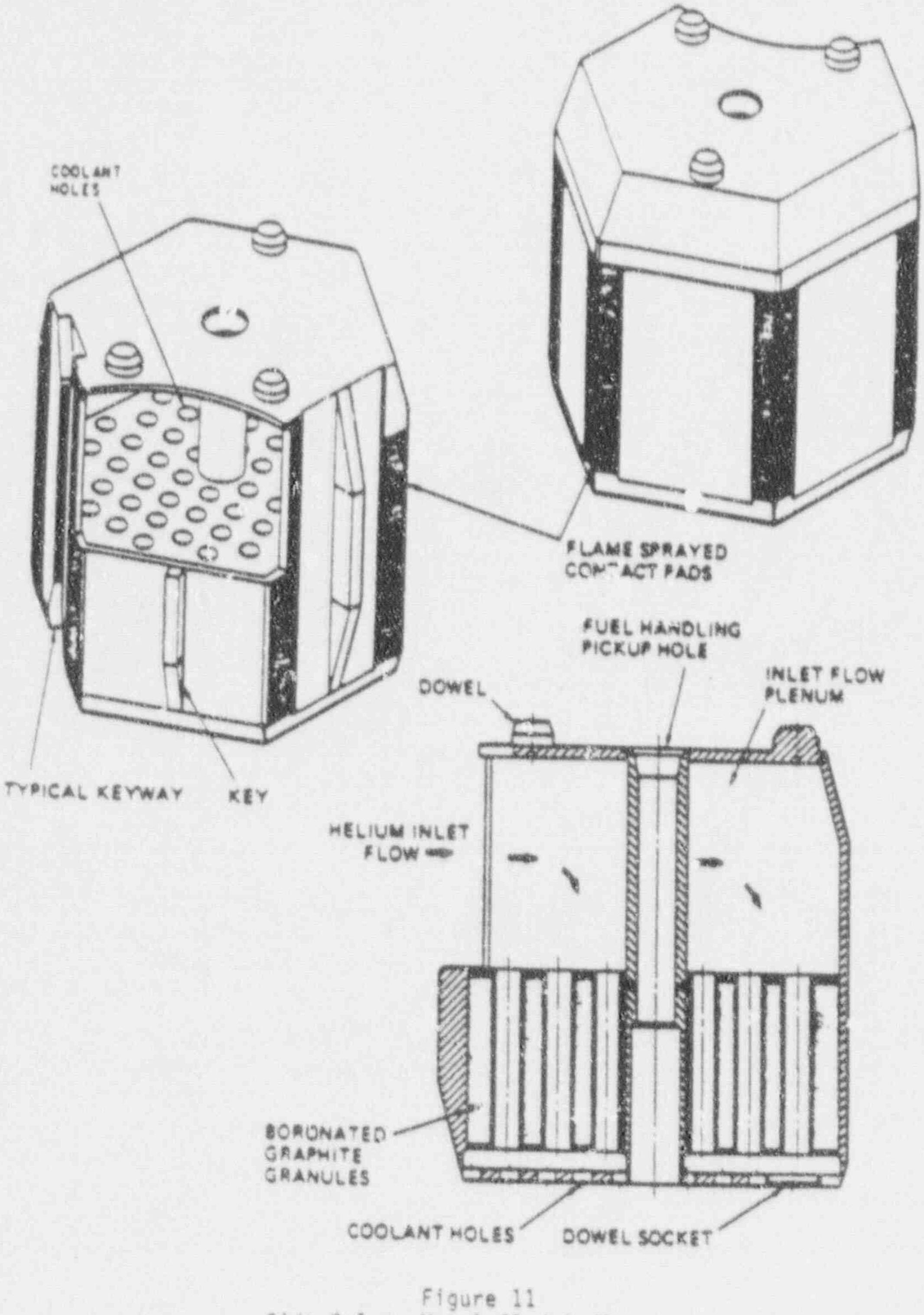


Figure 11
Side Column Metal Clad Reflector

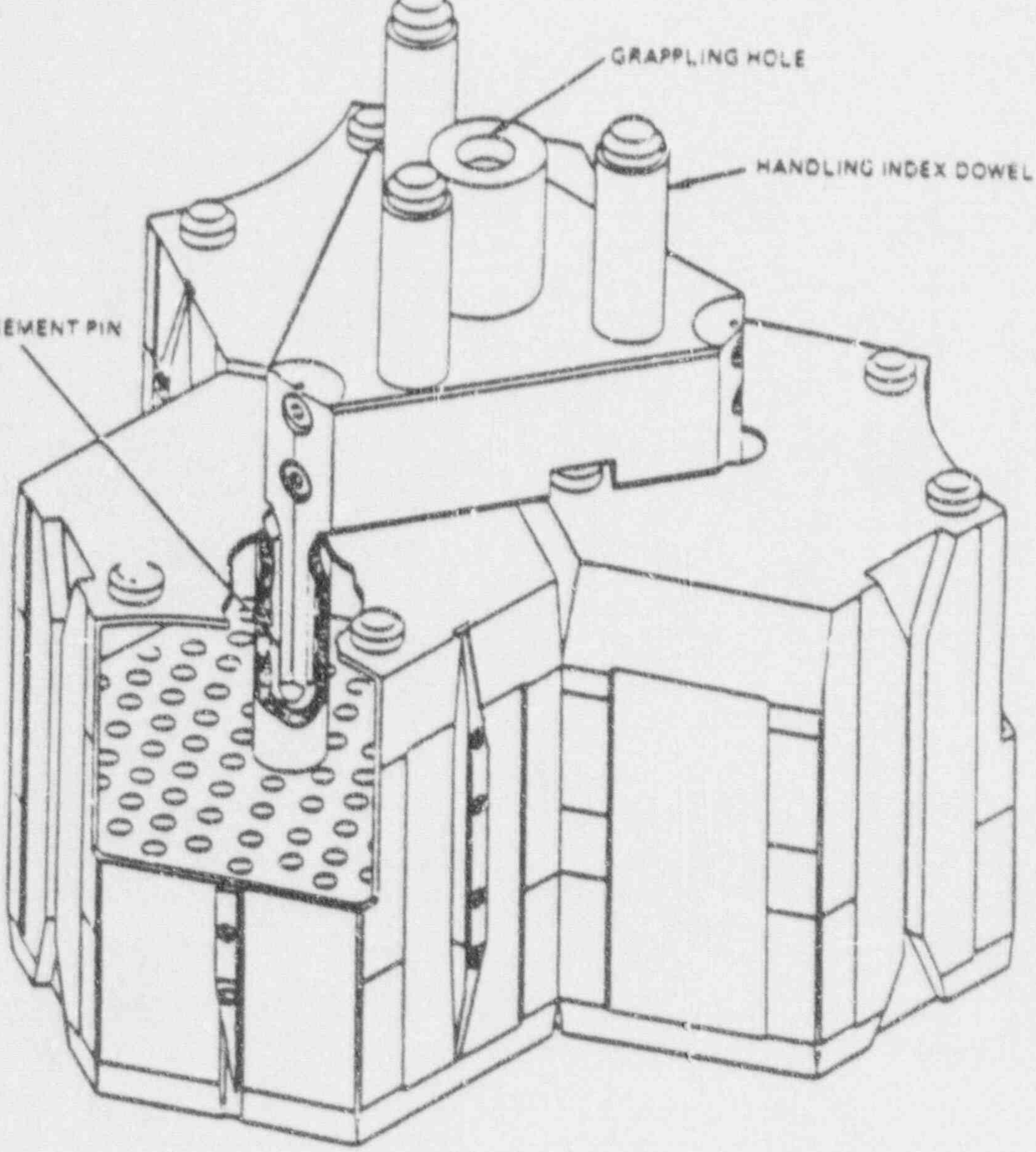


Figure 12
Region Constraint Device

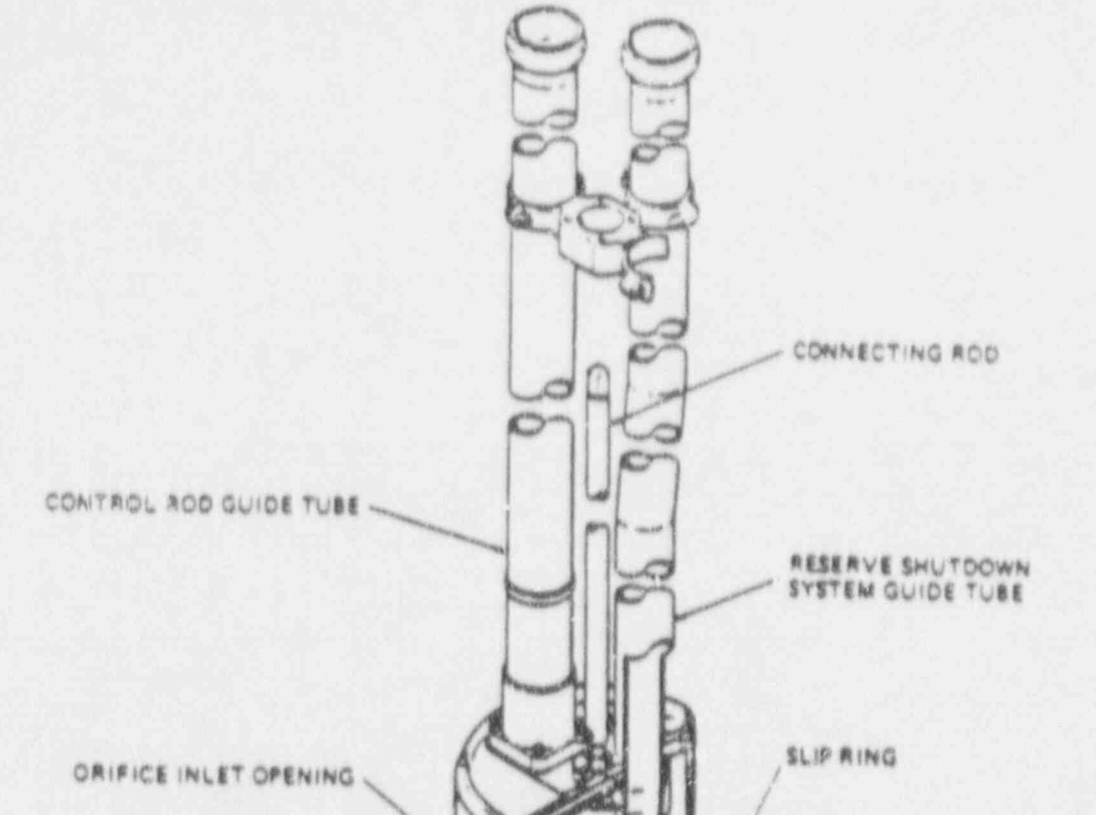


Figure 13
Lower Orifice .alve Assembly

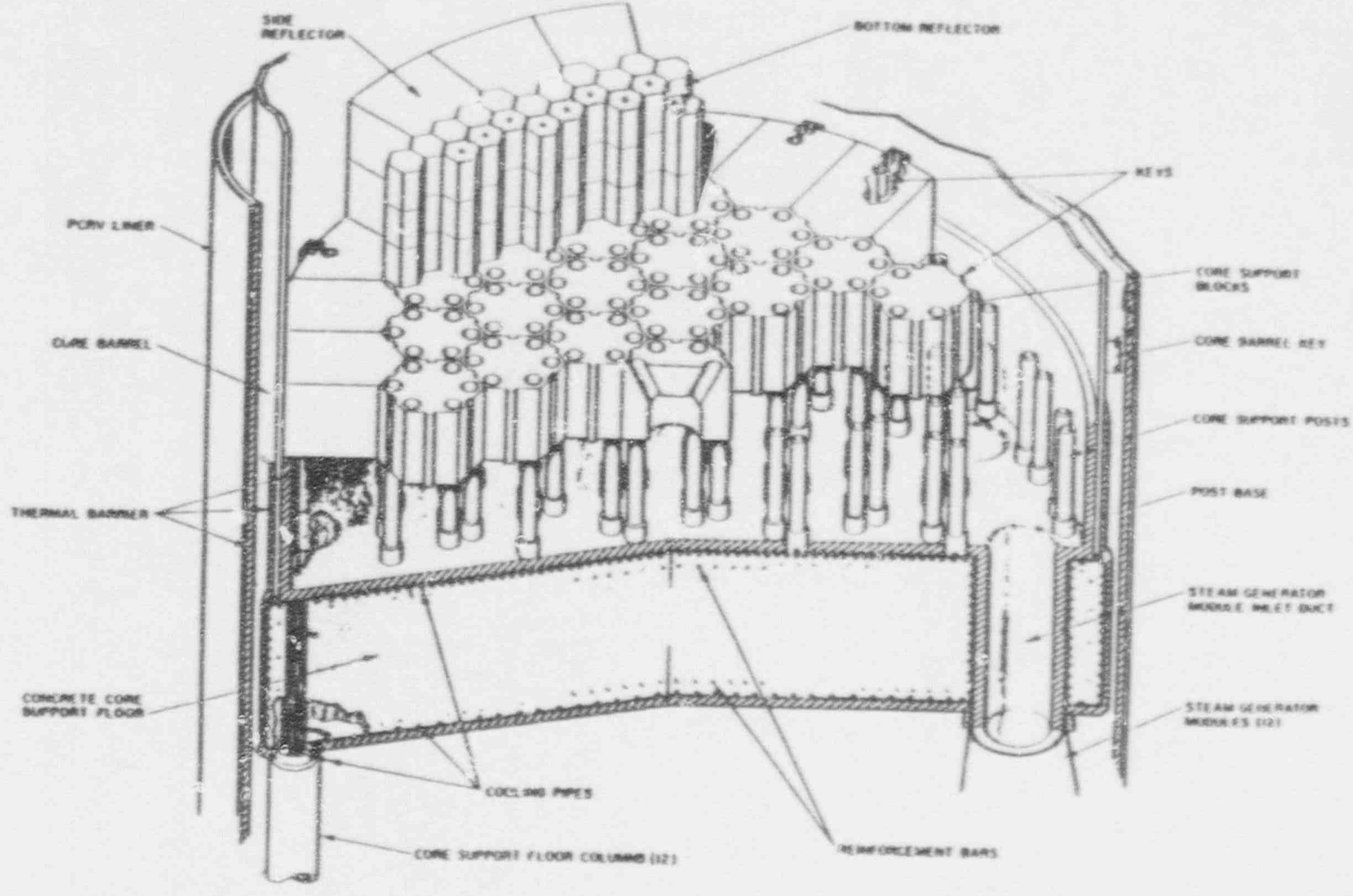


Figure 14
Core Support Arrangement

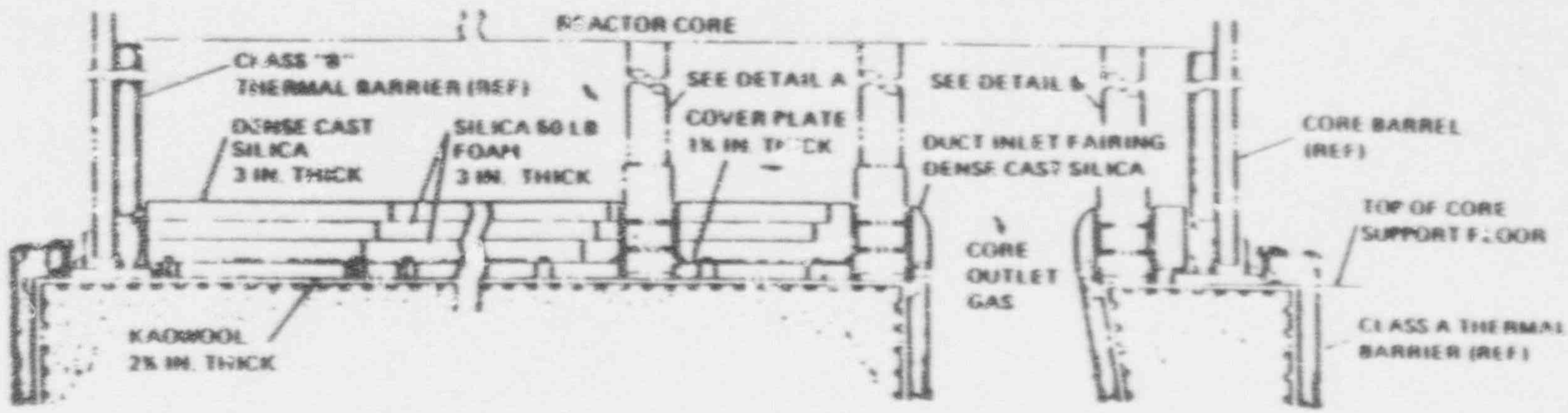


Figure 15
Class C Insulation

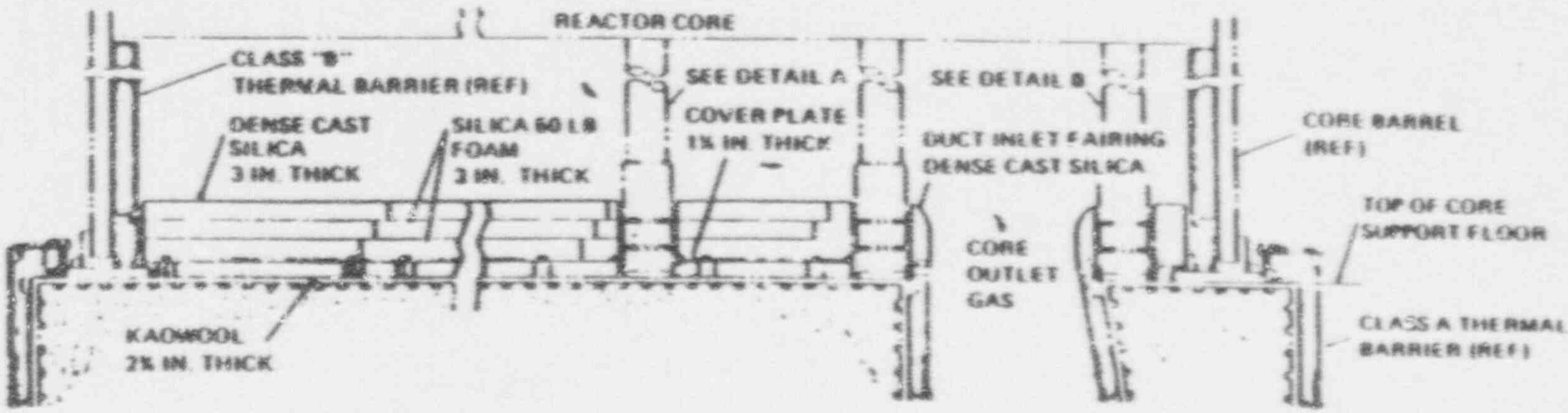


Figure 15
Class C Insulation

Appendices

EE-DEC-0010

REV D

Fort St. Vrain Activation Analysis

Appendix A
EE-DEC-0010

Ebasco's Activation Analysis

Volumes 1 and 2

Public Service

FORT ST. VRAIN NUCLEAR GENERATING STATION

PUBLIC SERVICE COMPANY OF COLORADO

CALCULATION WORKSHEET

CALCULATION FOR			CALCULATION NUMBER
PREPARED BY	DATE		
REVIEWED BY	DATE	CALC. REV.	PAGE OF

See Hard Copy
in
Special Projects

Form (B) 344-24-4308

Appendix B
EE-DEC-0010

Material Composition Data Base

FORM 1432 3546

T1368A

JOB00129

A

Diam Hill

```
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
*START JOB00129 T1368A 1   001 001 LOCAL 1368 VW DIAMOND HILL ROOM   9.00.16 AM 11 JUL 89 PRT15   DDDD START A*
```

Appendix D
[illegible]

J E S 2 J O B L O G -- S Y S T E M D D D D -- N O D E L O O K O U T

```
--------- JOB00129  IEF097I T1368A   - USER T8284    ASSIGNED
09.00.04 JOB00129  TSS7011 T8284    LAST-USED 11 JUL 89 08:55 SYSTEM=DDDD FACILITY=BATCH
09.00.04 JOB00129  TSS702I COUNT=03532  MODE=WARN  LOCKTIME=NONE NAME=FISHER, STEVE
09.00.04 JOB00129  $HASP373 T1368A   STARTED - INIT 62 - CLASS A - SYS DDDD
09.00.14 JOB00129  * T1368A   001 SAS      SASLPA      ------------ R000
09.00.15 JOB00129  * T1368A     1     6311     6.51    ------------  EOJ
09.00.15 JOB00129  $HASP395 T1368A   ENDED
------ JES2 JOB STATISTICS ------

  11 JUL 89 JOB EXECUTION DATE

         58 CARDS READ

      1,161 SYSOUT PRINT RECORDS

          0 SYSOUT PUNCH RECORDS

         87 SYSOUT SPOOL KBYTES

       0.18 MINUTES EXECUTION TIME
```

```
1 //T1368A JOB (12,4821-63-54),'1368 VW DIAMOND HILL',                    JOB00129
  //           MSGLEVEL=(0,0),CLASS=A,MSGCLASS=A,NOTIFY=T1368              00020000
```

FORM [illegible] 46

```
TSS701I T8284    LAST-USED 11 JUL 89 08:55 SYSTEM=DDDD FACILITY=BATCH
TSS702I COUNT=03532  MODE=WARN  LOCKTIME=NONE NAME=FISHER, STEVE
IEF142I T1368A SAS - STEP WAS EXECUTED - COND CODE 0090
IEF373I STEP /SAS     / START 89192.0900
IEF374I STEP /SAS     / STOP  89192.0900 CPU    0MIN 00.30SEC SRB    0MIN 00.04SEC VIRT  1664K SYS   192K EXT       4K SYS    9012K
************************************ S T E P   T E R M I N A T I O N ************************************
*    JOB    STP   STEP      PGM      STARTED        ENDED        TCB      SRB     ELAPSED   SWAP   CORE    COMP *
*   NAME     #    NAME      NAME       TIME          TIME       SECONDS  SECONDS  SECONDS  COUNT   USED    CODE *
* T1368A   001 SAS        SASLPA   09:00:04.96 09:00:14.19       .30      .04      9.23       0  1856K   R000 *
*****************************************************************************************************************
*                      SWAP     SWAP       VIO      VIO         TCB      I/O      MSO      SRB      TOTAL      *
*  PAGEINS PAGEOUTS  PAGEINS PAGEOUTS  PAGEINS PAGEOUTS        S U      S U      S U      S U       S U       *
*       0        0        0        0        0        0        1851     1540     2688      232      6311      *
*****************************************************************************************************************
IEF375I  JOB /T1368A  / START 89192.0900
IEF376I  JOB /T1368A  / STOP  89192.0900 CPU    0MIN 00.30SEC SRB    0MIN 00.04SEC
************************************ J O B   T E R M I N A T I O N *************************************
*    JOB   PERF   TOTAL    ACTIVE   STARTED        ENDED         TCB      SRB    ELAPSED   TOTAL                *
*   NAME    GRP    S U     SECONDS    TIME          TIME        SECONDS  SECONDS SECONDS   SWAPS                *
* T1368A    1     6311      6.51 09:00:04.96 09:00:14.99        .30      .04    10.03       0                *
*****************************************************************************************************************
```

```
1          SAS(R) LOG    OS SAS 5.18           MVS/XA JOB TI368A    STEP SAS                                9:00 TUESDAY, JULY 11, 19

NOTE: COPYRIGHT (C) 1984,1988 SAS INSTITUTE INC., CARY, N.C.  27512, U.S.A.
NOTE: THE JOB TI368A HAS BEEN RUN UNDER RELEASE 5.18 OF SAS AT PUBLIC SERVICE COMPANY OF COLORADO (01298001).

NOTE: SAS OPTIONS SPECIFIED ARE:
        SORT=4

BASE SAS PRODUCT NEWS:

YOU ARE RUNNING THE VERSION 5 MAINTENANCE RELEASE OF THE SAS SYSTEM (5.18).


          DATA TEMP;
            SET SASDAT.ACTANAL;
            ARRAY ELEMS (17) ELEM1-ELEM17;
            ARRAY WEIGHTS (17) WEIGHT1-WEIGHT17;
            ARRAY NUMS (17) NUM1-NUM17;
            FILE PRINT HEADER=TOPPAGE;
            PUT _PAGE_;
            PUT @26 'COMPONENT:  ' COMP $68.;
            PUT @26 'LOCATION:  ' LOC $6. @52 'FIXED OR REMOVABLE:  ' FIXED $2.;
            PUT @26 'DESC: ' DESC $69.;
            PUT @36 DESC2 $69.;
            PUT @26 'REF DWGS; ' REFDWG1 $69.;
            PUT @36 REFDWG2 $69.;
            PUT @36 REFDWG3 $69.;
            PUT @36 REFDWG4 $69.;
            PUT @36 REFDWG5 $69.;
            PUT @26 'COMPOSITION REF:   ' COMPREF $60.;
            PUT @26 'COMPONENT VOLUME (CM**3):';
            PUT @45 COMPVOL E12. +1 VOLNOTE $20.
                +2 COMPVOL2 E12. +1 VOLNOTE2 $20.;
            PUT @45 COMPVOL3 E12. +1 VOLNOTE3 $20.
                +2 COMPVOL4 E12. +1 VOLNOTE4 $20.;
            PUT @45 COMPVOL5 E12. (1 VOLNOTE5 $20.
                +2 COMPVOL6 E12. +1 VOLNOTE6 $20.;
            PUT @45 COMPVOL7 E12. +1 VOLNOTE7 $20.
                +2 COMPVOL8 E12. +1 VOLNOTE8 $20.;
            PUT @26 'COMPONENT DENSITY (G/CM2):  ';
            PUT @45 DENSITY E12. +1 DENNOTE1 $20. +2 DENSITY2 E12. +1
                DENNOTE2 $20.;
            PUT @45 DENSITY3 E12. +1 DENNOTE3 $20. +2 DENSITY4 E12. +1
                DENNOTE4 $20.;
            PUT @26 'CALCULATION NUMBERS:   ' CALCNO 3. +2 CALCNO2 3. +2
              CALCNO3 3.;
            PUT ;
            PUT @38 'ELEMENT' @51 'WEIGHT F  CTION' @74 'NUMBER DENSITY';
            DO I = 1 TO 17;
              PUT @40 ELEMS(I) $2. @54 WEIGHTS(I) 8.5 @75 NUMS(I) E12.;
            END;
            PUT;
            PUT @26 'COMMENTS: ' COMMENTS $69.;
            PUT @36 COMMENT2 $69.;
            PUT @36 COMMENT3 $69.;
          RETURN;
          TOPPAGE:
            PUT ;
```

```
46          PUT @53 'ACTIVATION ANALYSIS DATA';                00560000
47          PUT ;                                              00570000
48          PUT ;                                              005?0000
49        RETURN;                                              00?9000

NOTE: AT LEAST ONE W.D FORMAT WAS TOO SMALL FOR THE NUMBER TO
      BE PRINTED. THE DECIMAL POINT MAY BE SHIFTED BY THE
      'BEST' FORMAT.
NOTE: 969 LINES WERE WRITTEN TO FILE PRINT.
NOTE: DATA SET WORK.TEMP HAS 26 OBSERVATIONS AND 97 VARIABLES. 28 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.20 SECONDS AND 776K AND PRINTED PAGES 1 TO 26.
NOTE: SAS USED 776K MEMORY.

NOTE: SAS INSTITUTE INC.
      SAS CIRCLE
      PO BOX 8000
      CARY, N.C. 27512-8000
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ACTIVATION ANALYSIS DATA

COMPONENT- REFLECTOR BLOCK KEY
LOCATION: FIXED OR REMOVABLE:
DESC: KEY FOR THE CORE BARREL AND LARGE METAL CLAD SIDE REFLECTOR

REF DWGS; R1105-705 SHTS 1&2

COMPOSITION REF: ASME-SA201GB
COMPONENT VOLUME (CM**3):
1.59090E+04 ONE KEY
3.61816E+05 24 TOTAL CORE

COMPONENT DENSITY (G/CM2):
7.85000E+00 MET HAND

CALCULATION NUMBERS: C06 V06

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
C	0.00280	1.10200E+21
MN	0.01035	8.90700E+20
P	0.00035	5.34300E+19
S	0.00040	5.89900E+19
SI	0.00283	[illegible].76400E+20
FE	0.98307	8.32300E+22
CO	0.00020	1.60500E+19

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: TOP REFLECTOR CR
LOCATION: FIXED OR REMOVABLE:
DESC: METAL CLAD TOP REFLECTOR FOR A CONTROL ROD REGION
METAL SHELL ONLY - ONLY PRIMARY PLATES NOT INNER TUBES
REF DWGS; 90R1701-318,ISSUE E

COMPOSITION REF: SST347 (ASTM-A240)
COMPONENT VOLUME (CM**3):
3.00690E+03 ONE ELE - PRIM PLATE
1.11255E+05 37 TOT CORE PRI PLAT
9.64500E+03 TOTAL METAL
2.04200E+03 GRANULE VOLUME
COMPONENT DENSITY (G/CM2):
7.80000E+00 MET HAND

CALCULATION NUMBERS: C03 V07

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
C	0.00080	3.12900E+20
MN	0.02000	1.71000E+21
P	0.00045	6.82500E+19
S	0.00030	4.39600E+19
SI	0.01000	1.67300E+21
CR	0.18000	1.62600E+22
NI	0.11000	8.80200E+21
NB	0.01000	5.05700E+20
FE	0.66645	5.60600E+22
CO	0.00200	1.59400E+20

COMMENTS: NUMBER DENSITIES FOR PRIMARY PLATES ONLY (TOP,MIDDLE,BOTTOM,SIDES)
NOT FOR INNER TUBES

ACTIVATION ANALYSIS DATA

COMPONENT: BORONATED RODS
LOCATION: FIXED OR REMOVABLE:
DESC: BORONATED RODS IN SIDE REFLECTOR BLOCKS

REF DWGS; 90R1701-050,ISSUE F
90R1701-830,ISSUE F
-829,ISSUE H
-819,ISSUE F
REFERENCE SPECIFICATION: 17-R-12
COMPOSITION REF: AISI-304
COMPONENT VOLUME (CM**3):
1.81900E+03 ONE ROD
5.63512E+06 309792 TOTAL CORE

COMPONENT DENSITY (G/CM2):
7.90000E+00 MET HAND

CALCULATION NUMBERS: C02 V01

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
C	0.00080	3.16900E+20
MN	0.02000	1.73200E+21
SI	0.01000	1.69400E+21
CR	0.19000	1.73900E+22
NI	0.09250	7.49700E+21
P	0.00045	6.91300E+19
S	0.00030	4.45200E+19
N	0.00100	3.39700E+20
B	0.02250	9.90400E+21
FE	0.66045	5.62700E+22
CO	0.00200	1.61500E+20

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: LARGE SIDE REFLECTOR METAL JACKET
LOCATION: FIXED OR REMOVABLE:
DESC: METAL JACKET FOR KEYED LARGE SIDE REFLECTOR (TYPE 1 - TYPICAL)

REF DWGS; R1701-701
-711
-710

COMPOSITION REF: SA387 GRC (GRC=GR11 PER TELECON W/ E DUPONT, QA)
COMPONENT VOLUME (CM**3):
1.61780E+03 ONE ELEMENT
3.88272E+05 24 TOTAL CORE

COMPONENT DENSITY (G/CM2):
7.86000E+00 MET HAND

CALCULATION NUMBERS: V10 C07

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
C	0.00170	6.70000E+20
MN	0.00525	4.52400E+20
P	0.00035	5.34900E+19
S	0.00040	5.90650E+19
SI	0.00650	1.09600E+21
CR	0.01250	1.13800E+21
MO	0.00550	2.71400E+20
FE	0.96760	8.20200E+22
CO	0.00020	1.60700E+19
.	.	.

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: PCRV LINER
LOCATION: FIXED OR REMOVABLE:
DESC: PCRV LINER AND COOLING TUBES HOMOGENOUS MIX

REF DWGS; SYSTEM DESCRIPTION SD-11-2 PAGE 5 OF 7
R1102-300 REV F
R1102-200 REV M
R1102-100 REV D

COMPOSITION REF: A537 GRB (LINER) , A537 (TUBES)
COMPONENT VOLUME (CM**3):
1.60000E+66 TOP HEAD
7.00000E+06 SIDEWALL
1.39000E+06 CSF (TOP)
9.65000E+05 CSF (SIDES)
COMPONENT DENSITY (G/CM2):
7.86000E+00 TYP FOR CARBON STEEL

CALCULATION NUMBERS: VC1 VC- 10

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
C	0.00240	9.45900E+20
MN	0.01310	1.12990E+21
P	0.00035	5.34900E+19
S	0.00040	5.98700E+19
SI	0.00333	5.61300E+20
CU	0.00365	2.71900E+20
NI	0.00265	2.13700E+20
CR	0.00270	2.45800E+20
MO	0.00085	4.19400E+19
FE	0.97037	8.22600E+22
CO	0.00020	1.60700E+19

COMMENTS: THE COMP OF THE LINER & COOLING TUBES ARE CLOSE (TUBES - SA106 GRB)
SO THE MIXTURE WAS ASSUMED TO BE ALL A537

ACTIVATION ANALYSIS DATA

COMPONENT: CORE BARREL TOP
LOCATION: FIXED OR REMOVABLE:
DESC: TOP PORTION OF CORE BARREL (TOP 12' - 2.25")

REF DWGS; R1105-505 REV D
R1100-500 REV K

COMPOSITION REF: ASMESA201 GRB (ASTM 515/516)
COMPONENT VOLUME (CM**3):
5.50850E+06 TOP

COMPONENT DENSITY (G/CM2):
7.85000E+00 MET HAND

CALCULATION NUMBERS: C08 V04

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
C	0.00300	1.18100E+21
MN	0.01035	8.90700E+20
P	0.00035	5.34300E+19
S	0.00040	5.89900E+19
SI	0.00283	4.76400E+20
FE	0.98305	8.32300E+22
CO	0.00020	1.60500E+19

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: CORE BARREL BOTTOM/MIDDLE
LOCATION: FIXED OR REMOVABLE:
DESC: BOTTOM OF CORE BARREL
MIDDLE 8'- 2.50", BOTTOM 9' - 2.75"
REF DWGS; R1105-505 REVD

COMPOSITION REF: ASMESA387 GB
COMPONENT VOLUME (CM**3):
4.08350E+06 MIDDLE
5.05720E+06 BOTTOM

COMPONENT DENSITY (G/CM2):
7.86600E+00 MET HAND

CALCULATION NUMBERS: C08 V04

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
C	0.00170	6.70000E+20
MN	0.00525	4.52400E+20
P	0.00035	5.34900E+19
S	0.00040	5.90700E+19
SI	0.00225	3.79300E+20
CR	0.00975	8.87700E+20
MO	0.00525	2.59100E+20
FE	0.97485	8.26400E+22
CO	0.00020	1.60700E+19

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: RCD-PRIMARY
LOCATION: FIXED OR REMOVABLE:
DESC: REGION CONSTRAINT DEVICE ON TOP OF TOP REFLECTORS
PRIMARY STRUCTURE ONLY - PINS ON A SEPARATE OBSERVATION
REF DWGS; 90R1701-874 ISSUE C
-873 ISSUE D
-872 ISSUE B
-871 ISSUE B
-870 ISSUE A
COMPOSITION REF: SA515 GR70
COMPONENT VOLUME (CM**3):
1.00210E+04 ONE DEVICE
8.41738E+05 84 TOTAL CORE

COMPONENT DENSITY (G/CM2):
7.85000E+00 MET HAND

CALCULATION NUMBERS: C01 V11

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
C	0.00350	1.37800E+21
MN	0.01250	1.07600E+21
P	0.00035	5.34300E+19
S	0.00040	5.89900E+19
SI	0.00280	4.71400E+20
FE	0.98025	8.29900E+22
CO	0.00020	1.60500E+19

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: TOP REFLECTOR NCR
LOCATION: FIXED OR REMOVABLE:
DESC: TOP METAL CLAD REFLECTOR FOR A NON CONTROL ROD REGION, ALSO SAME
COMP FOR METAL CLAD SIDE REFLECTOR AND REFLECTOR KEYS

REF DWGS;				
90R1701-310	ISSUE J	90R1701-340	ISS ?
90R1701-320	?	-347	F
90R1701-327	E	-324	D
90R1701-150	H		

COMPOSITION REF: ASTMA387 GRD (GRD=GR22 PER TELECON W/ E DUPONT, QA)
COMPONENT VOLUME (CM**3):
6.70500E+03 ONE ELE,COOL, PRI PT 6.66100E+03 ONE ELE,SIDE, F PT
1.40805E+06 210 TOT CORE, ", " 4.39626E+05 COR TOT, SIDE,
8.65200E+03 TOT MET, I ELE, COOL
5.51000E+03 TOTAL B GRANULES
COMPONENT DENSITY (G/CM2)
7.86000E+00 MET HAND

CALCULATION NUMBERS: C04 V08 V09

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
C	0.00150	5.91200E+20
MN	0.00450	3.87800E+20
P	0.00035	5.34900E+19
S	0.00035	5.16800E+19
SI	0.00500	8.42800E+20
CR	0.02250	2.04900E+21
MO	0.01000	4.93400E+20
FE	0.95560	8.10000E+22
CO	0.00020	1.60700E+19
.	.	.
.	.	.
.	.	.

COMMENTS:

FORM 0029

ACTIVATION ANALYSIS DATA

COMPONENT: RCD PINS
LOCATION: FIXED OR REMOVABLE:
DESC: REGION CONSTRAINT DEVICE PINS

REF DWGS; 90R1701-872 ISSUE B

COMPOSITION REF: ASME-SA637 GRADE 718 (UNS 0778)
COMPONENT VOLUME (CM**3):
4.21000E+02 ONE PIN
1.26360E+03 PER RCD
1.06087E+05 84 TOTAL CORE

COMPONENT DENSITY (G/CM2):
8.19000E+02 TELE W/ INCO

CALCULATION NUMBERS: VC2

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
C	0.00080	3.28600E+20
MN	0.00350	3.14300E+20
SI	0.00350	6.14700E+20
P	0.00015	2.38900E+19
S	0.00015	2.30800E+19
CR	0.19000	1.80300E+22
CO	0.01000	8.37000E+20
NB	0.05130	2.72400E+21
TI	0.00900	9.27200E+20
B	0.00006	2.73800E+19
CU	0.00300	2.32900E+20
NI	0.51500	4.32900E+22
FE	0.21360	1.88700E+22
.	.	.

COMMENTS: DENSITY REF - TELECON W/ MR. BREITZIG, INCO.

FORM (A) 3546

SAS

9:00 TUESDAY, JULY 11, 1989

ACTIVATION ANALYSIS DATA

COMPONENT: INSULATION AND COVER PLATES / CSF
LOCATION: FIXED OR REMOVABLE:
DESC: HOMOGENOUS MIXTURE OF COVER PLATES AND KAOWOOL ON THE TOP OF THE CSF - THIS DOES NOT INCLUDE THE SILICA FOAM BRICKS
REF DWGS: 90-R1104-900

COMPOSITION REF: AISI1020 (CVPL),INCONEL 600 (FAST), GAMD-9074 (KAO)
COMPONENT VOLUME (CM**3):
3.23900E+06 COMPOSITE MIXTURE

COMPONENT DENSITY (G/CM2):
7.48000E-01

CALCULATION NUMBERS: VC8

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
O	.	3.25300E+21
AL	.	9.19500E+20
SI	.	8.98700E+20
FE	.	8.49900E+21
TI	.	2.21100E+19
CA	.	1.85300E+18
NA	.	6.70800E+18
B	.	2.38900E+18
C	.	8.01700E+19
MN	.	4.01700E+19
P	.	6.15900E+18
S	.	7.46400E+18
CO	.	2.64400E+18
NI	.	7.55700E+19
CR	.	1.80300E+19
CU	.	4.76100E+17

COMMENTS:

FORM 1812 546

ACTIVATION ANALYSIS DATA

COMPONENT: INSULATION AND COVER PLATE - PCRV TOP HEAD
LOCATION: FIXED OR REMOVABLE:
DESC: HOMOGENOUS MIXTURE OF COVER PLATES, INSULATION AND FASTENERS FOR THE PCRV TOP HEAD
REF DWGS; 90-1104-104
90-1104-250

COMPOSITION REF: KAOWOOL (GAMD-9074),AISI1020 (CVPL), NITRIDED C STEEL (FAST)
COMPONENT VOLUME (CM**3):
8.33500E+06 TOTAL FOR COMP

COMPONENT DENSITY (G/CM2):
1.36000E+00 CALCUALTED

CALCULATION NUMBERS: VC4

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
AL	.	8.94300E+20
SI	.	8.73100E+20
FE	.	1.06700E+22
TI	.	2.15100E+19
CA	.	1.80300E+18
NA	.	6.52400E+18
B	.	2.32300E+18
O	.	3.16400E+21
C	.	9.98400E+19
MN	.	4.91200E+19
P	.	7.74300E+18
S	.	9.34900E+18
CO	.	2.03400E+18

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: INSULATION AND COVER PLATE - PCRV SIDES
LOCATION: FIXED OR REMOVABLE:
DESC: COMPOSITE KAOWOOL, COVER PLATE AND FASTENERS FOR THE PCRV SIDES

REF DWGS; 90-R11104-101
          90-R11104-230

COMPOSITION REF: AISI1020(CVPL),KAOWOOL(GAMD-9074),NITRIDED C STEEL (FAST)
COMPONENT VOLUME (CM**3):
3.00500E+07 TOTAL COMP

COMPONENT DENSITY (G/CM2):
1.33000E+00 CALCULATED

CALCULATION NUMBERS: VC3

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
AL	.	8.72200E+20
SI	.	8.51400E+20
FE	.	1.24800E+22
TI	.	2.09700E+19
CA	.	1.75800E+18
NA	.	6.36300E+18
B	.	2.26600E+18
O	.	[illegible].06800E+21
C	.	1.16800E+20
MN	.	5.74600E+18
P	.	9.05800E+18
	.	1.09400E+19
CU	.	2.38000E+18

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: CORE SUPPORT FLOOR POST SEATS
LOCATION: FIXED OR REMOVABLE: F
DESC: POST SEATS FOR GRAPHITE CORE SUPPORTS POSTS SETTING ON TOP OF CSF

REF DWGS; R1100-700
R1104-1596

COMPOSITION REF: INCONEL 600 (SMALL AMOUNT OF CARBON STEEL AT BASE NEGLECTED)
COMPONENT VOLUME (CM**3):
8.60000E+04 TOTAL FOR ALL 183 SL

COMPONENT DENSITY (G/CM2):
8.47000E+00

CALCULATION NUMBERS: VC5

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
NI	0.75000	6.52000E+22
CR	0.15500	1.52000E+22
FE	0.08000	7.31000E+21
C	0.00150	6.37000E+20
MN	0.00100	9.29000E+[illegible]
S	0.00015	2.39000E+19
SI	0.00500	9.06000E+20
CU	0.00500	4.01000E+20
CO	0.00200	1.73000E+20

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: PCRV CONCRETE AND REBAR (OBS 1 OF 4)
LOCATION: FIXED OR REMOVABLE: F
DESC: HOMOGENOUS MIXTURE OF CONCRETE AND REBAR

REF DWGS; R1102-100 REV D
FSAR SECTION 5.5.2.2

COMPOSITION REF: A431,A432,A305 (REBAR); NUREG/CR-3473 PG 53 (CONCRETE)
COMPONENT VOLUME (CM**3):

1.44000E+07	TYP TOP LAYER	5.37000E+07	4TH 6" SIDE LAYER
4.90000E+07	1ST 6" SIDE LAYER	5.53000E+07	5TH 6" SIDE LAYER
5.06000E+07	2ND 6" SIDE LAYER	5.68000E+07	6TH 6" SIDE LAYER
5.22000E+07	3RD 6" SIDE LAYER	5.84000E+07	7TH 6" SIDE LAYER

COMPONENT DENSITY (G/CM3):

3.49200E+00	CALCULATED: (2%)	2.40000E+00	CONCRETE
	(.2)(7.86)+(.8)(2.4)	7.86000E+00	REBAR

CALCULATION NUMBERS: VC6

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
H	.	1.59000E+22
O	.	4.30000E+22
NA	.	1.38000E+21
MN	.	5.13600E+20
AL	.	3.42900E+21
SI	.	1.05690E+22
K	.	2.58800E+20
CA	.	4.47200E+21
FE	.	3.00000E+21
S	.	5.98000E+19
P	.	3.15200E+20
CU	.	4.44000E+18
B	.	1.34800E+18
CO	.	1.21500E+18
N	.	6.99000E+18
CL	.	2.62000E+18
SC	.	3.79000E+17

COMMENTS: VOLUMES BROKE IN 6" LAYERS

ACTIVATION ANALYSIS DATA

COMPONENT: PCRV CONCRETE AND REBAR (OBS 2 OF 4)
LOCATION: FIXED OR REMOVABLE:
DESC:

REF DWGS:

COMPOSITION REF:
COMPONENT VOLUME (CM**3):
8.99000E+07 TOTAL CSF VOLUME

COMPONENT DENSITY (G/CM2):

CALCULATION NUMBERS:

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
TI	.	1.24000E+20
LI	.	1.17000E+18
V	.	6.00000E+18
CR	.	6.35000E+18
NI	.	5.71000E+17
ZN	.	4.37000E+18
GA	.	5.13000E+17
	.	.
AS	.	4.61000E+17
SE	.	5.36000E+16
BR	.	1.40000E+17
RB	.	2.04000E+18
SR	.	2.55000E+19
Y	.	1.06000E+18
ZR	.	4.14000E+18
	.	.
	.	.

COMMENTS:

SAS

9:00 TUESDAY, JULY 11, 1989

ACTIVATION ANALYSIS DATA

COMPONENT: PCRV CONCRETE AND REBAR (OBS 3 OF 4)
LOCATION: FIXED OR REMOVABLE:
DESC:

REF DWGS;

COMPOSITION REF:
COMPONENT VOLUME (CM**3): .

COMPONENT DENSITY (G/CM2): .

CALCULATION NUMBERS: .

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
NB	.	2.57000E+17
MO	.	6.00000E+17
PD	.	1.75000E+17
AG	.	1.17000E+16
CD	.	1.75000E+16
SN	.	4.08000E+17
SB	.	1.05000E+17
CS	.	7.58000E+16
BA	.	5.54000E+19
C	.	3.16000E+19
LA	.	7.58000E+17
CE	.	1.42000E+18
SM	.	1.37000E+17
EU	.	3.21000E+16
	.	.
	.	.
	.	.

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: PCRV CONCRETE AND REBAR (OBS 4 OF 4)
LOCATION:
FIXED OR REMOVABLE:
DESC:

REF DWGS:

COMPOSITION REF:
COMPONENT VOLUME (CM**3):

COMPONENT DENSITY (G/CM2):

CALCULATION NUMBERS:

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
LU	.	1.57000E+16
HF	.	1.28000E+17
TA	.	2.57000E+16
W	.	8.16000E+16
PB	.	3.56000E+18
TH	.	2.04000E+17
U	.	1.57000E+17
O	.	3.18000E+22

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: STEAM GENERATOR
LOCATION: FIXED OR REMOVABLE: R?
DESC: INCLUDES SUPERHEATER II, REHEATER AND THEIR CENTRAL SUPPORT STRUCTURE

REF DWGS; 22-B-001-0076
-0077
-0078
-0087
-0102
COMPOSITION REF: INCOLOY 800 (ASSUMED FOR ALL INCLUDED PARTS)
COMPONENT VOLUME (CM**3):
1.48000E+07 TOT FOR TUBES & SUP

COMPONENT DENSITY (G/CM2):
7.94000E+00 PER TELE W/QA

CALCULATION NUMBERS: VC7

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
NI	0.32500	2.65000E+22
CR	0.21000	1.93000E+22
FE	0.43700	3.74000E+22
C	0.00100	3.98000E+20
MN	0.00015	1.31000E+19
SI	0.01000	1.70000E+21
CU	0.00750	5.64000E+20
AL	0.00380	6.74000E+20
TI	0.00380	3.80000E+20
CO	0.00200	1.62000E+20

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: CORE BARREL KEYS
LOCATION: FIXED OR REMOVABLE:
DESC: KEYS THE CORE BARREL AND LINER TOGETHER

REF DWGS; R1100-500
R1100-504
R1100-506

COMPOSITION REF: ASTM A387 GRB (COMP PER TELE W/ E DUPONT QA)
COMPONENT VOLUME (CM**3):
1.90000E+06 24 TOTAL KEYS

COMPONENT DENSITY (G/CM2):
7.85000E+00

CALCULATION NUMBERS: VC9

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
C	0.00170	6.69200E+20
MN	0.00530	4.56100E+20
P	0.00035	5.34200E+19
S	0.00040	5.89800E+19
SI	0.00230	3.87200E+20
CR	0.00980	8.90900E+20
MO	0.00530	2.61200E+20
CO	0.00020	1.60400E+19
FE	0.97470	8.25100E+22

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: ORIFICE VALVE
LOCATION: FIXED OR REMOVABLE:
DESC: ORIFICE VALVE AND LOWER GUIDE TUBE

REF DWGS; D1201-590

COMPOSITION REF: ASTM A53 TYPE S GR B (ASSUMED AS TYPICAL FOR ALL)
COMPONENT VOLUME (CM**3):
1.59200E+06 37 TOTAL CORE

COMPONENT DENSITY (G/CM2):
7.65000E+00 ASTM

CALCULATION NUMBERS: VC- 11

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
C	0.00300	1.18100E+21
MN	0.01200	1.03300E+21
P	0.00050	7.63200E+19
S	0.00060	8.84700E+19
CO	0.00020	1.60400E+19
FE	0.98370	8.32800E+22

COMMENTS:

ACTIVATION ANALYSIS DATA

COMPONENT: SILICA BLOCKS - CSF
LOCATION: FIXED OR REMOVABLE:
DESC: THREE 3" LAYERS OF SILICA BLOCKS , TWO DIFFERENT DENSITIES - ONE
COMPOSITE DENSITY ASSUMED
REF DWGS; 90-R1104-900

COMPOSITION REF: MASSROCK & GLASSROCK FOAM (FSAR)
COMPONENT VOLUME (CM**3):
9.51700E+06 COMPOSITE MIXTURE

COMPONENT DENSITY (G/CM2):
1.17700E+00 COMPOSITE MIXTURE

CALCULATION NUMBERS: VC- 12

ELEMENT	WEIGHT FRACTION	NUMBER DENSITY
O	.	2.35800E+22
SI	.	1.17600E+22
FE	.	1.02500E+19
TI	.	1.33900E+19
CA	.	1.12200E+18
NA	.	4.06100E+18
B	.	1.44600E+18

COMMENTS:

FORM 1A12 546

SAS

9:00 TUESDAY, JULY 11, 1989

ACTIVATION ANALYSIS DATA

COMPONENT: LARGE SIDE REFLECTOR - HLM GRAPHITE
LOCATION: FIXED OR REMOVABLE: F
DESC: HLM GRAPHITE IS USED IN THE LARGE PERMANENT SIDE REFLECTORS

REF DWGS; GRAPHITE DATA AND IMPURITY DATA COME FROM GA

COMPOSITION REF: GRAPHITE DESIGN MANUAL,GA DOC 906374,ISS A,8/84,PROPRIETORY
COMPONENT VOLUME (CM**3):
4.68100E+07 PCRV TOTAL VOL FROM FSAR TAB 3.3-1
1.95000E+06 AV PER BLK(24 TOTAL)

COMPONENT DENSITY (G/CM2):
1.80000E+00 GRAPH DESIGN MAN

CALCULATION NUMBERS:

ELEMENT	WEIGHT FRACTION ppm		NUMBER DENSITY	atoms/b·cm
B	5.00000	3	~~5.36170E+17~~	3.01E-7
FE	3630	2000	~~7.04680E+19~~	3.88E-5
V	76.00000	42	~~1.61740E+18~~	8.94E-7
TI	71.00000	39	~~1.66760E+18~~	8.83E-7
CA	354	195	~~9.57600E+18~~	5.14E-6
SI	118	65	~~4.55500E+18~~	2.31E-6
AL	82.00000	45	~~3.29460E+18~~	1.81E-6
BA	48.00000	25	~~3.55250E+17~~	1.97E-7
S	89.00000	38	~~2.33200E+18~~	1.28E-6
LI	4.00000	2	~~6.24770E+17~~	3.12E-7
Co		.2		3.68E-9

COMMENTS:

COMPONENT: HASTELLOY-X CANS AND GRAPHITE (H-451/H327)
LOCATION: B FIXED OR REMOVABLE: R
DESC: BORONATED CANS IN BOTTOM REFLECTORS (NON CONTROL ROD ONLY)
TUBES ONLY - DOES NOT INCLUDE END CAPS
REF DWGS; 90R1701-274, ISSUE E 90R1701-272
-355
-350
-440
-275
COMPOSITION REF: AMS-5588B
COMPONENT VOLUME (CM**3):
4.13000E+00 ONE CAN
8.28520E+04 TOTAL CORE

COMPONENT DENSITY (G/CM2):
8.23000E+00 MET HAND

CALCULATION NUMBERS: C05 V03

ELEMENT	WEIGHT FRACTION	atoms/cc NUMBER DENSITY *
CR	0.22000	2.09700E+22
NI	0.49000	4.73700E+22
CO	0.01500	1.26200E+21
MO	0.09000	4.65000E+21
W	0.00600	1.61800E+20
AL	0.02000	3.67400E+21
FE	0.15800	1.40260E+22
C	0.00150	6.19000E+20

Element	Graphite Number Density ** atoms/cc
B	1.51 E -7
Fe	2.91 E -7
Va	1.12 E -7
Ti	1.02 E -7
Si	1.02 E -6
S	7.60 E -8
Li	1.17 E -8
Co	1.38 E -9
Ca	6.08 E -7

COMMENTS: * Metal Only

** Graphite Number densities - weighted, see C-06 App. C & C-20

FORM (A)2 - 13546

SAS

9:00 TUESDAY, JULY 11, 1989

ACTIVATION ANALYSIS DATA

COMPONENT: Removable Reflector Graphite (H327/H451 mix)
LOCATION:
FIXED OR REMOVABLE:
DESC:

REF DWGS;

COMPOSITION REF:
COMPONENT VOLUME (CM**3):

COMPONENT DENSITY (G/CM2):

CALCULATION NUMBERS:

ELEMENT	~~WEIGHT FRACTION~~ ppm	NUMBER DENSITY atoms/b-cm
B	2	1.94 E-7
Fe	20	3.75 E-7
Ca	30	7.84 E-7
S	3	9.80 E-8
Li	0.1	1.51 E-8
Co	0.1	1.78 E-9
V	7	1.44 E-7
Ti	6	1.31 E-7
Si	35	1.31 E-6

COMMENTS: Actual number densities used as input to REBATE are weighted by the Graphite Volume Fraction of the block. See Calculations C-06 and C-20 for details.

ACTIVATION ANALYSIS DATA

COMPONENT: CORE SUPPORT BLOCKS -PGX GRAPHITE
LOCATION: FIXED OR REMOVABLE: F
DESC: CORE SUPPORT BLOCKS ARE JUST ABOVE CORE SUPPORT POSTS

REF DWGS;

COMPOSITION REF: GRAPHITE DESIGN MANUAL GA DOC 906374 (PROPIETARY)
COMPONENT VOLUME (CM**3):
4.17780E+05 IRREGULAR BLOCK
4.69280E+05 HEXAGONAL BLOCK
24 IRREC BLCK 37 HEXAGONAL BLKS
2.73900E+07 TOTAL VOLUME CSB
COMPONENT DENSITY (G/CM2):
1.76000E+00 GRAPHITE DESIGN MAN

CALCULATION NUMBERS:

ELEMENT	~~WEIGHT FRACTION~~ PPM	NUMBER DENSITY — atoms/b cm
B	~~4.00000~~ 2	~~3.92210E+17~~ 1.961E-7
FE	~~3686~~ 1900	~~6.99650E+19~~ 3.61E-5
V	~~27.00000~~ 14	~~5.61850E+17~~ 2.91E-7
TI	~~54.00000~~ 28	~~1.19550E+18~~ 6.20E-7
CA	~~368~~ 190	~~9.73350E+18~~ 5.03E-6
SI	~~120~~ 62	~~4.52920E+18~~ 2.34E-6
AL	~~120~~ 66	~~5.02890E+18~~ 2.59E-6
S	~~601~~ 310	~~1.98680E+19~~ 1.02E-5
LI	~~4.00000~~ 2	~~6.10890E+17~~ 3.05E-7
Co	.19	3.42E-9

COMMENTS: WEIGHT FRACTIONS ARE IN PPM

T1368A

JOB00129

A

```
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
*END   JOB00129 T1368A   1   001 001 LOCAL   1368 VW DIAMOND HILL ROOM   9.00.19 AM 11 JUL 89 PRT15   DDDD END   A*
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Appendix C
EE-DEC-0010

Detailed Component Curie Inventory

T8184A

JOB00097

A

```
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
ART JOB00097 T8184A   1    001 001 LOCAL   D.HILL-8184-SHERMAN  ROOM    8.32.11 AM 11 OCT 90 PRT12   AAAA START A*
```

```
-------- JOB00097  IEF097I T8184A   - USER T8184    ASSIGNED
08.29.32 JOB00097  TSS7011 T8184    LAST-USED 11 OCT 90 08:26 SYSTEM=AAAA FACILITY=BATCH
08.29.32 JOB00097  TSS7021 COUNT=09897  MODE=WARN  LOCKTIME=NONE NAME=SHERMAN, RUSSELL
08.29.32 JOB00097  $HASP373 T8184A   STARTED - INIT 16 - CLASS C - SYS AAAA
08.30.06 JOB00097  * T8184A   001          IEBGENER    ------------ R000
08.30.07 JOB00097  * T8184A    1      4885    32.48   ------------ EOJ *
08.30.07 JOB00097  $HASP395 T8184A   ENDED

------ JES2 JOB STATISTICS ------

  11 OCT 90 JOB EXECUTION DATE

         10 CARDS READ

      5,109 SYSOUT PRINT RECORDS

          0 SYSOUT PUNCH RECORDS

        643 SYSOUT SPOOL KBYTES

       0.62 MINUTES EXECUTION TIME
```

2

```
1 //T8184A JOB (13,4840-63-09-W703N450','D.HILL-8184-SHERMAN',          JOB00097
  //             MSGCLASS=R,CLASS=C,NOTIFY=T8184,MSGLEVEL=(1,1)
2 //THOUP OUTPUT CHARS=GT18,PAGEDEF=MP120,PRMODE=PAGE,DEFAULT=YES,
  //               JESDS=ALL
  ***JOBPARM LINES=100
3 //         EXEC PGM=IEBGENER
4 //SYSPRINT      DD    SYSOUT=*
5 //SYSIN  DD     DUMMY
6 //SYSUT2 DD SYSOUT=*,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=6118),COPIES=02
7 //SYSUT1 DD  DSN=T8184.REAATE.L133RS(RSSITEA),DISP=SHR
```

```
TSS701I T8184    LAST-USED 11 OCT 90 08:26 SYSTEM=AAAA FACILITY=BATCH
TSS702I COUNT=09097  MODE=WARN  LOCKTIME=NONE NAME=SHERMAN, RUSSELL
IEF236I ALLOC. FOR T8184A
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I DMY  ALLOCATED TO SYSIN
IEF237I JES2 ALLOCATED TO SYSUT2
IEF237I 65C  ALLOCATED TO SYSUT1
IEF142I T8184A - STEP WAS EXECUTED - COND CODE 0000
IEF285I   JES2.JOB00097.00000101                         SYSOUT
IEF285I   JES2.JOB00097.00000102                         SYSOUT
IEF285I   T8184.REBATE.1133RS                            KEPT
IEF285I   VOL SER NOS= YS0303.
************************************ S T E P   T E R M I N A T I O N ************************************
*    JOB    STP   STEP      PGM      STARTED       ENDED        TCB      SRB    ELAPSED   SWAP  CORE   COMP *
*   NAME     #    NAME      NAME      TIME          TIME      SECONDS  SECONDS  SECONDS  COUNT  USED   CODE *
* T8184A   001           IEBGENER 08:29:33.22 08:30:06.99       .17      .06    33.77      0   344K   R000 *
**********************************************************************************************************
*                       SWAP     SWAP       VIO      VIO       TCB      I/O      MSO      SRB      TOTAL   *
*  PAGEINS PAGEOUTS  PAGEINS PAGEOUTS   PAGEINS PAGEOUTS     S U      S U      S U      S U       S U     *
*      7        7        0        0         0        0      1654     1670     1070      491      4885    *
**********************************************************************************************************
IEF373I STEP /        / START 90284.0829
IEF374I STEP /        / STOP  90284.0830 CPU    0MIN 00.17SEC SRB    0MIN 00.06SEC VIRT   128K SYS   216K EXT       4K SYS    9064K
*********************************** J O B   T E R M I N A T I O N ***************************************
*    JOB   PERF    TOTAL    ACTIVE   STARTED       ENDED        TCB      SRB   ELAPSED   TOTAL            *
*   NAME   GRP      S U    SECONDS    TIME          TIME      SECONDS  SECONDS SECONDS   SWAPS            *
* T8184A    1      4885     32.48 08:29:33.22 08:30:07.81       .17      .06    34.59      0              *
**********************************************************************************************************
IEF375I  JOB /T8184A  / START 90284.0829
IEF376I  JOB /T8184A  / STOP  90284.0830 CPU    0MIN 00.17SEC SRB    0MIN 00.06SEC
```

PROCESSING ENDED AT EOD

COMPONENT : BORONATED STAINLESS STEEL RODS R5
VOLUME : 2.50250E+07 CC
: ABOVE VOLUME IS FOR ALL SS RODS IN THE SPACER BLOCKS BTWN THE
: CORE BARREL AND THE PERMANENT LARGE SIDE REFLECTORS
: TOTAL OF 309792 RODS AT 80.78 CC OF HOMOGENIZED TARGET MATL/ROD
: (INTERVALS 46-51 TOTGRDRS)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
LI	3	8	8.40178E-01	1.89890E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	2.42138E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	1.76762E-13	1.76762E-13	1.76761E-13	1.76761E-13	1.76761E-13	1.76760E-13	1.76759E-13	1.76757E-13
B	5	12	1.99754E-02	6.24728E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	4.07729E-08	4.07581E-08	4.07483E-08	4.07237E-08	4.06745E-08	4.06254E-08	4.04783E-08	4.02831E-08
AL	13	28	1.38629E+02	1.33196E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	7.45964E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	9.17407E-10	7.88059E-33	3.30539E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	5.60655E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	5.55462E-12	5.56595E-13	1.20078E-13	2.59580E-15	1.21307E-18	5.66895E-22	5.78553E-32	2.75933E-45
V	23	52	2.02084E+02	5.08108E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	1.06055E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	1.05395E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	1.88761E-03	2.47417E-15	2.96326E-23	4.65209E-43	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	1.31281E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	5.04488E-17	5.04488E-17	5.04488E-17	5.04488E-17	5.04487E-17	5.04486E-17	5.04483E-17	5.04479E-17
MN	25	54	2.61565E+07	9.32953E-08	7.59082E-09	1.42531E-09	2.17751E-11	5.08233E-15	1.18619E-18	1.50817E-29	4.47552E-44
MN	25	56	9.29152E+03	3.64481E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.24660E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.24348E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	2.61511E-03	1.17506E-03	6.89352E-04	1.81716E-04	1.26269E-05	8.77401E-07	2.94379E-10	6.86309E-15
FE	26	59	3.89409E+06	3.10209E-05	1.48948E-12	1.96765E-17	1.24812E-29	5.07151E-54	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	8.30075E-20	8.30058E-20	8.30046E-20	8.30017E-20	8.29960E-20	8.29903E-20	8.29730E-20	8.29500E-20
FE	26	61	3.60001E+02	1.03108E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.54838E+07	3.27609E-10	2.00346E-11	3.10978E-12	2.95193E-14	2.65982E-18	2.39661E-22	1.75322E-34	1.15564E-50
CO	27	58	6.13405E+06	1.96095E-07	4.42968E-12	3.53982E-15	6.38994E-23	2.08216E-38	6.78472E-54	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	4.12898E-04	2.78062E-04	2.13637E-04	1.10538E-04	2.95921E-05	7.92215E-06	1.52000E-07	7.80768E-10
CO	27	61	5.94007E+03	1.56272E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	3.23588E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	2.82146E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	1.12273E-07	1.12270E-07	1.12268E-07	1.12263E-07	1.12253E-07	1.12243E-07	1.12214E-07	1.12175E-07
NI	28	63	2.90020E+09	1.60411E-05	1.56822E-05	1.54474E-05	1.48757E-05	1.37950E-05	1.27928E-05	1.02073E-05	7.54531E-06
TOTAL (CURIES/CC)				8.61426E-03	1.46897E-03	9.18591E-04	3.07282E-04	5.61669E-05	2.17452E-05	1.05073E-05	7.69855E-06
TOTAL (CURIES)				2.15572E+05	3.67609E+04	2.29877E+04	7.68973E+03	1.40558E+03	5.44175E+02	2.62946E+02	1.92656E+02

COMPONENT : BORONATED GRAPHITE BLOCK MINUS ALL THE BORON RODS REV 5
VOLUME : 3.39500E+07 CC
: ABOVE VOLUME IS FOR THE GRAPHITE MATERIAL ONLY
: COMPRISING EACH BORONATED GRAPHITE BLOCK.
:
: (INTERVAL 45 , TOTGRDRS)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	4.02388E-04	3.39662E-04	3.03377E-04	2.28729E-04	1.30016E-04	7.39046E-05	1.35737E-05	1.41709E-06
HE	2	6	8.09751E-01	3.94556E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	1.06335E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	8.41754E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	3.36033E-15	3.36033E-15	3.36033E-15	3.36032E-15	3.36031E-15	3.36031E-15	3.36028E-15	3.36024E-15
B	5	12	1.99754E-02	1.22826E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	1.45871E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	4.93892E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	4.29318E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	3.00524E-10	2.58153E-33	1.08278E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	4.33989E-10	1.66703E-19	8.80885E-26	1.78805E-41	7.36639E-73	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	2.09566E-15	2.07951E-15	2.06882E-15	2.04232E-15	1.99034E-15	1.93968E-15	1.79530E-15	1.61938E-15
CA	20	41	2.52053E+12	2.39043E-08	2.39037E-08	2.39032E-08	2.39022E-08	2.39001E-08	2.38981E-08	2.38918E-08	2.38835E-08
CA	20	45	1.42623E+07	9.15843E-06	9.19580E-08	4.27992E-09	2.80011E-12	4.36798E-19	9.53916E-26	9.93572E-46	2.26002E-72
CA	20	47	3.91608E+05	4.76389E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	4.59377E-12	5.38879E-16	1.29134E-18	3.63013E-25	2.86855E-38	2.26672E-51	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	5.46983E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	1.17781E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	5.48635E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	1.48163E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	7.83044E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	2.39672E-15	2.40161E-16	5.18114E-17	1.12004E-18	5.23417E-22	2.44605E-25	2.49636E-35	1.19060E-48
V	23	52	2.02084E+02	4.60000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	2.97535E-11	3.89992E-23	4.67085E-31	7.33285E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	1.69434E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	3.54952E-19	3.54952E-19	3.54952E-19	3.54951E-19	3.54950E-19	3.54950E-19	3.54948E-19	3.54945E-19
MN	25	54	2.61565E+07	7.27773E-10	5.92141E-11	1.11185E-11	1.69862E-13	3.96460E-17	9.25318E-21	1.17648E-31	3.49124E-46
MN	25	56	9.2915[illegible]E+03	3.51938E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.019[illegible]3E+02	9.30151E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60[illegible]0E+01	8.76205E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.16701E-03	5.24379E-04	3.07628E-04	8.10920E-05	5.63483E-06	3.91546E-07	1.31369E-10	3.06270E-15
FE	26	59	3.89409E+06	1.38054E-05	6.62872E-13	8.75675E-18	5.55456E-30	2.23475E-54	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	6.06288E-06	4.08299E-06	3.13698E-06	1.62310E-06	4.34523E-07	1.16327E-07	2.23193E-09	1.14643E-11
TOTAL (CURIES/CC)				2.10340E-03	8.68240E-04	6.14170E-04	3.11468E-04	1.36109E-04	7.44363E-05	1.35999E-05	1.44079E-06
TOTAL (CURIES)				7.14103E+04	2.94767E+04	2.08511E+04	1.05743E+04	4.62089E+03	2.52711E+03	4.61717E+02	4.89215E-01

COMPONENT : CORE BARREL - MIDDLE AND BOTTOM RS
VOLUME : 9.14100E+06 CC
: ABOVE VOLUME IS FOR THE LOWER 17 FEET OF THE CORE BARRE
: BOTTOM 9 FT - 2.75" THICK
: MIDDLE 8 FT - 2.50" THICK
: (INTERVALS 52-54 TOTORDRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
AL	13	28	1.38629E+02	2.35536E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	4.20397E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	8.84228E-10	7.59558E-33	3.18585E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	2.43035E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	2.43490E-13	2.43987E-14	5.26368E-15	1.13789E-16	5.31755E-20	2.48502E-23	2.53613E-33	1.20957E-46
V	23	52	2.02084E+02	1.93010E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	4.26917E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	4.61747E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	6.77932E-08	8.88594E-20	1.06425E-27	1.67079E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	2.60285E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	6.36256E-17	6.36256E-17	6.36256E-17	6.36255E-17	6.36254E-17	6.36253E-17	6.36249E-17	6.36245E-17
MN	25	54	2.61565E+07	9.95309E-08	8.09818E-09	1.52057E-09	2.32305E-11	5.42202E-15	1.26547E-18	1.60897E-29	4.77466E-44
MN	25	56	9.29152E+03	1.49268E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.40789E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.55922E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.10275E-06	4.95507E-07	2.90690E-07	7.66271E-08	5.32457E-09	3.69987E-10	1.24135E-13	2.89407E-18
FE	26	59	3.89409E+06	8.64670E-08	4.15174E-15	5.48458E-20	3.47896E-32	1.39968E-56	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.04479E-07	7.03604E-08	5.40582E-08	2.79702E-08	7.48794E-09	2.00461E-09	3.84618E-11	1.97559E-13
ZR	40	88	7.20602E+06	2.81852E-14	3.12670E-18	7.21876E-21	1.84890E-27	1.21282E-40	7.95564E-54	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	2.81148E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	2.04540E-18	2.04540E-18	2.04540E-18	2.04540E-18	2.04539E-18	2.04538E-18	2.04535E-18	2.04531E-18
ZR	40	95	5.63534E+06	6.37336E-13	5.58619E-18	2.37475E-21	8.84849E-30	1.22845E-46	1.70547E-63	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	8.89187E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	9.14346E-16	9.11633E-16	9.09830E-16	9.05336E-16	8.96415E-16	8.87582E-16	8.61601E-16	8.28139E-16
NB	41	92	8.80746E+05	1.80101E-11	7.89462E-44	2.11448E-65	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	2.70762E-16	2.70734E-16	2.70715E-16	2.70668E-16	2.70574E-16	2.70480E-16	2.70199E-16	2.69824E-16
NB	41	95	3.02684E+06	5.25959E-12	2.02031E-21	1.06756E-27	2.16697E-43	8.92746E-75	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	9.54700E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	9.25600E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	2.54320E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	1.64379E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	1.72741E-12	1.72701E-12	1.72675E-12	1.72608E-12	1.72475E-12	1.72343E-12	1.71946E-12	1.71416E-12
MO	42	99	2.41515E+05	1.16269E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	4.85388E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				3.12586E-06	5.73967E-07	3.46271E-07	1.04622E-07	1.28142E-08	2.37632E-09	4.03065E-11	1.91289E-12
TOTAL (CURIES)				2.85734E+01	5.24663E+00	3.16526E+00	9.56351E-01	1.17135E-01	2.17219E-02	3.68442E-04	1.74857E-05

COMPONENT : CORE BARREL - TOP RS
VOLUME : 5.50850E+06 CC
: ABOVE VOLUME IS FOR THE TOP 12 FT OF THE CORE BARREL
: TOP 12FT - 2.25" THICK
:
: (INTERVALS 52-54 RCBTOPRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
AL	13	28	1.38629E+02	2.95834E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	4.19926E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	8.83031E-10	7.58550E-33	3.18154E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	52	2.02084E+02	8.52220E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	4.56189E-09	5.97947E-21	7.16148E-29	1.12429E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	5.09573E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	6.40799E-17	6.40798E-17	6.40798E-17	6.40797E-17	6.40796E-17	6.40795E-17	6.40791E-17	6.40787E-17
MN	25	54	2.61565E+07	1.00241E-07	8.15599E-09	1.53143E-09	2.33963E-11	5.46073E-15	1.27451E-18	1.62046E-29	4.80874E-44
MN	25	56	9.29152E+03	2.88473E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.41794E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.57036E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.11063E-06	4.99044E-07	2.92765E-07	7.71741E-08	5.36258E-09	3.72629E-10	1.25022E-13	2.91473E-18
FE	26	59	3.89409E+06	8.70840E-08	4.18137E-15	5.52372E-20	3.50379E-32	1.40967E-56	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.04349E-07	7.02730E-08	5.39311E-08	2.79355E-08	7.47864E-09	2.00212E-09	3.84140E-11	1.97314E-13
TOTAL (CURIES/CC)				4.29788E-06	5.77473E-07	3.48288E-07	1.05133E-07	1.28412E-08	2.37474E-09	3.85391E-11	1.97380E-13
TOTAL (CURIES)				2.36749E+01	3.18101E+00	1.91854E+00	5.79125E-01	7.07359E-02	1.30813E-02	2.12292E-04	1.08727E-06

COMPONENT : METAL CLAD REFLECTOR - CONTROL ROD ELEMENT RS
VOLUME : 3.56860E+05 CC
: ABOVE VOLUME IS FOR THE TOTAL VOLUME OF METAL FOR ALL METAL
: CLAD CR REFLECTORS. TOTAL OF 37 ELEMENTS AT 9.645+3 CC EACH
:
: (INTERVALS 29-39 TOPREFRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	SHUTDOWN	1.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
				CONCENTRATION (CURIES/CC) AT TIME							
LI	3	8	8.40178E-01	1.71846E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	2.66747E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	3.82920E-13	3.82920E-13	3.82920E-13	3.82919E-13	3.82918E-13	3.82917E-13	3.82914E-13	3.82909E-13
B	5	12	1.99754E-02	1.37545E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	2.51004E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	1.59126E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.94043E-08	1.66684E-32	6.99131E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	9.56952E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	9.44170E-11	9.46095E-12	2.04107E-12	4.41232E-14	2.06196E-17	9.63603E-21	9.83421E-31	4.69028E-44
V	23	52	2.02084E+02	9.60905E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	55	1.19922E+02	1.89946E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	1.79186E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39643E+06	7.84694E-02	1.72843E-13	1.25185E-21	1.93391E-41	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	2.56329E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	9.13715E-16	9.13714E-16	9.13714E-16	9.13713E-16	9.13711E-16	9.13710E-16	9.13705E-16	9.13698E-16
MN	25	54	2.61565E+07	1.94999E-06	1.58654E-07	2.97908E-08	4.55127E-10	1.06227E-13	2.47930E-17	3.15227E-28	9.35443E-43
MN	25	56	9.29152E+03	1.59340E-01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	2.42221E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	2.25695E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.15072E-01	5.17058E-02	3.03333E-02	7.99598E-03	5.55615E-04	3.86079E-05	1.29534E-08	3.01994E-13
FE	26	59	3.89409E+06	1.36826E-03	6.56976E-11	8.67866E-16	5.50515E-28	2.21487E-52	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	1.77230E-18	1.77216E-18	1.77223E-18	1.77217E-18	1.77205E-18	1.77193E-18	1.77156E-18	1.77107E-18
FE	26	61	3.60001E+02	2.20088E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	6.99372E-09	4.27693E-10	6.63868E-11	6.30170E-13	5.67811E-17	5.11621E-21	3.74274E-33	2.46703E-49
CO	27	58	6.13405E+06	4.93357E-06	1.11447E-18	8.90547E-14	1.60765E-21	5.23853E-37	1.70697E-52	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.80705E-02	1.21694E-02	9.34983E-03	4.83769E-03	1.29510E-03	3.46714E-04	6.65229E-06	3.41695E-08
CO	27	61	5.94007E+03	3.66099E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	6.94866E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	6.02251E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	5.83180E-06	5.83164E-06	5.83154E-06	5.83129E-06	5.83078E-06	5.83026E-06	5.82876E-06	5.82674E-06
NI	28	63	2.90020E+09	8.32349E-04	8.13721E-04	8.01544E-04	7.71880E-04	7.15804E-04	6.63802E-04	5.29365E-04	3.91515E-04
Y	39	89	1.56998E+01	7.68123E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	4.75268E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	6.26056E-15	6.26055E-15	6.26055E-15	6.26055E-15	6.26050E-15	6.26047E-15	6.26039E-15	6.26027E-15
NB	41	92	8.60746E+05	2.11478E-09	9.26997E-42	2.48285E-63	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	4.94431E-07	4.94379E-07	4.94345E-07	4.94259E-07	4.94088E-07	4.93916E-07	6.93402E-07	4.92718E-07
TOTAL (CURIES/CC)				3.73180E-01	6.46953E-02	4.04910E-02	1.36119E-02	2.57285E-03	1.95545E-03	5.42372E-04	3.97869E-04
TOTAL (CURIES)				1.33173E+05	2.30872E+04	1.44496E+04	4.85753E+03	9.18146E+02	3. [illegible] 7E+02	1.93551E+02	1.41983E+02

COMPONENT : CORE SUPPORT BLOCKS RS
VOLUME : 2.73900E+07 CC
: ABOVE VOLUME IS FOR THE TOTAL VULUMJ OF THE CORE SUPPORT
: BLOCKS. 37 HEX BLOCKS AT 4.692+5 EACH AND 24 IRREGULAR
: BLOCKS AT 4.1778+5 CC EACH.
: (INTERVALS 39-46 TOTGDMRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
				CONCENTRATION (CURIES/CC) AT TIME							
H	1	3	3.87233E+08	2.04091E-06	1.72277E-06	1.53873E-06	1.16011E-06	6.59440E-07	3.74844E-07	6.88457E-08	7.18750E-09
HE	2	6	8.09751E-01	1.12233E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	5.39360E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.58968E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	1.17260E-17	1.17260E-17	1.17260E-17	1.17260E-17	1.17259E-17	1.17259E-17	1.17258E-17	1.17257E-17
B	5	12	1.99754E-02	4.15028E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	6.18296E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	2.07060E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	3.18865E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	6.98124E-10	5.99696E-33	2.51533E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	1.24261E-10	4.77311E-20	2.52218E-26	5.11961E-42	2.18917E-73	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	6.04061E-16	5.99406E-16	5.96324E-16	5.88686E-16	5.73702E- [illegible]	5.59099E-16	5.17484E-16	4.66776E-16
CA	20	41	2.52053E+12	1.21026E-10	1.21023E-10	1.21021E-10	1.21016E-10	1.21005E-10	1.20995E-10	1.20963E-10	1.20921E-10
CA	20	45	1.42623E+07	4.65314E-08	4.67212E-10	2.17451E-11	1.01620E-14	2.21925E-21	4.84658E-28	5.04806E-48	1.14825E-74
CA	20	47	3.91608E+05	2.41195E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.00113E-12	1.17639E-16	2.81424E-19	7.91123E-26	6.25151E-39	4.93991E-52	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	1.18120E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	2.37903E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	1.19445E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	3.28936E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	3.02684E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	2.32778E-16	2.33244E-17	5.03193E-18	1.08779E-19	5.08343E-23	2.37561E-26	2.42447E-36	1.15631E-49
V	23	52	2.02084E+02	7.77011E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	8.06150E-12	1.05565E-23	1.26553E-31	1.98678E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E [illegible]	4.68995E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	9.85370E-20	9.85370E-20	9.85369E-20	9.85368E-20	9.85366E-20	9.85364E-20	9.85359E-20	9.85352E-20
MN	25	54	2.61565E+07	1.97559E-10	1.60741E-11	3.01819E-12	4.61103E-14	1.07622E-17	2.51184E-21	3.19365E-32	9.47723E-47
MN	25	56	9.29152E+03	9.64216E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	2.54043E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	2.42847E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	5.61840E-06	2.52455E-06	1.48103E-06	3.90406E-07	2.71281E-08	1.88504E-09	6.32455E-13	1.47449E-17
FE	26	59	3.89409E+06	6.68944E-08	3.21196E-15	4.24310E-20	2.69147E-32	1.08285E-56	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	2.94408E-08	1.98266E-08	1.52329E-08	7.88164E-09	2.11000E-09	5.64872E-10	1.08380E-11	5.56695E-14
TOTAL (CURIES/CC)				8.90841E-06	4.26775E-06	3.03514E-06	1.55852E-06	6.88799E-07	3.77415E-07	6.89781E-08	7.30847E-09
TOTAL (CURIES)				2.44001E+02	1.16894E+02	8.31324E+01	4.26878E+01	1.88662E+01	1.03374E+01	1.88931E+00	2.00179E-01

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COMPONENT : CORE SUPPORT FLOOR KAOWOOL AND COVER PLATES - 05
VOLUME : 3.23900E+06 CC
: ABOVE VOLUME IS FOR THE COMPOSITE MIXTURE OF THE KAOWOOL
: AND COVER PLATE LAYER ON THE CORE SUPPORT FLOOR.
:
: (INTERVAL 54 TOTGDHRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
LI	3	8	8.40178E-01	5.04127E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	5.74092E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	6.59171E-18	6.59170E-18	6.59170E-18	6.59169E-18	6.59167E-18	6.59166E-18	6.59160E-18	6.59155E-18
B	5	12	1.99754E-02	2.28853E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	3.45563E-12	3.45438E-12	3.45354E-12	3.45146E-12	3.44729E-12	3.44312E-12	3.43066E-12	3.41411E-12
F	9	20	1.10023E+01	5.09636E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	8.24589E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	8.58652E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68155E+02	2.37030E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	5.12100E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	6.95119E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.59035E-11	1.36612E-34	5.72999E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	1.46673E-12	5.63397E-22	2.97708E-28	6.04297E-44	2.48957E-75	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	7.52036E-18	7.46242E-18	7.42404E-18	7.32895E-18	7.14240E-18	6.96061E-18	6.44251E-18	5.81121E-18
CA	20	41	2.52053E+12	2.01974E-12	2.01968E-12	2.01965E-12	2.01956E-12	2.01939E-12	2.01921E-12	2.01868E-12	2.01798E-12
CA	20	45	1.42623E+07	7.75399E-10	7.78563E-12	3.62360E-13	1.69339E-16	3.69813E-23	8.07634E-30	8.41208E-50	1.91344E-76
CA	20	47	3.91608E+05	4.02543E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.08552E-12	1.27339E-16	3.05146E-19	8.57810E-26	6.77847E-39	5.35631E-52	0.00000E+00	0.00000E+00
SC	21	47	2.95217E+05	1.22417E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	2.63220E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	1.27687E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	4.04708E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	4.65786E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	6.33847E-16	6.35139E-17	1.37023E-17	2.96211E-19	1.38425E-22	6.46893E-26	6.60197E-36	3.14871E-49
V	23	52	2.02084E+02	5.81179E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	1.16616E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	1.20268E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	2.98670E-07	3.91480E-19	4.68867E-27	7.36083E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	3.16968E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	8.38656E-19	8.38655E-19	8.38655E-19	8.38654E-19	8.38652E-19	8.38651E-19	8.38646E-19	8.38640E-19
MN	25	54	2.61565E+07	1.44854E-09	1.17859E-10	2.21300E-11	3.38089E-13	7.89105E-17	1.84173E-20	2.34165E-31	6.94889E-46
MN	25	56	9.29152E+03	1.28395E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.96349E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	2.06706E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	5.99178E-05	2.69232E-05	1.57945E-05	4.16351E-06	2.89509E-07	2.01031E-08	6.74485E-12	1.57248E-16
FE	26	59	3.89409E+06	7.11433E-07	3.41597E-14	4.51260E-19	2.86242E-31	1.15163E-55	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	9.20921E-23	9.20902E-23	9.20889E-23	9.20857E-23	9.20793E-23	9.20730E-23	9.20538E-23	9.20283E-23
FE	26	61	3.60201E+02	1.14392E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	3.63463E-13	2.22272E-14	3.45012E-15	5.27499E-17	2.95091E-21	2.65889E-25	1.94510E-37	1.28211E-53
CO	27	58	6.13405E+06	2.00319E-10	4.52511E-15	3.61608E-18	6.52759E-26	2.12701E-41	6.93087E-57	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.02680E-06	6.91487E-07	5.31273E-07	2.74885E-07	7.35899E-08	1.97008E-08	3.77994E-10	1.94157E-12
CO	27	61	5.94007E+03	1.62079E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.54012E+02	4.10950E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	3.13024E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	1.71923E-10	1.71918E-10	1.71915E-10	1.71908E-10	1.71893E-10	1.71878E-10	1.71833E-10	1.71774E-10
NI	28	63	2.90020E+09	2.45455E-08	2.39963E-08	2.36371E-08	2.27623E-08	2.11086E-08	1.95751E-08	1.56112E-08	1.15456E-08
NI	28	65	9.21738E+03	4.59565E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	3.55592E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				8.00680E-05	2.76389E-05	1.63496E-05	4.46133E-06	3.84185E-07	5.95564E-08	1.61733E-08	1.17247E-08
TOTAL (CURIES)				2.59343E+02	8.95225E+01	5.29564E+01	1.44502E+01	1.24437E+00	1.92903E-01	5.23852E-02	3.79763E-02

COMPONENT : CORE SUPPORT FLOOR LINER - R5
VOLUME : 1.39000E+06 CC
: ABOVE VOLUME IS FOR THE CSF LINER ON TOP OF THE CSF
:
:
: (INTERVAL 55 TOTGDNRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
AL	13	28	1.38629E+02	3.59792E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	4.55703E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	9.49486E-11	8.15616E-34	3.42098E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	6.75146E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	6.70503E-15	6.71870E-16	1.44947E-16	3.13341E-18	1.46430E-21	6.84304E-25	6.98377E-35	3.33081E-48
V	23	52	2.02084E+02	6.55324E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	1.21515E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.60117E+01	1.27209E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	1.58068E-06	2.07187E-18	2.48143E-26	3.89565E-46	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	6.69876E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	6.29845E-18	6.29845E-18	6.29845E-18	6.29844E-18	6.29843E-18	6.29842E-18	6.29838E-18	6.29833E-18
MN	25	54	2.61565E+07	1.05732E-08	8.60272E-10	1.61531E-10	2.46778E-12	5.75983E-16	1.34432E-19	1.70922E-30	5.07213E-45
MN	25	56	9.29152E+03	1.39772E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.44647E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.55059E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	2.24125E-04	1.00707E-04	5.90801E-05	1.55738E-05	1.08217E-06	7.51966E-08	2.52294E-11	5.88193E-16
FE	26	59	3.89409E+06	2.66748E-06	1.28080E-13	1.69198E-18	1.07325E-30	4.31799E-55	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	2.02037E-22	2.02033E-22	2.02030E-22	2.02023E-22	2.02009E-22	2.01995E-22	2.01953E-22	2.01897E-22
FE	26	61	3.60001E+02	2.51002E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	7.97454E-13	4.87674E-14	7.56971E-15	7.18547E-17	6.47443E-21	5.83373E-25	4.26763E-37	2.81301E-53
CO	27	58	6.13405E+06	4.28330E-10	9.67577E-15	7.73205E-18	1.39576E-25	4.54807E-41	1.48199E-56	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	2.42065E-06	1.63017E-06	1.25247E-06	6.48037E-07	1.73487E-07	4.64444E-08	8.91115E-10	4.57721E-12
CO	27	61	5.94007E+03	3.47273E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	2.37383E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	6.86840E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	1.88096E-10	1.88091E-10	1.88087E-10	1.88079E-10	1.88063E-10	1.88047E-10	1.87998E-10	1.87932E-10
NI	28	63	2.90020E+09	2.68370E-08	2.62366E-08	2.58438E-08	2.48873E-08	2.30793E-08	2.14026E-08	1.70687E-08	1.26234E-08
NI	28	65	9.21738E+03	1.98727E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	7.85973E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	4.70474E-16	5.21917E-20	1.20497E-22	3.08624E-29	2.02446E-42	1.32797E-55	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	4.63522E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	3.37853E-20	3.37852E-20	3.37852E-20	3.37851E-20	3.37850E-20	3.37848E-20	3.37844E-20	3.37837E-20
ZR	40	95	5.63534E+06	1.04888E-14	9.19336E-20	3.90820E-23	1.45622E-31	2.02169E-48	2.80674E-65	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	1.45971E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	1.48079E-17	1.47640E-17	1.47348E-17	1.46620E-17	1.45175E-17	1.43745E-17	1.39537E-17	1.34118E-17
NB	41	92	8.80746E+05	3.00487E-13	1.31804E-45	3.53020E-67	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.70134E+11	4.47151E-18	4.47104E-18	4.47073E-18	4.46996E-18	4.46841E-18	4.46686E-18	4.46221E-18	4.45601E-18
NB	41	95	3.02684E+06	6.73617E-14	3.35573E-23	1.77321E-29	3.59933E-45	1.48285E-76	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	1.57008E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	1.52972E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	4.14278E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	2.64793E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	1.95618E-14	1.95573E-14	1.95543E-14	1.95468E-14	1.95317E-14	1.95167E-14	1.94717E-14	1.94118E-14
MO	42	99	2.41515E+05	1.47704E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	8.20789E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				3.78486E-04	1.02365E-04	6.03588E-05	1.62468E-05	1.27892E-06	1.43232E-07	1.81730E-08	1.28160E-08
TOTAL (CURIES)				5.26096E+02	1.42287E+02	8.38987E+01	2.25831E+01	1.77770E+00	1.99092E-01	2.52695E-02	1.78142E-02

COMPONENT : LARGE PERMANENT REFLECTORS - R5
VOLUME : 1.01490E+08 CC
: ABOVE VOLUME IS THE TOTAL VOLUME OF ALL PERMANENT AND
: IRREGULAR BLOCKS. 54 HEX BLKS AT 8.85+4 CC EACH.
: 288 PERM BLKS AT 3.3580+5 CC EACH.
: (INTERVALS 35-45 TOTGRDRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	9.63679E-04	8.13457E-04	7.26557E-04	5.47782E-04	3.11374E-04	1.76994E-04	3.25076E-05	3.39379E-06
HE	2	6	8.09751E-01	2.01652E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	8.82199E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	4.96142E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	2.79970E-14	2.79970E-14	2.79970E-14	2.79970E-14	2.79969E-14	2.79968E-14	2.79966E-14	2.79963E-14
B	5	12	1.99754E-02	1.01985E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	4.61251E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	2.06294E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	3.56206E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.60910E-08	1.38223E-31	5.79755E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	1.96874E-06	7.56232E-18	3.99604E-26	8.11130E-40	3.34168E-71	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	7.68396E-14	7.62476E-14	7.58554E-14	7.48838E-14	7.29778E-14	7.11203E-14	6.58267E-14	5.93763E-14
CA	20	41	2.52053E+12	1.98124E-07	1.98119E-07	1.98116E-07	1.98107E-07	1.98090E-07	1.98073E-07	1.98021E-07	1.97953E-07
CA	20	45	1.42623E+07	7.59965E-05	7.63066E-07	3.55147E-08	1.65969E-11	3.62454E-18	7.91558E-25	8.24465E-45	1.87536E-71
CA	20	47	3.91608E+05	3.94843E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.93071E-10	2.26486E-14	5.42736E-17	1.52571E-23	1.20463E-36	9.52678E-50	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	3.19163E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	3.89545E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	2.37526E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	4.43173E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	6.46028E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	7.16232E-14	7.17692E-15	1.54832E-15	3.34711E-17	1.56417E-20	7.30973E-24	7.46007E-34	3.55797E-47
V	23	52	2.02084E+02	3.81653E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	1.56416E-09	2.05021E-21	2.45549E-29	3.85493E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	5.11107E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.06074E-17	1.06073E-17	1.06073E-17	1.06073E-17	1.06073E-17	1.06073E-17	1.06072E-17	1.06072E-17
MN	25	54	2.61565E+07	3.64946E-08	2.96933E-09	5.57542E-10	8.51782E-12	1.98807E-15	4.64006E-19	5.89955E-30	1.75070E-44
MN	25	56	9.29152E+03	1.25900E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	3.65009E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	2.63231E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	9.67291E-03	4.34638E-03	2.54982E-03	6.72142E-04	4.67050E-05	3.24538E-06	1.08886E-09	2.53856E-14
FE	26	59	3.89409E+06	1.14683E-04	5.50652E-12	7.27429E-17	4.61420E-29	1.85642E-53	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	5.04223E-05	3.39565E-05	2.60889E-05	1.34986E-05	3.61374E-06	9.67439E-07	1.85620E-08	9.53435E-11
TOTAL (CURIES/CC)				1.50674E-02	5.19476E-03	3.30270E-03	1.23362E-03	3.61891E-04	1.81405E-04	3.27252E-05	3.59184E-06
TOTAL (CURIES)				1.52919E+06	5.27216E+05	3.35191E+05	1.25200E+05	3.67283E+04	1.84108E+04	3.32128E+03	3.64536E+02

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COMPONENT : METAL SHELL FOR LARGE SIDE REFLECTOR - SEE ** BELOW
VOLUME : 3.88272E+05 CC
: ABOVE VOLUME IS FOR THE TOTAL NUMBER OF SHELLS IN THE PCRV
: ONE SHELL 1.6178-3 - 24 SHELLS PCRV TOTAL
: ** USE ORIGINAL CALC FROM TE284.REBATE.L133(LARGEREF)
: (INTERVAL 2 LARGEREF)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	SHUTDOWN	5.00 YRS	CONCENTRATION (CURIES/CC) AT TIME 5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
AL	13	28	1.38629E+02	3.78514E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	6.99108E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.00773E-13	8.65649E-37	3.63084E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.23672E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.26665E-17	1.26924E-18	2.73829E-19	5.91936E-21	2.76623E-24	1.29273E-27	1.31931E-37	6.29226E-51
V	23	52	2.02084E+02	2.03040E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	3.14565E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	2.29544E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	2.76937E-08	3.62993E-20	6.34749E-28	6.82521E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10945E+02	1.85905E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	3.38065E-21	3.38065E-21	3.38065E-21	3.38065E-21	3.38064E-21	3.38063E-21	3.38061E-21	3.38059E-21
MN	25	54	2.61565E+07	1.05218E-11	8.56091E-13	1.60746E-13	2.45579E-15	5.73184E-19	1.33778E-22	1.70091E-33	5.04748E-48
MN	25	56	9.29152E+03	7.73625E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	9.13389E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	6.06876E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	7.21498E-08	3.24154E-08	1.90166E-08	5.01285E-09	3.48327E-10	2.42941E-11	8.12078E-15	1.89327E-19
FE	26	59	3.89409E+06	3.72281E-09	1.78752E-16	2.36137E-21	1.49786E-33	6.02629E-58	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	5.34840E-09	3.60184E-09	2.76731E-09	1.43183E-09	3.83317E-10	1.02618E-10	1.96891E-12	1.01133E-14
TOTAL (CURIES/CC)				1.86280E-07	3.60181E-08	2.17841E-08	6.44468E-09	7.31644E-10	1.26822E-10	1.97703E-12	1.01135E-14
TOTAL (CURIES)				7.23271E-02	1.39848E-02	8.45614E-03	2.50229E-03	2.84[illegible]77E-04	4.92416E-05	7.67624E-07	3.92678E-09

COMPONENT : METAL CLAD BLOCK - NON CONTROL ROD WITH COOLANT HOLES RS
VOLUME : 1.81692E+06 CC
: ABOVE VOLUME IS THE TOTAL METAL VOLUME FOR THE NCR ELEMENTS
: WITH COOLANT HOLES. 210 ELEMENTS AT 8.652+3 CC EACH.
: VOLUME OF BORON GRANULES IS 5.51+3 CC.
: (INTERVALS 29-39 TOTCURRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	CONCENTRATION (CURIES/CC) AT TIME 5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
LI	3	8	8.40178E-01	1.71846E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	2.66747E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
GE	4	10	7.88563E+13	3.82920E-13	3.82920E-13	3.82920E-13	3.82919E-13	3.82918E-13	3.82917E-13	3.82914E-13	3.82909E-13
B	5	12	1.99754E-02	1.37545E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	1.26447E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	1.24712E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	2.28120E-08	1.95956E-31	8.21910E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.20590E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.18979E-11	1.19222E-12	2.57205E-13	5.56017E-15	2.59837E-18	1.21428E-21	1.23926E-31	5.91045E-45
V	23	52	2.02084E+02	1.21458E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	2.39361E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	2.25801E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	9.88843E-03	1.29612E-14	1.55233E-22	2.43704E-42	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	5.86632E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.32021E-15	1.32021E-15	1.32021E-15	1.32021E-15	1.32020E-15	1.32020E-15	1.32020E-15	1.32019E-15
MN	25	54	2.61565E+07	2.81750E-06	2.29242E-07	4.30441E-08	6.57604E-10	1.53486E-13	3.58228E-17	4.55465E-28	1.35160E-42
MN	25	56	9.29152E+03	3.61367E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	3.49960E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	3.26099E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.66265E-01	7.47086E-02	4.38280E-02	1.15532E-02	8.02797E-04	5.57838E-05	1.87162E-08	4.36345E-13
FE	26	59	3.89409E+06	1.97697E-03	9.49250E-11	1.25399E-15	7.95427E-28	3.20022E-52	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.82178E-03	1.22686E-03	9.42606E-04	4.87713E-04	1.30566E-04	3.49540E-05	6.70653E-07	3.44481E-09
ZR	40	88	7.20602E+06	1.32100E-12	1.46544E-16	3.38333E-19	8.66555E-26	5.68429E-39	3.72869E-52	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	1.24666E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	9.21946E-17	9.21945E-17	9.21944E-17	9.21942E-17	9.21937E-17	9.21933E-17	9.21920E-17	9.21903E-17
ZR	40	95	5.63534E+06	2.78211E-11	2.43849E-16	1.03663E-19	3.86255E-28	5.36243E-45	7.44474E-62	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	3.79833E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	3.72391E-14	3.71286E-14	3.70551E-14	3.68721E-14	3.65088E-14	3.61490E-14	3.50909E-14	3.37281E-14
NB	41	92	8.80746E+05	8.53442E-10	3.74100E-42	1.00198E-63	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	1.22064E-14	1.22051E-14	1.22042E-14	1.22021E-14	1.21979E-14	1.21937E-14	1.21810E-14	1.21641E-14
NB	41	95	3.02684E+06	2.45506E-10	9.43035E-20	4.98314E-26	1.01149E-41	4.16714E-73	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	4.13568E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	4.18424E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	1.04769E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	6.63431E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	1.56101E-10	1.56065E-10	1.56041E-10	1.55981E-10	1.55860E-10	1.55741E-10	1.55381E-10	1.54903E-10
MO	42	99	2.41515E+05	1.29580E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	7.21358E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				2.16307E-01	7.59356E-02	4.47706E-02	1.20409E-02	9.33363E-04	9.87380E-05	6.89525E-07	3.60058E-09
TOTAL (CURIES)				3.93812E+05	1.37969E+05	8.13446E+04	2.18774E+04	1.69585E+03	1.64864E+02	1.25281E+00	6.54196E-03

COMPONENT : METAL CLAD BLOCK - NON CONTROL ROD COLUMN WITHOUT COOLANT HOLES R5
VOLUME : 4.54140E+05 CC
: ABOVE VOLUME IS THE TOTAL METAL VOLUME FOR NCR ELEMENTS
: WITHOUT COOLANT HOLES.
: 60 ELEMENTS AT 7.569+3 CC EACH.
: (INTERVALS 29-39 TOTGUPRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
LI	3	8	8.40178E-01	1.71846E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	2.66747E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	3.82920E-13	3.82920E-13	3.82920E-13	3.82919E-13	3.82918E-13	3.82917E-13	3.82914E-13	3.82909E-13
B	5	12	1.99754E-02	1.37545E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.34629E+02	1.26447E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	1.24712E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	2.28120E-08	1.95956E-31	8.21910E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.20590E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.18979E-11	1.19222E-12	2.57205E-13	5.56017E-15	2.59837E-18	1.21428E-21	1.23926E-31	5.91045E-45
V	23	52	2.02084E+02	1.21458E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19022E+02	2.39361E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	2.25801E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	9.88843E-03	1.29612E-14	1.55233E-22	2.43704E-42	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	5.86632E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.32021E-15	1.32021E-15	1.32021E-15	1.32021E-15	1.32020E-15	1.32020E-15	1.32020E-15	1.32019E-15
MN	25	54	2.61565E+07	2.81750E-06	2.29242E-07	4.30441E-08	6.57604E-10	1.53486E-13	3.58228E-17	4.55465E-28	1.35160E-42
MN	25	56	9.29152E+03	3.61367E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	3.49980E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	3.26099E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.66265E-01	7.47086E-02	4.38280E-02	1.15532E-02	8.02797E-04	5.57830E-05	1.87162E-08	4.36345E-13
FE	26	59	3.89409E+06	1.97697E-03	9.49250E-11	2.25399E-15	7.95427E-28	3.26022E-52	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.82178E-03	1.22686E-03	9.42606E-04	4.87713E-04	1.30566E-04	3.49540E-05	6.70653E-07	3.44481E-09
ZR	40	88	7.20602E+06	1.32100E-12	1.46544E-16	3.38333E-19	8.66555E-26	5.68429E-39	3.72869E-52	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	1.24666E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	9.21946E-17	9.21945E-17	9.21944E-17	9.21942E-17	9.21937E-17	9.21933E-17	9.21920E-17	9.21903E-17
ZR	40	95	5.63534E+06	2.78211E-11	2.43849E-16	1.03663E-19	3.86255E-28	5.36243E-45	7.44474E-62	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	3.79833E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	3.72391E-14	3.71286E-14	3.70551E-14	3.68721E-14	3.65088E-14	3.61490E-14	3.50909E-14	3.37281E-14
NB	41	92	8.80746E+05	8.53442E-10	3.74100E-42	1.00198E-63	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	1.22064E-14	1.22051E-14	1.22042E-14	1.22021E-14	1.21979E-14	1.21937E-14	1.21810E-14	1.21641E-14
NB	41	95	3.02684E+06	2.45506E-10	9.43035E-20	4.98314E-26	1.01149E-41	4.16714E-73	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	4.13568E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	4.18424E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	1.04769E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	6.63431E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	1.56101E-10	1.56065E-10	1.56041E-10	1.55981E-10	1.55860E-10	1.55741E-10	1.55381E-10	1.54903E-10
MO	42	99	2.41515E+05	1.29580E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	7.21358E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				2.16307E-01	7.59356E-02	4.47706E-02	1.24089E-02	9.33363E-04	9.07380E-05	6.89525E-07	3.60058E-09
TOTAL (CURIES)				9.82336E+04	3.44854E+04	2.03321E+04	5.46827E+03	4.23877E+02	4.12077E+01	3.13141E-01	1.63517E-03

COMPONENT : ORIFICE VALVE - R5
VOLUME : 1.59200E+06 CC
: ABOVE VOLUME IS THE TOTAL VOLUME OF ALL ORIFICE VALVES AND
: LOWER GUIDE TUBES.
: 37 TOTAL DEVICES AT 4.302+4 CC EACH.
: (INTERVALS 36-39 UPOVRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
SI	14	31	9.43057E+03	8.16166E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.78782E-08	1.53575E-31	6.44148E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	52	2.02084E+02	1.09986E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	5.84930E-08	7.66692E-20	9.18251E-28	1.44158E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	7.23835E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	6.93264E-16	6.93263E-16	6.93263E-16	6.93262E-16	6.93261E-16	6.93260E-16	6.93256E-16	6.93251E-16
MN	25	54	2.61565E+07	1.32577E-06	1.07869E-07	2.02543E-08	3.09434E-10	7.22224E-14	1.68564E-17	2.14318E-28	6.35994E-43
MN	25	56	9.29152E+03	4.23036E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.70119E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.70459E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	4.18330E-04	1.87971E-04	1.10273E-04	2.90685E-05	2.01988E-06	1.40355E-07	4.70908E-11	1.09787E-15
FE	26	59	3.89409E+06	9.25611E-06	4.44435E-13	5.87113E-18	3.72416E-30	1.49833E-54	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.07787E-04	7.25881E-05	5.57697E-05	2.88558E-05	7.72502E-06	2.06807E-06	3.96795E-08	2.03814E-10
TOTAL (CURIES/CC)				9.59845E-04	2.60667E-04	1.66063E-04	5.79246E-05	9.74490E-06	2.20843E-06	3.97266E-08	2.03816E-10
TOTAL (CURIES)				1.52807E+03	4.14981E+02	2.64373E+02	9.22160E+01	1.55139E+01	3.51582E+00	6.32447E-02	3.[illegible]474E-[illegible]

COMPONENT : RADIAL COVER PLATE - R5
VOLUME : 4.45840E+06 CC
: ABOVE VOLUME IS FOR BOTH LAYERS OF THE COVER PLATES
: ON THE SIDES OF THE PCRV ABOVE THE CSF.
:
: (INTERVAL 58 TOTGRDRS)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
AL	13	28	1.38629E+02	1.83549E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	2.47918E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	5.66557E-11	4.86676E-34	2.04179E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	52	2.82084E+02	1.99352E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	2.46020E-10	3.22468E-23	3.86213E-30	9.86324E-58	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	7.10045E+02	1.27973E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	3.64215E-18	3.64215E-18	3.64214E-18	3.64214E-18	3.64213E-18	3.64213E-18	3.64211E-18	3.64208E-18
MN	25	54	2.61565E+07	5.13985E-09	4.18171E-10	7.85189E-11	1.49957E-12	2.79981E-16	6.53462E-20	8.30836E-31	2.46552E-45
MN	25	56	9.29152E+03	1.28156E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	7.35622E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	8.84024E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.30395E-07	5.85910E-08	3.43727E-08	9.06078E-09	6.29604E-10	4.37492E-11	1.46784E-14	3.42210E-19
FE	26	59	3.84609E+06	6.76759E-09	3.24946E-16	4.29267E-21	1.72291E-33	1.09550E-57	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	7.89382E-09	5.31602E-09	4.98432E-09	2.41327E-09	5.65745E-10	1.51456E-10	2.90595E-12	1.49264E-14
TOTAL (CURIES/CC)				1.65251E-07	6.43254E-08	3.85355E-08	1.11752E-08	1.19535E-09	1.95206E-10	2.92063E-12	1.49304E-14
TOTAL (CURIES)				7.36753E-01	2.86788E-01	1.71887E-01	4.98237E-02	5.32935E-03	8.70305E-04	1.30213E-05	6.65656E-08

COMPONENT : RADIAL KAOWOOL - R5
VOLUME : 2.55900E+07 CC
: ABOVE VOLUME IS FOR BOTH LAYERS OF KAOWOOL
: ON THE SIDES OF THE PCRV ABOVE THE CSF.
:
: (INTERVAL 59 TOTGRDRS)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
LI	3	8	8.40178E-01	1.21694E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.22448E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	3.77047E-19	3.77046E-19	3.77046E-19	3.77046E-19	3.77044E-19	3.77043E-19	3.77040E-19	3.77036E-19
B	5	12	1.99754E-02	5.18622E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80976E+11	6.87197E-15	6.86948E-15	6.86782E-15	6.86367E-15	6.85538E-15	6.84710E-15	6.82237E-15	6.78942E-15
F	9	20	1.10023E+01	1.16372E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	1.70778E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	4.13295E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	4.80478E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	1.35578E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	2.98036E-12	1.14482E-21	6.04940E-28	1.22793E-43	5.05879E-75	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	1.61292E-17	1.60049E-17	1.59226E-17	1.57187E-17	1.53186E-17	1.49287E-17	1.38175E-17	1.24635E-17
CA	20	41	2.52053E+12	2.98595E-15	2.98587E-15	2.98587E-15	2.98569E-15	2.98543E-15	2.98517E-15	2.98439E-15	2.98336E-15
CA	20	45	1.42623E+07	3.36171E-12	3.37543E-14	1.57100E-15	7.34164E-19	1.60332E-25	3.50146E-32	3.64702E-52	8.29566E-79
CA	20	47	3.91608E+05	6.67489E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25849E+06	2.29520E-12	2.69243E-16	6.45196E-19	1.81374E-25	1.43323E-38	1.13253E-51	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	2.83965E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	6.11297E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	2.66957E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	1.02062E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.19849E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				1.44805E-08	4.38953E-14	1.14416E-14	9.86619E-15	9.85650E-15	9.84757E-15	9.82090E-15	9.78561E-15
TOTAL (CURIES)				3.70556E-01	1.12328E-06	2.92790E-07	2.52476E-07	2.52228E-07	2.51999E-07	2.51317E-07	2.50414E-07

COMPONENT : RADIAL PCRV LINER - R5
VOLUME : 7.00000E+06 CC
: ABOVE VOLUME IS FOR THE PCRV LINER AND COOLING TUBES
: ON THE SIDES OF THE PCRV ABOVE THE CSF.
:
: (INTERV 60 TOTGRDRS)

NUCLIDE SYM Z M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	50.00 YRS	60.00 YRS	100.00 YRS
AL 13 28	1.38629E+02	8.62084E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI 14 31	9.43057E+03	1.05390E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P 15 32	1.23556E+06	2.19739E-10	1.88756E-33	7.91716E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI 22 51	3.48315E+02	1.80647E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V 23 49	2.85246E+07	1.85082E-14	1.85459E-15	4.00102E-16	8.64928E-18	4.04197E-21	1.88891E-24	1.92776E-34	9.19416E-48
V 23 52	2.02084E+02	1.53388E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V 23 53	1.19922E+02	2.95678E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V 23 54	5.50117E+01	3.50586E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR 24 51	2.39843E+06	3.38094E-08	4.43154E-20	5.30756E-28	8.33275E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR 24 55	2.10045E+02	1.56079E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN 25 53	1.16760E+14	1.73857E-17	1.73857E-17	1.73857E-17	1.73857E-17	1.73857E-17	1.73857E-17	1.73856E-17	1.73854E-17
MN 25 54	2.61565E+07	2.42446E-08	1.97263E-09	3.70394E-10	5.65868E-12	1.32074E-15	3.08255E-19	3.91927E-30	1.16305E-44
MN 25 56	9.29152E+03	3.08770E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN 25 57	1.01933E+02	3.45830E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN 25 58	6.60140E+01	4.21157E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE 26 55	8.20292E+07	3.05247E-06	1.37159E-06	8.04644E-07	2.12107E-07	1.47387E-08	1.02414E-09	3.43612E-15	8.01092E-18
FE 26 59	3.89409E+06	6.41219E-08	3.07883E-15	4.06724E-20	2.57992E-32	1.03791E-56	0.00000E+00	0.00000E+00	0.00000E+00
FE 26 60	3.15569E+12	5.56294E-22	5.56282E-22	5.56275E-22	5.56256E-22	5.56217E-22	5.56178E-22	5.56063E-22	5.55909E-22
FE 26 61	3.60001E+02	6.92727E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO 27 57	2.34838E+07	2.19837E-12	1.34439E-13	2.08677E-14	1.98086E-16	1.78483E-20	1.60820E-24	1.17647E-36	7.75473E-53
CO 27 58	6.13405E+06	1.02789E-09	2.32194E-14	1.85549E-17	3.34946E-25	2.09142E-40	3.55640E-56	0.00000E+00	0.00000E+00
CO 27 60	1.65983E+08	6.90553E-08	4.65047E-08	3.57298E-08	1.84869E-08	4.94915E-09	1.32494E-09	2.54213E-11	1.30576E-13
CO 27 61	5.94007E+03	8.13657E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO 27 62	8.34012E+02	6.83679E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO 27 64	2.99999E-01	1.89550E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI 28 59	2.52053E+12	2.83693E-12	2.83686E-12	2.83681E-12	2.83668E-12	2.83644E-12	2.83619E-12	2.83545E-12	2.83447E-12
NI 28 63	2.90020E+09	3.53158E-10	3.45237E-10	3.40068E-10	3.27483E-10	3.03692E-10	2.81629E-10	2.24600E-10	1.66107E-10
NI 28 65	9.21738E+03	4.65770E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]	0.00000E+00
CU 29 64	4.62098E+04	1.58714E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]	0.00000E+00
ZR 40 88	7.20602E+06	1.13018E-15	1.25375E-19	2.89460E-22	7.41379E-29	4.86318E-42	3.19008E-55	[illegible]	0.00000E+00
ZR 40 89	2.82249E+05	1.16989E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR 40 93	4.74758E+13	8.46618E-20	8.46617E-20	8.46616E-20	8.46615E-20	8.46611E-20	8.46607E-20	8.46595E-20	8.46580E-20
ZR 40 95	5.63534E+06	2.66702E-14	2.33762E-19	9.93748E-23	3.70277E-31	5.14060E-48	7.13677E-65	0.00000E+00	0.00000E+00
ZR 40 97	6.04840E+04	3.74989E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 91	2.20888E+10	4.03123E-17	3.98937E-17	3.98147E-17	3.96181E-17	3.92277E-17	3.88411E-17	3.77042E-17	3.62599E-17
NB 41 92	8.80746E+05	7.4754E-13	3.22074E-45	8.62635E-67	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 94	6.30134E+11	1.12070E-17	1.12058E-17	1.12050E-17	1.12031E-17	1.11992E-17	1.11953E-17	1.11836E-17	1.11681E-17
NB 41 95	3.02684E+06	2.15040E-13	8.26010E-25	4.36476E-29	8.85973E-45	3.65002E-76	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 96	8.28132E+04	4.00410E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 97	4.33217E+03	3.82321E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 98	3.06025E+03	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 100	3.09994E+00	7.29168E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO 42 93	2.84077E+11	9.74333E-14	9.74108E-14	9.73958E-14	9.73583E-14	9.72834E-14	9.72085E-14	9.69842E-14	9.66860E-14
MO 42 99	2.41515E+05	6.46088E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO 42 101	8.76292E+02	2.71454E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)		6.50254E-06	1.42041E-06	8.41087E-07	2.30930E-07	1.99964E-08	2.63365E-09	2.53297E-10	1.69169E-10
TOTAL (CURIES)		4.55178E+01	9.94286E+00	5.88761E+00	1.61651E+00	1.39961E-01	1.84355E-02	1.77308E-03	1.18418E-03

COMPONENT : REFLECTOR KEYS - KEYS THE CORE BARREL AND THE LPS SIDE REF
VOLUME : 3.81820E+05 CC
: ABOVE VOLUME IS FOR THE TOTAL NUMBER OF KEYS IN THE CORE.
: ONE KEY : 1.5909+4 CC - 24 KEYS TOTAL.
: THIS CALC SAME AS R1 - FILE T8284.REBATE.L133(REFLKEY)
: (INTERVAL 2 REFLKEY)

NUCLIDE SYM Z M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
AL 13 28	1.38629E+02	1.66529E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI 14 31	9.43057E+03	4.98549E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P 15 32	1.23556E+06	1.00645E-13	8.64551E-37	3.62623E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V 23 52	2.02084E+02	3.83216E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR 24 51	2.39843E+06	4.75446E-13	6.23187E-25	7.46377E-33	1.17175E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR 24 55	2.10045E+02	3.60893E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN 25 53	1.16760E+14	3.43052E-21	3.43052E-21	3.43052E-21	3.43051E-21	3.43051E-21	3.43050E-21	3.43048E-21	3.43045E-21
MN 25 54	2.61565E+07	1.06770E-11	8.68720E-13	1.63117E-13	2.49201E-15	5.81639E-19	1.35752E-22	1.72600E-33	5.12194E-48
MN 25 56	9.29152E+03	1.52311E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN 25 57	1.01933E+02	9.26864E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN 25 58	6.60140E+01	6.15830E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE 26 55	8.20292E+07	7.32050E-08	3.28934E-08	1.92971E-08	5.08680E-09	3.53465E-10	2.45612E-11	8.24058E-15	1.92119E-19
FE 26 59	3.89409E+06	3.77773E-09	1.81389E-16	2.39621E-21	1.51995E-33	6.11519E-58	0.00000E+00	0.00000E+00	0.00000E+00
CO 27 60	1.65983E+08	5.34175E-09	3.59736E-09	2.76387E-09	1.43005E-09	3.82840E-10	1.02491E-10	1.96646E-12	1.01007E-14
TOTAL (CURIES/CC)		2.34647E-07	3.64919E-08	2.20612E-08	6.51685E-09	7.36306E-10	1.27052E-10	1.97470E-12	1.01009E-14
TOTAL (CURIES)		8.95929E-02	1.39333E-02	8.42339E-03	2.48826E-03	2.81136E-04	4.85109E-05	7.53979E-07	3.85673E-09

COMPONENT : SILICA INSULATION BLOCKS - RS
VOLUME : 9.15705E+06 CC
: ABOVE VOLUME IS THE TOTAL VOLUME OF ALL THREE LAYERS OF
: SILICA INSULATION, 2 LAYERS OF GLASSROCK AND 1 LAYER OF
: MASSROCK.
: (INTERVAL 56 TOTGDNRS)

NUCLIDE SYM	Z	A	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
LI	3	8	8.40178E-01	5.04127E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00066E-16	5.74092E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	6.39171E-18	6.39170E-18	6.39170E-18	6.39169E-18	6.39167E-18	6.39166E-18	6.39160E-18	6.39153E-18
B	5	12	1.99756E-02	2.28853E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	3.45563E-12	3.45458E-12	3.45354E-12	3.45144E-12	3.44729E-12	3.44312E-12	3.43066E-12	3.41411E-12
F	9	20	1.10023E+01	5.09630E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	8.24589E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	8.58652E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	2.37050E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	5.12109E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	6.95119E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23356E+06	1.69035E-11	1.56612E-34	5.72999E-53	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	1.46673E-12	1.63397E-23	2.97708E-28	3.94207E-44	2.48957E-75	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.4840[illegible]E+09	7.52036E-18	7.46242E-18	7.42404E-18	7.32895E-18	7.14240E-18	6.96061E-18	[illegible]	5.81171E-18
CA	20	41	2.52055E+12	2.01976E-12	2.01968E-12	2.01965E-12	2.01956E-12	2.01939E-12	2.01921E-12	[illegible]	2.01798E-12
CA	20	45	1.42623E+07	7.76399E-10	7.78563E-12	3.62360E-13	1.69339E-16	3.69815E-23	8.07634E-30	8.42208E-50	1.91366E-76
CA	20	47	3.91608E+05	4.02543E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.08552E-12	2.27339E-16	3.05146E-19	8.57810E-26	6.77847E-39	5.35631E-52	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	1.22417E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	2.63220E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.4[illegible]849E+03	1.27687E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	4.04708E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	4.65786E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	6.35847E-16	6.36139E-17	1.37025E-17	2.96311E-19	1.38425E-22	6.46895E-26	6.60197E-36	3.14871E-49
V	23	52	2.02084E+02	5.81179E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	1.16616E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.60117E+01	1.20268E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	2.98670E-07	3.91480E-19	4.68867E-27	7.36083E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	3.16968E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	8.38656E-19	8.38655E-19	8.38655E-19	8.38654E-19	8.38652E-19	8.38651E-19	8.38646E-19	8.38640E-19
MN	25	54	2.61365E+07	1.44654E-09	1.17859E-10	2.21300E-11	3.38089E-13	7.89105E-17	1.84173E-20	2.34165E-31	6.94889E-46
MN	25	56	9.29152E+03	1.28395E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.96369E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	2.46706E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	[illegible]78E-05	2.69232E-05	1.67945E-05	4.16351E-06	2.89509E-07	2.01031E-08	6.74485E-12	1.57248E-16
FE	26	59	3.89409E+06	[illegible]33E-07	3.41597E-14	4.51260E-19	2.86247E-31	1.15163E-55	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	9.20921E-23	9.20902E-23	9.20889E-23	9.20857E-23	9.20793E-23	9.20730E-23	9.20538E-23	9.20283E-23
FE	26	61	3.60001E+02	1.14397E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	3.63463E-13	2.22272E-14	3.45012E-15	3.27499E-17	2.95091E-21	2.65889E-25	1.94510E-37	1.28211E-53
CO	27	58	6.13405E+06	2.00319E-10	4.52511E-15	3.61608E-18	6.57539E-26	2.12701E-41	6.93087E-57	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	[illegible]80E-06	6.91487E-07	5.31273E-07	2.74885E-07	7.35899E-08	1.97008E-08	3.77994E-10	1.94157E-12
CO	27	61	5.94007E+03	[illegible]9E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	[illegible]E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.9999[illegible]E-01	[illegible]4E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	1.71923E-18	1.71918E-18	1.71915E-18	1.71908E-18	1.71893E-18	1.71878E-18	1.71833E-18	1.71774E-18
NI	28	63	2.90020E+09	2.45455E-08	2.39965E-08	2.36371E-08	2.27625E-08	2.11086E-08	1.95751E-08	1.56112E-08	1.15456E-08
NI	28	65	9.21738E+03	4.59565E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	3.55592E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				8.00688E-05	2.76309E-05	1.63496E-05	4.46133E-06	3.84185E-07	5.95564E-08	1.61735E-08	1.17247E-08
TOTAL (CURIES)				7.33196E+02	2.53091E+02	1.49714E+02	4.08526E+01	3.51800E+00	5.45361E-01	1.48099E-01	1.07364E-01

COMPONENT : TOP HEAD COVER PLATES - R5
VOLUME : 1.05700E+06 CC
: ABOVE VOLUME IS FOR BOTH LAYERS OF COVER PLATES
: ON THE TOP HEAD OF THE PCRV.
:
: (INTERVAL 43 TOTGURMS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	50.00 YRS	60.00 YRS	100.00 YRS
				CONCENTRATION (CURIES/CC) AT TIME							
AL	13	28	1.38629E+02	3.81797E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	4.83632E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.10523E-09	9.44400E-33	3.98212E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	52	2.02884E+02	3.7958[illegible]E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	4.38878E-09	5.75256E-21	6.88972E-29	1.08163E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10845E+02	2.07507E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	5.83562E-17	5.83561E-17	5.83561E-17	5.83561E-17	5.83560E-17	5.83559E-17	5.83555E-17	5.83551E-17
MN	25	54	2.61565E+07	9.97625E-08	8.11703E-09	1.52411E-09	2.52885E-11	3.47494E-15	1.26842E-18	1.61272E-29	4.78577E-44
MN	25	56	9.29152E+03	7.51776E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.31922E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.69140E+01	1.42176E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	3.11907E-05	5.02837E-06	2.96991E-06	7.77607E-07	5.40334E-08	3.75461E-09	1.25972E-12	2.93648E-17
FE	26	59	3.89409E+06	4.54697E-07	2.18326E-14	2.88415E-19	1.82945E-31	7.36039E-56	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65583E+08	5.64697E-07	3.93759E-07	3.02527E-07	1.56530E-07	4.19049E-08	1.[illegible]184E-08	2.15244E-10	1.10560E-12
TOTAL (CURIES/CC)				1.98[illegible]6E-05	5.43025E-06	3.25396E-06	9.34161E-07	9.59583E-08	1.49730E-08	2.16504E-10	1.10569E-12
TOTAL (CURIES)				2.10265E+01	[illegible].73977E+00	3.43943E+00	9.87408E-01	1.01407E-01	1.58265E-02	2.28845E-04	1.16871E-06

COMPONENT : TOP HEAD - KAOWOOL - R5
VOLUME : 7.27800E+06 CC
: ABOVE VOLUME IS FOR BOTH LAYERS OF KAOWOOL
: ON THE TOP HEAD OF THE PCRV.
:
: (INTERVAL 44 TOTGURMS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	50.00 YRS	60.00 YRS	100.00 YRS
				CONCENTRATION (CURIES/CC) AT TIME							
LI	3	8	8.40178E-01	2.28943E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	2.81216E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	8.54431E-18	8.54431E-18	8.54430E-18	8.54429E-18	8.54426E-18	8.54424E-18	8.54417E-18	8.54408E-18
B	5	12	1.99754E-02	3.49322E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	4.89937E-13	4.89759E-13	4.89641E-13	4.89345E-13	4.88754E-13	4.88164E-13	4.86397E-13	4.84851E-13
F	9	20	1.10023E+01	2.23649E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	3.56857E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41821E+04	1.08837E-43	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	1.03950E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	8.32208E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	6.55911E-11	2.51179E-20	1.32727E-26	2.69614E-47	1.10995E-73	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	3.29327E-16	3.26798E-16	3.25109E-16	3.20946E-16	3.12776E-16	3.04[illegible]15E-16	2.82127E-16	2.54481E-16
CA	20	41	2.57051E+12	1.59928E-13	1.59924E-13	1.59921E-13	1.59914E-13	1.59900E-13	1.59[illegible]E-13	1.59845E-13	1.59709E-13
CA	20	45	1.42623E+07	1.61457E-10	1.62117E-12	7.54528E-14	3.52609E-17	7.70053E-24	1.63171E-50	1.75162E-50	3.98430E-77
CA	20	47	3.91608E+05	3.33238E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	5.89565E-11	5.87195E-15	1.40712E-17	3.95561E-24	3.12575E-37	2.46495E-50	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	6.30716E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58255E+05	1.29608E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.46849E+03	5.91392E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.63147E+02	1.92273E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	8.19381E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				8.62786E-07	2.27764E-12	7.25363E-13	6.49624E-13	6.40976E-13	6.48366E-13	6.46533E-13	6.44103E-13
TOTAL (CURIES)				6.27936E+00	1.65725E-05	5.27919E-06	4.72796E-06	4.72325E-06	4.71879E-06	4.70546E-06	4.68778E-06

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COMPONENT : TOP HEAD LINER - R5
VOLUME : 1.60000E+06 CC
: ABOVE VOLUME IS FOR THE PCRV LINER AND COOLING TUBES
: ON THE TOP HEAD OF THE PCRV.
:
: (INTERVAL 45 TOTQUPRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	SHUTDOWN	CONCENTRATION (CURIES/CC) AT TIME 5.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
AL	13	28	1.38629E+02	1.70419E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	2.35156E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	6.89527E-09	4.20507E-32	1.76375E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.40315E+02	3.51805E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85256E+07	3.36914E-13	3.37691E-14	7.28327E-15	1.57448E-16	7.35782E-20	5.43849E-25	3.50920E-33	1.67366E-46
V	23	52	2.02084E+02	3.26349E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	5.85703E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	6.38470E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39943E+06	1.95544E-06	2.56304E-18	3.06975E-26	1.01926E-46	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	3.26343E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	3.16483E-16	3.16483E-16	3.16483E-16	3.16483E-16	3.16482E-16	3.16482E-16	3.16480E-16	3.16478E-16
MN	25	54	2.61565E+07	5.36019E-07	4.36123E-08	8.16097E-09	1.25107E-10	2.92000E-14	6.81515E-18	8.66504E-29	2.57137E-43
MN	25	56	9.29152E+03	1.59237E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	7.04722E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	7.70170E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.40119E-04	6.29605E-05	3.69359E-05	9.73646E-06	6.76555E-07	4.70117E-08	1.57730E-11	3.67129E-16
FE	26	59	3.89409E+06	3.18037E-06	1.52707E-13	2.01730E-18	1.27961E-30	5.14622E-55	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	1.01336E-20	1.01333E-20	1.01332E-20	1.01328E-20	1.01321E-20	1.01314E-20	1.01293E-20	1.01265E-20
FE	26	61	3.60071E+02	1.26107E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	4.00527E-11	2.44815E-12	3.00004E-13	5.60714E-15	3.25020E-19	2.92857E-23	2.14238E-35	1.41215E-51
CO	27	58	6.13495E+06	2.26946E-08	5.08139E-13	4.06061E-16	7.33004E-24	2.38849E-39	7.78209E-55	0.00000E+00	0.00000E+00
CO	27	60	1.65973E+08	5.72142E-06	2.50616E-06	1.92549E-06	9.96268E-07	2.66712E-07	7.14018E-08	1.36997E-09	7.03683E-12
CO	27	61	3.96007E+03	1.71408E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	1.14190E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99990E-01	2.45070E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	1.46607E-10	1.46603E-10	1.46600E-10	1.46594E-10	1.46581E-10	1.46569E-10	1.46530E-10	1.46480E-10
NI	28	63	2.90020E+09	1.72152E-08	1.68300E-08	1.65761E-08	1.59645E-08	1.48047E-08	1.37292E-08	1.09491E-08	8.09759E-09
NI	28	65	9.21736E+03	9.83719E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	7.41958E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	2.26937E-14	2.60641E-18	5.78667E-21	1.48211E-27	9.72211E-41	6.37736E-54	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	2.25372E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	1.64751E-18	1.64751E-18	1.64750E-18	1.64750E-18	1.64749E-18	1.64748E-18	1.64746E-18	1.64743E-18
ZR	40	95	5.63554E+06	5.08899E-13	4.56046E-18	1.89619E-21	7.06533E-30	9.80890E-47	1.36178E-63	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	7.86327E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	7.37719E-16	7.30446E-16	7.291[illegible]	7.25499E-16	7.18350E-16	7.11271E-16	6.90451E-16	6.63637E-16
NB	41	92	8.80746E+05	1.47545E-11	6.46752E-44	1.732[illegible]-65	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	2.18107E-16	2.18065E-16	2.180[illegible]-16	2.18032E-16	2.17956E-16	2.17880E-16	2.17654E-16	2.17352E-16
NB	41	95	3.02684E+06	4.27848E-12	1.64345E-21	8.684[illegible]E-28	1.76275E-43	7.26216E-75	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	7.60549E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	7.45424E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	2.82109E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	1.92873E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84277E+11	2.97722E-12	2.97653E-12	2.97607E-12	2.97493E-12	2.97264E-12	2.97035E-12	2.96349E-12	2.95438E-12
MO	42	99	2.41515E+05	2.38291E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	1.05703E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				3.16589E-04	6.55272E-05	3.88863E-05	1.07490E-05	9.58221E-07	1.32292E-07	1.26843E-08	8.13406E-09
TOTAL (CURIES)				5.06542E+02	1.04844E+02	6.22181E+01	1.71985E+01	1.53315E+00	2.11667E-01	1.99749E-02	1.32065E-02

COMPONENT : REGION CONSTRAINT DEVICE, PRIMARY BODY - REV 5
VOLUME : 8.41760E+05 CC
: ABOVE VOLUME IS THE TOTAL VOLUME OF THE RCD PRIMARY BODY
: FOR ALL THE DEVICES.
: 84 TOTAL AT 1.0021E+4 CC EACH.
: (INTERVAL 39 , UPRCDRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	SHUTDOWN	CONCENTRATION (CURIES/CC) AT TIME 3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
AL	13	28	1.38629E+02	2.70830E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	4.50392E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	9.39083E-09	6.06680E-32	3.58350E-57	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	52	2.02084E+02	9.24294E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39943E+06	4.61659E-08	6.05116E-20	7.24735E-28	1.13778E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	6.96144E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	5.64604E-16	5.64604E-16	5.64604E-16	5.64603E-16	5.64602E-16	5.64601E-16	5.64598E-16	5.64594E-16
MN	25	54	2.61565E+07	1.04055E-06	8.46629E-08	1.58969E-08	2.42866E-10	5.66849E-14	1.32300E-17	1.68211E-28	4.99169E-43
MN	25	56	9.29152E+03	2.52677E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.34784E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.38461E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.75706E-04	7.89510E-05	4.63168E-05	1.22093E-05	8.48384E-07	5.89515E-08	1.97790E-11	4.61123E-16
FE	26	59	3.89409E+06	5.37722E-06	2.58189E-13	3.41076E-18	2.16350E-30	8.70436E-55	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	6.74098E-06	4.53966E-06	3.48784E-06	1.80464E-06	4.83123E-07	1.29337E-07	2.48156E-09	1.27465E-11
TOTAL (CURIES/CC)				4.41648E-04	8.35753E-05	4.98205E-05	1.40142E-05	1.33151E-06	1.88289E-07	2.50134E-09	1.27475E-11
TOTAL (CURIES)				3.71761E+02	7.03503E+01	4.19369E+01	1.17966E+01	1.12081E+00	1.58496E-01	2.10552E-03	1.07304E-05

COMPONENT : REGION CONSTRAINT DEVICE , LEGS ONLY - REVS
VOLUME : 1.05840E+05 CC
: ABOVE VOLUME IS THE TOTAL VOLUME OF THE RCD LEGS
: FOR ALL THE DEVICES.
: 84 TOTAL AT 1.26E+3 CC EACH.
: (INTERVALS 36-38 , UPRCDRS)

NUCLIDE SYM	Z	A	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
				CONCENTRATION (CURIES/CC) AT TIME							
LI	3	8	8.40178E-01	5.17105E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	7.27597E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	2.68984E-16	2.68983E-16	2.68983E-16	2.68983E-16	2.68982E-16	2.68981E-16	2.68979E-16	2.68976E-16
B	5	12	1.99754E-02	2.68445E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	4.73294E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	2.73512E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	4.99402E-09	4.28990E-32	1.79933E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	45	1.42623E+07	2.27259E-10	2.28186E-12	1.06205E-13	4.96310E-17	1.08388E-23	2.36706E-30	2.46547E-50	5.60804E-77
CA	20	47	3.91608E+05	1.86008E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	4.60007E-09	3.39619E-13	1.29311E-15	3.63511E-22	2.87249E-35	2.26983E-48	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	5.91446E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58255E+05	1.05069E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	5.46363E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	1.59114E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48514E+02	2.17676E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	5.67292E-11	5.68448E-12	1.22635E-12	2.65108E-14	1.23890E-17	5.78968E-21	5.90875E-31	2.81809E-44
V	23	52	2.02084E+02	5.21527E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	1.07992E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	1.07621E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	4.73665E-04	6.20855E-16	7.43582E-24	1.16736E-43	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	2.35317E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.66652E-16	1.66652E-16	1.66652E-16	1.66652E-16	1.66651E-16	1.66651E-16	1.66650E-16	1.66649E-16
MN	25	54	2.61565E+07	3.21667E-07	2.61719E-08	4.91423E-09	7.50769E-11	1.75231E-14	4.08979E-18	5.19992E-29	1.54309E-43
MN	25	56	9.29152E+03	1.46959E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	4.11855E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	4.10037E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.13336E-04	5.09260E-05	2.98759E-05	7.87540E-06	5.47236E-07	3.80257E-08	1.27581E-11	2.97440E-16
FE	26	59	3.89409E+06	2.40216E-06	1.15540E-13	1.52368E-18	9.66499E-31	3.88849E-55	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	4.72020E-18	4.72010E-18	4.72004E-18	4.71988E-18	4.71955E-18	4.71922E-18	4.71824E-18	4.71693E-18
FE	26	61	3.60001E+02	5.86474E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	1.86319E-08	1.13942E-09	1.76861E-10	1.67883E-12	1.51270E-16	1.36301[illegible]	9.97181E-33	6.57241E-49
CO	27	58	6.13405E+06	1.19696E-05	2.70387E-10	2.16070E-13	3.90041E-21	1.27095E-36	4.14138E-51	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	6.32846E-04	4.26185E-04	3.27440E-04	1.69420E-04	4.53558E-05	1.21422E-05	1.32979E-07	1.19665E-09
CO	27	61	5.94007E+03	8.95895E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	2.96276E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	1.60482E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	1.02778E-07	1.02776E-07	1.02774E-07	1.02769E-07	1.02760E-07	1.02751E-07	1.02725E-07	1.02689E-07
NI	28	63	2.90020E+09	1.22395E-05	1.19656E-05	1.17865E-05	1.13503E-05	1.05257E-05	9.76102E-06	7.78445E-06	5.75712E-06
NI	28	65	9.21738E+03	2.17844E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	66	4.62098E+04	2.10402E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	2.11592E-11	0.000[illegible]E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	1.31594E-09	0.00[illegible]E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	1.71453E-14	1.71452E-14	1.71452E-14	1.71452E-14	1.71451E-14	1.71450E-14	1.71448E-14	1.71445E-14
NB	41	92	8.80746E+05	6.17247E-09	2.76566E-41	7.24678E-63	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	4.68709E-08	4.68660E-08	4.68628E-08	4.68546E-08	4.68384E-08	4.68221E-08	4.67734E-08	4.67085E-08
TOTAL (CURIES/CC)				1.41579E-03	4.89254E-04	3.69257E-04	1.88796E-04	5.65783E-05	2.20908E-05	8.16693E-06	5.90772E-06
TOTAL (CURIES)				1.49848E+02	5.17826E+01	3.90821E+01	1.99821E+01	5.98874E+00	2.33809E+00	8.64388E-01	6.25273E-01

COMPONENT : BORONATED BOTTOM REFLECTOR WITH HASTELLOY-X CANS - RS
VOLUME : 8.28520E+04 CC
: ABOVE VOLUME IS FOR THE TOTAL NUMBER OF HASTELLOY-X CANS ONLY.
: ONE CAN = 4.13 CC. BOTTOM NCA ELEMENTS, 208 ELE W/72 CANS.
: CR ELE, 37 W/9 CANS. BOTT NCA SIDE ELE, 64 ELE W/72 CANS.
: (INTERVALS 25-32 HASTXNRS)

NUCLIDE SYM	Z	A	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
				CONCENTRATION (CURIES/CC) AT TIME							
NA	11	24	5.41521E+04	8.05154E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	3.48970E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	1.77308E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48515E+02	1.80751E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.76938E-09	1.77290E-10	3.82497E-11	8.26871E-13	3.86412E-16	1.80580E-19	1.84296E-29	8.78961E-43
V	23	52	2.02084E+02	2.50451E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	4.22507E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	3.35918E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	3.40815E-02	4.46721E-14	5.35028E-22	8.39951E-42	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	1.39785E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	3.32047E-15	3.32047E-15	3.32047E-15	3.32047E-15	3.32046E-15	3.32046E-15	3.32044E-15	3.32041E-15
MN	25	54	2.61565E+07	1.07443E-05	8.74197E-07	1.64145E-07	2.50775E-09	5.85306E-13	1.36608E-16	1.73688E-27	5.15423E-42
MN	25	56	9.29152E+03	5.91240E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.10717E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	8.23399E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	6.08349E-03	3.63220E-03	2.13084E-03	5.61698E-04	3.90306E-05	2.71211E-06	9.09967E-10	2.12143E-14
FE	26	59	3.89409E+06	1.27555E-04	6.12461E-12	8.09081E-17	5.13214E-29	2.06480E-53	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	1.21110E-16	1.21108E-16	1.[illegible]06E-16	1.21102E-16	1.21095E-16	1.21085E-16	1.21060E-16	1.21026E-16
FE	26	61	3.60001E+02	1.58313E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	4.77787E-07	2.92185E-08	4.55532E-09	4.30510E-11	3.87909E-15	3.49522E-19	2.55691E-31	1.68539E-47
CO	27	58	6.13405E+06	5.29770E-06	1.19672E-08	9.56319E-12	1.72631E-19	5.62517E-35	1.83296E-50	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	6.18702E-02	4.11272E-02	3.15982E-02	1.63492E-02	4.37687E-03	1.17174E-03	2.24817E-05	1.15478E-07
CO	27	61	5.94007E+03	3.36082E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	4.80711E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	6.11323E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	8.11160E-06	8.11159E-06	8.11125E-06	8.11090E-06	8.11019E-06	8.10949E-06	8.10738E-06	8.10456E-06
NI	28	63	2.90020E+09	1.09070E-03	1.06630E-03	1.05034E-03	1.01146E-03	9.37982E-04	8.69839E-04	6.93701E-04	5.13038E-04
ZR	40	88	7.20602E+06	2.17793E-10	2.41607E-14	5.57809E-17	1.42869E-23	9.37167E-37	6.14748E-50	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	1.92713E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	1.46019E-14	1.46019E-14	1.46019E-14	1.46019E-14	1.46018E-14	1.46017E-14	1.46015E-14	1.46013E-14
ZR	40	95	5.63534E+06	4.20100E-09	3.68214E-14	1.56532E-17	5.83248E-26	8.09731E-43	1.12416E-59	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	5.54480E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	5.12420E-12	5.10900E-12	5.09889E-12	5.07371E-12	5.02371E-12	4.97421E-12	4.82860E-12	4.64108E-12
NB	41	92	8.80746E+05	1.45513E-07	6.37848E-40	1.70840E-61	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	1.93358E-12	1.93338E-12	1.93325E-12	1.93291E-12	1.93224E-12	1.93157E-12	1.92956E-12	1.92688E-12
NB	41	95	3.02684E+06	4.08326E-08	1.56846E-17	8.28796E-24	1.68232E-39	6.93079E-71	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	5.16916E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	6.64838E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	1.45299E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	9.09033E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.94877E+11	3.83359E-08	3.83270E-08	3.83211E-08	3.83064E-08	3.82769E-08	3.82474E-08	3.81592E-08	3.80418E-08
MO	42	99	2.41516E+05	3.68841E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	1.67898E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	1.19776E-12	1.12005E-12	1.07107E-12	9.57774E-13	7.65868E-13	6.12414E-13	3.13126E-13	1.28022E-13
HF	72	179	1.89384E+10	6.26334E-14	6.24108E-14	6.22727E-14	6.19142E-14	6.12032E-14	6.05003E-14	5.84399E-14	5.58014E-14
HF	72	180	1.98723E+04	7.86854E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	5.20216E-19	5.20216E-19	5.20216E-19	5.20216E-19	5.20215E-19	5.20215E-19	5.20214E-19	5.20212E-19
W	74	181	1.22968E+07	7.52439E-08	3.31537E-10	8.91856E-12	1.65523E-15	1.47984E-23	2.07531E-31	5.72383E-55	0.00000E+00
W	74	185	6.47801E+06	6.94599E-04	2.76908E-08	3.23149E-11	1.50344E-18	3.25399E-33	7.04295E-48	0.00000E+00	0.00000E+00
W	74	187	8.59904E+04	1.27966E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

TOTAL (CURIES/CC)	1.25668E-01	4.58348E-02	3.47877E-02	1.79305E-02	5.36202E-03	2.05243E-03	7.24328E-04	5.21296E-04
TOTAL (CURIES)	1.04139E+06	3.79760E+03	2.88225E+03	1.48558E+03	4.44256E+02	1.70048E+02	6.00121E+01	4.31904E+01

Activation levels of the graphite in hex. refirctor blocks contnining Hastelloy cans was re-analyzed in Rev. D. See pg 61 of this printout (follows concrete data).

~~COMPONENT : BORONATED BOTTOM REFLECTORS WITH HAST-X CANS, GRAPHITE ONLY - RS~~
~~VOLUME : 1.52620E+07 CC~~
~~: ABOVE VOLUME IS FOR THE TOTAL NUMBER OF HAST-X CANS,GRAPHITE ONLY,~~
~~: WITH THE CI/CC ACTIVITY FROM REBATE BEING FOR ONE HOMOGENIZED~~
~~: BLOCK OF GRAPHITE + METAL. THE TOAL VOLUME THEREFORE BECOMES~~
~~: (INTERVALS 25-32 HASTXGRS) (307)(4.497+4)=1.5262+7~~

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	14.00 YRS	26.00 YRS	38.00 YRS	60.00 YRS	100.00 YRS
				CONCENTRATION (CURIES/CC) AT TIME							
H	1	3	3.67233E+08	1.67485E-07	9.07299E-08	8.10374E-08	6.10975E-08	3.47295E-08	1.97412E-08	3.62577E-09	3.7[illegible]E-10
HE	2	6	8.09751E-01	2.21102E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	2.05356E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	2.09002E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.68563E+13	9.12325E-17	9.12324E-17	9.12324E-17	9.12325E-17	9.12320E-17	9.12318E-17	9.12310E-17	9.12300E-17
B	5	12	1.99754E-02	1.31012E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	2.56046E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	7.60482E-10	6.54696E-53	2.75441E-46	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	45	1.42623E+07	6.71199E-13	6.73958E-15	3.13665E-16	1.46583E-19	3.20119E-26	6.99102E-35	7.28165E-53	0.00000E+00
CA	20	47	3.91608E+05	3.09771E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.95118E-11	2.28687E-15	5.58490E-18	1.54188E-24	1.21841E-37	9.62779E-51	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	3.08022E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	4.85521E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	2.39351E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.05167E+02	4.65448E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48316E+02	1.96674E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	7.70399E-15	7.71979E-16	1.6[illegible]E-16	3.60025E-18	1.68246E-21	7.86256E-25	8.02426E-35	3.82705E-48
V	23	52	2.02084E+02	1.15321E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39463E+06	4.20962E-12	5.51775E-26	6.69846E-32	1.03748E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10065E+02	1.41160E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+16	3.07889E-20	3.07889E-20	3.07889E-20	3.07889E-20	3.07888E-20	3.07888E-20	3.07886E-20	3.07884E-20
MN	25	54	2.61565E+07	9.96264E-11	8.10595E-12	1.52203E-12	2.32528E-14	5.42723E-18	1.26669E-21	1.61053E-32	4.77924E-47
MN	25	56	9.29152E+03	3.57509E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.02662E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	2.63494E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	7.48691E-08	3.36414E-08	1.97358E-08	5.20243E-09	3.61500E-10	2.51295E-11	8.42790E-15	1.96487E-19
FE	26	59	3.89409E+06	1.17502E-09	5.64192E-17	7.45315E-22	4.72766E-34	1.90207E-58	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	5.95166E-10	4.80824E-10	3.87955E-10	1.59339E-10	4.26568E-11	1.16197E-11	2.19106E-13	1.12544E-15
TOTAL (CURIES/CC)				1.34463E-06	1.24700E-07	1.01083E-07	6.64592E-08	3.51537E-08	1.97770E-08	3.62600E-09	3.78632E-10
TOTAL (CURIES)				2.05218E+01	1.90439E+00	1.54272E+00	1.01430E+00	5.36210E-01	3.01040E-01	5.53400E-02	5.77715E-0[illegible]

COMPONENT : CONCRETE - RADIAL FIRST 6 INCHES - RS
VOLUME : 4.90000E+07 CC
: ABOVE VOLUME IS FOR THE FIRST 6 INCHES OF CONCRETE
: IN THE RADIAL DIRECTION.
:
: (INTERVALS 61-63 TOTGRDRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	6.18132E-09	5.21776E-09	4.66036E-09	3.51364E-09	1.99725E-09	1.13529E-09	2.08513E-10	2.17688E-11
HE	2	6	8.09751E-01	9.23546E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	1.63496E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	2.60380E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	1.32259E-19	1.32259E-19	1.32258E-19	1.32258E-19	1.32258E-19	1.32258E-19	1.32256E-19	1.32255E-19
B	5	12	1.99754E-02	2.26719E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	3.03075E-12	3.02965E-12	3.02892E-12	3.02709E-12	3.02344E-12	3.01978E-12	3.00885E-12	2.99434E-12
F	9	20	1.10023E+01	1.00416E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	1.42537E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	3.13560E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	7.24425E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	3.44192E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	2.79142E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.00603E-10	8.64190E-34	3.62472E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	3.91579E-10	6.96710E-14	2.20398E-16	1.24053E-22	3.92988E-35	1.24495E-47	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	6.59890E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	2.95218E-13	2.95216E-13	2.95215E-13	2.95212E-13	2.95202E-13	2.95198E-13	2.95178E-13	2.95152E-13
AR	18	37	3.02684E+06	2.88556E-09	1.10840E-18	5.85695E-25	1.18886E-40	6.89786E-72	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	5.13179E-11	5.09225E-11	5.06606E-11	5.00117E-11	4.87368E-11	4.74982E-11	4.39628E-11	3.96549E-11
AR	18	41	6.60140E+03	3.44732E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	3.99065E-16	3.99065E-16	3.99065E-16	3.99065E-16	3.99065E-16	3.99065E-16	3.99065E-16	3.99065E-16
K	19	42	4.47192E+04	1.10105E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	8.27303E-11	8.27282E-11	8.27267E-11	8.27231E-11	8.27160E-11	8.27088E-11	8.26872E-11	8.26585E-11
CA	20	45	1.42623E+07	3.36663E-08	3.38037E-10	1.57329E-11	7.35258E-15	1.60567E-21	3.50659E-28	3.65236E-48	8.30780E-75
CA	20	47	3.91608E+05	1.64907E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	4.49404E-09	5.27181E-13	1.26330E-15	3.55133E-22	2.80628E-35	2.21751E-48	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	5.98794E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	1.43669E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	6.02797E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	2.45032E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	4.84379E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	4.10570E-16	4.11407E-17	8.87554E-18	1.91869E-19	8.96638E-23	4.19021E-26	4.27638E-36	2.03946E-49
V	23	52	2.02044E+02	1.27266E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	3.55010E-14	0.00000E+00	0.00000E+00	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	4.37220E-16	0.00000E+00	0.00000E+00	[illegible]	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	2.05734E-09	2.69665E-21	3.22972E-[illegible]	[illegible]	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	3.24363E-11	0.00000E+00	0.00000E+00	[illegible]	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	3.06236E-19	3.06235E-19	3.06235E-19	[illegible]	[illegible]	3.06234E-19	3.06232E-19	3.06230E-19
MN	25	54	2.61565E+07	1.00716E-10	3.26036E-11	6.12190E-[illegible]	[illegible]	[illegible]	[illegible]	6.47780E-32	1.92230E-46
MN	25	56	9.29152E+03	1.07376E-06	0.00000E+00	0.00000E+00	[illegible]	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.03697E-12	0.00000E+00	0.00000E+00	[illegible]	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	7.38046E-14	0.00000E+00	0.00000E+00	[illegible]	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	3.60275E-07	1.61884E-07	9.49697E-08	2.603[illegible]	[illegible]	1.20477E-10	4.05556E-16	9.45505E-19
FE	26	59	3.89409E+06	4.76340E-09	2.28716E-16	3.02141E-21	1.91653E-3[illegible]	7.71875E-58	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	7.17338E-25	7.17323E-25	7.17313E-25	7.17269E-25	7.17239E-25	7.17149E-25	7.17040E-25	7.16841E-25
FE	26	61	3.60001E+02	8.93923E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	2.83587E-15	1.73424E-16	2.69190E-17	2.55526E-19	2.30240E-23	2.07456E-27	1.51765E-39	1.00035E-55
CO	27	58	6.13405E+06	1.21350E-12	2.74125E-17	2.19057E-20	3.95433E-28	1.28052E-43	4.14065E-59	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	9.38973E-09	6.32343E-09	4.85832E-09	2.51374E-09	6.72957E-10	1.80158E-10	3.45664E-12	1.77550E-14
CO	27	61	5.94007E+03	1.00125E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.54012E+02	4.50467E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	2.44600E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	2.28637E-14	2.28631E-14	2.28627E-14	2.28617E-14	2.28597E-14	2.28577E-14	2.28537E-14	2.28438E-14
NI	28	63	2.90028E+09	3.22931E-12	3.15706E-12	3.10979E-12	2.99470E-12	2.77714E-12	2.57539E-12	2.05568E-12	1.51896E-12
NI	28	65	9.21738E+03	3.50438E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	6.04308E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	5.12[illegible]5E-16	1.01210E-33	1.59305E-45	4.95188E-75	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	2.93[illegible]7E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	1.86726E-14	8.49679E-21	5.22555E-25	1.46240E-35	1.14529E-56	8.96927E-78	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	4.44618E-19	4.12890E-19	3.93006E-19	3.47385E-19	2.71416E-19	2.12061E-19	1.51143E-19	3.76906E-20
SR	38	91	3.48315E+04	3.92752E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	1.80640E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50096E+02	9.17660E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	3.50459E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	5.69467E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	4.75094E-15	1.21625E-20	2.27668E-24	1.09043E-33	2.50265E-52	5.74387E-71	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	1.41579E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	2.98184E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	2.69801E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	7.48258E-18	8.30075E-22	1.91643E-24	4.90843E-31	3.21977E-44	2.11206E-57	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	7.86870E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	1.26772E-16	1.26772E-16	1.26772E-16	1.26772E-16	1.26771E-16	1.26771E-16	1.26769E-16	1.26766E-16
ZR	40	95	5.63534E+06	6.12640E-14	5.36981E-19	2.28277E-22	8.50573E-31	1.18086E-47	1.63941E-64	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	2.93740E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	2.74680E-19	2.73785E-19	2.73243E-19	2.71894E-19	2.69214E-19	2.66562E-19	2.58759E-19	2.48710E-19
NB	41	92	8.80746E+05	1.14725E-14	5.02888E-47	1.34692E-68	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	2.54966E-14	2.54939E-14	2.54922E-14	2.54877E-14	2.54789E-14	2.54701E-14	2.54435E-14	2.54082E-14
NB	41	95	3.02684E+06	1.43703E-15	5.51990E-25	2.91680E-31	5.92062E-47	2.43917E-78	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	2.70014E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	2.56483E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	7.47213E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	5.63444E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	4.31999E-16	4.31899E-16	4.31833E-16	4.31667E-16	4.31334E-16	4.31002E-16	4.30008E-16	4.28685E-16
MO	42	99	2.41515E+05	6.04362E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	1.86137E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	5.67357E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	3.[illegible]7746E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	1.24766E-23	1.24766E-23	1.24766E-23	1.24766E-23	1.24766E-23	1.24766E-23	1.24765E-23	1.24765E-23
PD	46	109	4.85704E+04	3.29098E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	1.27642E-16	1.99912E-55	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	2.02397E-12	1.99186E-12	1.97074E-12	1.91891E-12	1.81931E-12	1.72488E-12	1.46999E-12	1.18774E-12
AG	47	110	2.15826E+07	4.45214E-10	2.12859E-11	2.80397E-12	1.76596E-14	7.00473E-19	2.77843E-23	1.73392E-36	4.29202E-54
CD	48	109	3.99508E+07	2.71461E-17	5.25228E-18	1.75701E-18	1.13721E-19	4.76401E-22	1.99576E-24	1.46724E-31	4.51389E-41
CD	48	111	2.92221E+03	6.61229E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	1.95793E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	3.80017E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	3.25361E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	9.13048E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	5.48984E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	9.42166E-18	2.05758E-24	7.46185E-29	5.90978E-40	3.70677E-62	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	1.09473E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	4.73686E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	6.97968E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	2.39957E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	2.56918E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	5.20035E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	7.10814E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	6.38755E-13	8.70079E-16	1.06916E-17	1.78961E-22	5.01380E-32	1.40470E-41	3.08907E-70	0.00000E+00
SN	50	121	9.72156E+04	1.50890E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	1.93492E-12	4.43634E-15	7.71375E-17	3.07524E-21	4.88744E-30	7.76755E-39	3.11817E-65	0.00000E+00
SN	50	125	8.12599E+05	2.71148E-11	2.29810E-46	9.55305E-70	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

I	53	130	4.44981E+04	2.41768E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	1.17994E-15	3.74469E-78	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.60940E+05	1.01183E-14	1.05061E-65	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	1.25462E-09	4.15553E-10	2.31871E-10	4.25562E-11	1.44462E-12	5.00128E-14	1.99383E-18	2.71533E-24
EU	63	152	4.17559E+08	7.42594E-09	6.34598E-09	5.71475E-09	4.39788E-09	2.60457E-09	1.54251E-09	3.20409E-10	3.94161E-11
EU	63	154	2.69812E+08	8.36768E-10	6.55730E-10	5.57580E-10	3.71760E-10	1.65262E-10	7.34658E-11	6.45384E-12	2.52034E-13
LU	71	176	1.22687E+07	5.80596E-21	2.76027E-23	7.80433E-25	1.04906E-28	1.89551E-36	5.42489E-44	2.02028E-67	0.00000E+00
LU	71	177	5.82426E+05	2.22590E-18	1.93177E-20	8.15811E-22	2.99004E-25	4.01647E-32	5.39523E-39	1.30772E-59	0.00000E+00
HF	72	173	8.49653E+04	4.71461E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04040E+06	5.15649E-11	1.00074E-15	7.22860E-19	1.01375E-26	1.99369E-42	3.92092E-58	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	1.92735E-19	1.80230E-19	1.72348E-19	1.54117E-19	1.25237E-19	9.85448E-20	5.05857E-20	2.86002E-20
HF	72	179	1.89586E+10	9.33552E-21	9.30525E-21	9.28176E-21	9.22831E-21	9.12234E-21	9.01758E-21	8.71047E-21	8.31720E-21
HF	72	180	1.98723E+04	1.96534E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	4.67764E-10	7.77829E-18	5.06762E-23	5.49052E-36	6.44455E-62	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	9.42914E-26	9.42913E-26	9.42913E-26	9.42913E-26	9.42912E-26	9.42911E-26	9.42909E-26	9.42906E-26
TA	73	180	2.93458E+0?	2.20779E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89562E+06	9.30958E-10	1.22558E-12	1.17216E-14	2.32810E-19	5.82194E-29	1.45591E-38	2.27689E-67	0.00000E+00
W	74	181	1.20968E+07	1.63511E-14	7.20457E-17	1.95634E-18	2.29310E-22	3.21581E-30	4.50982E-38	1.24384E-61	0.00000E+00
W	74	185	6.47801E+06	3.63155E-11	1.44775E-15	1.68951E-18	7.86037E-26	1.70128E-40	3.68225E-55	0.00000E+00	0.00000E+00
W	74	187	8.59986E+04	7.27117E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	6.56616E-17	5.45963E-24	1.04006E-28	1.64749E-40	4.13341E-64	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11967E+02	4.94050E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	6.86016E-19	3.95740E-19	2.74258E-19	1.09628E-19	1.75189E-20	2.79957E-21	1.14248E-23	7.45058E-27
TL	81	206	2.52054E+02	1.17122E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86168E+02	9.72527E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	2.45373E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	1.12023E-19	1.12023E-19	1.12023E-19	1.12023E-19	1.12023E-19	1.12023E-19	1.12022E-19	1.12022E-19
PB	82	207	7.95989E-01	2.45411E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				4.20087E-06	1.81418E-07	1.11159E-07	3.60154E-08	7.32047E-09	3.19022E-09	6.72399E-10	1.09815E-10
TOTAL (CURIES)				2.05843E+02	8.88950E+00	5.44678E+00	1.76475E+00	3.58703E-01	1.56321E-01	3.29475E-02	5.38086E-03

COMPONENT : CONCRETE - RADIAL SECOND 6 INCHES - RS
VOLUME : 5.06000E+07 CC
: ABOVE VOLUME IS FOR THE SECOND 6 INCHES OF CONCRETE
: IN THE RADIAL DIRECTION.
:
: (INTERVALS 64-66 TOTGRIDS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.0C YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	2.08714E-09	1.76179E-09	1.57356E-09	1.18639E-09	6.74373E-10	3.83334E-10	7.04049E-11	7.35028E-12
HE	2	6	8.09751E-01	2.04669E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	5.51745E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	5.00064E-16	5.45482E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	3.40290E-20	3.40290E-20	3.40290E-20	3.40289E-20	3.40288E-20	3.40287E-20	3.40285E-20	3.40281E-20
B	5	12	1.99754E-02	7.61523E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	1.02100E-12	1.02063E-12	1.02038E-12	1.01977E-12	1.01853E-12	1.01730E-12	1.01362E-12	1.00873E-12
F	9	20	1.10023E+01	2.45435E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	3.33630E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	1.04362E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	1.67843E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	1.14424E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	6.20325E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23356E+06	2.24066E-11	1.92476E-34	8.07313E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	1.33677E-10	2.37042E-14	7.52392E-17	4.23489E-23	1.34158E-35	4.25000E-48	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	3.55168E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	9.70469E-14	9.70462E-14	9.70458E-14	9.70447E-14	9.70425E-14	9.70404E-14	9.70339E-14	9.70252E-14
AR	18	37	3.02684E+06	6.60894E-10	2.55062E-19	1.34144E-25	2.72291E-41	1.12176E-72	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	1.67012E-11	1.65724E-11	1.64872E-11	1.62760E-11	1.58617E-11	1.54580E-11	1.63074E-11	1.29054E-11
AR	18	41	6.60140E+03	7.97032E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	1.33565E-16	1.33565E-16	1.33565E-16	1.33565E-16	1.33565E-16	1.33565E-16	1.33565E-16	1.33565E-16
K	19	42	4.47192E+04	3.64669E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	2.84340E-11	2.84333E-11	2.84328E-11	2.84316E-11	2.84291E-11	2.84266E-11	2.84192E-11	2.84094E-11
CA	20	45	1.42623E+07	1.10796E-08	1.11242E-10	5.17743E-12	2.41954E-15	5.28396E-22	1.15396E-28	1.20193E-48	2.73395E-75
CA	20	47	3.91608E+05	5.66690E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.47309E-09	1.72804E-13	4.14296E-16	1.16488E-22	9.19866E-36	7.26873E-49	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	1.26083E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	3.46948E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	1.38437E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	6.10679E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.61898E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.02428E-16	1.02637E-17	2.21426E-18	4.78671E-20	2.23692E-23	1.04537E-26	1.06687E-36	5.08826E-50
V	23	52	2.02084E+02	4.27961E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.94922E+02	8.39433E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	1.09018E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39643E+06	6.48279E-10	8.49726E-22	1.01770E-29	1.59771E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	7.48281E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	7.63990E-20	7.63990E-20	7.63989E-20	7.63989E-20	7.63987E-20	7.63986E-20	7.63981E-20	7.63976E-20
MN	25	54	2.61565E+07	9.00760E-11	7.32890E-12	1.37613E-12	2.10237E-14	4.96096E-18	1.14526E-21	1.45615E-32	6.32109E-47
MN	25	56	9.29152E+03	9.81972E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01935E+02	1.36622E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.83092E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+0?	1.23465E-07	5.54772E-08	3.25456E-08	8.57921E-09	5.96142E-10	4.14240E-11	1.38983E-14	3.24022E-19
FE	26	59	3.89409E+0?	1.50462E-09	7.22449E-17	9.54378E-22	6.05578E-34	2.43560E-58	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	1.78806E-25	1.78803E-25	1.78800E-25	1.78794E-25	1.78782E-25	1.78769E-25	1.78732E-25	1.78682E-25
FE	26	61	3.60001E+02	2.23001E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	7.07168E-16	4.32461E-17	6.71268E-18	6.37194E-20	5.74141E-24	5.17325E-28	3.78446E-40	2.49453E-56
CO	27	58	6.13405E+06	2.64916E-13	5.98431E-18	4.78214E-21	8.63253E-29	2.81291E-44	9.16586E-60	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	2.86381E-09	1.92861E-09	1.48176E-09	7.66674E-10	2.05247E-10	5.49470E-11	1.05425E-12	5.41517E-15
CO	27	61	5.94807E+03	2.31558E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	1.98801E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

CO	27	64	2.99999E-01	6.10179E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	7.67493E-15	7.67473E-15	7.67460E-15	7.67426E-15	7.67360E-15	7.67293E-15	7.67093E-15	[illegible]
NI	28	63	2.90820E+09	1.09872E-12	1.07414E-12	1.05806E-12	1.01890E-12	9.44879E-13	8.76235E-13	6.98802E-13	5.16810E-13
NI	28	65	9.21738E+03	8.10201E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	1.96745E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	1.26636E-16	2.50872E-34	3.95614E-46	1.22352E-75	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	7.17804E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	4.39899E-15	2.04884E-21	1.25107E-25	3.44521E-36	2.69814E-57	2.11303E-78	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	1.07439E-19	9.97720E-20	9.49672E-20	8.39433E-20	6.55859E-20	5.12431E-20	2.44405E-20	9.10768E-21
SR	38	91	3.48316E+04	9.58225E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	4.48775E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	2.28571E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	8.71161E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	1.90984E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	1.13214E-15	2.89829E-21	5.72387E-25	2.59847E-34	5.96318E-53	1.36875E-71	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	3.43109E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	7.34556E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	6.73045E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	1.75812E-18	1.95035E-22	4.50287E-25	1.15330E-31	7.56522E-45	4.96252E-58	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	1.89299E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	4.06054E-17	4.06053E-17	4.06053E-17	4.06052E-17	4.06050E-17	4.06048E-17	4.06042E-17	4.06035E-17
ZR	40	95	5.63554E+06	1.52763E-14	1.53896E-19	5.69206E-25	2.12090E-31	2.94447E-48	4.08785E-65	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	2.62924E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	6.79967E-20	6.77950E-20	6.76608E-20	6.73267E-20	6.66632E-20	6.60063E-20	6.40742E-20	6.15858E-20
NB	41	92	8.80746E+05	2.79881E-15	1.22684E-47	3.28513E-69	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	5.58344E-15	5.58286E-15	5.58247E-15	5.58150E-15	5.57957E-15	5.57763E-15	5.57182E-15	5.56439E-15
NB	41	95	3.02684E+06	3.41534E-16	1.31113E-25	6.92820E-32	1.40631E-47	5.79369E-79	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	6.52968E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	6.14010E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	1.83600E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	1.25496E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	2.38203E-17	2.38148E-17	2.38111E-17	2.38019E-17	2.37836E-17	2.37653E-17	2.37105E-17	2.36375E-17
MO	42	99	2.41515E+05	4.78064E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	2.48271E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	1.43633E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	7.79673E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	2.98555E-24	2.98555E-24	2.98555E-24	2.98554E-24	2.98554E-24	2.98554E-24	2.98553E-24	2.98552E-24
PD	46	109	4.83704E+04	7.86081E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	3.18440E-17	4.98737E-56	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	5.74061E-13	5.64955E-13	5.58964E-13	5.44265E-13	5.16014E-13	4.89231E-13	4.16956E-13	3.34881E-13
AG	47	110	2.15826E+07	9.43883E-11	4.51275E-12	5.94460E-13	3.74395E-15	1.48565E-19	5.89045E-24	3.67603E-37	9.09956E-55
CD	48	109	3.99508E+07	6.47478E-18	1.25275E-18	4.19074E-19	2.71243E-20	1.13629E-22	4.76020E-25	3.49960E-32	1.07783E-41
CD	48	111	2.92221E+03	1.59611E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	4.83610E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	1.44697E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	8.11709E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	2.25648E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	1.31000E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	2.26731E-18	4.95334E-25	1.79569E-29	1.42218E-40	8.92029E-63	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	2.61444E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	1.15378E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	1.67267E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	5.91192E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	6.20051E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40893E+01	1.29638E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	1.77133E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	3.50401E-14	4.77299E-17	5.86507E-19	9.81723E-24	2.75042E-33	7.70577E-43	1.69457E-71	0.00000E+00
SN	50	121	9.72156E+04	3.56460E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.6[illegible]67E+07	4.74047E-13	1.08688E-15	1.68984E-17	7.53420E-22	1.19740E-30	1.90362E-39	7.63937E-66	0.00000E+00
SN	50	125	8.12599E+05	6.28499E-12	5.32681E-47	2.21432E-70	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
I	53	130	4.44981E+04	5.76393E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	2.78044E-16	8.87102E-79	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	2.52430E-15	2.62185E-66	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47601E+07	2.76129E-10	1.00271E-10	5.10364E-11	9.43296E-12	3.22242E-13	1.10082E-14	4.38856E-19	5.97665E-25
EU	63	152	4.17559E+08	2.53633E-09	2.16747E-09	1.95187E-09	1.50210E-09	8.89591E-10	5.26844E-10	1.09436E-10	1.34620E-11
EU	63	154	2.69812E+08	2.50756E-10	1.96619E-10	1.67189E-10	1.11471E-10	4.95534E-11	2.20285E-11	1.95516E-12	7.55722E-14
LU	71	176	1.22687E+07	1.32546E-21	6.30148E-24	1.78167E-25	2.39493E-29	4.32731E-37	7.81876E-45	4.61215E-58	0.00000E+00
LU	71	177	1.38242E+07	5.30866E-19	4.60719E-21	1.96567E-22	7.13112E-26	9.57910E-33	1.28674E-39	5.11885E-60	0.00000E+00
HF	72	173	8.49653E+04	1.17620E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	1.55441E-11	3.01777E-16	2.17989E-19	3.05710E-27	6.01229E-43	1.18241E-58	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	4.64819E-20	4.34661E-20	4.15651E-20	3.71685E-20	2.97212E-20	2.37661E-20	1.21515E-20	4.96816E-21
HF	72	179	1.89384E+10	2.23752E-21	2.27978E-21	2.22464E-21	2.21183E-21	2.18643E-21	2.16132E-21	2.08771E-21	1.99345E-21
HF	72	180	1.96723E+06	4.70461E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	1.10185E-10	1.83231E-18	1.19377E-23	1.29339E-36	1.51815E-62	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	2.29291E-26	2.29290E-26	2.29290E-26	2.29290E-26	2.29290E-26	2.29290E-26	2.29289E-26	2.29289E-26
TA	73	180	2.93458E+04	5.49764E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	1.68831E-10	2.22267E-13	2.66986E-15	4.22215E-20	1.05584E-29	2.64038E-39	4.12928E-68	0.00000E+00
W	74	181	1.20968E+07	4.27903E-15	1.79728E-17	4.83048E-19	5.72046E-23	8.02251E-31	1.12504E-38	3.10293E-62	0.00000E+00
W	74	185	6.47801E+06	7.66712E-12	3.05656E-16	3.56699E-19	1.65952E-26	3.59182E-41	7.77415E-56	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	1.58675E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	1.40157E-17	1.33167E-24	2.53685E-29	4.01843E-41	1.00819E-64	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	5.11947E+02	1.22174E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	1.65863E-19	9.56809E-20	6.63044E-20	2.65055E-20	4.23566E-21	6.76872E-22	2.76225E-24	1.80158E-27
TL	81	206	2.52054E+02	2.86654E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	2.36217E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	6.12134E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	2.79278E-20	2.79278E-20	2.79278E-20	2.79278E-20	2.79278E-20	2.79278E-20	2.79277E-20	2.79277E-20
PB	82	207	7.95989E-01	6.18326E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
			TOTAL (CURIES/CC)	1.35903E-06	6.18031E-08	3.78261E-08	1.22027E-08	2.46211E-09	1.07497E-09	2.27810E-10	6.41814E-11
			TOTAL (CURIES)	6.87668E+01	3.12724E+00	1.91400E+00	6.17456E-01	1.24583E-01	5.43932E-02	1.15272E-02	3.24758E-03

COMPONENT : CONCRETE - RADIAL THIRD 6 INCHES - RS
VOLUME : 5.22000E+07 CC
: ABOVE VOLUME IS FOR THE THIRD 6 INCHES OF CONCRETE
: IN THE RADIAL DIRECTION.
:
: (INTERVALS 67-69 TOTGRDRS)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	2.35518E-10	1.96825E-10	1.77567E-10	1.33879E-10	7.60985E-11	4.32565E-11	7.94470E-12	8.29428E-13
HE	2	6	8.09751E-01	4.53360E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	6.22637E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.19286E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	5.19598E-21	5.19598E-21	5.19598E-21	5.19597E-21	5.19595E-21	5.19594E-21	5.19590E-21	5.19586E-21
B	5	12	1.99754E-02	8.59112E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	1.16284E-13	1.15242E-13	1.15214E-13	1.15144E-13	1.15005E-13	1.14867E-13	1.14451E-13	1.13898E-13
F	9	20	1.10023E+01	5.92426E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	7.79058E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	1.17715E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68155E+02	3.87968E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	1.51217E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	1.38616E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	5.01881E-12	4.31119E-35	1.80826E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	1.51558E-11	2.69657E-15	8.53035E-18	4.80136E-24	1.52103E-36	4.81849E-49	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	3.63756E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	1.08901E-14	1.08900E-14	1.08900E-14	1.08898E-14	1.08896E-14	1.08894E-14	1.08886E-14	1.08876E-14
AR	18	37	3.02654E+06	1.51628E-10	5.82435E-20	3.07766E-26	6.24714E-42	2.57369E-73	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	1.99345E-12	1.97809E-12	1.96792E-12	1.94271E-12	1.89527E-12	1.84508E-12	1.70774E-12	1.54040E-12
AR	18	41	6.60140E+03	1.84041E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	1.50667E-17	1.50667E-17	1.50667E-17	1.50667E-17	1.50667E-17	1.50667E-17	1.50667E-17	1.50667E-17
K	19	42	4.47192E+04	6.06076E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52083E+12	3.22633E-12	3.22625E-12	3.22619E-12	3.22605E-12	3.22577E-12	3.22549E-12	3.22465E-12	3.22353E-12
CA	20	45	1.42623E+07	1.25008E-09	1.25518E-11	5.84185E-13	2.75004E-16	5.96205E-23	1.30264E-29	1.35617E-49	3.08480E-76
CA	20	47	3.91608E+05	6.43087E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.64985E-10	1.93444E-14	4.63558E-17	1.38313E-23	1.02974E-36	8.13694E-50	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	2.78825E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	8.29982E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.46849E+03	3.17515E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	1.49295E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.46315E+02	1.82540E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	2.50570E-17	2.51081E-18	5.41672E-19	1.17097E-20	5.47216E-24	2.55727E-27	2.60986E-37	1.24474E-50
V	23	52	2.82084E+02	4.82982E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	1.97617E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	2.66600E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39845E+06	7.21929E-11	9.46263E-25	1.13332E-30	1.77922E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	1.72526E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.86894E-20	1.86894E-20	1.86894E-20	1.86893E-20	1.86893E-20	1.86893E-20	1.86892E-20	1.86890E-20
MN	25	54	2.61565E+07	2.02946E-11	1.65124E-12	5.10049E-13	4.73675E-15	1.10556E-18	2.58033E-22	3.28073E-33	9.73564E-48
MN	25	56	9.29152E+03	1.10055E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	3.18774E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	4.46324E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.40064E-08	6.29357E-09	3.49214E-09	9.73262E-10	6.76289E-11	4.69931E-12	1.57668E-15	3.67584E-20
FE	26	59	3.89409E+06	1.68564E-10	8.09364E-18	1.06920E-22	6.76209E-35	2.72862E-59	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	4.37179E-26	4.37170E-26	4.37163E-26	4.37148E-26	4.37118E-26	4.37088E-26	4.36997E-26	4.36876E-26
FE	26	61	3.60201E+02	5.45506E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34836E+07	1.72945E-16	1.05763E-17	1.64166E-18	1.55633E-20	1.40412E-24	1.26517E-28	9.25529E-41	6.10064E-57
CO	27	58	6.11405E+06	6.91775E-14	1.33679E-18	1.06825E-21	1.92836E-29	6.28355E-45	2.04749E-60	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	3.18731E-10	2.14647E-10	1.64914E-10	8.53280E-11	2.28433E-11	6.11549E-12	1.17334E-13	6.02688E-16
CO	27	61	5.94007E+03	5.34230E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	2.60467E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	1.49260E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52055E+12	8.64989E-16	8.64967E-16	8.64952E-16	8.64914E-16	8.64839E-16	8.64764E-16	8.64539E-16	8.64239E-16
NI	28	63	2.90020E+09	1.25677E-13	1.22865E-13	1.21026E-13	1.16547E-13	1.08080E-13	1.00228E-13	7.99323E-14	5.91153E-14
NI	28	65	9.21738E+03	1.86907E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	2.21467E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	3.07925E-17	6.08870E-35	9.57105E-47	2.97509E-76	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	1.72954E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	1.03124E-15	4.80300E-22	7.88593E-26	8.07644E-37	6.32513E-58	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	2.57195E-20	2.38841E-20	2.27339E-20	2.00949E-20	1.57004E-20	1.22669E-20	5.85873E-21	2.18026E-21
SR	38	91	3.48315E+04	2.31090E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	1.09497E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	5.58598E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	2.12595E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	2.[illegible]5466E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	2.67909E-16	6.05050E-22	1.28350E-25	6.14960E-35	1.41126E-53	3.23981E-72	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	8.23331E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	1.78262E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	1.64638E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	4.11910E-19	4.56968E-23	1.05498E-25	2.70206E-32	1.77246E-45	1.16267E-58	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	4.51448E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	4.58427E-18	4.58426E-18	4.58426E-18	4.58425E-18	4.58423E-18	4.58421E-18	4.58414E-18	4.58406E-18
ZR	40	95	5.63534E+06	3.73581E-15	3.27440E-20	1.39199E-23	5.18663E-32	7.20067E-49	9.99678E-66	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	1.92774E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	1.65566E-20	1.65875E-20	1.64748E-20	1.63935E-20	1.62319E-20	1.60720E-20	1.56015E-20	1.49956E-20
NB	41	92	8.80746E+05	6.73675E-16	2.95380E-48	7.90926E-70	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	5.99030E-16	5.18965E-16	5.98926E-16	5.98822E-16	5.98614E-16	5.98407E-16	5.97784E-16	5.96956E-16
NB	41	95	3.02684E+06	8.05470E-17	3.09596E-26	1.63489E-32	3.31856E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	1.56386E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	1.45855E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	4.44849E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	3.06842E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	2.06503E-18	2.06455E-18	2.06423E-18	2.06344E-18	2.06185E-18	2.06026E-18	2.05552E-18	2.04919E-18
MO	42	99	2.41515E+05	4.69656E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	2.46731E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	3.46638E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	1.84600E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	7.08700E-25	7.08700E-25	7.08700E-25	7.08700E[illegible]	7.08699E-25	7.08698E-25	7.08696E-25	7.08693E-25
PD	46	109	4.83704E+04	1.86307E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	7.78996E-18	1.22006E-56	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	6.30800E-14	6.20801E-14	6.14218E-14	5.98065E-14	5.67023E-14	5.37592E-14	4.58150E-14	3.70182E-14
AG	47	110	2.15826E+07	9.50966E-12	4.54661E-13	5.98920E-14	3.77204E-16	1.49619E-20	5.93465E-25	3.70361E-38	9.16763E-56
CD	48	109	3.99508E+07	1.53331E-18	2.96668E-19	9.92423E-20	6.42339E-21	2.69089E-23	1.12728E-25	8.28752E-33	2.55245E-42
CD	48	111	2.92221E+03	3.81665E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	1.17561E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	3.53962E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	1.98567E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	5.48756E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	5.10262E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	5.40795E-19	1.18103E-25	4.28302E-30	3.39215E-41	2.12764E-63	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	6.19508E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	2.77876E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	3.97633E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	1.43486E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	1.48255E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	3.16981E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.80998E+01	4.33808E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	2.92281E-15	3.98021E-18	4.89090E-20	8.18662E-25	2.29358E-34	6.42586E-44	1.61310E-72	0.00000E+00
SN	50	121	9.72156E+04	3.67693E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.87967E+07	5.21282E-14	1.19518E-16	2.07814E-18	8.28493E-23	1.31671E-31	2.09264E-40	8.40058E-67	0.00000E+00
SN	50	125	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

I	53	130	4.44981E+04	1.56887E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.36018E+05	6.51269E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	6.17516E-16	6.41185E-67	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	2.83410E-11	1.02914E-11	5.23820E-12	9.68166E-13	3.50738E-14	1.12986E-15	4.50427E-20	6.15422E-26
EU	63	152	4.17559E+08	2.86998E-10	2.45260E-10	2.25864E-10	1.69970E-10	1.50662E-10	5.94151E-11	1.25832E-11	1.52536E-12
EU	63	154	2.69812E+08	2.76548E-11	2.16842E-11	1.84385E-11	1.22937E-11	6.66504E-12	2.42963E-12	2.15421E-13	8.33455E-15
LU	71	176	1.22687E+07	5.01905E-22	1.65531E-24	4.05818E-26	5.45502E-30	9.85650E-38	1.78691E-45	1.05055E-68	0.00000E+00
LU	71	177	1.58242E+07	1.25644E-19	1.99041E-21	4.60494E-25	1.68776E-26	2.26714E-33	3.04540E-40	7.38157E-61	0.00000E+00
HF	72	173	8.49653E+06	2.87752E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	1.70005E-17	5.30050E-17	2.38412E-20	3.54352E-28	6.57557E-44	1.29519E-69	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	1.11933E-20	1.05829E-20	9.92883E-21	8.87858E-21	7.09961E-21	5.67709E-21	2.90268E-21	1.18676E-21
HF	72	179	1.89584E+16	5.31779E-22	5.29936E-22	5.28712E-22	5.25668E-22	5.19631E-22	5.13664E-22	4.96170E-22	4.73769E-22
HF	72	18[illegible]	1.98725E+04	1.12657E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66557E+06	1.10666E-11	1.83998E-19	1.19876E-24	1.29880E-37	1.52448E-63	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.86077E+14	5.51425E-27	5.51425E-27	5.51425E-27	5.51425E-27	5.51424E-27	5.51424E-27	5.51422E-27	5.51421E-27
TA	73	180	2.93458E+04	1.36551E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89367E+06	1.67989E-11	2.14575E-14	2.57747E-16	6.07604E-21	1.01951E-30	2.54901E-40	3.98639E-69	0.00000E+00
W	74	181	1.20968E+07	9.97812E-16	4.39652E-18	1.18163E-19	1.39936E-23	1.96242E-31	2.75279E-39	7.59039E-63	0.00000E+00
W	74	185	6.47801E+06	8.10498E-13	3.23112E-17	3.77068E-20	1.75629E-27	5.79696E-42	8.21811E-57	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	1.61564E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02625E+06	3.86135E-18	5.21063E-25	6.11629E-30	9.68836E-42	2.45072E-65	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11967E+02	2.97232E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	3.96942E-20	2.28983E-20	1.58679E-20	6.54327E-21	1.01568E-21	1.61988E-22	6.61060E-25	4.31125E-28
TL	81	206	2.52054E+02	6.92667E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	5.67760E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	1.49745E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	6.82898E-21	6.82898E-21	6.82898E-21	6.82898E-21	6.82898E-21	6.82897E-21	6.82896E-21	6.82895E-21
PB	82	207	7.95989E-01	1.49812E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				1.52989E-07	7.00446E-09	4.28560E-09	1.38117E-09	2.78161E-10	1.21469E-10	2.58452E-11	7.34805E-12
TOTAL (CURIES)				7.96600E+00	3.65633E-01	2.23708E-01	7.20972E-02	1.45190E-02	6.34066E-03	1.34912E-03	3.83568E-04

COMPONENT : CONCRETE - RADIAL FOURTH 6 INCHES - RS
VOLUME : 5.37*08E+07 CC
: ABOVE VOLUME IS FOR THE FOURTH 6 INCHES OF CONCRETE
: IN THE RADIAL DIRECTION.
:
: (INTERVALS 70-72 TOTGPGRS)

NUCLIDE			HALF-LIFE			CONCENTRATION (CURIES/CC) AT TIME					
ID	Z	N	(SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60. YRS	100.00 YRS
H	1	3	3.87233E+08	2.56741E-11	2.16720E-11	1.93564E-11	1.45930E-11	8.29556E-12	4.71564E-12	8.66061E-13	9.04168E-16
HE	2	6	8.09751E-01	1.81907E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	6.78999E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	2.66960E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	8.94218E-22	8.94217E-22	8.94216E-22	8.94215E-22	8.94213E-22	8.94210E-22	8.94203E-22	8.94195E-22
B	5	12	1.99754E-02	9.36827E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	1.25868E-14	1.25823E-14	1.25792E-14	1.25716E-14	1.25564E-14	1.25413E-14	1.24959E-14	1.24356E-14
F	9	20	1.10023E+01	3.43218E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	1.83392E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	1.28639E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	9.85329E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.36629E+02	[illegible].48569E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43857E+03	3.13566E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23356E+06	1.13473E-10	9.78179E-36	4.10282E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	1.65753E-12	2.94914E-16	9.32935E-19	5.25109E-25	1.66350E-37	5.26982E-50	0.00000E+00	0.00000E+00
S	16	37	3.04812E+02	8.59085E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77441E+12	1.19557E-15	1.19556E-15	1.19556E-15	1.19554E-15	1.19552E-15	1.19549E-15	1.19541E-15	1.19530E-15
AR	18	37	3.02684E+06	5.51558E-11	1.35037E-20	7.15556E-27	1.44840E-42	5.96710E-74	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	2.43246E-13	2.41571E-13	2.40130E-13	2.37054E-13	2.31021E-13	2.25140E-13	2.08383E-13	1.87963E-13
AR	18	41	6.60140E+03	6.29327E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	1.64332E-18	1.64332E-18	1.64332E-18	1.64332E-18	1.64332E-18	1.64332E-18	1.64332E-18	1.64332E-18
K	19	42	4.47192E+04	6.43776E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52055E+12	3.51625E-13	3.51614E-13	3.51619E-13	3.51594E-13	3.51564E-13	3.51533E-13	3.51442E-13	3.51320E-13
CA	20	45	1.42623E+07	1.36742E-10	1.37580E-12	6.39822E-14	2.98631E-17	6.52171E-24	1.42427E-30	1.48347E-50	5.37437E-77
CA	20	47	3.91608E+05	7.00609E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.80276E-11	2.11476E-15	5.06767E-18	1.42460E-24	1.12572E-37	8.89541E-51	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	6.30556E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	[illegible]5253E+05	1.99238E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.46849E+03	7.36447E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	3.64590E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.99350E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	6.12217E-18	6.13665E-19	1.32347E-19	2.86103E-21	1.33701E-24	6.24618E-28	6.37668E-38	3.04126E-51
V	23	52	2.02884E+02	5.27177E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	4.68296E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	6.51209E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39845E+06	7.99806E-12	1.04834E-23	1.25557E-31	1.97115E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	4.01928E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	4.56637E-21	4.56636E-21	4.56636E-21	4.56636E-21	4.56635E-21	4.56634E-21	4.56631E-21	4.56628E-21
MN	25	54	2.61565E+07	4.62927E-12	3.76654E-13	7.07232E-14	1.08047E-15	2.52183E-19	5.88584E-23	7.48348E-34	2.22074E-48
MN	25	56	9.29152E+03	1.20360E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	7.50040E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.08746E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.52696E-09	6.86188E-10	4.02504E-10	1.06162E-10	7.37271E-12	5.12306E-13	1.71885E-16	4.00730E-21
FE	26	59	3.89409E+06	1.84479E-11	8.85784E-19	1.17015E-23	7.42245E-36	2.98626E-60	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+13	1.06770E-26	1.06768E-26	1.06766E-26	1.06763E-26	1.06755E-26	1.06748E-26	1.06726E-26	1.06696E-26
FE	26	61	3.60081E+02	1.33279E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	4.22464E-17	2.58355E-18	4.01017E-19	3.80661E-21	3.42993E-25	3.09051E-29	2.26084E-41	1.49024E-57
CO	27	58	6.13405E+06	1.54382E-14	5.83563E-19	2.42581E-22	4.37897E-30	1.42689E-45	4.64951E-61	0.00000E+00	0.00000E+00
CO	27	60	1.66983E+08	3.69474E-11	2.35350E-11	1.80870E-11	9.35582E-12	2.50466E-12	6.70525E-13	1.28652E-14	6.60819E-17
CO	27	61	5.94007E+03	1.24580E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	6.25452E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

CO	27	60	2.00000E-01	3.66675E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	9.43252E-17	9.43228E-17	9.43217E-17	[illegible]	9.43089E-17	9.43067E-17	9.42761E-17	[illegible]
NI	28	63	2.90020E+09	1.40086E-14	1.36952E-14	1.34902E-14	1.29909E-14	1.20471E-14	1.11719E-14	8.90966E-15	6.58029E-15
NI	28	65	9.21738E-05	4.35759E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.32098E+04	2.41974E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	7.48742E-18	1.47857E-35	2.32727E-47	7.23415E-77	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	4.78857E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	2.43590E-16	1.13452E-22	6.81690E-27	1.90775E-37	1.49607E-58	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	6.17784E-21	5.75625E-21	5.46000E-21	4.82620E-21	3.77677E-21	2.94615E-21	[illegible]	3.23633E-22
SR	38	91	3.48315E+04	5.38211E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	2.66981E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	1.36375E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	5.18662E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	2.35010E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	6.77640E-17	1.63237E-22	3.05481E-26	1.46350E-35	3.35890E-64	7.70905E-75	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	1.98103E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	4.32785E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	4.82245E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.[illegible]0602E+06	9.72247E-20	1.07855E-23	2.49011E-26	6.37779E-33	4.18560E-46	2.74429E-59	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	1.88110E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	5.04673E-19	5.04672E-19	5.04671E-19	5.04670E-19	5.04668E-19	5.04666E-19	5.04659E-19	5.04649E-19
ZR	40	95	5.63534E+06	9.12554E-16	7.99828E-21	3.40016E-24	1.26692E-32	1.75888E-49	2.44188E-66	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	2.58538E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	4.03028E-21	4.01832E-21	4.01038E-21	3.99057E-21	3.95124E-21	3.91231E-21	3.79779E-21	3.65030E-21
NB	41	92	8.80746E+05	1.62525E-16	7.12416E-49	1.90812E-70	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	6.74558E-17	6.74488E-17	6.74441E-17	6.74324E-17	6.74090E-17	6.73856E-17	6.73154E-17	6.72220E-17
NB	41	95	1.02684E+06	1.91264E-17	7.34682E-27	3.88217E-33	7.88016E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	1.72731E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	3.48200E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	1.07859E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	5.09994E+00	7.49403E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	3.40656E-19	3.40578E-19	3.40525E-19	3.40394E-19	3.40132E-19	3.39871E-19	3.39086E-19	3.38043E-19
MO	42	99	2.41515E+05	5.80940E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	2.96504E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	8.38727E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	4.39381E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	1.69109E-25	1.69109E-25	1.69109E-25	1.69109E-25	1.69108E-25	1.69108E-25	1.69108E-25	1.69107E-25
PD	46	109	4.83706E+06	4.44077E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	1.90332E-18	2.98096E-57	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10589E+09	6.94774E-15	6.83753E-15	6.76503E-15	6.58712E-15	6.24521E-15	5.92106E-15	5.04608E-15	4.07720E-15
AG	47	110	2.15826E+07	1.06995E-12	5.11549E-14	6.75858E-15	4.24400E-17	1.68340E-21	6.67720E-26	4.16701E-39	1.03147E-56
CD	48	109	3.99508E+07	3.65167E-19	7.06531E-20	2.36351E-20	1.52977E-21	6.40849E-24	2.68467E-26	1.97372E-33	4.07876E-43
CD	48	111	2.92221E+03	9.15884E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	2.85798E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	8.64823E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97561E+02	4.85159E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	1.33468E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	7.38953E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	1.29523E-19	2.82863E-26	1.02581E-30	8.12940E-42	5.09583E-64	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	1.47606E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	6.70537E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	9.49863E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	3.48381E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	3.55747E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	7.74188E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	1.05992E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	4.73136E-16	6.44481E-19	7.91942E-21	1.32559E-25	3.71[illegible]E-35	1.04048E-44	2.28812E-73	0.00000E+00
SN	50	121	9.72156E+04	4.14673E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	5.90618E-15	1.35415E-17	2.35456E-19	9.38691E-24	1.49185E-32	2.37098E-41	9.51794E-68	0.00000E+00
SN	50	125	8.12599E+05	7.49193E-14	6.34975E-49	2.63955E-72	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
I	53	130	4.44981E+04	3.26511E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	1.53761E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	1.50876E-16	1.56661E-67	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	3.17951E-12	1.15457E-12	5.87662E-13	1.88616E-13	3.71047E-15	1.26754E-16	5.05525E-21	6.68184E-27
EU	63	152	4.17559E+00	3.12718E-11	2.67259E-11	2.40657E-11	1.85202E-11	1.09682E-11	6.49575E-12	1.34929E-12	1.65987E-13
EU	63	154	2.69812E+08	3.03301E-12	2.37819E-12	2.02222E-12	1.34829E-12	5.99371E-13	2.66445E-13	2.34067E-14	9.14080E-16
LU	71	174	1.22687E+07	6.96658E-23	3.31205E-25	9.36442E-27	1.21877E-30	2.77443E-38	4.10953E-46	2.42414E-69	0.00000E+00
LU	71	177	1.38242E+07	2.99124E-20	2.69598E-22	1.09632E-23	4.01812E-27	5.39747E-34	7.25030E-41	1.75736E-61	0.00000E+00
HF	72	173	8.49653E+04	7.03014E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	1.86230E-13	3.61551E-18	2.61167E-21	3.66265E-29	7.20315E-45	1.41662E-60	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	2.66256E-21	2.48981E-21	2.38092E-21	2.12907E-21	1.70248E-21	1.36136E-21	6.96060E-22	2.84584E-22
HF	72	179	1.89384E+10	1.27010E-22	1.26571E-22	1.26279E-22	1.25552E-22	1.24110E-22	1.22685E-22	1.18507E-22	1.13156E-22
HF	72	180	1.98723E+04	2.70654E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	1.22812E-12	2.04228E-20	1.33056E-25	1.44160E-38	1.69209E-64	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	1.32919E-27	1.32919E-27	1.32919E-27	1.32919E-27	1.32919E-27	1.32919E-27	1.32919E-27	1.32918E-27
TA	73	180	2.93458E+04	3.27968E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	1.86578E-12	2.45630E-15	2.95049E-17	4.66595E-22	1.16683E-31	2.91792E-41	4.56332E-70	0.00000E+00
W	74	181	1.20968E+07	2.43788E-16	1.07417E-18	2.88700E-20	5.41891E-24	4.79464E-32	6.72395E-40	1.85451E-63	0.00000E+00
W	74	185	6.47801E+06	9.18295E-14	3.66087E-18	4.27220E-21	1.98762E-28	4.50195E-43	9.31115E-58	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	1.81335E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	9.32547E-19	7.75395E-26	1.47713E-30	2.33982E-42	5.87040E-66	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11947E+02	7.23048E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	9.53275E-21	5.49911E-21	3.81074E-21	1.52336E-21	2.43434E-22	3.89022E-23	1.58756E-25	1.03532E-28
TL	81	206	2.52054E+02	1.67508E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	1.36767E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86702E+05	3.65860E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	1.66795E-21	1.66795E-21	1.66795E-21	1.66795E-21	1.66795E-21	1.66795E-21	1.66795E-21	1.66794E-21
PB	82	207	7.95989E-01	3.63617E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				1.68045E-08	7.64803E-10	4.67387E-10	1.50652E-10	5.83590E-11	1.32683E-11	2.83943E-12	8.21128E-13
TOTAL (CURIES)				9.82401E-01	4.18270E-02	2.50987E-02	8.09003E-03	1.63028E-03	7.12505E-04	1.52477E-04	4.40946E-05

COMPONENT : CONCRETE - RADIAL FIFTH 6 INCHES - R5
VOLUME : 5.53000E+07 CC
: ABOVE VOLUME IS FOR THE FIFTH 6 INCHES OF CONCRETE
: IN THE RADIAL DIRECTION.
:
: (INTERVALS 73-75 TOTGRDRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	3.61182E-12	3.04680E-12	2.72310E-12	2.05306E-12	1.16702E-12	6.63365E-13	1.21837E-13	1.27198E-14
HE	2	6	8.09751E-01	2.32212E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	9.55712E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	6.06896E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	1.82166E-22	1.82166E-22	1.82166E-22	1.82166E-22	1.82165E-22	1.82165E-22	1.82163E-22	1.82161E-22
B	5	12	1.99754E-02	1.31849E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	1.77414E-15	1.77349E-15	1.77306E-15	1.77199E-15	1.76985E-15	1.76771E-15	1.76132E-15	1.75282E-15
F	9	20	1.10075E+01	3.47013E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	4.34640E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	1.81578E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	2.13001E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	2.18321E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	7.17042E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	2.61218E-13	2.24588E-36	9.41163E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	2.33919E-13	4.16196E-17	1.31660E-19	7.41056E-26	2.34760E-38	7.43700E-51	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	2.04115E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	1.70043E-16	1.70042E-16	1.70041E-16	1.70039E-16	1.70035E-16	1.70031E-16	1.70020E-16	1.70005E-16
AR	18	37	3.02684E+06	8.22348E-12	3.15879E-21	1.66915E-27	3.38810E-43	1.39583E-74	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	3.84409E-14	3.83432E-14	3.81460E-14	3.76574E-14	3.66989E-14	3.57648E-14	3.31028E-14	2.98590E-14
AR	18	41	6.60140E+03	1.01001E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	2.31345E-19	2.31345E-19	2.31345E-19	2.31345E-19	2.31345E-19	2.31345E-19	2.31345E-19	2.31345E-19
K	19	42	4.47192E+04	6.26562E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	4.93831E-14	4.93818E-14	4.93809E-14	4.93788E-14	4.93745E-14	4.93702E-14	4.93574E-14	4.93402E-14
CA	20	45	1.42623E+07	1.93228E-11	1.94017E-13	9.02995E-15	4.21991E-18	9.21574E-25	2.01261E-31	2.09628E-51	4.76828E-78
CA	20	47	3.91608E+05	9.84282E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25849E+06	2.55125E-12	2.99279E-16	7.17173E-19	2.01608E-25	1.59312E-38	1.25887E-51	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	1.44693E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	4.79983E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	1.72422E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	8.90964E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	2.81183E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.49674E-18	1.49979E-19	3.23559E-20	6.99459E-22	3.26870E-25	1.52754E-28	1.55896E-38	7.43523E-52
V	23	52	2.02084E+02	7.42894E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	1.11608E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	1.59170E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	1.15364E-12	1.51212E-24	1.81103E-32	2.84318E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	9.44370E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.11638E-21	1.11638E-21	1.11638E-21	1.11637E-21	1.11637E-21	1.11637E-21	1.11636E-21	1.11636E-21
MN	25	54	2.61565E+07	1.06721E-12	8.68321E-14	1.63042E-14	2.49087E-16	5.81373E-20	1.35690E-23	1.72521E-34	5.11959E-49
MN	25	56	9.29152E+03	1.78214E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.77727E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	2.65228E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	2.14537E-10	9.63992E-11	5.65528E-11	1.49075E-11	1.03588E-12	7.19799E-14	2.41501E-17	5.63032E-22
FE	26	59	3.89409E+06	2.61129E-12	1.25382E-19	1.65634E-24	1.05064E-36	4.22782E-61	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	2.60936E-27	2.60931E-27	2.60927E-27	2.60918E-27	2.60900E-27	2.60882E-27	2.60828E-27	2.60755E-27
FE	26	61	3.60001E+02	3.25831E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	1.03264E-17	6.31499E-19	9.80217E-20	9.30460E-22	8.38387E-26	7.55421E-30	5.52624E-42	3.64261E-58
CO	27	58	6.13405E+06	3.08940E-15	6.97880E-20	5.57666E-23	1.00671E-30	3.73037E-46	1.06891E-61	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	4.96416E-12	3.34307E-12	2.56850E-12	1.32896E-12	3.55779E-13	9.57460E-14	1.82746E-15	9.38673E-18
CO	27	61	5.94007E+03	2.92629E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	1.50782E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	8.91522E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	1.32796E-17	1.32793E-17	1.32790E-17	1.32784E-17	1.32773E-17	1.32761E-17	1.32727E-17	1.32681E-17
NI	28	63	2.90020E+09	2.02185E-15	1.97662E-15	1.94702E-15	1.87497E-15	1.75875E-15	1.61243E-15	1.28592E-15	9.51027E-16
NI	28	65	9.21738E+03	1.02480E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	3.41491E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	1.82301E-18	3.59997E-36	5.66636E-48	1.76135E-77	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	1.01184E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	5.79174E-17	2.69751E-25	1.62083E-27	4.53598E-38	3.55239E-59	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	1.48861E-21	1.38239E-21	1.31581E-21	1.16307E-21	9.08723E-22	7.09996E-22	3.38633E-22	1.26191E-22
SR	38	91	3.48315E+04	1.35148E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	4.51559E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	3.33184E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	1.26559E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	3.30853E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	1.52556E-17	3.90558E-23	7.30875E-27	3.50148E-36	8.03629E-55	1.84442E-73	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	4.78100E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	1.05234E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	9.83370E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	2.30927E-20	2.56177E-24	5.91448E-27	1.51484E-33	9.93684E-47	6.51821E-60	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	2.59948E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	7.19288E-20	7.19287E-20	7.19287E-20	7.19285E-20	7.19282E-20	7.19279E-20	7.19269E-20	7.19255E-20
ZR	40	95	5.63534E+06	2.23046E-16	1.95498E-21	8.31085E-25	3.09668E-33	4.29916E-50	5.96856E-67	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	4.78507E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.30888E+10	9.82203E-22	9.79290E-22	9.77352E-22	9.72525E-22	9.62942E-22	9.53453E-22	9.25544E-22	8.89599E-22
NB	41	92	8.80746E+05	3.93253E-17	1.72379E-49	4.61697E-71	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	9.95058E-18	9.94955E-18	9.94886E-18	9.94713E-18	9.94368E-18	9.94022E-18	9.92988E-18	9.91610E-18
NB	41	95	3.02684E+06	4.56727E-18	1.79438E-27	9.27038E-34	1.88173E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	9.05800E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	8.35136E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	2.61974E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	1.83149E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	7.00614E-20	7.00452E-20	7.00344E-20	7.00074E-20	6.99536E-20	6.98998E-20	6.97385E-20	6.95240E-20
MO	42	99	2.41515E+05	9.55825E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	4.75605E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	2.03270E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00[illegible]E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	1.05071E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00[illegible]E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	4.05484E-26	4.05484E-26	4.05484E-26	4.05484E-26	4.05483E-26	4.05483E-26	4.05482E-26	4.05480E-26
PD	46	109	4.83704E+04	1.06363E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	4.65320E-19	7.28779E-58	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	9.94929E-16	9.79147E-16	9.68764E-16	9.43287E-16	8.94326E-16	8.47905E-16	7.22608E-16	5.83861E-16
AG	47	110	2.15826E+07	1.59944E-13	7.66699E-15	1.00735E-15	6.34424E-18	2.51646E-22	9.98156E-27	6.22915E-40	1.54192E-57
CD	48	109	3.99508E+07	8.74144E-20	1.69131E-20	5.65782E-21	3.66198E-22	1.53408E-24	6.42663E-27	4.72473E-34	1.45515E-43
CD	48	111	2.92221E+03	2.20587E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	6.95745E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	2.11427E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	1.18611E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	3.24948E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	1.76902E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	3.11479E-20	6.80233E-27	2.46488E-31	1.95377E-42	1.22545E-64	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	3.53484E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	1.62215E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	2.27942E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	8.47165E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	8.56739E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40095E+01	1.89212E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	2.59128E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	9.65830E-17	1.31560E-19	1.61662E-21	2.70598E-26	7.58113E-36	2.12398E-45	4.67083E-74	0.00000E+00
SN	50	121	9.72156E+04	6.10656E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	8.76156E-16	2.00883E-18	3.49289E-20	1.39251E-24	2.21310E-33	3.51725E-42	1.41195E-68	0.00000E+00

SYM	Z	A	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
I	53	136	4.64981E+04	7.81870E-25	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	3.65535E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	3.68863E-17	5.63002E-68	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47401E+07	4.71764E-13	1.71511E-13	8.71950E-14	1.61161E-14	5.50546E-16	1.88075E-17	7.49780E-22	1.02110E-27
EU	63	152	4.17559E+08	4.39576E-12	3.75476E-12	3.38128E-12	2.60212E-12	1.54176E-12	9.12665E-13	1.89578E-13	2.53216E-14
EU	63	154	2.69812E+08	4.32193E-13	3.38884E-13	2.88160E-13	1.92127E-13	8.54083E-14	3.79674E-14	3.33557E-15	1.50753E-16
LU	71	174	1.22687E+08	1.62511E-25	7.72607E-26	2.18446E-27	2.93615E-31	5.30560E-39	9.58637E-47	5.65483E-70	0.00000E+00
LU	71	177	5.58242E+05	7.15956E-21	6.21150E-23	2.62404E-24	9.61739E-28	1.29189E-34	1.73536E-41	4.20624E-62	0.00000E+00
HF	72	173	8.49655E+04	1.71872E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	2.65744E-16	5.15921E-19	3.72676E-22	5.22644E-30	1.02787E-45	2.02146E-61	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	6.40964E-22	5.99379E-22	5.73165E-22	5.12537E-22	4.09842E-22	3.27725E-22	1.67564E-22	6.85087E-23
HF	72	179	1.89584E+16	3.04778E-23	3.05724E-23	3.03023E-23	3.01278E-23	2.97818E-23	2.94398E-23	2.84372E-23	2.71533E-23
HF	72	180	1.98723E+04	6.52476E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	1.82068E-15	5.02768E-21	1.97256E-26	2.15717E-39	2.56852E-65	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	3.21293E-28	3.21293E-28	3.21293E-28	3.21293E-28	3.21293E-28	3.21292E-28	3.21292E-28	3.21290E-28
TA	73	180	2.93458E+04	8.01035E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89361E+06	2.86567E-15	5.77266E-16	4.55170E-18	7.16449E-23	1.79215E-32	4.48168E-42	7.00886E-71	0.00000E+00
W	74	181	1.20960E+07	6.95996E-17	2.62605E-19	7.05793E-21	8.55830E-25	1.17216E-32	1.64382E-40	4.53376E-64	0.00000E+00
W	74	185	6.47801E+06	1.36858E-14	5.45596E-19	6.56705E-22	2.96224E-29	6.41134E-44	1.38768E-58	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	2.69656E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	2.25749E-19	1.87706E-26	3.57561E-31	5.66418E-43	1.42189E-66	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11947E+02	1.76110E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	2.29766E-21	1.32544E-21	9.18498E-22	3.67173E-22	5.86755E-23	9.37653E-24	5.82648E-26	2.49541E-29
TL	81	206	2.52054E+02	4.06323E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	3.50475E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	8.94438E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	4.07658E-22	4.07658E-22	4.07658E-22	4.07658E-22	4.07658E-22	4.07658E-22	4.07657E-22	4.07657E-22
PB	82	207	7.95989E-01	8.87545E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				2.38855E-09	1.07438E-10	6.57197E-11	2.11920E-11	4.27636E-12	1.87080E-12	4.03025E-13	1.58861E-13
TOTAL (CURIES)				1.32087E-01	5.96131E-03	3.65430E-03	1.17191E-03	2.36482E-04	1.03455E-04	2.22873E-05	8.78502E-06

COMPONENT : CONCRETE - RADIAL SIXTH 6 INCHES - R5
VOLUME : 5.68000E+07 CC
: ABOVE VOLUME IS FOR THE SIXTH 6 INCHES OF CONCRETE
: IN THE RADIAL DIRECTION.
:
: (INTERVALS 76-78 TOTGRDRS)

NUCLIDE SYM	Z	A	HALF-LIFE (SECONDS)	SHUTDOWN	CONCENTRATION (CURIES/CC) AT TIME 3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.67235E+08	6.37434E-13	5.58069E-13	4.80568E-13	3.62335E-13	2.05961E-13	1.17074E-13	2.15024E-14	2.24486E-15
HE	2	6	8.09751E-01	5.35428E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	1.68751E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.39535E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	4.01762E-23	4.01761E-23	4.01761E-23	4.01760E-23	4.01759E-23	4.01758E-23	4.01755E-23	4.01750E-23
B	5	12	1.99754E-02	2.32780E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	3.13571E-16	3.13458E-16	3.13382E-16	3.13193E-16	3.12814E-16	3.12436E-16	3.11306E-16	3.09804E-16
F	9	20	1.10023E+01	8.42731E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	1.03598E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	3.21407E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	5.04617E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	3.99938E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	1.65527E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	6.04965E-14	5.19670E-37	2.17968E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	4.13798E-14	7.36244E-18	2.32904E-20	1.31092E-26	4.15267E-39	1.31559E-51	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	4.87564E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	3.02937E-17	3.02935E-17	3.02934E-17	3.02931E-17	3.02924E-17	3.02917E-17	3.02897E-17	3.02870E-17
AR	18	37	3.02644E+06	1.95819E-12	7.44694E-22	3.93402E-28	7.98540E-44	3.28981E-75	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	7.44610E-15	7.38873E-15	7.35073E-15	7.25658E-15	7.07166E-15	6.89168E-15	6.37890E-15	5.75383E-15
AR	18	41	6.60140E+03	2.39289E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	4.08530E-20	4.08530E-20	4.08530E-20	4.08530E-20	4.08530E-20	4.08530E-20	4.08530E-20	4.08530E-20
K	19	42	4.47192E+04	1.10906E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	8.69991E-15	8.69968E-15	8.69953E-15	8.69915E-15	8.69839E-15	8.69764E-15	8.69538E-15	8.69236E-15
CA	20	45	1.42623E+07	5.42166E-12	5.43562E-14	1.59901E-15	7.47255E-19	1.63191E-25	3.56390E-32	3.71206E-52	8.44359E-79
CA	20	47	3.91608E+05	1.73410E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	4.57743E-15	5.31098E-17	1.27269E-19	3.57772E-26	2.82713E-39	2.23398E-52	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	3.35367E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	1.16008E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	4.06865E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	2.17977E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	4.97369E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	3.66317E-19	3.67064E-20	7.91889E-21	1.71188E-22	7.99994E-26	3.75856E-29	3.81545E-39	1.81972E-52
V	23	52	2.02084E+02	1.51507E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	2.67290E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	3.89483E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	2.08048E-13	2.72698E-25	3.26604E-33	5.12742E-53	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	2.23471E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	2.73226E-22	2.73225E-22	2.73225E-22	2.73225E-22	2.73225E-22	2.73224E-22	2.73223E-22	2.73221E-22
MN	25	54	2.61565E+07	2.48307E-13	2.02031E-14	3.79348E-15	5.79547E-17	1.35267E-20	3.15707E-24	4.01402E-35	1.19117E-49
MN	25	56	9.29152E+03	3.01807E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	4.23641E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	6.47781E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	3.78082E-11	1.69885E-11	9.96638E-12	2.62718E-12	1.82554E-13	1.26851E-14	4.25601E-18	9.92238E-23
FE	26	59	3.89409E+06	4.63349E-13	2.22478E-20	2.93901E-25	1.04426E-37	7.50045E-62	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	6.38422E-28	6.38409E-28	6.38401E-28	6.38378E-28	6.38334E-28	6.38290E-28	6.38157E-28	6.37980E-28
FE	26	61	3.60001E+02	7.97432E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	2.52691E-18	1.54530E-19	2.39863E-20	2.27687E-22	2.05156E-26	1.84854E-30	1.35229E-42	8.91365E-59
CO	27	58	6.13405E+06	7.17093E-16	1.61988E-20	1.29447E-23	2.33672E-31	7.61419E-47	2.48108E-62	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	8.83628E-13	5.95072E-13	4.57197E-13	2.36558E-13	6.33291E-14	1.69539E-14	3.25290E-16	1.67085E-18
CO	27	61	5.94007E+03	6.92787E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	3.64230E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

CO	27	64	2.00000E-01	2.18189E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	2.34525E-18	2.34519E-18	2.34513E-18	2.34505E-18	2.34485E-18	2.34464E-18	2.34405E-18	2.34322E-18
NI	28	63	2.90020E+09	3.64004E-16	3.55860E-16	3.50532E-16	3.37569E-16	3.15036E-16	2.90794E-16	2.31511E-16	1.71218E-16
NI	28	65	9.21758E+03	2.42788E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	6.04317E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	4.44572E-19	8.77911E-37	1.38184E-48	4.29534E-78	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.40799E+04	2.45575E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	1.38475E-17	6.44968E-24	3.87523E-28	1.08451E-38	8.49339E-60	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	3.59868E-22	3.34188E-22	[illegible]	2.81169E-22	2.19681E-22	1.71639E-22	8.18636E-23	3.05063E-23
SR	38	91	3.48315E+04	3.27962E-19	0.00000E+00	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	1.59219E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	8.14969E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	3.09351E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	5.84249E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	3.66651E-18	9.38630E-24	1.75655E-27	8.41530E-37	1.93141E-55	4.43279E-74	0.00000E+00	0.00000E+00
Y	39	92	1.27640E+04	1.15711E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]
Y	39	94	1.12200E+03	2.56335E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]
Y	39	96	9.80406E+00	2.40667E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]
ZR	40	88	7.20602E+[illegible]	5.51407E-21	6.11699E-25	1.41226E-27	3.61714E-34	2.37272E-47	1.55642E-60	0.00000E+00	[illegible]
ZR	40	89	2.82249E+05	6.27298E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	1.28360E-20	1.28360E-20	1.28360E-20	1.28360E-20	1.28359E-20	1.28358E-20	1.28357E-20	1.28354E-20
ZR	40	95	5.63534E+06	5.45788E-17	4.78378E-22	2.03564E-25	7.57748E-34	1.05199E-50	1.46049E-67	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	1.02452E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	2.39723E-22	2.39012E-22	2.38539E-22	2.37361E-22	2.35022E-22	2.32706E-22	2.25895E-22	2.17122E-22
NB	41	92	8.80746E+05	9.54235E-18	4.18282E-50	1.12032E-71	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	1.82654E-18	1.82635E-18	1.82622E-18	1.82591E-18	1.82527E-18	1.82464E-18	1.82274E-18	1.82021E-18
NB	41	95	3.02684E+06	1.09592E-18	4.20963E-28	2.22443E-34	4.51527E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	2.19046E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	2.01118E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	6.37505E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	4.48112E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	1.54940E-20	1.54905E-20	1.54881E-20	1.54821E-20	1.54702E-20	1.54583E-20	1.54226E-20	1.53752E-20
MO	42	99	2.41515E+05	1.89502E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	9.21966E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	4.93743E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	2.52290E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	9.76371E-27	9.76370E-27	9.76370E-27	9.76369E-27	9.76369E-27	9.76367E-27	9.76364E-27	9.76360E-27
PD	46	109	4.83704E+04	2.55915E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	1.13884E-19	1.78364E-58	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	1.78358E-16	1.75529E-16	1.73668E-16	1.69101E-16	1.60343E-16	1.52002E-16	1.29540E-16	1.04667E-16
AG	47	110	2.15026E+07	2.97581E-14	1.42275E-15	1.07417E-16	1.18037E-18	4.68196E-23	1.85710E-27	1.15895E-40	2.86678E-58
CD	48	109	3.99508E+07	2.10187E-20	4.06673E-21	1.36042E-21	8.80519E-23	3.68867E-25	1.54527E-27	1.13606E-34	3.49888E-44
CD	48	111	2.92221E+03	5.33034E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	1.69649E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	5.17447E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	2.90292E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	7.92503E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	4.25389E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	7.51763E-21	1.64176E-27	5.95387E-32	4.71546E-43	2.95766E-65	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	8.50271E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.4099[illegible]E+01	3.93397E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	5.49198E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	2.06369E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	2.07020E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	4.62952E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	6.34201E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	2.13439E-17	2.90736E-20	3.57256E-22	5.97996E-27	1.67536E-36	4.69580E-46	1.03221E-74	0.00000E+00
SN	50	121	9.72156E+04	1.11808E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	1.61513E-16	3.70313E-19	6.43888E-21	2.56699E-25	4.07968E-34	6.48379E-43	2.60282E-69	0.00000E+00
SN	50	125	8.12599E+05	2.00833E-15	1.70215E-58	7.07573E-74	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
I	53	130	4.44981E+04	1.87883E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	8.74073E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	9.02770E-18	9.37575E-69	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	8.72057E-14	3.16669E-14	1.61181E-14	2.97987E-15	1.01769E-16	3.47654E-18	1.38597E-22	1.88751E-26
EU	63	152	4.17559E+08	7.74498E-13	6.61863E-13	5.96028E-13	4.56683E-13	2.71647E-13	1.60878E-13	3.34175E-14	4.11095E-15
EU	63	154	2.69812E+08	7.71717E-14	6.05106E-14	5.14534E-14	3.43060E-14	1.52504E-14	6.77941E-15	5.95559E-16	2.32578E-17
LU	71	174	1.22687E+07	3.82557E-24	1.81865E-26	1.14202E-28	4.91193E-32	1.24889E-39	2.25655E-47	1.33110E-78	0.00000E+00
LU	71	177	1.58242E+07	1.72156E-18	1.49407E-23	4.50466E-25	2.31256E-28	3.10642E-35	4.17279E-42	1.01142E-62	0.00000E+00
HF	72	173	8.49653E+04	4.20645E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	4.75376E-15	9.22905E-20	6.66662E-23	9.34932E-31	1.83879E-46	3.61609E-62	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	1.54841E-22	1.44795E-22	1.38463E-22	1.23817E-22	9.90079E-23	7.91700E-23	4.04794E-23	1.65500E-23
HF	72	179	1.89584E+10	7.34355E-24	7.31815E-24	7.30127E-24	7.25922E-24	7.17586E-24	7.09345E-24	6.85187E-24	6.54252E-24
HF	72	180	1.98723E+04	1.57793E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	3.37888E-14	5.68557E-22	3.65207E-27	3.95685E-40	4.64459E-66	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	7.78707E-29	7.78700E-29	7.78700E-29	7.78700E-29	7.78699E-29	7.78699E-29	7.78697E-29	7.78694E-29
TA	73	180	2.93456E+04	1.95913E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	5.44579E-14	7.16939E-17	8.61185E-19	1.56189E-23	3.40571E-33	8.51676E-43	1.33193E-71	0.00000E+00
W	74	181	1.20968E+07	1.45863E-17	4.42697E-20	1.72735E-21	2.04560E-25	2.86873E-33	4.02507E-41	1.10959E-64	0.00000E+00
W	74	185	6.47801E+06	2.53432E-15	1.01033E-19	1.17904E-22	5.48545E-30	1.18725E-44	2.56969E-59	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	6.99491E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	5.47766E-20	4.55459E-27	8.67653E-32	1.37439E-43	3.44821E-67	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11967E+02	4.29609E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	5.55632E-22	3.20526E-22	2.22116E-22	8.87919E-23	1.41892E-23	2.26749E-24	9.25340E-27	6.03453E-30
TL	81	206	2.52054E+02	9.87278E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86168E+02	8.08551E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	2.18966E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	9.97467E-23	9.97467E-23	9.97466E-23	9.97466E-23	9.97466E-23	9.97465E-23	9.97464E-23	9.97462E-23
PB	82	207	7.95989E-01	2.16971E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				4.25289E-10	1.89687E-11	1.15903E-11	3.75890E-12	7.55435E-13	3.30753E-13	7.16261E-14	2.14471E-14
TOTAL (CURIES)				2.41564E-02	1.07629E-03	6.58327E-04	2.12378E-04	4.29087E-05	1.87868E-05	4.06836E-06	1.21828E-06

COMPONENT : CONCRETE - RADIAL SEVENTH 6 INCHES - R5
VOLUME : 5.84000E+07 CC
: ABOVE VOLUME IS FOR THE SEVENTH 6 INCHES OF CONCRETE
: IN THE RADIAL DIRECTION.
:
: (INTERVALS 79-81 TOTORDRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	5.00 YRS	5.80 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.60 YRS	100.00 YRS
H	1	3	3.87233E+08	1.33159E-13	1.12402E-13	1.06594E-13	7.56912E-14	4.30250E-14	2.44566E-14	4.49182E-15	4.68947E-16
HE	2	6	8.09751E-01	1.24680E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	3.52617E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	3.23951E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	9.23616E-24	9.23615E-24	9.23615E-24	9.23613E-24	9.23611E-24	9.23608E-24	9.23600E-24	9.23590E-24
B	5	12	1.99754E-02	4.86332E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	6.55528E-17	6.55291E-17	6.55152E-17	6.54737E-17	6.53946E-17	6.53156E-17	6.50792E-17	6.47655E-17
F	9	20	1.10023E+01	2.85092E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	2.48102E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	6.72403E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.67155E+02	1.20238E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	8.52699E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	3.85534E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.41286E-16	1.21366E-37	5.09050E-63	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	8.65625E-15	1.54015E-18	4.87213E-21	2.74231E-27	8.68741E-40	2.75209E-52	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	1.16976E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	6.35438E-18	6.35433E-18	6.35431E-18	6.35423E-18	6.35409E-18	6.35395E-18	6.35352E-18	6.35295E-18
AR	18	37	3.02684E+06	4.59762E-15	1.76603E-22	9.35197E-29	1.89423E-44	7.80384E-76	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	1.61987E-15	1.60739E-15	1.59912E-15	1.57864E-15	1.53846E-15	1.49930E-15	1.38770E-15	1.25172E-15
AR	18	41	6.60142E+03	5.70202E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.18146E+16	8.53586E-21	8.53586E-21	8.53586E-21	8.53586E-21	8.53586E-21	8.53586E-21	8.53586E-21	8.53586E-21
K	19	42	4.47192E+04	2.31939E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	3.52053E+12	1.81656E-15	1.81651E-15	1.81648E-15	1.81640E-15	1.81624E-15	1.81609E-15	1.81561E-15	1.81498E-15
CA	20	45	1.42623E+07	7.15866E-13	7.18786E-15	3.54538E-16	1.56338E-19	3.41421E-26	7.45625E-33	7.76622E-53	0.00000E+00
CA	20	47	3.91608E+05	3.62092E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	9.47818E-16	1.11185E-17	2.66438E-20	7.48995E-27	5.91860E-40	4.67685E-53	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	7.84179E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	2.81177E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	9.46302E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	5.33928E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.04010E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	8.97578E-20	8.99608E-21	1.94035E-21	4.19459E-23	1.96021E-26	9.16053E-35	9.34891E-40	4.45883E-53
V	23	52	2.52084E+02	2.74518E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	6.42763E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	9.54170E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	4.36891E-14	3.75272E-26	6.88992E-34	1.08166E-53	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	5.21911E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	6.69478E-23	6.69478E-23	6.69478E-23	6.69477E-23	6.69476E-23	6.69475E-23	6.69471E-23	6.69466E-23
MN	25	54	2.61565E+07	5.82339E-14	4.75811E-16	8.89662E-16	1.35918E-17	3.17234E-21	7.40408E-25	9.41383E-56	2.79357E-50
MN	25	56	9.29152E+03	6.31398E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.01479E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.58452E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20297E+07	7.89562E-12	3.54774E-12	2.08129E-12	5.48636E-13	3.81230E-14	2.64904E-15	8.88786E-19	2.07219E-23
FE	26	59	3.89409E+06	9.69565E-16	4.65540E-21	6.14993E-26	5.90100E-38	1.56948E-62	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	1.56388E-28	1.56385E-28	1.56383E-28	1.56377E-28	1.56366E-28	1.56356E-28	1.56325E-28	1.56280E-28
FE	26	61	3.60001E+02	1.95390E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	6.19072E-19	3.78587E-20	5.87645E-21	5.57815E-25	5.92617E-27	4.52875E-31	3.31301E-43	2.18377E-59
CO	27	58	6.13405E+06	1.67858E-16	3.79162E-21	3.85010E-24	5.46981E-32	1.78234E-47	5.80774E-63	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.85073E-13	1.24656E-13	9.57583E-14	4.95462E-14	1.32641E-14	3.55094E-15	6.81309E-17	3.49954E-19
CO	27	61	5.94007E+03	1.64996E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.54012E+02	8.82705E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	66	2.99999E-01	5.34609E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	4.90033E-19	4.90020E-19	4.90012E-19	4.89990E-19	4.89948E-19	4.89905E-19	4.89778E-19	4.89608E-19
NI	28	63	2.90020E+09	7.67915E-17	7.50735E-17	7.39495E-17	7.12127E-17	6.60392E-17	6.12416E-17	4.88404E-17	3.61208E-17
NI	28	65	9.21738E+03	5.78654E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62095E+04	1.26332E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	1.08586E-19	2.14423E-37	3.37510E-49	1.04915E-78	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	5.97279E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	3.52606E-16	1.54912E-24	9.30804E-29	2.60491E-39	2.04005E-60	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	6.72369E-23	6.10117E-23	7.71103E-23	6.81593E-23	5.32537E-23	4.16077E-23	1.98448E-23	7.39514E-24
SR	38	91	3.48315E+04	7.97556E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	5.89599E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	1.99587E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	7.57179E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	1.22078E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	8.84563E-19	2.20444E-24	4.23767E-28	2.03019E-37	4.65951E-56	1.06941E-74	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	2.80758E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	6.25456E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.60406E+08	5.89686E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	1.32252E-21	1.46715E-25	3.58722E-28	8.67552E-35	5.69083E-48	3.73298E-61	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	1.51649E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	2.69723E-21	2.69723E-21	2.69722E-21	2.69722E-21	2.69721E-21	2.69719E-21	2.69716E-21	2.69711E-21
ZR	40	95	5.63534E+06	1.33711E-17	1.17197E-22	4.98216E-26	1.85639E-34	2.67725E-51	3.57802E-68	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	2.25768E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	5.85951E-23	5.84213E-23	5.83057E-23	5.80177E-23	5.74460E-23	5.68799E-23	5.52159E-23	5.30706E-23
NB	41	92	8.80746E+05	2.32126E-18	1.61751E-50	2.72527E-72	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	3.86308E-19	3.86267E-19	3.86241E-19	3.86174E-19	3.86040E-19	3.85906E-19	3.85504E-19	3.84969E-19
NB	41	95	3.02684E+06	2.64034E-19	1.01421E-28	5.35971E-35	1.08783E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	5.31160E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	4.06013E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	1.55416E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	1.09771E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	3.48545E-21	3.48464E-21	3.48410E-21	3.48276E-21	3.48008E-21	3.47740E-21	3.46938E-21	3.45871E-21
MO	42	99	2.41515E+05	4.10498E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	1.98319E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	1.20179E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	6.07913E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	2.35939E-27	2.35939E-27	2.35939E-27	2.35938E-27	2.35938E-27	2.35938E-27	2.35937E-27	2.35936E-27
PD	46	109	4.83704E+04	6.18028E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	2.79049E-20	4.37043E-59	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	3.74393E-17	3.68454E-17	3.645[illegible]E-17	3.54960E-17	3.36536E-17	3.19068E-17	2.71918E-17	2.19708E-17
AG	47	110	2.15826E+07	6.31435E-15	3.01892E-16	3.97679E-17	2.50461E-19	9.93462E-24	3.94057E-28	2.45918E-41	6.08725E-59
CD	48	109	3.99508E+07	5.07279E-21	9.81495E-22	3.28332E-22	2.12511E-23	8.902[illegible]E-26	3.72947E-28	2.74184E-35	8.44444E-[illegible]
CD	48	111	2.92221E+03	1.29176E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	4.14329E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	1.26780E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	7.11299E-25	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	1.93581E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	1.82675E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	1.82006E-21	3.97480E-28	1.44147E-32	1.14164E-43	7.16066E-66	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	2.05289E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	9.56203E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	1.32775E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	5.03568E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	5.01670E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40893E+01	1.13408E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	1.55397E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	4.78949E-18	6.52399E-21	8.01672E-23	1.34188E-27	3.75943E-37	1.05327E-46	2.31623E-75	0.00000E+00
SN	50	121	9.72156E+04	2.36483E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	3.43852E-17	7.88375E-20	1.37080E-21	5.46696E-26	8.68540E-35	1.38036E-43	5.54125E-70	0.00000E+00
SN	50	125	8.12599E+05	4.24047E-16	3.59399E-51	1.49480E-74	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

I	53	130	4.44981E+04	4.52882E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	2.16016E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	2.21204E-18	2.29682E-69	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	1.84706E-14	6.70720E-15	3.41388E-15	6.30981E-16	2.15551E-17	7.36349E-19	2.93556E-23	3.99784E-29
EU	63	152	4.17559E+08	1.61731E-13	1.38710E-13	1.24463E-13	9.57823E-14	5.67255E-14	3.35946E-14	6.97825E-15	8.58450E-16
EU	63	154	2.69812E+08	1.61796E-14	1.26864E-14	1.07875E-14	7.19247E-15	3.19734E-15	1.42135E-15	1.24863E-16	4.87616E-18
LU	71	176	1.22687E+07	9.07073E-25	4.31240E-27	1.21928E-28	1.63896E-32	2.96139E-40	5.35075E-48	3.15631E-71	0.00000E+00
LU	71	177	1.38242E+07	4.15554E-22	3.60643E-24	1.52304E-25	5.58212E-29	7.49836E-36	1.00724E-42	2.44138E-63	0.00000E+00
HF	72	173	8.49653E+04	1.03070E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	9.97251E-16	1.93608E-20	1.39853E-23	1.96132E-31	3.85724E-47	7.58590E-63	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	3.75184E-23	3.50842E-23	3.35498E-23	3.00010E-23	2.39898E-23	1.91831E-23	9.80826E-24	4.01011E-24
HF	72	179	1.89584E+10	1.77554E-24	1.76940E-24	1.76532E-24	1.75515E-24	1.73500E-24	1.71507E-24	1.65666E-24	1.58187E-24
HF	72	180	1.98723E+04	3.82661E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	7.14269E-15	1.18779E-22	7.73852E-28	8.38431E-41	9.84116E-67	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	1.89143E-29	1.89183E-29	1.89183E-29	1.89183E-29	1.89183E-29	1.89182E-29	1.89182E-29	1.89181E-29
TA	73	180	2.93458E+04	4.79751E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	1.16254E-14	1.53049E-17	1.83842E-19	2.90729E-24	7.27036E-34	1.81812E-43	2.84335E-72	0.00000E+00
W	74	181	1.20968E+07	3.57399E-18	1.57476E-20	4.23241E-22	5.01220E-26	7.02904E-34	9.85745E-42	2.71875E-65	0.00000E+00
W	74	185	6.47801E+06	5.57823E-16	2.14408E-20	2.50212E-23	1.16410E-30	2.51955E-45	5.45531E-60	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	1.05855E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	1.33201E-20	1.10754E-27	2.10987E-32	3.34209E-44	8.38501E-68	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11967E+02	1.04961E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	1.34751E-22	7.77332E-23	5.38671E-23	2.15336E-23	3.44114E-24	5.49906E-25	2.24412E-27	1.46348E-30
TL	81	206	2.52054E+02	2.40366E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	1.94395E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	5.36373E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	2.44352E-23	2.44352E-23	2.44352E-23	2.44352E-23	2.44351E-23	2.44351E-23	2.44351E-23	2.44351E-23
PB	82	207	7.95989E-01	5.31096E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				8.92076E-11	3.95824E-12	2.42096E-12	7.81067E-13	1.57883E-13	6.91544E-14	1.50156E-14	4.52961E-15
TOTAL (CURIES)				5.20972E-03	2.31161E-04	1.41384E-04	4.56143E-05	9.22038E-06	4.03861E-06	8.76911E-07	2.64518E-07

COMPONENT : CONCRETE - RADIAL EIGHTH 6 INCHES - R5
VOLUME : 5.99000E+07 CC
: ABOVE VOLUME IS FOR THE EIGHTH 6 INCHES OF CONCRETE
: IN THE RADIAL DIRECTION.
:
: (INTERVALS 82-84 TOTGRORS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	CONCENTRATION (CURIES/CC) AT TIME 5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87253E+08	2.93095E-14	2.47407E-14	2.20977E-14	1.66604E-14	9.47020E-15	5.38513E-15	9.88697E-16	1.03220E-16
HE	2	6	8.09751E-01	2.92729E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	7.76318E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	7.58052E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	2.15306E-24	2.15306E-24	2.15306E-24	2.15305E-24	2.15305E-24	2.15304E-24	2.15302E-24	2.15300E-24
B	5	12	1.99754E-02	1.07056E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	1.44347E-17	1.44294E-17	1.44259E-17	1.44172E-17	1.43998E-17	1.43824E-17	1.43304E-17	1.42612E-17
F	9	20	1.10023E+01	5.00075E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	5.96562E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	1.48171E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	2.87093E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	1.90429E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	9.03929E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	3.32385E-15	2.85521E-38	1.19757E-53	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	1.90689E-15	3.39280E-19	1.07328E-21	4.84103E-28	1.91375E-40	6.06259E-53	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	2.81706E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	1.40279E-18	1.40278E-18	1.40278E-18	1.40276E-18	1.40273E-18	1.40270E-18	1.40260E-18	1.40248E-18
AR	18	37	3.02684E+06	1.09656E-13	4.21208E-23	2.22573E-29	4.51785E-45	1.86126E-76	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	3.65668E-16	3.62851E-16	3.60985E-16	3.56361E-16	3.47291E-16	3.38451E-16	3.13259E-16	2.82563E-16
AR	18	41	6.60140E+03	1.36533E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	1.87909E-21	1.87909E-21	1.87909E-21	1.87909E-21	1.87909E-21	1.87909E-21	1.87909E-21	1.87909E-21
K	19	42	4.47192E+04	5.18885E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	3.99639E-16	3.99629E-16	3.99622E-16	3.99605E-16	3.99570E-16	3.99535E-16	3.99432E-16	3.99293E-16
CA	20	45	1.42623E+07	1.57685E-13	1.58329E-15	7.36896E-17	3.44369E-20	7.52057E-27	1.64241E-33	1.71968E-53	0.00000E+00
CA	20	47	3.91608E+05	7.96606E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	2.08904E-14	2.45152E-18	5.87466E-21	1.65145E-27	1.30499E-40	1.03119E-53	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	1.84643E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	6.83204E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	2.30734E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	1.30936E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	2.29110E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	2.20179E-20	2.20628E-21	4.75974E-22	1.02894E-23	4.80845E-27	2.24710E-30	2.29332E-40	1.09376E-53
V	23	52	2.02084E+02	6.04605E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	1.55109E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	2.34025E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	9.73055E-15	1.27542E-26	1.52755E-34	2.39813E-54	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	1.27229E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.64225E-23	1.64225E-23	1.64224E-23	1.64224E-23	1.64224E-23	1.64224E-23	1.64223E-23	1.64222E-23
MN	25	54	2.61565E+07	1.37509E-14	1.11882E-15	2.10679E-16	3.20946E-18	7.49093E-22	1.74835E-25	2.22291E-36	6.59654E-51
MN	25	56	9.29152E+03	1.39104E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.81935E+02	2.44869E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	3.88005E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.73713E-12	7.80556E-13	4.57915E-13	1.20788E-13	8.38763E-15	5.82829E-16	1.95566E-19	4.55894E-24
FE	26	59	3.89409E+06	2.13718E-14	1.02617E-21	1.35561E-26	8.59885E-39	3.65955E-63	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	3.83530E-29	3.83522E-29	3.83516E-29	3.83503E-29	3.83476E-29	3.83450E-29	3.83370E-29	3.83264E-29
FE	26	61	3.60001E+02	4.79287E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	1.51841E-19	9.28565E-21	1.44132E-21	1.36816E-23	1.23278E-27	1.11078E-31	8.12585E-44	5.35617E-60
CO	27	58	6.13405E+06	3.95661E-17	8.93778E-22	7.14231E-25	1.28930E-32	4.29118E-48	1.36895E-63	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	4.88294E-14	2.74962E-14	2.11255E-14	1.09305E-14	2.92622E-15	7.83382E-16	1.50305E-17	7.72042E-20
CO	27	61	5.94007E+03	3.94931E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

CO	27	64	2.90000E-01	1.31138E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	1.07880E-19	1.07877E-19	1.07875E-19	1.07871E-19	1.07861E-19	1.07852E-19	1.07826E-19	1.07786E-19
NI	28	63	2.90020E+09	1.70074E-17	1.66269E-17	1.63780E-17	1.57719E-17	1.46261E-17	1.35035E-17	1.05170E-17	7.99966E-18
NI	28	65	9.21738E+03	1.38602E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	2.78387E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	2.65608E-20	5.24506E-38	8.25574E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	1.45549E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	8.01992E-19	5.73529E-26	2.24439E-29	6.28105E-40	4.91905E-61	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	2.11989E-23	1.96861E-23	1.87381E-23	1.65629E-23	1.29408E-23	1.01108E-23	4.82238E-24	1.79705E-24
SR	38	91	3.48315E+04	1.94331E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	9.54540E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	4.89568E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	1.85567E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	2.68745E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	2.14085E-19	5.48061E-25	1.02564E-28	4.91365E-38	1.12774E-56	2.58828E-75	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	6.82770E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	1.52853E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	1.44648E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	3.18402E-22	3.53217E-26	8.15489E-29	2.08867E-35	1.37009E-48	8.98732E-62	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	3.68572E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	5.96187E-22	5.96186E-22	5.96185E-22	5.96184E-22	5.96181E-22	5.96179E-22	5.96170E-22	5.96159E-22
ZR	40	95	5.63534E+06	3.27949E-18	2.87444E-23	1.22196E-26	4.55309E-35	6.32112E-52	8.77570E-69	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	5.18945E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	1.43422E-23	1.42996E-23	1.42714E-23	1.42009E-23	1.40609E-23	1.39224E-23	1.35148E-23	1.29900E-23
NB	41	92	8.80746E+05	5.65903E-19	2.48059E-51	6.64396E-73	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	8.58710E-20	8.58620E-20	8.58560E-20	8.58411E-20	8.58114E-20	8.57816E-20	8.56923E-20	8.55734E-20
NB	41	95	3.02684E+06	6.38315E-20	2.45189E-29	1.29561E-35	1.62988E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	1.29110E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	1.17795E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	3.79519E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	2.69207E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	8.00540E-22	8.00355E-22	8.00232E-22	7.99924E-22	7.99308E-22	7.98693E-22	7.96850E-22	7.94400E-22
MO	42	99	2.61515E+05	9.28563E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	4.46925E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	2.93071E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.04813E+03	1.46932E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	5.71875E-28	5.71874E-28	5.71874E-28	5.71874E-28	5.71873E-28	5.71873E-28	5.71871E-28	5.71868E-28
PD	46	109	4.83704E+04	1.49722E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	6.84513E-21	1.07208E-59	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	8.27456E-18	8.14330E-18	8.05695E-18	7.84507E-18	7.43787E-18	7.05180E-18	6.00974E-18	4.85582E-18
AG	47	110	2.15826E+07	1.40874E-15	6.73526E-17	8.87229E-18	5.58782E-20	2.21643E-24	8.79147E-29	5.48646E-42	1.35808E-59
CD	48	109	3.99508E+07	1.22820E-21	2.37634E-22	7.94942E-23	5.14521E-24	2.15543E-26	9.02962E-29	6.63840E-36	2.04453E-45
CD	48	111	2.92221E+03	3.13835E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	1.01341E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	3.11011E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	1.74483E-25	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	4.73546E-25	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	2.48617E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	4.41833E-22	9.64912E-29	3.49926E-33	2.77142E-44	1.73830E-66	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	4.97219E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	2.32892E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	3.21928E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	1.23071E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	1.21876E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	2.78132E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	3.81193E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	1.10038E-18	1.49868E-21	1.84183E-23	3.08294E-28	8.63723E-38	2.41987E-47	5.32151E-76	0.00000E+00
SN	50	121	9.72156E+04	5.25236E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	7.67271E-18	1.75918E-20	3.05880E-22	1.21945E-26	1.93806E-35	3.08014E-44	1.25648E-70	0.00000E+00
SN	50	125	8.12599E+05	9.41961E-17	7.98337E-52	3.31663E-75	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
I	53	130	6.44981E+04	1.09470E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	5.06628E-26	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	5.42620E-19	5.63418E-70	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	4.11418E-15	1.49398E-15	7.60415E-16	1.40546E-16	4.80122E-18	1.64016E-19	[illegible].53872E-24	8.90487E-30
EU	63	152	4.17559E+08	3.55871E-14	3.04116E-14	2.73866E-14	2.10758E-14	1.24818E-14	7.39212E-15	[illegible].55348E-15	1.88892E-16
EU	63	154	2.69812E+08	3.57219E-15	2.80097E-15	2.38172E-15	1.58798E-15	7.05923E-16	3.13811E-16	2.75678E-17	1.07658E-18
LU	71	174	1.22687E+07	2.16378E-25	1.02870E-27	2.90854E-29	3.90967E-33	7.06425E-41	1.27640E-48	7.52924E-72	0.00000E+00
LU	71	177	1.38242E+07	1.00634E-22	8.73362E-25	3.68832E-26	1.35181E-29	1.81586E-36	2.45971E-43	5.91225E-64	0.00000E+00
HF	72	173	8.49653E+04	2.52834E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	2.20315E-16	4.27724E-21	3.08967E-24	4.33298E-32	8.52151E-48	1.67589E-63	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	9.11456E-24	8.52321E-24	8.15045E-24	7.28851E-24	5.82798E-24	4.66025E-24	2.38277E-24	9.74190E-25
HF	72	179	1.89384E+10	4.30567E-25	4.29078E-25	4.28088E-25	4.25622E-25	4.20735E-25	4.15903E-25	4.01759E-25	3.83601E-25
HF	72	180	1.98723E+04	9.30234E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	1.59169E-15	2.64688E-23	1.72446E-28	1.86837E-41	2.19302E-67	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	4.60598E-30	4.60598E-30	4.60598E-30	4.60598E-30	4.60596E-30	4.60597E-30	4.60596E-30	4.60595E-30
TA	73	180	2.93458E+04	1.17621E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	2.60675E-15	3.45174E-18	4.12222E-20	6.51893E-25	1.63021E-34	4.07671E-44	6.37554E-73	0.00000E+00
W	74	181	1.20968E+07	8.76699E-19	3.86287E-21	1.03821E-22	1.22949E-26	1.72422E-34	2.41802E-42	6.66906E-66	0.00000E+00
W	74	185	6.47801E+06	1.19904E-16	4.78010E-21	5.57833E-24	2.59529E-31	5.61717E-46	1.21578E-60	0.00000E+00	0.00000E+00
W	74	187	8.59986E+04	2.35903E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	3.26543E-21	2.69851E-28	5.14069E-33	8.14299E-45	2.04380E-68	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11947E+02	2.66807E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	3.27608E-23	1.88986E-23	1.30963E-23	5.23529E-24	8.36616E-25	1.33694E-25	5.45593E-28	3.55804E-31
TL	81	206	2.52054E+02	5.86286E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	4.73863E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	1.31573E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	5.99283E-24	5.99283E-24	5.99283E-24	5.99282E-24	5.99282E-24	5.99282E-24	5.99281E-24	5.99280E-24
PB	82	207	7.95989E-01	1.30161E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				1.96956E-11	8.71078E-13	5.32760E-13	1.71902E-13	3.47615E-14	1.52300E-14	3.31242E-15	1.00364E-15
TOTAL (CURIES)				1.17977E-03	5.21776E-05	3.19123E-05	1.02969E-05	2.08221E-06	9.12277E-07	1.98414E-07	6.01298E-08

COMPONENT : CONCRETE - AXIAL UP - FIRST 6 INCHES - RS
VOLUME : 1.44000E+07 CC
: ABOVE VOLUME IS FOR THE FIRST 6 INCHES OF CONCRETE
: IN THE AXIAL UP DIRECTION.
: (INTERVALS 46-48 TOTOUPRS)

NUCLIDE SYM	Z	A	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	2.33577E-07	1.97166E-07	1.76104E-07	1.32772E-07	7.54712E-08	4.28999E-08	7.87921E-09	8.22590E-10
HE	2	6	8.09751E-01	2.09635E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	6.17731E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	[illegible].00064E-16	5.70959E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	3.78577E-18	3.78577E-18	3.78577E-18	3.78576E-18	3.78575E-18	3.78574E-18	3.78571E-18	3.78567E-18
B	5	12	1.99754E-02	8.54753E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	1.14335E-10	1.14293E-10	1.14266E-10	1.14197E-10	1.14059E-10	1.13921E-10	1.13509E-10	1.12961E-10
F	9	20	1.10023E+01	1.82153E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	2.79365E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	1.17835E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	1.46665E-08	0.00000E+90	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	1.28141E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	6.10904E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	2.19126E-09	1.88230E-32	7.89594E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	1.47774E-08	2.62924E-12	8.31736E-15	4.68148E-21	1.48305E-33	4.69818E-46	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	1.27970E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	1.11725E-11	1.11724E-11	1.11724E-11	1.11723E-11	1.11720E-11	1.11718E-11	1.11710E-11	1.11700E-11
AR	18	37	3.02684E+06	5.96718E-08	2.28442E-17	1.20712E-23	2.45026E-39	1.00945E-70	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	1.85968E-09	1.84535E-09	1.83586E-09	1.81234E-09	1.76621E-09	1.72126E-09	1.59314E-09	1.43703E-09
AR	18	41	6.60140E+03	6.97879E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	1.50191E-14	1.50191E-14	1.50191E-14	1.50191E-14	1.50191E-14	1.50191E-14	1.50191E-14	1.50191E-14
K	19	42	4.47192E+04	4.11584E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	3.11877E-09	3.11869E-09	3.11864E-09	3.11850E-09	3.11823E-09	3.11796E-09	3.11715E-09	3.11607E-09
CA	20	45	1.42623E+07	1.25604E-06	1.26116E-08	5.86972E-10	2.74306E-13	5.99049E-20	1.30825E-26	1.36264E-46	3.09951E-73
CA	20	47	3.91608E+05	6.21629E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.70096E-07	1.99534E-11	4.78151E-14	1.34415E-20	1.06216E-33	8.39310E-47	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	1.27531E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	2.66525E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	1.24548E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	4.34983E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.82528E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	7.28209E-15	7.29694E-16	1.57421E-16	3.40309E-18	1.59033E-21	7.43198E-25	7.58482E-35	3.61747E-48
V	23	52	2.02084E+02	4.80137E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	6.82972E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	7.75842E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	7.76890E-08	1.01830E-19	1.21960E-27	1.91467E-47	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	6.57113E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	5.43160E-18	5.43159E-18	5.43159E-18	5.43159E-18	5.43158E-18	5.43157E-18	5.43154E-18	5.43149E-18
MN	25	54	2.61565E+07	8.62749E-09	7.01962E-10	1.31806E-10	2.01365E-12	4.69989E-16	1.09693E-19	1.39468E-30	4.13874E-45
MN	25	56	9.29152E+03	1.14604E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.15254E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.31544E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.35678E-05	6.09649E-06	3.57652E-06	9.42785E-07	6.55111E-08	4.55216E-09	1.52730E-12	3.56073E-17
FE	26	59	3.89409E+06	1.76622E-07	8.48057E-15	1.12031E-19	7.10632E-32	2.85907E-56	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	1.27326E-23	1.27323E-23	1.27321E-23	1.27317E-23	1.27308E-23	1.27299E-23	1.27273E-23	1.27238E-23
FE	26	61	3.60001E+02	1.58560E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	5.03179E-14	3.07713E-15	[illegible].77634E-16	4.53389E-18	4.08524E-22	3.68097E-26	2.69280E-38	1.77496E-54
CO	27	58	6.13405E+06	2.60777E-11	5.89082E-16	[illegible].78744E-19	8.49767E-27	2.76897E-42	9.02267E-58	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	3.47232E-07	2.33841E-07	1.79661E-07	9.29581E-08	2.48859E-08	6.66224E-09	1.27826E-10	6.56581E-13
CO	27	61	5.94007E+03	2.04156E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	8.30689E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	4.33865E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	8.63586E-13	8.63563E-13	8.63548E-13	8.63511E-13	8.63436E-13	8.63361E-13	8.63136E-13	8.62837E-13
NI	28	63	2.90020E+09	1.21204E-10	1.18492E-10	1.16718E-10	1.12398E-10	1.04233E-10	9.66605E-11	7.70872E-11	5.70111E-11
NI	28	65	9.21736E+03	7.15201E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	2.25113E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	9.16550E-15	1.80994E-32	2.84866E-44	8.85547E-74	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	5.31947E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	3.46145E-13	1.70553E-19	1.02466E-23	2.86757E-34	2.24576E-55	1.75876E-76	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	8.22011E-18	7.63353E-18	7.26591E-18	6.42248E-18	5.01796E-18	3.92059E-18	1.86993E-18	6.96826E-19
SR	38	91	3.48315E+04	7.11345E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	3.21547E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50895E+02	1.62985E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	6.25214E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	2.14504E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	9.09308E-14	2.32784E-19	4.35632E-23	2.08703E-32	4.78996E-51	1.09935E-69	0.00000E+00	0.00000E+00
Y	39	92	1.27640E+04	2.59704E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	5.34819E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	4.78567E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	1.45275E-16	1.61160E-20	3.72077E-23	9.52982E-30	4.25122E-43	4.10057E-56	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	1.47329E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	4.67238E-15	4.67238E-15	4.67237E-15	4.67236E-15	4.67234E-15	4.67232E-15	4.67225E-15	4.67217E-15
ZR	40	95	5.63534E+06	1.08717E-12	9.52899E-18	4.05088E-21	1.50939E-29	2.09550E-46	2.90921E-63	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	9.22658E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	4.90162E-18	4.88708E-18	4.87741E-18	4.85332E-18	4.80550E-18	4.75814E-18	4.61887E-18	4.43968E-18
NB	41	92	8.80746E+05	2.12035E-13	9.29442E-46	2.4893[illegible]E-67	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	8.52721E-13	8.52633E-13	8.52573E-13	8.52426E-13	8.52130E-13	8.51834E-13	8.50947E-13	8.49767E-13
NB	41	95	3.02684E+06	2.77272E-14	1.06505E-23	5.62790E-30	1.14237E-45	4.70632E-77	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	4.99133E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	4.85563E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	1.34337E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	8.93576E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	1.03616E-14	1.03592E-14	1.03576E-14	1.03536E-14	1.03456E-14	1.03377E-14	1.03138E-14	1.02821E-14
MO	42	99	2.41515E+05	1.14675E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	5.47831E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	1.06414E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84815E+03	6.17420E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	2.37310E-22	2.37310E-22	2.37309E-22	2.37309E-22	2.37309E-22	2.37309E-22	2.37308E-22	2.37307E-22
PD	46	109	4.83704E+04	6.29007E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	2.26393E-15	3.54575E-54	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	7.41023E-11	7.29268E-11	7.21535E-11	7.02560E-11	6.66093E-11	6.31520E-11	5.38198E-11	4.34860E-11
AG	47	110	2.15826E+07	1.63824E-08	7.83249E-10	1.03177E-10	6.49813E-13	2.57750E-17	1.0[illegible]37E-21	6.38025E-35	1.57932E-52
CD	48	109	3.99508E+07	5.18668E-16	1.00353E-16	3.35703E-17	2.17282E-18	9.10236E-21	3.81320E-23	2.80339E-30	8.63402E-40
CD	48	111	2.92221E+03	1.22882E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	3.50533E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	1.02878E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	5.77080E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	1.63251E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	1.05002E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	1.76505E-16	3.85465E-23	1.37790E-27	1.10713E-38	[illegible]422E-61	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61407E+04	2.09367E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.[illegible]000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	8.61862E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	1.31988E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	4.30383E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	4.77395E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	9.22973E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	1.26074E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00[illegible]E+00	0.00000E+00
SN	50	113	9.94473E+06	1.54[illegible]5E-11	2.10838E-14	2.59079E-16	4.33658E-21	1.21495E-30	3.40388E-40	7.48545E-69	0.00000E+00
SN	50	121	9.72156E+04	4.92008E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	6.61381E-11	1.5[illegible]640E-13	2.63664E-15	1.05116E-19	1.67059E-28	2.65505E-37	1.06583E-63	0.00000E+00
SN	50	125	8.12599E+05	9.48888E-10	8.04225E-45	3.34311E-68	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

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I	53	135	6.64981E+04	6.47155E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	2.33476E-14	7.44909E-77	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	131	5.58960E+05	1.79664E-15	1.86343E-64	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CE	55	134	6.47801E+07	6.57422E-08	1.46193E-08	8.45442E-09	1.56261E-09	5.33809E-11	1.82356E-12	7.26986E-17	9.90660E-25
EU	63	152	4.17559E+08	2.60632E-07	2.39820E-07	2.15965E-07	1.46199E-07	9.84288E-08	5.82927E-08	1.21085E-08	1.48956E-09
EU	63	154	2.69612E+08	3.11396E-08	2.44167E-08	2.07626E-08	1.38428E-08	6.15569E-09	2.73556E-09	2.40314E-10	9.38478E-12
LU	71	174	1.22687E+07	1.75289E-19	5.86141E-22	1.65724E-23	2.22767E-27	4.02511E-35	7.27273E-43	4.29005E-66	0.00000E+00
LU	71	177	1.58242E+07	4.17405E-17	3.71102E-19	1.56721E-20	5.74400E-24	7.71581E-31	1.03645E-37	2.51218E-58	0.00000E+00
HF	72	175	8.49653E+06	8.56217E-16	8.15090E-00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	1.95150E-09	3.78668E-14	2.73676E-17	3.83800E-25	7.54817E-41	1.48447E-56	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	3.68297E-18	3.34837E-18	3.22105E-18	2.88034E-18	2.30322E-18	1.84173E-18	9.41672E-19	5.85003E-19
HF	72	179	1.89584E+10	1.77095E-19	1.76481E-19	1.76174E-19	1.75060E-19	1.73049E-19	1.71062E-19	1.65236E-19	1.57776E-19
HF	72	180	1.98723E+04	3.68297E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	1.77214E-08	2.94695E-16	1.91997E-21	2.08019E-34	2.44164E-60	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	1.72511E-24	1.72511E-24	1.72511E-24	1.72511E	1.72511E-24	1.72511E-24	1.72510E-24	1.72510E-24
TA	73	180	7.93458E+04	3.97217E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	5.34305E-08	4.40113E-11	5.28662E-13	8.56935E-18	2.89069E-27	5.22826E-37	8.17644E-66	0.00000E+00
W	74	181	1.20968E+07	2.90028E-13	1.27701E-15	3.43456E-17	4.06737E-21	5.70404E-29	7.99927E-37	2.24625E-60	0.00000E+00
W	74	185	6.47601E+06	7.22773E-09	4.89445E-14	5.71178E-17	2.65758E-24	5.75155E-39	1.24487E-53	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	2.67822E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	1.19089E-15	9.90200E-25	1.88634E-29	2.98801E-39	7.49665E-63	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11947E+02	8.82866E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19272E+08	1.27965E-17	7.36459E-18	5.10347E-18	2.04014E-18	3.26021E-19	5.20991E-20	2.12612E-22	1.38653E-25
TL	81	206	2.52054E+02	2.11715E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	1.77719E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	4.35221E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	1.98810E-18	1.98810E-18	1.98809E-18	1.98809E-18	1.98809E-18	1.98809E-18	1.98809E-18	1.98809E-18
PB	82	207	7.95989E-01	4.56448E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
			TOTAL (CURIES/CC)	1.56769E-04	6.82779E-06	4.18355E-06	1.35536E-06	2.75686E-07	1.20270E-07	2.53250E-08	7.10165E-09
			TOTAL (CURIES)	2.25748E+03	9.83201E+01	6.02432E+01	1.95172E+01	3.96988E+00	1.73189E+00	3.64680E-01	1.02264E-01

COMPONENT : CONCRETE - AXIAL UP - SECOND 6 INCHES - RS
VOLUME : 1.44000E+07 CC
: ABOVE VOLUME IS FOR THE SECOND 6 INCHES OF CONCRETE
: IN THE AXIAL UP DIRECTION.
:
: (INTERVALS 49-51 TOTGUPRS)

NUCLIDE			HALF-LIFE	CONCENTRATION (CURIES/CC) AT TIME							
SYM	Z	M	(SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	5.98306E-08	5.05040E-08	4.51088E-08	3.40096E-08	1.93319E-08	1.09886E-08	2.01825E-09	2.10766E-10
HE	2	6	8.09751E-01	4.48562E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	1.58148E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.18566E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	8.75338E-19	8.75337E-19	8.75337E-19	8.75336E-19	8.75333E-19	8.75331E-19	8.75325E-19	8.75314E-19
B	5	12	1.99756E-02	2.18255E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	2.92597E-11	2.92491E-11	2.92420E-11	2.92244E-11	2.91891E-11	2.91538E-11	2.90483E-11	2.89082E-11
F	9	20	1.10823E+01	4.41455E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	6.41322E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	2.98788E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68155E+02	3.31899E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	3.26143E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	1.33810E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	4.79469E-10	4.11867E-33	1.72752E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	3.83606E-09	4.82522E-13	2.15910E-15	1.21526E-21	3.84965E-34	1.21960E-46	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	2.95635E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	2.76932E-12	2.76930E-12	2.76928E-12	2.76925E-12	2.76919E-12	2.76913E-12	2.76894E-12	2.76870E-12
AR	18	37	3.02684E+06	1.33362E-06	5.12269E-18	2.70690E-24	5.49456E-40	2.26344E-71	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	4.71489E-10	4.67777E-10	4.65371E-10	4.59411E-10	4.47712E-10	4.36321E-10	4.03844E-10	3.64272E-10
AR	18	41	6.58140E+03	1.57391E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	3.82701E-15	3.82701E-15	3.82701E-15	3.82701E-15	3.82701E-15	3.82701E-15	3.82701E-15	3.82701E-15
K	19	42	4.47192E+04	1.83149E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	8.17132E-10	8.17111E-10	8.17097E-10	8.17061E-10	8.16990E-10	8.16919E-10	8.16707E-10	8.16423E-10
CA	20	45	1.42625E+07	3.17062E-07	3.18356E-09	1.48170E-10	6.92432E-14	1.51218E-20	3.30243E-27	3.43972E-47	7.82411E-74
CA	20	47	3.91608E+05	1.62851E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	4.20447E-08	4.93212E-12	1.18190E-14	3.32250E-21	2.62546E-34	2.07462E-47	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	2.67256E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	6.35752E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	2.78294E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	1.07645E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.46315E+02	4.63606E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.80393E-15	1.80761E-16	3.89967E-17	8.43019E-19	3.93958E-22	1.84106E-25	1.87893E-35	8.96127E-49
V	23	52	2.02084E+02	1.22627E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	1.58750E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	1.92089E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	1.83794E-08	2.40907E-20	2.88529E-28	4.52967E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	1.47966E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.34552E-18	1.34552E-18	1.34552E-18	1.34552E-18	1.34551E-18	1.34551E-18	1.34550E-18	1.34549E-18
MN	25	54	2.61565E+07	1.89771E-09	1.54404E-10	2.09920E-11	4.42924E-13	1.03379E-16	2.41732E-20	3.06775E-31	9.10360E-46
MN	25	56	9.29152E+03	2.80070E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	2.63963E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	3.24038E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	3.54729E-06	1.59392E-06	9.35080E-07	2.46491E-07	1.71279E-08	1.19016E-09	3.99513E-13	9.30952E-18
FE	26	59	3.89409E+06	4.28863E-08	2.05920E-15	2.72027E-20	1.72551E-32	6.94222E-57	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	3.15142E-24	3.15135E-24	3.15131E-24	3.15120E-24	3.15098E-24	3.15076E-24	3.15011E-24	3.14923E-24
FE	26	61	3.60001E+02	3.92764E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	1.24592E-14	7.61930E-16	1.18267E-16	1.12264E-18	1.01155E-22	9.11448E-27	6.66764E-39	4.39499E-55
CO	27	58	6.13405E+06	5.61175E-12	1.26767E-16	1.01301E-19	1.82864E-27	5.95863E-43	1.94162E-58	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	8.12825E-08	5.47390E-08	4.20562E-08	2.17603E-08	5.82547E-09	1.55954E-09	2.99225E-11	1.55697E-13
CO	27	61	5.94067E+03	4.60356E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34612E+02	1.98563E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

CO	27	60	2.99999E-01	1.07470E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.62053E+12	2.19861E-13	2.19856E-13	2.19852E-13	2.19842E-13	2.198[illegible]E-13	2.19804E-13	2.19747E-13	2.1967[illegible]E-13
NI	28	63	2.90020E+09	3.14583E-11	3.07345E-11	3.02941E-11	2.91779E-11	2.79556E-11	2.50882E-11	2.00079E-11	1.47972E-11
NI	28	65	9.21738E+03	1.60917E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	5.62585E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	2.24895E-15	4.44103E-33	6.99020E-45	2.17285E-74	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	1.28874E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	8.44024E-14	3.93136E-20	2.36201E-26	6.61024E-35	5.17685E-56	4.05423E-77	0.00000E+00	0.00000E+00
SR	38	90	8.86577E+08	1.96391E-18	1.82377E-18	1.73594E-18	1.53443E-18	1.19887E-18	9.36691E-19	4.46756E-19	1.66483E-19
SR	38	91	3.48315E+04	1.72280E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	5.75604E+03	7.93229E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	4.4[illegible]7E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	1.54191E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	5.47267E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	2.12798E-14	5.44765E-20	1.01947E-23	4.88410E-33	1.12096E-51	2.57272E-78	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	6.23369E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	1.50821E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	1.18542E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.70602E+06	3.55326E-17	3.71990E-21	8.56831E-24	2.19968E-30	1.44291E-43	9.66499E-57	0.00000E+00	0.00000E+00
ZR	40	89	2.82749E+05	3.69637E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	1.15932E-15	1.15931E-15	1.15931E-15	1.15931E-15	1.15930E-15	1.15930E-15	1.15928E-15	1.15926E-15
ZR	40	95	5.63554E+06	2.69171E-13	2.35926E-18	1.00295E-21	3.73705E-30	5.18820E-47	7.20285E-64	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	5.63266E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	1.20528E-18	1.20171E-18	1.19933E-18	1.19340E-18	1.18164E-18	1.17000E-18	1.13575E-18	1.09164E-18
NB	41	92	8.80746E+05	5.10235E-14	2.23658E-46	5.99040E-68	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30154E+11	1.53392E-13	1.53376E-13	1.53365E-13	1.53339E-13	1.53285E-13	1.53232E-13	1.53073E-13	1.52860E-13
NB	41	95	3.02684E+06	6.46078E-15	2.48171E-24	1.31137E-30	2.66187E-46	1.09663E-77	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	1.19316E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	1.14372E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	3.27761E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+03	0.00000E+00
NB	41	100	5.09994E+00	1.21176E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	4.61733E-16	4.61626E-16	4.61555E-16	4.61377E-16	4.61022E-16	4.60667E-16	4.59605E-16	4.58191E-16
MO	42	99	2.41515E+05	1.19384E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	10[illegible]	8.76292E+02	6.33783E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	105	7.61566E+02	2.58088E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	1.45082E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	5.57914E-23	5.57914E-23	5.57914E-23	5.57914E-23	5.57913E-23	5.57913E-23	5.57911E-23	5.57909E-23
PD	46	109	4.03704E+04	1.47471E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	5.60826E-16	8.78359E-55	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	1.61592E-11	1.59029E-11	1.57342E-11	1.53205E-11	1.45252E-11	1.37715E-[illegible]	1.17363E-11	9.48282E-12
AG	47	110	2.15826E+07	2.52936E-09	1.20950E-10	1.59300E-11	1.00328E-13	3.97954E-18	1.57849E-22	9.85080E-36	2.43839E-53
CD	48	109	3.99504E+07	1.21502E-16	2.35083E-17	7.86408E-18	5.08997E-19	2.13229E-21	8.93269E-24	6.56714E-31	2.02258E-40
CD	48	111	2.92221E+03	2.92873E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	8.59551E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	2.54843E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	1.42955E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]	0.00000E+00
IN	49	111	2.42444E+05	4.00651E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]	0.00000E+00
IN	49	112	1.25400E+03	2.46038E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]	0.00000E+00
IN	49	114	4.27869E+06	4.18643E-17	9.14266E-24	3.31560E-28	2.62595E-39	1.64766E-61	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	4.90923E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	2.08165E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	3.11222E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	1.05286E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	1.13763E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40095E+01	2.28465E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	3.12313E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00[illegible]E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94475E+06	6.78467E-13	9.24175E-16	1.13563E-17	1.90087E-22	5.32552E-32	1.49203E-41	3.28112E-70	0.00000E+00
SN	50	121	9.72156E+04	9.31568E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	1.31728E-11	3.02023E-14	5.25146E-16	2.09360E-20	3.32733E-29	5.28809E-38	2.12283E-64	0.00000E+00
SN	50	125	8.12599E+05	1.72737E-10	1.46403E-45	6.08586E-69	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
I	53	130	4.44981E+06	1.85687E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	5.36792E-15	1.71264E-77	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	4.44571E-14	4.61612E-65	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	7.46694E-09	2.71146E-09	1.58010E-09	2.55081E-10	8.71388E-12	2.97677E-13	1.18673E-17	1.61617E-23
EU	63	152	4.17559E+08	7.28102E-08	6.22214E-08	5.60523E-08	4.31296E-08	2.55374E-08	1.51241E-08	3.14156E-09	3.86469E-10
EU	63	154	2.69812E+08	7.09288E-08	5.56155E-08	4.72910E-08	3.15307E-08	1.40167E-08	6.23098E-10	5.47381E-11	2.13764E-12
LU	71	174	1.22687E+07	2.71974E-20	1.29302E-22	3.65584E-24	4.91422E-28	8.87934E-36	1.60435E-43	9.46380E-67	0.00000E+00
LU	71	177	1.50242E+07	9.99810E-18	8.67496E-20	3.66439E-21	1.34304E-24	1.80408E-31	2.42338E-38	5.87390E-59	0.00000E+00
HF	72	175	6.49655E+04	2.07147E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.94840E+06	4.38736E-18	8.51771E-15	6.15278E-18	8.62872E-26	1.69698E-41	3.53758E-57	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	8.56259E-19	8.80705E-19	7.65686E-19	4.84693E-19	5.47584E-19	4.37805E-19	2.23847E-19	[illegible].15201E-20
HF	72	179	1.89584E+10	4.17198E-20	4.15755E-20	4.14795E-20	4.12457E-20	4.07671E-20	4.02989E-20	3.89265E-20	3.71690E-20
HF	72	180	1.98723E+04	8.60724E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	5.66357E+06	2.98508E-09	4.96400E-17	3.23489E-22	3.50397E-35	4.11282E-61	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	4.15392E-25	4.15392E-25	4.15392E-25	4.15392E-25	4.15391E-25	4.15391E-25	4.15390E-25	4.15389E-25
TA	73	180	2.93458E+04	9.69792E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	4.59996E-09	5.79256E-12	6.95799E-14	1.10035E-18	2.75167E-28	6.88118E-38	1.07614E-66	0.00000E+00
W	74	181	1.20968E+07	7.18418E-14	3.16547E-16	8.50769E-18	1.00752E-21	1.41293E-29	1.98147E-37	5.46554E-61	0.00000E+00
W	74	185	6.47801E+06	2.08634E-10	8.51739E-15	9.70633E-18	4.51583E-25	9.77391E-40	2.11547E-54	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	4.27593E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	2.88226E-16	2.59655E-23	4.56544E-28	7.23179E-40	1.81439E-63	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11967E+02	2.16811E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	3.04423E-18	1.75612E-18	1.21696E-18	4.86678E-19	7.77408E-20	1.74232E-20	5.06981E-23	3.50625E-26
TL	81	206	2.82054E+02	5.16182E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86168E+02	4.27785E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	1.07818E-13	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+16	4.92150E-19	4.92150[illegible]	4.92150E-19	4.92150E-19	4.92150E-19	4.92149E-19	4.92149E-19	4.92148E-19
PB	82	207	7.95989E-01	1.87789E-11	0.00000E+[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				3.87884E-05	1.77449E-06	1.08594E-06	3.50143E-07	7.05716E-08	3.00103E-08	6.52936E-09	1.83650E-09
TOTAL (CURIES)				5.58553E+02	2.55527E+01	1.56375E+01	5.04206E+00	1.01623E+00	4.43669E-01	9.40228E-02	2.64455E-02

COMPONENT : CONCRETE - AXIAL UP - THIRD 6 INCHES - RS
VOLUME : 1.44000E+07 CC
: ABOVE VOLUME IS FOR THE THIRD 6 INCHES OF CONCRETE
: IN THE AXIAL (A) DIRECTION.
:
: (INTERVALS 32.5A TOTGUPRS)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
				CONCENTRATION (CURIES/CC) AT TIME							
H	1	3	3.87233E+08	5.57295E-09	4.95744E-09	4.42785E-09	3.53834E-09	1.89761E-09	1.07865E-09	1.98111E-10	2.06828E-11
HE	2	6	8.09751E-01	9.72320E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	1.55245E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	5.0000E-16	2.56641E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88561E+13	1.18536E-19	1.18536E-19	1.18536E-19	1.18536E-19	1.18535E-19	1.18535E-19	1.18534E-19	1.18533E-19
B	5	12	1.99754E-02	2.14208E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80178E+11	2.87407E-12	2.87305E-12	2.87234E-12	2.87060E-12	2.86713E-12	2.86367E-12	2.85331E-12	2.83954E-12
F	9	20	1.10023E+01	1.07398E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76210E+01	1.49305E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41522E+04	2.93322E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	7.61331E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	3.24689E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	2.96126E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.06226E-10	9.12491E-34	3.82731E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	5.77973E-10	6.72503E-14	2.12740E-16	1.19742E-22	3.79333E-35	1.20169E-47	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	6.92078E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	2.70807E-13	2.70805E-13	2.70804E-13	2.70801E-13	2.70794E-13	2.70788E-13	2.70770E-13	2.70746E-13
AR	18	37	3.02684E+06	3.03376E-09	1.16332E-18	6.15774E-25	1.24992E-40	5.14940E-72	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	4.88876E-11	4.85109E-11	4.87614E-11	4.76632E-11	4.64306E-11	4.52488E-11	4.18808E-11	3.77769E-11
AR	18	41	6.60140E+03	3.60512E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	3.75650E-16	3.75650E-16	3.75650E-16	3.75650E-16	3.75650E-16	3.75650E-16	3.75650E-16	3.75650E-16
K	19	42	4.47192E+04	1.01170E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	8.05394E-11	8.05373E-11	8.05359E-11	8.05324E-11	8.05254E-11	8.05184E-11	8.04975E-11	8.04695E-11
CA	20	45	1.42623E+07	3.11497E-08	3.12768E-10	1.45569E-11	6.80278E-15	1.48564E-21	3.24446E-28	3.37934E-48	7.68678E-75
CA	20	47	3.91608E+05	1.60513E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	4.10284E-09	4.81290E-15	1.15333E-15	3.24219E-22	2.56200E-35	2.02448E-48	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	5.86756E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58753E+05	1.52760E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	6.31391E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	2.65852E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	4.54910E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	4.45827E-16	4.46736E-17	9.65772E-18	2.08345E-19	9.73656E-23	4.55693E-26	4.64361E-36	2.21470E-49
V	23	52	2.02084E+02	1.20398E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	3.73513E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	4.74556E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39443E+06	1.78815E-09	2.34581E-21	2.60713E-29	4.40696E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	3.58528E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	3.32533E-19	3.32533E-19	3.32533E-19	3.32532E-19	3.32532E-19	3.32531E-19	3.32529E-19	3.32527E-19
MN	25	54	2.61565E+07	4.22156E-10	3.43855E-11	6.45647E-12	9.86384E-14	2.30223E-17	5.37330E-21	6.83182E-32	2.02736E-46
MN	25	56	9.29152E+03	2.73036E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	6.17976E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	7.97752E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.28292E+07	3.49609E-07	1.57092E-07	9.21584E-08	2.42933E-08	1.68806E-09	1.17298E-10	3.93550E-14	9.17515E-19
FE	26	59	3.89409E+06	4.19483E-09	2.01416E-16	2.66076E-21	1.68778E-33	6.79038E-58	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+13	7.78391E-25	7.78375E-25	7.78364E-25	7.78338E-25	7.78284E-25	7.78230E-25	7.78068E-25	7.77852E-25
FE	26	61	3.60001E+02	9.70641E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	3.07826E-15	1.88247E-16	2.92199E-17	2.77366E-19	2.49920E-23	2.25188E-27	1.64735E-39	1.06585E-55
CO	27	58	6.13405E+06	1.24075E-12	2.80280E-17	2.23976E-20	4.04311E-28	1.31745E-47	4.29290E-59	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	7.92011E-09	5.33573E-09	4.09793E-09	2.12031E-09	5.67630E-10	1.51961E-10	2.91563E-12	1.49761E-14
CO	27	61	5.94007E+03	1.15262E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	4.78158E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	2.65589E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	2.15631E-14	2.15625E-14	2.15621E-14	2.15612E-14	2.15593E-14	2.15574E-14	2.15518E-14	2.15444E-14
NI	28	63	2.90020E+09	3.12596E-12	3.05602E-12	3.01027E-12	2.89886E-12	2.68826E-12	2.49297E-12	1.98815E-12	1.47037E-12
NI	28	65	9.21738E+03	3.67586E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	5.51777E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	5.52162E-16	1.09037E-33	1.71625E-45	5.33484E-75	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	3.13548E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	1.97011E-14	9.17581E-21	5.51337E-25	1.54295E-35	1.20837E-56	9.46330E-78	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	4.72562E-19	4.38840E-19	4.17706E-19	3.69218E-19	2.88475E-19	2.25389E-19	1.07499E-19	4.00594E-20
SR	38	91	3.48315E+04	4.19058E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	1.95481E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	9.95162E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	3.79822E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	5.37212E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	5.03196E-15	1.28819E-20	2.41071E-24	1.15495E-33	2.65069E-52	6.08362E-71	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	1.50572E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	3.20492E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	2.92952E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	7.84430E-18	8.70208E-22	2.80907E-24	5.14574E-31	3.37542E-44	2.21416E-57	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	8.35715E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	1.14029E-16	1.14029E-16	1.14029E-16	1.14029E-16	1.14028E-16	1.14028E-16	1.14026E-16	1.14024E-16
ZR	40	95	5.63534E+06	6.64967E-14	5.82855E-19	2.47778E-22	9.25258E-31	1.28174E-47	1.77946E-64	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	4.14738E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	2.96364E-19	2.95485E-19	2.94900E-19	2.93443E-19	2.90552E-19	2.87689E-19	2.79268E-19	2.68422E-19
NB	41	92	8.80746E+05	1.23290E-14	3.40433E-47	1.44748E-68	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	1.47891E-14	1.47876E-14	1.47066E-14	1.47040E-14	1.46989E-14	1.46938E-14	1.46785E-14	1.46582E-14
NB	41	95	3.02684E+06	1.52169E-13	5.84510E-25	3.08863E-31	6.26942E-47	2.58286E-78	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	2.87203E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	2.71964E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	8.01516E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	5.46312E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	4.36968E-17	4.36847E-17	4.36780E-17	4.36611E-17	4.36275E-17	4.35940E-17	4.34934E-17	4.33596E-17
MO	42	99	2.41515E+05	1.70994E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	5.88617E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	2.61565E+02	6.28299E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	3.44668E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	1.32431E-23	1.32431E-23	1.32431E-23	1.32430E-23	1.32430E-23	1.32430E-23	1.32430E-23	1.32429E-23
PD	46	109	4.83704E+04	3.49214E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	1.38603E-16	2.17079E-55	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	1.56260E-12	1.53781E-12	1.52150E-12	1.48149E-12	1.40459E-12	1.33169E-12	1.13490E-12	9.16990E-13
AG	47	110	2.15826E+07	2.30819E-10	1.10355E-11	1.45370E-12	9.15551E-15	3.63156E-19	1.44046E-23	8.90943E-37	2.22517E-54
CD	48	109	3.99508E+07	2.87577E-17	5.56408E-18	1.86132E-18	1.20472E-19	5.04683E-22	2.11424E-24	1.55435E-31	4.78715E-41
CD	48	111	2.92221E+05	7.03193E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	2.10932E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	6.29808E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	3.33302E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	9.83838E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	5.82280E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	1.00117E-17	2.18644E-24	7.92915E-29	6.27988E-40	3.93890E-62	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	1.16231E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	5.05230E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	7.40653E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	2.57951E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	2.73135E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	5.64339E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00975E+01	7.71856E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	6.15825E-14	8.38846E-17	1.03078E-18	1.72536E-23	4.83382E-33	1.35428E-42	2.97818E-71	0.00000E+00
SN	50	121	9.72156E+04	9.05582E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	1.28201E-12	2.93936E-15	5.11686E-17	2.83754E-21	3.25824E-30	5.14650E-39	2.06599E-65	0.00000E+00
SN	50	125	8.12599E+05	1.64458E-11	1.39366E-46	5.79418E-70	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

I	53	130	4.44981E+04	2.33351E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	1.24930E-15	3.98590E-76	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	1.89872E-14	1.14083E-65	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	6.90803E-10	2.50850E-10	1.27680E-10	2.35988E-11	8.06164E-13	2.75395E-14	1.09790E-18	1.49520E-24
EU	63	152	4.17559E+08	7.16095E-09	6.11953E-09	5.51083E-09	4.24095E-09	2.51163E-09	1.48747E-09	3.08976E-10	3.80096E-11
EU	63	154	2.69812E+08	6.85874E-10	5.37796E-10	4.57298E-10	3.06899E-10	1.35540E-10	6.02529E-11	5.29311E-12	2.00707E-13
LU	71	174	1.22687E+07	6.89560E-21	2.89796E-23	8.19365E-25	1.10139E-28	1.99007E-36	3.59574E-44	2.12106E-67	0.00000E+00
LU	71	177	1.58242E+07	2.36197E-18	2.04986E-20	8.65683E-22	3.17283E-25	4.26200E-32	5.72505E-39	1.38766E-59	0.00000E+00
HF	72	175	8.49653E+06	5.11969E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	4.20959E-11	8.17259E-16	5.90348E-19	8.27910E-27	1.62822E-42	3.20216E-58	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	2.05118E-19	1.91810E-19	1.83421E-19	1.64020E-19	1.31156E-19	1.04876E-19	5.36231E-20	2.19236E-20
HF	72	179	1.89384E+10	9.91867E-21	9.88436E-21	9.86156E-21	9.80477E-21	9.69218E-21	9.58087E-21	9.25458E-21	8.83674E-21
HF	72	180	1.98723E+04	2.07054E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	2.68475E-10	4.46458E-18	2.90871E-23	3.15144E-36	3.69904E-62	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	1.00564E-25	1.00564E-25	1.00564E-25	1.00564E-25	1.00564E-25	1.00564E-25	1.00563E-25	1.00563E-25
TA	73	180	2.93458E+04	2.39370E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	3.90818E-10	5.14513E-15	6.18030E-15	9.77361E-20	2.44412E-29	6.11208E-39	9.55864E-68	0.00000E+00
W	74	181	1.20968E+07	1.77544E-14	7.82290E-17	2.10253E-18	2.48990E-22	3.49181E-30	4.89680E-38	1.35059E-61	0.00000E+00
W	74	185	6.47801E+06	1.98147E-11	7.89029E-16	9.21840E-19	4.28882E-26	9.28260E-41	2.00913E-55	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	3.93203E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	7.00689E-17	5.82609E-24	1.10988E-28	1.75807E-40	4.41085E-64	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11947E+02	5.32625E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	7.31054E-19	4.21721E-19	2.92242E-19	1.16825E-19	1.86690E-20	2.98337E-21	1.21748E-23	7.93972E-27
TL	81	206	2.52054E+02	1.25313E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	1.05556E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	2.66438E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	1.21573E-19	1.21573E-19	1.21573E-19	1.21573E-19	1.21573E-19	1.21573E-19	1.21573E-19	1.21573E-19
PB	82	207	7.95989E-01	2.65801E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				3.80622E-06	1.74787E-07	1.06939E-07	3.44572E-08	6.93549E-09	3.02842E-09	6.43995E-10	1.82695E-10
TOTAL (CURIES)				5.48095E+01	2.51693E+00	1.53992E+00	4.96184E-01	9.98710E-02	4.36093E-02	9.27353E-03	2.63080E-03

COMPPONENT : CONCRETE - AXIAL UP - FOURTH 6 INCHES - R5
VOLUME : 1.44000E+07 CC
: ABOVE VOLUME IS FOR THE FOURTH 6 INCHES OF CONCRETE
: IN THE AXIAL UP DIRECTION.
:
: (INTERVALS 55-57 TOTQUPRS)

NUCLIDE			HALF-LIFE	CONCENTRATION (CURIES/CC) AT TIME							
SYM	Z	M	(SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	6.28796E-10	5.30777E-10	4.74075E-10	3.57425E-10	2.03170E-10	1.15488E-10	2.12110E-11	2.21444E-12
HE	2	6	8.09751E-01	2.15368E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	1.66266E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	5.69237E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	1.96486E-20	1.96486E-20	1.96486E-20	1.96485E-20	1.96485E-20	1.96484E-20	1.96483E-20	1.96480E-20
B	5	12	1.99754E-02	2.29420E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	3.08152E-13	3.08040E-13	3.07965E-13	3.07779E-13	3.07408E-13	3.07036E-13	3.05925E-13	3.04450E-13
F	9	20	1.10023E+01	2.62849E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	3.52563E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	3.14737E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	1.77465E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	3.58051E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	6.64745E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	2.39099E-11	2.05388E-34	8.61467E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	4.05726E-11	7.21882E-15	2.28361E-17	1.28535E-23	4.07186E-36	1.28993E-48	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	1.64167E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	2.91892E-14	2.91890E-14	2.91888E-14	2.91885E-14	2.91878E-14	2.91872E-14	2.91852E-14	2.91826E-14
AR	18	37	3.02684E+06	7.01171E-10	2.69333E-19	1.42520E-25	2.88885E-41	1.19014E-72	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	5.78725E-12	5.74266E-12	5.71313E-12	5.63995E-12	5.49640E-12	5.35650E-12	4.95780E-12	4.47198E-12
AR	18	41	6.60140E+03	8.40024E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	4.02412E-17	4.02412E-17	4.02412E-17	4.02412E-17	4.02412E-17	4.02412E-17	4.02412E-17	4.02412E-17
K	19	42	4.47192E+04	1.08601E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	8.61796E-12	8.61771E-12	8.61756E-12	8.61719E-12	8.61644E-12	8.61569E-12	8.61345E-12	8.61046E-12
CA	20	45	1.42623E+07	3.34626E-09	3.35991E-11	1.56377E-12	7.30789E-16	1.59595E-22	3.48537E-29	3.63026E-49	8.25752E-76
CA	20	47	3.91608E+05	1.71759E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	4.40624E-10	5.16882E-14	1.23862E-16	3.48195E-23	2.75146E-36	2.17419E-49	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	1.31870E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	3.70216E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	1.45893E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	6.58659E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	4.87865E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.10519E-16	1.10744E-17	2.38915E-18	5.16480E-20	2.41364E-23	1.12794E-26	1.15113E-36	5.49017E-50
V	23	52	2.02084E+02	1.29044E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	8.89809E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	1.17605E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	1.94364E-10	2.54761E-22	3.05121E-30	4.79016E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	7.87868E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	8.24335E-20	8.24334E-20	8.24334E-20	8.24333E-20	8.24331E-20	8.24330E-20	8.24325E-20	8.24319E-20
MN	25	54	2.61565E+07	9.56996E-11	7.78645E-12	1.46204E-12	2.23362E-14	5.21331E-18	1.21676E-21	1.54704E-32	4.59086E-47
MN	25	56	9.29152E+03	2.94379E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.44488E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.97130E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	3.74202E-08	1.68142E-08	9.86411E-09	2.60022E-09	1.80681E-10	1.25549E-11	4.21733E-15	9.82056E-20
FE	26	59	3.89409E+06	4.51137E-10	2.16615E-17	2.86155E-22	1.81513E-34	7.30278E-59	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	1.92866E-25	1.92862E-25	1.92860E-25	1.92853E-25	1.92840E-25	1.92826E-25	1.92786E-25	1.92733E-25
FE	26	61	3.60001E+02	2.49610E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	7.62895E-16	4.66540E-17	7.24166E-18	6.87407E-20	6.19385E-24	5.58091E-28	4.08268E-40	2.69111E-56
CO	27	58	6.13405E+06	2.79710E-13	6.31851E-18	5.04921E-21	9.11463E-29	2.97000E-44	9.67774E-60	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	8.53757E-10	5.74956E-10	4.41741E-10	2.28561E-10	6.11883E-11	1.63808E-11	3.14294E-13	1.61437E-15
CO	27	61	5.94007E+03	2.44762E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	1.16045E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

CO	27	64	2.00000E-01	6.58356E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52055E+12	2.30964E-15	2.30958E-15	2.30964E-15	2.30964E-15	2.30924E-15	2.30904E-15	2.30843E-15	2.30763E-15
NI	28	63	2.90020E+09	3.41181E-13	3.35548E-13	3.28554E-13	3.16395E-13	2.93409E-13	2.72093E-13	2.16996E-13	1.60483E-13
NI	28	65	9.21738E+03	8.54752E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	5.92219E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	1.36136E-16	2.68828E-34	4.23137E-46	1.31529E-75	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	7.67248E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	4.06452E-15	2.17251E-21	1.30557E-25	3.65316E-36	2.86100E-57	2.24056E-78	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	1.14643E-19	1.06462E-19	1.01335E-19	8.95718E-20	6.99835E-20	5.46790E-20	2.60792E-20	9.71836E-21
SR	38	91	3.48315E+04	1.02523E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	4.83448E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	2.46476E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	9.39126E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	5.75483E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	1.20411E-15	3.08254E-21	5.76867E-25	2.7636[illegible]E-34	6.34290E-53	1.45577E-71	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	3.66357E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	7.88756E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	7.26184E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	1.85961E-18	2.96295E-22	4.76283E-25	1.21988E-31	8.00196E-45	5.24900E-58	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	2.01798E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	1.23129E-17	1.23129E-17	1.23129E-17	1.23129E-17	1.23128E-17	1.23128E-17	1.23126E-17	1.23124E-17
ZR	40	95	5.63534E+06	1.64798E-14	1.44644E-19	6.14047E-23	2.28798E-31	3.17643E-48	4.40988E-65	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	7.81484E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	7.31579E-20	7.29409E-20	7.27966E-20	7.24370E-20	7.17232E-20	7.10165E-20	6.89377E-20	6.62604E-20
NB	41	92	8.80746E+05	3.00218E-15	1.31598E-47	3.52470E-69	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	1.63325E-15	1.63308E-15	1.63297E-15	1.63268E-15	1.63212E-15	1.63155E-15	1.62985E-15	1.62759E-15
NB	41	95	3.02684E+06	3.62906E-16	1.39399E-25	7.36606E-32	1.49519E-47	6.15985E-79	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	6.96991E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	6.53716E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	1.96958E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	1.35366E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	7.57218E-18	7.57043E-18	7.56926E-18	7.56635E-18	7.56052E-18	7.55470E-18	7.53727E-18	7.51409E-18
MO	42	99	2.41515E+05	1.36972E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	7.04139E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	1.53844E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	6.27235E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	3.17925E-24	3.17925E-24	3.17924E-24	3.17924E-24	3.17924E-24	3.17924E-24	3.17923E-24	3.17921E-24
PD	46	109	4.83704E+04	8.36771E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	3.43592E-17	5.38151E-56	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	1.69330E-13	1.66644E-13	1.64877E-13	1.60541E-13	1.52208E-13	1.44307E-13	1.22983E-13	9.93691E-14
AG	47	110	2.15826E+07	2.56952E-11	1.22850E-12	1.61829E-13	1.01921E-15	4.04272E-20	1.60355E-24	1.00072E-37	2.47710E-55
CD	48	109	3.99508E+07	6.88721E-18	1.33255E-18	4.45769E-19	2.88521E-20	1.20867E-22	5.06342E-25	3.22252E-32	1.14648E-41
CD	48	111	2.92221E+03	1.70318E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	5.19852E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	1.56124E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	8.75822E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	2.42592E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	1.39431E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	2.41751E-18	5.27956E-25	1.91464E-29	1.51639E-40	9.51121E-63	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	2.78414E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	1.23400E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	1.78155E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	6.34857E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	6.61533E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	1.39837E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	1.91340E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	1.05211E-14	1.43312E-17	1.76103E-19	2.94770E-24	8.25834E-34	2.31371E-43	5.08807E-72	0.00000E+00
SN	50	121	9.72156E+04	1.00538E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	1.42513E-13	3.26751E-16	5.68144E-18	2.26502E-22	3.59977E-31	5.72107E-40	2.29664E-66	0.00000E+00
SN	50	125	8.12599E+05	1.81521E-12	1.53847E-47	6.39531E-71	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
I	53	130	4.44981E+04	6.11176E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	2.95168E-16	9.41738E-79	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.68990E+05	2.72368E-15	1.82808E-66	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	7.65877E-11	2.78112E-11	1.41555E-11	2.61634E-12	8.93775E-14	3.05324E-15	1.21722E-19	1.65769E-25
EU	63	152	4.17559E+08	7.66223E-10	6.54791E-10	5.89659E-10	4.53782E-10	2.68745E-10	1.59159E-10	3.30604E-11	5.06703E-12
EU	63	154	2.69812E+08	7.39914E-11	5.80169E-11	4.93329E-11	3.28922E-11	1.46219E-11	6.50003E-12	5.71616E-13	2.22994E-14
LU	71	174	1.22687E+07	1.39526E-21	6.63331E-24	1.87569E-25	2.52104E-29	4.55519E-37	8.23050E-45	4.85502E-68	0.00000E+00
LU	71	177	1.38242E+07	5.64942E-19	4.90291E-21	2.07056E-22	7.56884E-26	1.01939E-32	1.36933E-39	3.31904E-60	0.00000E+00
HF	72	175	8.49653E+04	1.26910E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	4.53808E-12	8.01031E-17	6.36414E-20	8.92513E-28	1.75527E-43	3.45203E-59	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	4.96006E-20	4.63825E-20	4.43540E-20	3.96623E-20	3.17153E-20	2.53607E-20	1.29668E-20	5.30150E-21
HF	72	179	1.89384E+10	2.38415E-21	2.37591E-21	2.37042E-21	2.35677E-21	2.32971E-21	2.30296E-21	2.22453E-21	2.12409E-21
HF	72	180	1.98723E+04	5.02276E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	2.95144E-11	4.90806E-19	3.19764E-24	3.46449E-37	4.06648E-63	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	2.45160E-26	2.45160E-26	2.45160E-26	2.45160E-26	2.45160E-26	2.45160E-26	2.45159E-26	2.45158E-26
TA	73	180	2.93458E+04	5.92763E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	4.44398E-11	5.85050E-14	7.02759E-16	1.11135E-20	2.77919E-30	6.95001E-40	1.08691E-68	0.00000E+00
W	74	181	1.20968E+07	4.40112E-15	1.93921E-17	5.21192E-19	6.17217E-23	8.65578E-31	1.21388E-38	3.34795E-62	0.00000E+00
W	74	185	6.47801E+06	2.21533E-12	8.83160E-17	1.83064E-19	4.79500E-27	1.03782E-41	2.24625E-56	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	4.36276E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	1.71355E-17	1.42478E-24	2.71422E-29	4.29939E-41	1.07868E-64	0.00000E+00	0.00000E+00	[illegible]
HG	80	205	3.11947E+02	1.31380E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]
TL	81	204	1.19282E+08	1.77132E-19	1.02181E-19	7.08091E-20	2.83662E-20	4.52343E-21	7.22858E-22	2.94992E-24	1.92377E-27
TL	81	206	2.52054E+02	3.07094E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	2.52483E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	6.60476E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	3.01257E-20	3.01257E-20	3.01257E-20	3.01257E-20	3.01257E-20	3.01257E-20	3.01256E-20	3.01256E-20
PB	82	207	7.95989E-01	4.57744E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				4.10353E-07	1.871[illegible]E-08	1.14514E-08	3.69059E-09	7.43394E-10	3.24814E-10	6.94112E-11	1.998[illegible]E-11
TOTAL (CURIES)				5.90908E+08	2.69546E-01	1.64900E-01	5.31645E-02	1.87049E-02	4.67733E-03	9.99522E-04	2.877[illegible]E-04

COMPONENT : CONCRETE - AXIAL UP - FIFTH 6 INCHES - RS
VOLUME : 1.44000E+07 CC
: ABOVE VOLUME IS FOR THE FIFTH 6 INCHES OF CONCRETE
: IN THE AXIAL UP DIRECTION.
:
: (INTERVALS 58-60 TOTGURRS)

NUCLIDE SYM	Z	A	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	8.58678E-11	7.24824E-11	6.47393E-11	4.88096E-11	2.77448E-11	1.57709E-11	2.89656E-12	5.02401E-13
HE	2	6	8.0975E-01	4.86311E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40175E-01	2.27152E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.28549E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88562E+13	3.90822E-21	3.90821E-21	3.90821E-21	3.90821E-21	3.90820E-21	3.90818E-21	3.90815E-21	3.90811E-21
B	5	12	1.99724E-02	3.13443E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80578E+11	4.21578E-14	4.21426E-14	4.21324E-14	4.21069E-14	4.20561E-14	4.20053E-14	4.18532E-14	4.16514E-14
F	9	20	1.10223E+01	6.45894E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	8.41147E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	4.31130E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	4.18775E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	5.08517E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	1.51148E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23356E+06	5.45606E-12	4.66680E-35	1.96581E-58	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	5.55483E-12	9.88335E-16	3.12651E-18	1.75978E-24	5.57482E-37	1.76606E-49	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	3.95117E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	4.02897E-15	4.02894E-15	4.02893E-15	4.02888E-15	4.02879E-15	4.02870E-15	4.02843E-15	4.02807E-15
AR	18	37	3.02684E+06	1.64120E-10	6.30414E-20	3.33120E-26	6.76178E-42	2.78571E-73	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	8.86735E-13	8.79962E-13	8.75577E-13	8.64164E-13	8.42169E-13	8.20733E-13	7.59644E-13	6.85206E-13
AR	18	41	6.60140E+03	1.98251E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	5.49952E-18	5.49952E-18	5.49952E-18	5.49952E-18	5.49952E-18	5.49952E-18	5.49952E-18	5.49952E-18
K	19	42	4.47192E+04	1.48870E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52055E+12	1.17444E-12	1.17441E-12	1.17439E-12	1.17434E-12	1.17424E-12	1.17414E-12	1.17383E-12	1.17342E-12
CA	20	45	1.42623E+07	4.59314E-10	4.60887E-12	2.14507E-13	1.00246E-16	2.18920E-23	4.78096E-30	4.97971E-50	1.13270E-76
CA	20	47	3.91608E+05	2.34081E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	6.05461E-11	7.10246E-15	1.70199E-17	4.78454E-24	3.78077E-37	2.98754E-50	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	3.01342E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	9.02549E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	3.41877E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.02147E+02	1.65538E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	6.67907E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	2.74543E-17	2.75102E-18	5.95496E-19	1.28308E-20	5.99570E-24	2.80195E-27	2.85956E-37	1.36383E-50
V	23	52	2.02884E+02	1.76489E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	2.15863E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	2.92068E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	2.71958E-11	3.56667E-23	4.26933E-31	6.70250E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	1.85719E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	2.04775E-20	2.04775E-20	2.04774E-20	2.04774E-20	2.04774E-20	2.04773E-20	2.04772E-20	2.04771E-20
MN	25	54	2.61565E+07	2.19782E-11	1.78822E-12	3.35769E-13	5.12970E-15	1.19728E-18	2.79439E-22	3.55289E-33	1.05433E-47
MN	25	56	9.29152E+03	4.04312E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	3.44324E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	4.88343E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	5.10181E-09	2.29242E-09	1.34486E-09	3.54509E-10	2.46337E-11	1.71172E-12	5.74303E-16	1.33892E-20
FE	26	59	3.89409E+06	6.20203E-11	2.97793E-18	3.93394E-23	2.49556E-35	1.00395E-59	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+13	4.78904E-26	4.78894E-26	4.78888E-26	4.78871E-26	4.78838E-26	4.78805E-26	4.78705E-26	4.78572E-26
FE	26	61	3.60001E+02	5.97688E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	1.89471E-16	1.15869E-17	1.79852E-18	1.70723E-20	1.53829E-24	1.38606E-28	1.01397E-40	6.68358E-57
CO	27	58	6.13405E+06	6.40281E-14	1.44636E-18	1.15581E-21	2.08642E-29	6.79859E-45	2.21532E-60	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.17841E-10	7.93592E-11	6.09720E-11	3.15475E-11	8.44562E-12	2.26099E-12	4.33609E-14	2.22826E-16
CO	27	61	5.94007E+03	5.76529E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	2.83153E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	1.63538E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	3.15664E-16	3.15656E-16	3.15651E-16	3.15637E-16	3.15610E-16	3.15582E-16	3.15500E-16	3.15391E-16
NI	28	63	2.90028E+09	4.76924E-14	4.66254E-14	4.59274E-14	4.42276E-14	4.10146E-14	3.80349E-14	3.03330E-14	2.24333E-14
NI	28	65	9.21738E+03	2.01448E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	8.11471E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	3.36574E-17	6.64644E-35	1.04615E-46	3.25189E-76	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	1.88468E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	1.11396E-15	5.19762E-22	3.12304E-26	8.76081E-37	6.84480E-58	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	2.79491E-20	2.59732E-20	2.47224E-20	2.18526E-20	1.70737E-20	1.33394E-20	6.36247E-21	2.37096E-21
SR	38	91	3.48315E+04	2.51794E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	1.19349E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	6.11800E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	2.32799E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	7.86467E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	2.90598E-16	7.43935E-22	1.39220E-25	6.66976E-35	1.53078E-53	3.51332E-72	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	8.95805E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	93	1.22200E+03	1.94701E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	1.80387E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	4.45075E-19	4.93740E-23	1.15992E-25	2.91962E-32	1.91517E-45	1.25628E-58	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	4.90557E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	1.70166E-18	1.70166E-18	1.70165E-18	1.70165E-18	1.70164E-18	1.70163E-18	1.70161E-18	1.70158E-18
ZR	40	95	5.63534E+06	4.89271E-15	3.58723E-20	1.52497E-23	5.68214E-32	7.88859E-49	1.09518E-65	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	1.09694E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20688E+10	1.81069E-20	1.80532E-20	1.80175E-20	1.79285E-20	1.77519E-20	1.75769E-20	1.70624E-20	1.63998E-20
NB	41	92	8.83746E+05	7.35089E-16	3.22221E-48	8.63029E-70	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	2.34893E-16	2.34869E-16	2.34853E-16	2.34812E-16	2.34730E-16	2.34649E-16	2.34405E-16	2.34079E-16
NB	41	95	3.02684E+06	8.73381E-17	3.35482E-26	1.77274E-32	3.59834E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]
NB	41	97	4.33217E+03	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]
NB	41	98	3.06025E+03	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]
NB	41	100	3.09996E+00	3.36131E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	1.58640E-18	1.58603E-18	1.58578E-18	1.58517E-18	1.58395E-18	1.58273E-18	1.57908E-18	[illegible]
MO	42	99	2.41515E+05	2.21955E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	1.10541E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	3.78178E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	1.99956E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	7.69408E-25	7.69408E-25	7.69407E-25	7.69407E-25	7.69406E-25	7.69405E-25	7.69403E-25	7.69400E-25
PD	46	109	4.83704E+04	2.02205E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	6.53527E-18	1.33679E-56	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10589E+09	2.35892E-14	2.32150E-14	2.29668E-14	2.23648E-14	2.12039E-14	2.01033E-14	[illegible]	1.58430E-14
AG	47	110	2.15826E+07	3.76816E-12	1.80157E-13	2.37319E-14	1.49465E-16	5.92859E-21	2.35154E-25	[illegible]	3.63223E-56
CD	48	109	3.99508E+07	1.66335E-18	3.21827E-19	1.07659E-19	6.96812E-21	2.91909E-23	1.22284E-25	8.99035E-33	2.76889E-42
CD	48	111	2.92221E+03	4.15029E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	1.28492E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	3.87825E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	2.17565E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	5.99843E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	3.36705E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	5.87717E-19	1.28350E-25	4.65464E-30	5.68648E-41	2.51225E-63	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	6.72551E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	3.82686E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	4.31782E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	1.56725E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	1.61198E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	3.47243E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	4.75312E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	2.19079E-15	2.98418E-18	5.66697E-20	4.13795E-25	1.71962E-34	4.81781E-44	1.85968E-72	0.00000E+00
SN	50	121	9.72156E+04	1.44172E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.87967E+07	2.85253E-14	4.70680E-17	8.18264E-19	3.26217E-23	5.18452E-32	8.23971E-41	3.30771E-67	0.00000E+00
SN	50	125	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

I	53	130	4.44981E+04	1.48246E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	7.05255E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	6.76597E-16	7.02531E-67	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	1.11270E-11	4.04052E-12	2.05657E-12	3.80113E-13	1.29851E-14	4.43588E-16	1.76843E-20	2.40830E-26
EU	63	152	4.17559E+08	1.04483E-10	8.92879E-11	8.04065E-11	6.18781E-11	3.66462E-11	2.17031E-11	4.50815E-12	5.56183E-13
EU	63	154	2.69812E+08	1.02521E-11	8.03867E-12	6.83544E-12	4.55745E-12	2.02597E-12	9.00620E-13	7.91184E-14	3.08974E-16
LU	71	174	1.22687E+07	3.24404E-22	1.54561E-24	4.36437E-26	5.86600E-30	1.06002E-37	1.91528E-45	1.12979E-68	0.00000E+00
LU	71	177	1.38242E+07	1.50331E-19	1.18517E-21	4.99665E-23	1.83133E-26	2.45994E-33	3.30445E-40	8.00947E-61	0.00000E+00
HF	72	175	8.49653E+04	3.13261E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	6.29410E-13	1.22292E-17	8.83378E-21	1.23886E-28	2.43641E-44	4.79160E-60	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	1.20733E-20	1.12900E-20	1.07962E-20	9.65423E-21	7.71985E-21	6.17305E-21	3.15627E-21	1.29044E-21
HF	72	179	1.89584E+10	5.77576E-22	5.76578E-22	5.74250E-22	5.70943E-22	5.64387E-22	5.57906E-22	5.38905E-22	5.14574E-22
HF	72	180	1.98723E+04	1.22551E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	4.28479E-12	7.12535E-20	4.64222E-25	5.02962E-38	5.90357E-64	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	6.00510E-27	6.00510E-27	6.00510E-27	6.00509E-27	6.00509E-27	6.00508E-27	6.00507E-27	6.00505E-27
TA	73	180	2.93458E+04	1.47115E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	6.72506E-12	8.85554E-15	1.06448E-16	1.68181E-21	4.20574E-31	1.05174E-40	1.64481E-69	0.00000E+00
W	74	181	1.20968E+07	1.09326E-15	4.81709E-18	1.29467E-19	1.53320E-23	2.15014E-31	3.01533E-39	8.31669E-63	0.00000E+00
W	74	185	6.47801E+06	3.22065E-15	1.28590E-17	1.49830E-20	6.97078E-28	1.50874E-42	3.26551E-57	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	6.35857E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02523E+06	4.20725E-18	3.49823E-25	6.66417E-30	1.05562E-41	2.64846E-65	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11947E+02	3.24955E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	4.31863E-20	2.49128E-20	1.77439E-20	6.90132E-21	1.10285E-21	1.76239E-22	7.19217E-25	4.69031E-28
TL	81	206	2.52054E+02	7.55369E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	6.18051E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	1.64068E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	7.48106E-21	7.48105E-21	7.48105E-21	7.48105E-21	7.48105E-21	7.48104E-21	7.48103E-21	7.48102E-21
PB	82	207	7.95989E-01	1.63142E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
			TOTAL (CURIES/CC)	5.65886E-08	2.55440E-09	1.56260E-09	5.03838E-10	1.01634E-10	4.44475E-11	9.55516E-12	2.80143E-12
			TOTAL (CURIES)	8.14875E-01	3.67833E-02	2.25015E-02	7.25527E-03	1.46354E-03	6.40040E-04	1.37594E-04	4.03406E-05

COMPONENT : CONCRETE - AXIAL UP - SIXTH 6 INCHES - R5
VOLUME : 1.44000E+07 CC
: ABOVE VOLUME IS FOR THE SIXTH 6 INCHES OF CONCRETE
: IN THE AXIAL UP DIRECTION.
:
: (INTERVALS 61-63 TOTGUP46)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87235E+08	1.40414E-11	1.25279E-11	1.11095E-11	8.43629E-12	4.79540E-12	2.72564E-12	5.00641E-13	5.22670E-14
HE	2	6	8.59751E-01	1.11622E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	3.92778E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00664E-16	2.94394E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.28563E+13	8.52908E-22	8.52907E-22	8.52907E-22	8.52905E-22	8.52903E-22	8.52901E-22	8.52893E-22	8.52884E-22
B	5	12	1.99754E-02	5.41958E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80976E+11	7.29706E-15	7.29442E-15	7.29266E-15	7.28825E-15	7.27945E-15	7.27065E-15	7.24434E-15	7.20940E-15
F	9	20	1.10025E+01	1.59196E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.74720E+01	2.02279E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	7.47215E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	9.97949E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.34629E+02	9.89907E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	3.47800E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.26047E-12	1.08276E-35	4.54146E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	9.62106E-13	1.71181E-16	5.41517E-19	3.04796E-25	9.65569E-38	3.05844E-50	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	9.66221E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	7.02882E-16	7.02877E-16	7.02874E-16	7.02866E-16	7.02851E-16	7.02835E-16	7.07788E-16	7.02725E-16
AR	18	37	3.02684E+06	3.88141E-11	1.49188E-20	7.87907E-27	1.59932E-42	4.58886E-74	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	1.67144E-13	1.65856E-13	1.65003E-13	1.62890E-13	1.58744E-13	1.54783E-13	1.45188E-13	1.29157E-13
AR	18	41	6.60140E+03	4.72598E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.11146E+16	9.51059E-19	9.51059E-19	9.51059E-19	9.51059E-19	9.51059E-19	9.51059E-19	9.51059E-19	9.51059E-19
K	19	42	4.47192E+04	2.58061E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52055E+12	2.02607E-13	2.02601E-13	2.02598E-13	2.02589E-13	2.02571E-13	2.02554E-13	2.02501E-13	2.02431E-13
CA	20	45	1.42623E+07	7.96009E-11	7.99257E-13	3.71981E-14	1.73840E-17	3.79645E-24	8.29180E-31	8.65567E-51	1.96430E-77
CA	20	47	3.91608E+05	4.03656E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.05234E-11	1.23446E-15	2.95819E-18	8.31590E-25	6.57127E-38	5.19256E-51	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	6.97226E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	2.21018E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	8.10181E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	4.06706E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.75491E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	7.85246E+07	6.83066E-18	6.84458E-19	1.47662E-19	3.19212E-21	1.49174E-24	6.97125E-28	7.11462E-38	3.39321E-51
V	23	52	2.02084E+02	3.05460E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	5.17504E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	7.26498E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	4.86117E-12	6.29309E-24	7.55710E-32	1.18326E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.18045E+02	6.42195E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	5.09481E-21	5.09480E-21	5.09480E-21	5.09480E-21	5.09479E-21	5.09478E-21	5.09475E-21	5.09471E-21
MN	25	54	2.61565E+07	5.10995E-12	4.15763E-13	7.80667E-14	1.19266E-15	2.78369E-19	6.49699E-23	8.26051E-34	2.45152E-48
MN	25	56	9.29152E+03	7.02057E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	8.27518E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	4.60140E+01	1.21204E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	8.80424E-10	3.95606E-10	2.32083E-10	6.11780E-11	4.25107E-12	2.95395E-13	9.91080E-17	2.31059E-21
FE	26	59	3.89409E+06	1.07746E-11	5.17478E-19	6.83405E-24	4.33623E-36	1.74458E-60	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+13	1.19187E-26	1.19105E-26	1.19105E-26	1.19099E-26	1.19091E-26	1.19083E-26	1.19058E-26	1.19025E-26
FE	26	61	3.60001E+02	1.48702E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	4.71316E-17	2.88228E-18	4.47390E-19	4.24679E-21	3.82656E-25	3.44789E-29	2.52228E-41	1.66256E-57
CO	27	58	6.13405E+06	1.48406E-14	3.35242E-19	2.67897E-22	4.83597E-31	1.57580E-45	5.13474E-61	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	2.05417E-11	1.38337E-11	1.06285E-11	5.49927E-12	1.47222E-12	3.94129E-13	7.56203E-15	3.88424E-17
CO	27	61	5.94007E+03	1.37208E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	6.93717E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

CO	27	64	2.99999E-01	4.06871E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52055E+12	5.45980E-17	5.45960E-17	5.45960E-17	5.45973E-17	5.45885E-17	5.45838E-17	5.45496E-17	5.45500E-17
NI	28	63	2.90020E+09	8.40154E-15	8.21258E-15	8.09061E-15	7.79119E-15	7.22517E-15	6.78027E-15	5.36349E-15	3.95187E-15
NI	28	65	9.21738E+03	4.79828E-16	0.00000E+26	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	1.40637E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	8.33890E-18	1.64671E-35	2.59193E-47	8.05682E-77	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.30799E+04	4.64301E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	2.69144E-16	1.25554E-22	7.53204E-27	2.10789E-37	1.65081E-58	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	6.85253E-21	6.36353E-21	6.05708E-21	5.35597E-21	4.18312E-21	3.26832E-21	1.55883E-21	5.60895E-22
SR	38	91	3.48315E+04	6.20211E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	2.97647E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	1.52112E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	5.78201E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	1.36019E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	7.05889E-17	1.80709E-22	3.58178E-26	1.62014E-35	3.71842E-54	8.53418E-73	0.00000E+00	0.00000E+00
Y	39	92	1.27448E+04	2.19858E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	4.81751E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	4.48788E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	1.07306E-19	1.19039E-23	2.74831E-26	7.03912E-33	4.61741E-46	3.02886E-59	0.00000E+00	[illegible]
ZR	40	89	2.82249E+05	1.19857E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]
ZR	40	93	4.74758E+13	2.97138E-19	2.97137E-19	2.97137E-19	2.97136E-19	2.97135E-19	2.97133E-19	2.97129E-19	[illegible]
ZR	40	95	5.63534E+06	1.01604E-15	8.92505E-21	3.79329E-24	1.41341E-32	1.96225E-49	2.72422E-66	0.00000E+00	[illegible]
ZR	40	97	6.04840E+04	2.30942E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	4.49045E-21	4.47715E-21	4.46827E-21	4.44620E-21	4.40239E-21	4.35901E-21	4.23142E-21	4.06708E-21
NB	41	92	8.80746E+05	1.80745E-16	7.92282E-49	2.12203E-70	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	4.22230E-17	4.22166E-17	4.22157E-17	4.22083E-17	4.21957E-17	4.21790E-17	4.21351E-17	4.20767E-17
NB	41	95	3.02684E+06	2.11662E-17	8.13035E-27	4.29622E-33	8.72057E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	4.16891E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	3.85735E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	1.20000E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	8.36000E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	3.45978E-19	3.45898E-19	3.45845E-19	3.45711E-19	3.45445E-19	3.45179E-19	3.44383E-19	3.43324E-19
MO	42	99	2.41515E+05	4.31640E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	2.10983E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	9.32368E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+05	4.85930E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	1.87345E-25	1.87345E-25	1.87345E-25	1.87345E-25	1.87345E-25	1.87344E-25	1.87344E-25	1.87343E-25
PD	46	109	4.83704E+04	4.91778E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34472E+05	2.17358E-18	5.32593E-57	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10589E+09	4.14051E-15	4.07483E-15	4.03162E-15	3.92560E-15	3.72184E-15	3.52866E-15	3.00722E-15	2.42981E-15
AG	47	110	2.15826E+07	6.85700E-13	3.27836E-14	4.31855E-15	2.71985E-17	1.07884E-21	4.27922E-26	2.67051E-39	6.61038E-57
CD	48	109	3.99508E+07	4.04295E-19	7.22237E-20	2.61677E-20	1.69568E-21	7.09518E-24	2.97234E-26	2.18521E-33	6.73011E-43
CD	48	111	2.92221E+03	1.01598E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	3.18287E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	9.64899E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	5.41505E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	1.48631E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	8.18340E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	1.43611E-19	3.15628E-26	1.13758E-30	9.00803E-42	5.65006E-64	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	1.63505E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	7.44842E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	1.05248E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	3.87793E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	3.94599E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	8.63658E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.80998E+01	1.18258E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	4.77341E-16	6.50209E-19	7.98980E-21	1.33737E-25	3.74481E-35	1.04973E-44	2.50844E-73	0.00000E+00
SN	50	121	9.72156E+04	2.58441E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	3.69964E-15	8.48245E-18	1.47490E-19	5.87998E-26	9.34498E-33	1.48519E-41	5.96206E-68	0.00000E+00
SN	50	125	8.12599E+05	4.64653E-14	3.95815E-49	1.63706E-72	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

I	53	130	4.44981E+04	3.61878E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	1.69966E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	1.68338E-16	1.74791E-67	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	2.01209E-12	7.30647E-13	3.71890E-13	6.87357E-14	2.34810E-15	8.02139E-17	3.19784E-21	4.35504E-27
EU	63	152	4.17559E+08	1.80361E-11	1.54131E-11	1.38800E-11	1.06816E-11	6.32599E-12	3.74645E-12	7.78210E-13	9.57339E-14
EU	63	154	2.69812E+08	1.79319E-12	1.40604E-12	1.19559E-12	7.97144E-13	3.54363E-13	1.57529E-13	1.38386E-14	5.40427E-16
LU	71	174	1.22687E+07	7.65645E-23	5.64002E-22	1.82917E-26	1.58342E-34	2.49965E-38	4.51647E-46	2.66418E-69	0.00000E+00
LU	71	177	1.58242E+07	3.51228E-20	2.87460E-22	1.21398E-23	4.44936E-27	5.97675E-34	8.02844E-41	1.44597E-61	0.00000E+00
HF	72	173	8.49655E+04	7.84371E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	1.18425E-13	2.14381E-18	1.54859E-21	2.17175E-29	4.27110E-45	8.39982E-61	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	2.95340E-21	2.76178E-21	2.64099E-21	2.36163E-21	1.88644E-21	1.51066E-21	7.72091E-22	3.15670E-22
HF	72	179	1.89384E+10	1.40753E-22	1.40266E-22	1.39943E-22	1.39137E-22	1.37559E-22	1.35940E-22	1.31329E-22	1.25400E-22
HF	72	180	1.98725E+04	3.00323E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	7.79100E-13	1.29560E-20	6.44092E-26	5.14532E-39	1.07344E-64	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	1.47619E-27	1.47619E-27	1.47619E-27	1.47619E-27	1.47618E-27	1.47618E-27	1.47618E-27	1.47618E-27
TA	73	180	2.93458E+04	3.65729E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	1.25005E-12	1.64569E-15	1.97680E-17	3.12613E-22	7.81762E-32	1.95497E-41	3.05737E-70	0.00000E+00
W	74	181	1.20968E+07	2.71998E-16	1.19847E-18	5.22107E-20	5.81455E-24	5.54944E-32	7.56200E-40	2.06910E-63	0.00000E+00
W	74	185	6.47801E+06	5.83961E-14	2.32801E-18	2.71677E-21	1.26397E-28	2.73569E-43	5.92115E-58	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	1.15178E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	1.03611E-18	8.61502E-26	1.64117E-30	2.59966E-42	6.52251E-66	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11947E+02	8.05402E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	1.05787E-20	6.10248E-21	4.22886E-21	1.69051E-21	2.70148E-22	4.31705E-23	1.76175E-25	1.14891E-28
TL	81	206	2.52054E+02	1.86321E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	1.51869E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	4.88198E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	1.86074E-21	1.86074E-21	1.86074E-21	1.86074E-21	1.86073E-21	1.86073E-21	1.86073E-21	1.86073E-21
PB	82	207	7.95989E-01	4.05349E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
			TOTAL (CURIES/CC)	9.86293E-09	4.41156E-10	2.69855E-10	8.70475E-11	1.75817E-11	7.69498E-12	1.66244E-12	4.94560E-13
			TOTAL (CURIES)	1.42826E-01	6.35264E-03	3.88591E-03	1.25348E-03	2.53177E-04	1.10808E-04	2.39391E-05	7.12166E-06

COMPONENT : CONCRETE - AXIAL UP - SEVENTH 6 INCHES - R5
VOLUME : 1.44000E+07 CC
: ABOVE VOLUME IS FOR THE SEVENTH 6 INCHES OF CONCRETE
: IN THE AXIAL UP DIRECTION.
:
: (INTERVALS 64-66 TOTGUPRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87253E+08	3.05330E-12	2.57734E-12	2.30261E-12	1.75558E-12	9.86552E-13	5.60784E-13	1.02996E-13	1.07528E-16
HE	2	6	8.09751E-01	2.59738E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	8.04283E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	3	3.89064E-16	6.82641E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	1.95323E-22	1.95323E-22	1.95323E-22	1.95323E-22	1.95322E-22	1.95322E-22	1.95320E-22	1.95318E-22
B	5	12	1.99754E-02	1.11512E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80976E+11	1.50256E-15	1.50182E-15	1.50145E-15	1.50055E-15	1.49873E-15	1.49692E-15	1.49151E-15	1.48431E-15
F	9	20	1.10023E+01	5.93323E-[illegible]	0.00000E+00	0.00000E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	4.89493E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	1.6396[illegible]E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	2.39690E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	1.91206E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	8.09155E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	2.94432E-13	2.52919E-36	1.06083E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	1.98202E-13	3.52647E-17	1.11557E-19	6.27904E-26	1.98915E-38	6.30145E-51	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	2.30027E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	1.45231E-16	1.45230E-16	1.45230E-16	1.45228E-16	1.45225E-16	1.45222E-16	1.45212E-16	1.45199E-16
AR	18	37	3.02684E+06	9.26209E-12	3.58774E-21	1.87996E-27	3.81602E-43	1.57212E-74	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	3.59067E-14	3.56300E-14	3.54468E-14	3.49927E-14	3.41021E-14	3.32341E-14	3.07604E-14	2.77462E-14
AR	18	41	6.60140E+03	1.13556E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	1.95718E-19	1.95718E-19	1.95718E-19	1.95718E-19	1.95718E-19	1.95718E-19	1.95718E-19	1.95718E-19
K	19	42	4.47192E+04	5.31633E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52055E+12	4.16565E-14	4.16555E-14	4.16547E-14	4.16529E-14	4.16493E-14	4.16457E-14	4.16349E-14	4.16204E-14
CA	20	45	1.42623E+07	1.64442E-11	1.64711E-13	7.66599E-15	3.58250E-18	7.82372E-25	1.70861E-51	1.77964E-51	4.04804E-78
CA	20	47	3.91608E+05	8.30316E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	2.17011E-12	2.54568E-16	6.10631E-19	1.71489E-25	1.35511E-38	1.07080E-51	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	1.63136E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	5.43138E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44869E+03	1.93722E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	1.01276E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	2.38283E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.78160E-18	1.70507E-19	3.67844E-20	7.95194E-22	3.71609E-25	1.73662E-28	1.77234E-38	8.45289E-52
V	23	52	2.02084E+02	6.28946E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.99922E+02	1.25894E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	1.80961E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39643E+06	9.98099E-13	1.50825E-24	1.56686E-32	2.45985E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	1.06123E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.26917E-21	1.26917E-21	1.26917E-21	1.26917E-21	1.26917E-21	1.26917E-21	1.26916E-21	1.26915E-21
MN	25	54	2.61565E+07	1.20079E-12	4.77867E-14	1.83450E-14	2.80265E-16	6.54141E-20	1.52675E-23	1.94115E-34	5.76039E-49
MN	25	56	9.29152E+03	1.44717E-0[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	2.00202E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	3.01279E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.81047E-10	8.15508E-11	4.77244E-11	1.25804E-11	8.74172E-13	6.07434E-14	2.03602E-17	4.75140E-22
FE	26	59	3.89609E+06	2.22219E-12	1.06699E-19	1.40953E-24	8.94090E-37	3.59717E-61	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+13	2.96613E-27	2.96607E-27	2.96603E-27	2.96593E-27	2.96572E-27	2.96552E-27	2.96490E-27	2.96408E-27
FE	26	61	3.60001E+02	5.70424E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34638E+07	1.17390E-17	7.17885E-19	1.11431E-19	1.05774E-21	9.53074E-26	8.58759E-30	6.28220E-42	4.14092E-58
CO	27	58	6.[illegible]E+06	3.47812E-15	7.85690E-20	6.27856E-23	1.13338E-30	3.69311E-46	1.20340E-61	0.00000E+00	0.00000E+00
CO	27	60	1.6[illegible]83E+08	4.24121E-12	2.85620E-12	2.19445E-12	1.13542E-12	3.03965E-13	8.13748E-14	1.56131E-15	8.01969E-18
CO	27	61	5.94007E+03	3.29244E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.54012E+02	1.78510E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	1.01353E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	1.12355E-17	1.12352E-17	1.12350E-17	1.12345E-17	1.12336E-17	1.12326E-17	1.12297E-17	1.12258E-17
NI	28	63	2.90028E+09	1.74600E-15	1.70693E-15	1.68138E-15	1.61915E-15	1.50152E-15	1.39244E-15	1.11046E-15	8.21272E-16
NI	28	65	9.21738E+03	1.15248E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	2.89651E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	2.06954E-18	4.08679E-36	6.43262E-48	1.99953E-77	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	1.14652E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	6.53202E-17	3.04238E-25	1.82800E-27	5.11575E-38	4.00644E-59	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	1.68453E-21	1.56433E-21	1.48899E-21	1.31615E-21	1.02832E-21	8.03441E-22	3.83202E-22	1.42799E-22
SR	38	91	3.48315E+04	1.53129E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	7.40279E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	3.78698E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	1.43828E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	2.79895E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	1.72334E-17	4.41183E-23	8.25630E-27	3.95543E-36	9.07816E-55	2.08354E-73	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	5.41209E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	1.19411E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	1.11795E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	2.40210E-20	2.88662E-24	6.66448E-27	1.79694E-33	1.11969E-46	7.34477E-60	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	2.94010E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	6.15108E-20	6.15108E-20	6.15106E-20	6.15104E-20	6.15102E-20	6.15099E-20	6.15090E-20	6.15079E-20
ZR	40	95	5.63534E+06	2.53536E-16	2.22239E-21	9.44766E-25	3.52025E-33	4.88721E-50	6.78498E-67	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	5.11646E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	1.11540E-21	1.11209E-21	1.10989E-21	1.10441E-21	1.09352E-21	1.08275E-21	1.05106E-21	1.01024E-21
NB	41	92	8.80746E+05	4.45879E-17	1.95448E-49	5.23463E-71	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	8.83128E-18	8.83036E-18	8.82975E-18	8.82822E-18	8.82515E-18	8.82209E-18	8.81291E-18	8.80068E-18
NB	41	95	3.02684E+06	5.15767E-16	1.98116E-27	1.04687E-33	2.12498E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	1.02516E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	9.43956E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	2.97150E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09996E+00	2.08192E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	7.83045E-20	7.82864E-20	7.82743E-20	7.82442E-20	7.81840E-20	7.81238E-20	7.79435E-20	7.77038E-20
MO	42	99	2.41515E+05	4.50934E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	4.51259E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	2.61565E+02	2.30411E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	1.18598E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	4.58336E-26	4.58336E-26	4.58336E-26	4.58336E-26	4.58335E-26	4.58335E-26	4.58333E-26	4.58331E-26
PD	46	109	4.83704E+04	1.20201E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.54422E+05	5.24010E-19	8.28530E-58	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	8.57698E-16	8.44092E-16	8.35142E-16	8.13179E-16	7.70971E-16	7.30953E-16	6.22938E-16	5.03329E-16
AG	47	110	2.15826E+07	1.44532E-13	6.91013E-15	7.10265E-16	5.75791E-18	2.27398E-22	9.01974E-27	5.62891E-40	1.39334E-57
CD	48	109	3.99508E+07	9.87577E-20	1.91078E-20	6.39201E-21	4.13718E-22	1.73315E-24	7.26058E-27	5.33783E-34	1.64397E-43
CD	48	111	2.92221E+03	2.49607E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	7.89807E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	2.40344E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	1.36845E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	3.68903E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	1.99844E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	3.52320E-20	7.69425E-27	2.79033E-31	2.20994E-42	1.38613E-64	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	3.99699E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	1.83762E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	2.57690E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63965E+02	7.61316E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	9.69419E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40095E+01	2.15845E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	2.96594E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	1.07874E-16	1.46872E-19	1.80477E-21	3.02091E-26	8.46345E-36	2.37118E-45	5.21445E-74	0.00000E+00
SN	50	121	9.72156E+04	5.58314E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	7.77974E-17	1.78372E-18	3.10147E-20	1.23646E-24	1.96510E-33	3.12311E-42	1.25372E-68	0.00000E+00
SN	50	125	8.12599E+05	9.70024E-15	8.22139E-60	3.61757E-73	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

NUCLIDE	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
I 53 130	4.44981E+04	8.82675E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE 54 133	4.56018E+05	4.12401E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS 55 132	5.58990E+05	4.19551E-17	4.33424E-44	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS 55 134	6.47801E+07	4.22794E-13	1.53528E-13	7.81440E-14	1.44432E-14	4.93598E-16	1.68551E-17	6.71951E-22	9.15109E-28
EU 63 152	4.17559E+08	3.70880E-12	3.16963E-12	2.[illegible]17E-12	2.19647E-12	1.50082E-12	7.70589E-13	1.60025E-13	1.96849E-14
EU 63 154	2.69812E+08	3.70682E-13	2.90655E-13	2.47146E-13	1.6[illegible]85E-13	7.32528E-14	3.25630E-14	2.86068E-15	1.117[illegible]E-16
LU 71 174	1.22687E+07	1.82454E-23	8.67421E-26	2.45253E-27	5.[illegible]9670E-31	5.95670E-39	1.07628E-46	6.34879E-70	0.00000E+00
LU 71 177	1.38242E+07	8.08967E-21	7.02071E-[illegible]	2.96493E-24	2.1[illegible]668E-27	1.45972E-34	1.96081E-41	4.75269E-62	0.00000E+00
HF 72 173	8.49653E+04	1.95396E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF 72 175	6.04840E+06	2.28362E-14	4.43347E-19	3.20262E-22	4.49124E-30	8.85276E-46	1.75711E-61	0.00000E+00	0.00000E+00
HF 72 178	9.78261E+08	7.25262E-22	6.78207E-22	6.48545E-22	5.79944E-22	4.63743E-22	3.70874E-22	1.89601E-22	7.75[illegible]87E-23
HF 72 179	1.89584E+16	3.44594E-23	3.43402E-23	3.42610E-23	3.40637E-23	3.36725E-23	3.32858E-23	3.21522E-23	3.07006E-23
HF 72 180	1.98723E+04	7.36498E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF 72 181	3.66357E+06	1.63172E-13	2.71349E-21	1.76784E-26	1.91536E-39	2.74818E-65	0.00000E+00	0.00000E+00	0.00000E+00
HF 72 182	2.84077E+14	3.63909E-28	3.63909E-28	3.63409E-28	3.63909E-28	3.63909E-28	3.63908E-28	3.63908E-28	3.63906E-28
TA 73 180	2.93458E+04	9.10422E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA 73 182	9.89362E+06	2.65808E-13	3.49936E-16	4.20342E-18	6.64734E-23	1.66232E-32	4.15751E-42	6.50113E-71	0.00000E+00
W 74 181	1.20966E+07	6.77564E-17	2.98546E-19	8.02388E-21	9.50222E-25	1.33258E-32	1.86679E-48	5.15426E-64	0.00000E+00
W 74 185	6.47801E+06	1.22623E-14	4.88849E-19	5.70462E-22	2.65414E-29	5.74455E-44	1.24335E-58	0.00000E+00	0.00000E+00
W 74 187	8.59984E+04	2.42359E-13	0.00000E+00	0.00000E+00	0.00000E+0[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG 80 203	4.02525E+06	2.55778E-19	2.12674E-26	4.05147E-31	6.41763E-43	1.41013E-66	0.00000E+00	0.00000E+00	0.00000E+00
HG 80 205	3.11947E+02	1.99951E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL 81 204	1.19282E+08	2.60077E-21	1.50030E-21	1.03967E-21	4.15612E-22	6.64162E-23	1.06135E-23	4.33128E-26	2.80461E-29
TL 81 206	2.52054E+02	4.60620E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL 81 207	2.86188E+02	3.74217E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB 82 203	1.86782E+05	1.01685E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB 82 205	4.76390E+14	4.63407E-22	4.63407E-22	4.63407E-22	4.63407E-22	4.63407E-22	4.63406E-22	4.63406E-22	4.63405E-22
PB 82 207	7.95989E-01	1.00856E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)		2.03827E-09	9.07493E-11	5.55087E-11	1.79081E-11	3.61894E-12	1.58454E-12	3.43249E-13	1.02899E-13
TOTAL (CURIES)		2.93511E-02	1.30679E-03	7.99325E-04	2.57876E-04	5.21127E-05	2.28173E-05	4.94278E-06	1.48175E-06

COMPONENT : CONCRETE - AXIAL UP - EIGHTH 6 INCHES - RS
VOLUME : 1.44000E+07 CC
: ABOVE VOLUME IS FOR THE EIGHTH 6 INCHES OF CONCRETE
: IN THE AXIAL UP DIRECTION.
:
: (INTERVALS 67-69 TOTGUMRS)

NUCLIDE SYM Z M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H 1 3	3.87233E+08	6.66614E-13	5.62700E-13	5.02568E-13	3.78922E-13	2.15390E-13	1.22434E-13	2.24867E-14	2.34762E-15
HE 2 6	8.09751E-01	6.11299E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI 3 8	8.40178E-01	1.76509E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE 4 8	3.00864E-16	1.59951E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE 4 10	7.88563E+13	4.55395E-23	4.55394E-23	4.55394E-23	4.55393E-23	4.55392E-23	4.55391E-23	4.55387E-23	4.55382E-23
B 5 12	1.99754E-02	2.43472E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C 6 14	1.80978E+11	5.28148E-16	5.28029E-16	5.27949E-16	5.27751E-16	5.27355E-16	5.26960E-16	5.25776E-16	5.24205E-16
F 9 20	1.10023E+01	9.73725E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE 10 23	3.76718E+01	1.19049E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA 11 24	5.41521E+04	3.36524E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG 12 27	5.68153E+02	5.79376E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL 13 28	1.38629E+02	4.24073E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI 14 31	9.43057E+03	1.90123E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P 15 32	1.23556E+06	6.94476E-14	5.96561E-37	2.50218E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S 16 35	7.60030E+06	4.33117E-14	7.70616E-18	2.43778E-20	1.37212E-26	4.34675E-39	1.37701E-51	0.00000E+00	0.00000E+00
S 16 37	3.04012E+02	5.60603E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL 17 36	9.77641E+12	3.18089E-17	3.18087E-17	3.18086E-17	3.18082E-17	3.18075E-17	3.18068E-17	3.18047E-17	3.18018E-17
AR 18 37	3.02684E+06	2.22604E-12	8.55063E-22	4.51828E-28	9.17135E-44	3.77840E-75	0.00000E+00	0.00000E+00	0.00000E+00
AR 18 39	8.48405E+09	8.05961E-15	7.99751E-15	7.95638E-15	7.85447E-15	7.65455E-15	7.45972E-15	6.90447E-15	6.22790E-15
AR 18 41	6.60140E+03	2.74573E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K 19 40	4.10146E+16	4.27336E-20	4.27336E-20	4.27336E-20	4.27336E-20	4.27336E-20	4.27336E-20	4.27336E-20	4.27335E-20
K 19 42	4.47192E+04	1.16140E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA 20 41	2.52053E+12	9.09028E-15	9.09005E-15	9.08989E-15	9.08949E-15	9.08870E-15	9.08792E-15	9.08555E-15	9.08240E-15
CA 20 45	1.42623E+07	3.58400E-12	3.59862E-14	1.67488E-15	7.82710E-19	1.70934E-25	3.73299E-32	3.88818E-52	8.04420E-79
CA 20 47	3.91608E+05	1.81196E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC 21 46	7.25049E+06	6.74654E-13	5.56800E-17	1.33428E-19	3.75086E-26	2.96395E-39	2.54210E-52	0.00000E+00	0.00000E+00
SC 21 47	2.96217E+05	3.85247E-15	0.00000E+00	0.[illegible]00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC 21 48	1.58253E+05	1.33854E-15	0.00000E+00	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC 21 49	3.44849E+03	4.66550E-16	0.00000E+00	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC 21 50	1.03147E+02	2.52463E-17	0.00000E+00	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI 22 51	3.48315E+02	5.20630E-14	0.00000E+00	[illegible]00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V 23 49	2.85246E+07	4.24326E-19	4.25191E-2[illegible]	[illegible]72290E-21	1.98797E-22	9.26678E-26	4.33659E-29	4.41965E-39	2.10789E-52
V 23 52	2.02084E+02	1.37398E-12	0.00000E+0[illegible]	[illegible].00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V 23 53	1.19922E+02	3.07579E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V 23 54	5.50117E+01	4.51129E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR 24 51	2.39843E+06	2.19582E-13	2.87815E-25	3.44710E-53	5.41167E-53	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR 24 55	2.10045E+02	2.56315E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN 25 53	1.16760E+14	3.16493E-22	3.16493E-22	3.16492E-22	3.16492E-22	3.16492E-22	3.16491E-22	3.16489E-22	3.16487E-22
MN 25 54	2.61565E+07	2.84768E-13	2.31697E-14	4.35051E-15	6.64647E-17	1.55130E-20	3.62065E-24	4.60363E-35	1.36608E-49
MN 25 56	9.29152E+03	3.16278E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN 25 57	1.01933E+02	4.86926E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN 25 58	6.60140E+01	7.69839E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE 26 55	8.20292E+07	3.95110E-11	1.77537E-11	1.84152E-11	2.74550E-12	1.90776E-13	1.32564E-14	4.44769E-18	1.03693E-22
FE 26 59	3.89409E+06	4.85730E-13	2.33223E-20	3.08097E-25	1.95431E-37	7.86275E-62	0.00000E+00	0.00000E+00	0.00000E+00
FE 26 60	3.15569E+12	7.39444E-28	7.39429E-28	7.39419E-28	7.39393E-28	7.39342E-28	7.39291E-28	7.39137E-28	7.38932E-28
FE 26 61	3.60001E+02	9.23704E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO 27 57	2.34838E+07	2.92689E-18	1.78991E-19	2.77831E-20	2.63728E-22	2.37631E-26	2.14115E-30	1.56635E-42	1.03246E-58
CO 27 58	6.13405E+06	8.22755E-16	1.85856E-20	1.48570E-23	2.68103E-31	8.73612E-47	2.84666E-62	0.00000E+00	0.00000E+00
CO 27 60	1.65983E+08	9.27605E-13	6.24688E-13	4.79951E-13	2.48331E-13	6.64809E-14	1.77977E-14	3.41479E-16	1.75401E-18
CO 27 61	5.94007E+03	7.95330E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO 27 62	8.36012E+02	4.28216E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

CO	27	64	2.99999E-01	2.12738E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	2.45341E-18	2.45335E-18	2.45331E-18	2.45320E-18	2.45299E-18	2.45277E-18	2.45214E-18	2.45128E-18
NI	28	63	2.90020E+09	3.83764E-16	3.75178E-16	3.69562E-16	3.55884E-16	3.30030E-16	3.06054E-16	2.44079E-16	1.80513E-16
NI	28	65	9.21738E+03	2.78656E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	6.32748E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	5.14350E-19	1.01570E-36	1.59872E-48	4.96952E-78	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.01799E+04	2.83672E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	1.59326E-17	7.42057E-24	4.45872E-28	1.24780E-40	9.77223E-60	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	4.15239E-22	3.85607E-22	3.67037E-22	3.24431E-22	2.53482E-22	1.98049E-22	9.44595E-23	3.52001E-23
SR	38	91	1.48315E+04	3.73822E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	1.84337E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	9.43841E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	3.58224E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	4.11151E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	4.22442E-18	1.08146E-23	2.02384E-27	9.69581E-37	2.22530E-55	5.10731E-74	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	1.33553E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	2.96455E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	2.78776E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	6.33943E-21	7.03260E-25	1.62369E-27	4.15857E-34	2.72787E-47	1.78939E-60	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	7.23508E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	1.34848E-20	1.34848E-20	1.34848E-20	1.34847E-20	1.34847E-20	1.34846E-20	1.34844E-20	1.34842E-20
ZR	40	95	5.63534E+06	6.32170E-17	5.54098E-22	2.35554E-25	8.77688E-[illegible]	1.21851E-50	1.69167E-67	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	1.15611E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	2.77427E-22	2.76604E-22	2.76057E-22	2.74693E-22	2.71987E-22	2.69307E-22	2.61424E-22	2.51271E-22
NB	41	92	8.80746E+05	1.10292E-17	4.83413E-50	1.29476E-71	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.50134E+11	1.94313E-18	1.94293E-18	1.94279E-18	1.94245E-18	1.94178E-18	1.94111E-18	1.93909E-18	1.93640E-18
NB	41	95	3.02684E+06	1.76728E-18	4.84866E-28	2.56211E-34	6.20065E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	2.52780E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	2.31837E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	7.37943E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	5.19020E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	1.77028E-20	1.76988E-20	1.76960E-20	1.76892E-20	1.76756E-20	1.76620E-20	1.76213E-20	1.75671E-20
MO	42	99	2.41515E+05	2.07961E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	1.00453E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	5.70518E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	2.90476E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	1.12555E-26	1.12555E-26	1.12555E-26	1.12555E-26	1.12555E-26	1.12554E-26	1.12554E-26	1.12554E-26
PD	46	109	4.83704E+04	2.94962E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	1.31919E-19	2.06609E-58	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	1.87791E-16	1.84813E-16	1.82853E-16	1.78044E-16	1.68803E-16	1.60041E-16	1.36391E-16	1.10293E-16
AG	47	110	2.15826E+07	3.17918E-14	1.51998E-15	2.00226E-16	1.26194E-18	5.00194E-23	1.98402E-27	1.23816E-40	3.06484E-58
CD	48	109	3.99508E+07	2.42194E-20	4.68600E-21	1.56758E-21	1.01460E-22	4.25038E-25	1.78059E-27	1.30905E-34	4.03168E-44
CD	48	111	2.92221E+03	6.15020E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	1.96273E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	5.99388E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	3.34263E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	9.16918E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	4.90230E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	8.67120E-21	1.89369E-27	4.86748E-32	5.43905E-43	3.41151E-65	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	9.80025E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	4.54335E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	4.33180E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	2.38674E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	2.30853E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E-01	5.36215E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E-01	7.34630E-25	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	2.43674E-17	3.31921E-20	4.07866E-22	6.87705E-27	1.91268E-36	5.35670E-46	1.17843E-74	0.00000E+00
SN	50	121	9.72156E+04	1.18819E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	7.07967E+07	1.72005E-16	3.94368E-19	6.85714E-21	2.73373E-25	4.34469E-34	6.90[illegible]E-53	2.77190E-69	0.00000E+00
SN	50	125	8.12599E+05	2.13291E-15	1.80774E-50	7.51463E-74	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
I	53	130	4.469[illegible]E+04	2.16305E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.36[illegible]E+05	1.00598E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.59999E+05	1.84573E-17	1.08381E-68	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	9.29393E-14	3.37490E-14	1.71778E-14	3.17495E-15	1.08460E-16	3.70513E-18	1.47410E-22	2.01162E-28
EU	63	152	4.17559E+08	8.09484E-13	6.91761E-13	6.22952E-13	4.79403E-13	2.83918E-13	1.68145E-13	3.49270E-14	4.29665E-15
EU	63	154	2.69812E+06	8.11378E-14	6.36204E-14	5.40977E-14	3.60691E-14	1.60342E-14	7.12783E-15	6.26167E-16	2.44531E-17
LU	71	174	1.22687E+07	4.38431E-24	2.08438E-26	5.89335E-28	7.92186E-32	1.45138E-39	2.58627E-47	1.52559E-70	0.00000E+00
LU	71	177	1.38242E+07	1.48396E-21	1.72180E-23	7.27138E-25	2.46504E-28	3.57991E-35	4.80881E-42	1.16558E-62	0.00000E+00
HF	72	173	8.49653E+04	4.87257E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	5.00358E-15	9.71390E-20	7.91685E-23	9.84049E-31	1.93529E-46	3.80607E-62	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	1.78654E-22	1.67063E-22	1.59757E-22	1.42858E-22	1.14234E-22	9.13455E-23	4.67047E-23	1.90953E-23
HF	72	179	1.89584E+10	8.46736E-24	8.43607E-24	8.41860E-24	8.37012E-24	8.27400E-24	8.17898E-24	7.90043E-24	7.54373E-24
HF	72	180	1.98723E+04	1.62104E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	3.60506E-14	5.99500E-22	3.90579E-27	4.23176E-40	4.96704E-56	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	8.99201E-29	8.99200E-29	8.99200E-29	8.99200E-29	8.99199E-29	8.99199E-29	8.99196E-29	8.99194E-29
TA	73	180	2.93458E+04	2.26886E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	5.86730E-14	7.72431E-17	9.27839E-19	1.46730E-23	3.66932E-33	9.17597E-43	1.43502E-71	0.00000E+00
W	74	181	1.20960E+07	1.68960E-17	7.66467E-20	2.06087E-21	2.36952E-25	3.32298E-33	4.66011E-41	1.20529E-64	0.00000E+00
W	74	185	6.47061E+06	2.70574E-15	1.07867E-19	1.25879E-22	5.85648E-30	1.26756E-44	2.74351E-59	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	5.32609E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	6.32708E-20	5.26885E-27	1.00229E-31	1.58751E-43	3.98291E-67	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11967E+02	4.97091E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	6.41278E-22	3.69932E-22	2.56353E-22	1.02478E-22	1.63764E-23	2.61788E-24	1.06797E-26	6.96470E-30
TL	81	206	2.52054E+02	1.14088E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	9.24237E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	2.53569E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	1.15532E-22	1.15532E-22	1.15532E-22	1.15532E-22	1.15532E-22	1.15532E-22	1.15532E-22	1.15532E-22
PB	82	207	7.95989E-01	2.51232E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				6.46354E-10	1.98090E-11	1.21162E-11	3.90901E-12	7.90313E-13	3.46141E-13	7.51183E-14	2.26319E-14
TOTAL (CURIES)				6.42750E-03	2.85269E-04	1.74473E-04	5.62940E-05	1.13805E-05	4.98445E-06	1.08178E-06	3.25905E-07

COMPONENT : CONCRETE - AXIAL DOWN - FIRST 6 INCHES - RS
VOLUME : 9.67700E+06 CC
ABOVE VOLUME IS FOR THE FIRST 6 INCHES OF CONCRETE
IN THE AXIAL DOWN DIRECTION

(INTERVALS 56-58 TOTGDWRS)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.8[illegible]33E+08	1.97385E-08	1.66616E-08	1.48816E-08	1.12199E-08	6.37770E-09	3.62527E-09	6.65833E-10	6.95131E-11
HE	2	6	8.04751E-01	3.96202E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	5.21651E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.03635E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	2.20994E-19	2.20993E-19	2.20993E-19	2.20993E-19	2.20992E-19	2.20992E-19	2.20990E-19	2.20988E-19
B	5	12	1.99754E-02	7.19708E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	9.64761E-12	9.64411E-12	9.64178E-12	9.63596E-12	9.62432E-12	9.61269E-12	9.57790E-12	9.[illegible]171E-12
F	9	20	1.10023E+01	3.65310E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	5.67986E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	9.84087E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	2.93121E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	1.06730E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	1.15610E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	4.15802E-11	3.57177E-34	1.49813E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	1.26848E-09	2.25693E-13	7.13959E-16	4.01856E-22	1.27305E-34	4.03290E-47	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	2.60916E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	9.03493E-13	9.03487E-13	9.03483E-13	9.03473E-13	9.03453E-13	[illegible]3433E-13	9.03372E-[illegible]	[illegible]E-13
AR	18	37	3.02684E+06	1.16855E-09	4.48863E-19	2.37186E-25	4.81448E-41	1.98346E-72	[illegible]00000E+00	0.00000E+[illegible]	[illegible]E+00
AR	18	39	6.48405E+09	1.50243E-10	1.49085E-10	1.48319E-10	1.46419E-10	1.42692E-10	1.39060E-10	1.28710E-[illegible]	[illegible]E-10
AR	18	41	6.60140E+03	1.39900E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E[illegible]	[illegible]E+00
K	19	40	4.10146E+16	1.26188E-15	1.26188E-15	1.26188E-15	1.26188E-15	1.26188E-15	1.26188E-15	1.26188E-15	[illegible]188E-15
K	19	42	4.47192E+04	3.39131E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	2.71101E-10	2.71094E-10	2.71089E-10	2.71077E-10	2.71054E-10	2.71031E-10	2.70960E-10	2.70866E-10
CA	20	45	1.42623E+07	1.04361E-07	1.04787E-09	4.87701E-11	2.27914E-14	4.97735E-21	1.08700E-27	1.13219E-47	2.57531E-74
CA	20	47	3.91608E+05	5.40284E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.37290E-08	1.61051E-12	3.85932E-15	1.08491E-21	8.57303E-35	6.77436E-48	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	2.32320E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	5.36761E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	2.46904E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	8.45262E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.52648E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.41203E-16	1.41690E-17	3.05246E-18	6.59871E-20	3.08370E-23	1.44109E-26	3.47873E-36	7.01441E-50
V	23	52	2.02084E+02	4.04310E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	1.38705E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.60117E+01	1.50612E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	5.91303E-09	7.75046E-21	9.28256E-29	1.45729E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	1.32359E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.05321E-19	1.05321E-19	1.05321E-19	1.05321E-19	1.05321E-19	1.05321E-19	1.05320E-19	1.05319E-19
MN	25	54	2.61565E+07	1.66531E-10	1.35496E-11	2.84416E-12	3.86683E-14	9.07192E-18	2.11734E-21	2.69207E-32	7.98877E-47
MN	25	56	9.29152E+03	9.17210E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	2.31813E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.[illegible]40E+01	2.58968E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.[illegible]292E+07	1.17646E-06	3.28624E-07	3.10118E-07	8.1[illegible]5E-08	5.68044E-09	3.94716E-10	1.32432E-13	3.[illegible]8750E-18
FE	26	59	3.89409E+06	1.40356E-08	6.73924E-16	8.90275E-21	5.64717E-33	2.27201E-57	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	2.47339E-25	2.47334E-25	2.47331E-25	2.47322E-25	2.47305E-25	2.47288E-25	2.47236E-25	2.47168E-25
FE	26	61	3.60001E+02	3.07493E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	9.76610E-16	5.97234E-17	9.27031E-18	8.79974E-20	7.92897E-24	7.14433E-28	5.[illegible]9E-40	3.44498E-56
CO	27	58	6.13405E+06	4.90799E-13	1.10869E-17	8.85970E-21	1.59932E-28	5.21137E-44	1.69812E-59	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	2.64327E-08	1.78009E-08	1.36765E-08	7.07635E-09	1.89442E-09	5.07157E-10	9.73066E-[illegible]	4.99816E-14
CO	27	61	5.94007E+03	[illegible]05308E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	1.68688E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	[illegible]41414E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+[illegible]
NI	28	59	2.52053E+12	[illegible].24276E-14	7.24258E-14	7.24245E-14	7.24213E-14	7.24151E-14	7.24088E-14	7.23900E-14	7.23648E-14
NI	28	63	2.90020E+09	1.03466E-11	1.01[illegible]E-11	9.96367E-12	9.59492E-12	8.89747E-12	8.25145E-12	6.58057E-12	4.66677E-[illegible]
NI	28	65	9.21738E+03	1.41715E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	1.85019E-08	0.[illegible]E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	1.81307E-16	3.58[illegible]E-34	5.63544E-46	1.75174E-75	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	1.67452E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	7.50279E-15	3.43408E-21	2.04537E-25	5.72410E-36	4.48287E-57	3.51074E-78	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	1.66063E-19	1.54212E-19	1.46786E-19	1.29747E-19	1.01373E-19	7.92037E-20	3.77763E-20	1.40773E-20
SR	38	91	3.48315E+04	1.45793E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	6.28991E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	3.17099E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	1.21541E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	1.80460E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	1.82801E-15	4.65923E-21	8.71930E-25	4.17724E-34	9.58722E-53	2.20038E-71	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	5.26080E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	1.06374E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	9.28112E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	2.96325E-18	3.28725E-22	7.58944E-25	1.[illegible]384E-31	1.27509E-44	8.36415E-58	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	2.96094E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	3.80545E-16	3.80545E-16	3.80544E-16	3.8[illegible]544E-16	3.80542E-16	3.80540E-16	3.80535E-16	3.80528E-16
ZR	40	95	5.63534E+06	2.11021E-14	1.84958E-19	7.86279E-23	2.92973E-31	4.06738E-48	5.64688E-65	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	9.41404E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	9.65321E-20	9.62457E-20	9.60553E-20	9.55809E-20	9.46390E-20	9.37064E-20	9.09636E-20	8.74308E-20
NB	41	92	8.80746E+05	4.16293E-15	1.82479E-47	4.88748E-69	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	4.76142E-14	4.76092E-14	4.76059E-14	4.75977E-14	4.75812E-14	4.75646E-14	4.75151E-14	4.74492E-14
NB	41	95	3.02684E+06	5.53838E-16	2.12740E-25	1.12415E-31	2.28183E-47	9.40066E-79	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	1.00622E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	9.74243E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	2.68440E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	1.73569E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	5.89123E-17	5.88987E-17	5.88896E-17	5.88670E-17	5.88216E-17	5.87764E-17	5.86407E-17	5.84604E-17
MO	42	99	2.41515E+05	3.18711E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	1.75479E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	2.13461E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	1.27086E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	4.73471E-24	4.73471E-24	4.73471E-24	4.73471E-24	4.73470E-24	4.73470E-24	4.73468E-24	4.73466E-24
PD	46	109	4.83706E+04	1.25271E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	4.38986E-17	6.87535E-56	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	5.18252E-12	5.10031E-12	5.04623E-12	4.91352E-12	4.65849E-12	4.41669E-12	3.76402E-12	3.04130E-12
AG	47	110	2.15826E+07	7.38210E-10	3.52941E-11	4.64926E-12	2.92814E-14	1.16145E-18	4.60692E-23	2.87502E-36	7.11660E-54
CD	48	109	3.99508E+07	1.03781E-17	2.00798E-18	6.71717E-19	4.34764E-20	1.82131E-22	7.62992E-25	5.60937E-32	1.72760E-41
CD	48	111	2.92221E+03	2.47190E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	6.92995E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	1.99499E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	1.11898E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	3.22796E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	2.09589E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	3.54097E-18	7.73306E-25	2.80441E-29	2.22109E-40	1.39312E-62	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	4.17018E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	1.73946E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	2.64395E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	8.55605E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	9.609[illegible]3E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	1.79258E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.80998E+01	2.44462E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	8.73442E-14	1.18976E-16	1.46198E-18	2.44713E-23	6.85595E-33	1.92081E-42	4.22404E-71	0.00000E+00
SN	50	121	9.72156E+04	2.93611E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.87967E+07	4.[illegible]5784E-12	9.53116E-15	1.65725E-16	6.60693E-21	1.05003E-29	[illegible]66881E-38	6.69917E-65	0.00000E+00
SN	50	125	8.12599E+05	5.35425E-11	4.53796E-46	1.88640E-69	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

I	53	130	4.44981[illegible]E+04	9.39420E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	4.59706E-16	1.46670E-78	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.68990E+05	3.47988E-15	3.61326E-46	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	2.22476E-09	8.07874E-10	4.11197E-10	7.60008E-11	2.59628E-12	8.86922E-14	3.55584E-18	4.81535E-24
EU	63	152	4.17569E+08	2.40928E-08	2.05890E-08	1.65410E-08	1.42685E-08	8.45028E-09	5.00453E-09	1.03964E-09	1.27863E-10
EU	63	154	2.69812E+08	2.28151E-09	1.76894E-09	1.52117E-09	1.01423E-09	4.50864E-10	2.00427E-10	1.76072E-11	6.87548E-13
LU	71	174	1.22487E+07	2.38092E-21	1.13194E-23	3.20041E-25	4.30201E-29	7.77316E-37	1.40448E-44	8.28481E-68	0.00000E+00
LU	71	177	1.38242E+07	8.48996E-19	7.36010E-21	3.11164E-22	1.14045E-25	1.53195E-32	2.05783E-39	4.98786E-60	0.00000E+00
HF	72	173	8.49653E+04	1.62144E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	1.39766E-10	2.71345E-15	1.96006E-18	2.74801E-26	5.40599E-42	1.96317E-57	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	7.20467E-20	6.71724E-20	6.44258E-20	5.76110E-20	4.60677E-20	3.68373E-20	1.88348E-20	7.78062E-21
HF	72	179	1.89384E+19	3.53072E-21	3.51850E-21	3.51039E-21	3.49017E-21	3.45009E-21	3.41047E-21	3.29432E-21	3.14559E-21
HF	72	180	1.98723E+04	7.2[illegible]177E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	8.54221E-10	1.42883E-17	9.30895E-23	1.[illegible]0850E-35	1.18383E-6[illegible]	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	3.47138E-26	3.47138E-26	3.47138E-26	3.47138E-26	3.47137E-26	3.47137E-26	3.47136E-26	3.47135E-26
TA	73	180	2.93458E+04	7.63534E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	1.21792E-09	1.60339E-12	1.92598E-14	3.04578E-19	7.61667E-29	1.90472E-38	2.97878E-67	0.00000E+00
W	74	181	1.20968E+07	6.62441E-15	2.47821E-17	6.66056E-19	7.88772E-23	1.10616E-30	1.55127E-38	4.27851E-62	0.00000E+00
W	74	185	6.47801E+06	6.36717E-11	2.53633E-15	2.96221E-18	1.37815E-25	2.98283E-40	6.45605E-55	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	1.26399E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02526E+06	2.60445E-17	1.99926E-24	3.80860E-29	6.03292E-41	1.51361E-64	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11967E+02	1.74350E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	2.55009E-19	1.47106E-19	1.01941E-19	4.07513E-20	6.51219E-21	1.04067E-21	4.24687E-24	2.76956E-27
TL	81	206	2.52054E+02	4.26971E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	3.39525E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	6.43966E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	3.86069E-20	3.86069E-20	3.86069E-20	3.86069E-20	3.86069E-20	3.86068E-20	3.86068E-20	3.86067E-20
PB	82	207	7.95989E-01	8.51896E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				1.27176E-05	5.87810E-07	3.59651E-07	1.15846E-07	2.32942E-08	1.01656E-08	2.15346E-09	[illegible].03559E-10
TOTAL (CURIES)				1.23068E+02	5.68831E+00	3.48034E+00	1.12104E+00	2.25418E-01	9.83722E-02	2.08390E-02	5.84064E-03

COMPONENT : CONCRETE - AX[illegible] DOWN - SECOND 6 INCHES - RS
VOLUME : 9.67780E+06 CC
: ABOVE VOLUME FOR THE SECOND 6 INCHES OF CONCRETE
: IN THE AXIAL [illegible] DIRECTION.
:
: (INTERVALS 59-61 TOT[illegible])

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	1.31742E-09	1.11206E-09	9.95259E-10	7.48859E-10	4.25672E-10	2.41964E-10	4.44443E-11	4.63457E-12
HE	2	6	8.09751E-01	8.33145E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	3.48179E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	2.16137E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	1.809[illegible]3E-20	1.80963E-20	1.80963E-20	1.80963E-20	1.80962E-20	1.80962E-20	1.80960E-20	1.80958E-20
B	5	12	1.99754E-02	4.8034[illegible]E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	6.44122E-13	6.43889E-13	6.43733E-13	6.43344E-13	6.42567E-13	6.41791E-13	6.39468E-13	6.36384E-13
F	9	20	1.10023E+01	8.45318E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.7671[illegible]E+01	1.25812E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	6.56856E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	6.42669E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38429E+02	7.16977E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	2.47844E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	8.9115[illegible]E-12	7.65507E-35	3.21080E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60050E+06	8.478[illegible]E-11	1.50847E-14	4.77192E-17	2.68591E-23	8.50872E-36	2.69549E-48	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	5.80608E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	6.02667E-14	6.02664E-14	6.02661E-14	6.02654E-14	6.02641E-14	6.02627E-14	6.02587E-14	6.02533E-14
AR	18	37	3.02684E+06	2.54925E-10	9.79215E-20	5.17432E-26	1.05034E-41	4.32701E-73	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	1.02986E-11	1.02195E-11	1.01667E-11	1.00365E-11	9.78102E-12	9.53207E-12	8.82258E-12	7.95805E-12
AR	18	41	6.60140E+03	3.06022E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	8.42188E-17	8.42188E-17	8.42188E-17	8.42188E-17	8.42188E-17	8.42188E-17	8.42188E-17	8.42188E-17
K	19	42	4.47192E+04	2.26037E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52855E+12	1.81169E-11	1.81164E-11	1.81161E-11	1.81153E-11	1.81138E-11	1.81122E-11	1.81075E-11	1.81012E-11
CA	20	45	1.42623E+07	6.96798E-09	6.99642E-11	3.25628E-12	1.52174E-15	3.32328E-22	7.25766E-29	7.55936E-49	1.71948E-75
CA	20	47	3.91608E+05	3.61057E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	9.14862E-10	1.07319E-13	2.57174E-16	7.22952E-23	5.71281E-36	4.51423E-49	0.00000E+00	0.00000E+00
SC	21	47	2.95[illegible]E+05	4.90433E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.582[illegible]E+05	1.72605E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	5.36499E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	1.99761E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.01879E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	3.34087E-17	3.34768E-18	7.22216E-19	1.56126E-20	7.29608E-24	3.40963E-27	3.47974E-37	1.65962E-50
V	23	52	2.02004E+02	2.08880E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.9922[illegible]E+02	3.19236E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.[illegible]0117E+01	[illegible].56130E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	[illegible].93966E-10	5.16388E-22	4.18467E-30	9.70946E-58	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	[illegible].89075E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	2.49190E-20	2.49190E-20	2.49190E-20	2.49190E-20	2.49189E-20	2.49189E-20	2.49187E-20	2.49186E-20
MN	25	54	2.61545E+07	3.57611E-11	2.91127E-12	5.46642E-13	8.35129E-15	1.94920E-18	4.54934E-22	5.78421E-33	1.71647E-47
MN	25	56	9.29152E+03	6.11377E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	6.13036E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	6.06791E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	7.86180E-08	3.53259E-08	2.07240E-08	5.46295E-09	3.79601E-10	2.63773E-11	8.84990E-15	2.06325E-19
FE	26	59	3.89409E+06	9.35539E-10	4.49202E-17	5.93618E-22	3.76418E-34	1.51440E-58	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	5.84641E-26	5.84629E-26	5.84621E-26	5.84601E-26	5.84560E-26	5.84519E-26	5.84398E-26	5.84236E-26
FE	26	61	3.60001E+02	7.27482E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34832E+07	2.30958E-16	1.41235E-17	2.19226E-18	2.08098E-20	1.87505E-24	1.68950E-28	1.23594E-40	8.1[illegible]75E-57
CO	27	58	6.13405E+06	1.04595E-13	2.36275E-18	1.88811E-21	3.40834E-29	1.11061E-44	3.61891E-60	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.75457E-09	1.18463E-09	9.10315E-10	4.71004E-10	1.26093E-10	3.37565E-11	6.47677E-13	5.32679E-15
CO	27	61	5.94067E+03	8.86738E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	3.85598E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

CO 27 60	2.99999E-01	1.99062E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI 28 59	2.52053E+12	4.83288E-15	4.83275E-15	4.83267E-15	4.83240E-15	4.83204E-15	4.83162E-15	4.83036E-15	4.82869E-15
NI 28 63	2.90020E+09	6.94321E-13	6.78788E-13	6.68625E-13	6.43880E-13	5.97103E-13	5.53724E-13	4.41598E-13	3.26591E-13
NI 28 65	9.21738E+03	3.09688E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU 29 64	4.62098E+04	1.23444E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB 37 86	1.60972E+06	4.24466E-17	8.38209E-35	1.31934E-46	4.10108E-76	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 87	1.00799E+04	2.48351E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 89	4.50096E+06	1.02677E-15	7.57669E-22	4.55253E-26	1.27405E-36	9.97783E-58	7.81409E-79	0.00000E+00	0.00000E+00
SR 38 90	6.86377E+08	3.79652E-20	3.62560E-20	3.55581E-20	2.96627E-20	2.31758E-20	1.81875E-20	8.63641E-21	3.21834E-21
SR 38 91	3.48318E+04	3.32231E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 92	9.75404E+03	1.48128E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 93	4.50095E+02	7.48920E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 89	1.56998E+01	2.86428E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 90	2.38281E+05	1.20446E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 91	5.09667E+06	4.09811E-16	1.04912E-21	1.96332E-25	9.40590E-35	2.15876E-53	4.95460E-72	0.00000E+00	0.00000E+00
Y 39 92	1.27440E+04	1.20671E-16	0.00000E+00	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 94	1.12200E+03	2.48234E-17	0.00000E+00	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 96	9.80406E+00	2.19573E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR 40 88	7.20602E+06	6.58943E-19	7.30993E-23	1.60768E-25	4.32256E-32	2.83545E-45	1.85995E-58	0.00000E+00	0.00000E+00
ZR 40 89	2.82249E+05	6.73486E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR 40 93	4.74758E+13	2.54178E-17	2.54177E-17	2.54177E-17	2.54176E-17	2.54175E-17	2.54174E-17	2.54170E-17	2.54164E-17
ZR 40 95	5.63534E+06	4.98985E-15	4.37356E-20	1.85925E-23	6.92769E-32	9.61780E-49	1.33525E-65	0.00000E+00	0.00000E+00
ZR 40 97	6.04840E+04	5.15160E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 91	2.20888E+10	2.26525E-20	2.25853E-20	2.25407E-20	2.24293E-20	2.22083E-20	2.19895E-20	2.13458E-20	2.05168E-20
NB 41 92	8.80746E+05	4.60298E-16	4.20940E-48	1.12744E-69	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 94	6.38134E+11	3.14758E-15	3.14725E-15	3.14703E-15	3.14649E-15	3.14539E-15	3.14430E-15	3.14103E-15	3.13667E-15
NB 41 95	3.02684E+05	1.24298E-16	4.77454E-26	2.52294E-32	5.12114E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 96	8.28132E+04	2.30198E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 97	4.33217E+03	2.20440E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 98	3.06025E+03	6.24777E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 100	3.09994E+00	6.19288E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO 42 93	2.84077E+11	3.69869E-18	3.69803E-18	3.69746E-18	3.69604E-18	3.69319E-18	3.69035E-18	3.68184E-18	3.67051E-18
MO 42 99	2.41515E+05	2.06929E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO 42 101	8.76292E+02	1.14077E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH 45 104	2.61565E+02	4.94233E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH 45 106	7.84813E+03	2.86250E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD 46 107	2.05[illegible]E+14	1.07038E-24	1.07038E-24	1.07038E-24	1.07038E-24	1.07038E-24	1.07037E-24	1.07037E-24	1.07037E-24
PD 46 109	4.83704E+04	2.82638E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG 47 106	7.34422E+05	1.03864E-17	1.62671E-56	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG 47 108	4.10589E+09	3.43997E-13	3.38540E-13	3.34950E-13	3.26142E-13	3.09213E-13	2.93163E-13	2.49842E-13	2.01870E-13
AG 47 110	2.15826E+07	4.79071E-11	2.29046E-12	3.01720E-13	1.90026E-15	7.53742E-20	2.98972E-24	1.86578E-37	4.61841E-55
CD 48 109	5.99508E+07	2.33887E-18	4.52528E-19	1.51381E-19	9.79804E-21	4.10459E-23	1.71951E-25	1.26615E-32	3.89340E-42
CD 48 111	2.92221E+03	5.64324E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD 48 115	1.92541E+05	1.62172E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD 48 117	1.22399E+04	4.71998E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD 48 119	5.97541E+02	2.64752E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 111	2.42444E+05	7.55877E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 112	1.25400E+03	4.72513E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 114	4.27869E+06	8.85593E-19	1.75932E-25	6.38019E-30	5.05311E-41	3.16944E-63	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 115	1.61497E+04	9.40851E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 116	1.40998E+01	4.01121E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 117	6.95931E+03	5.98846E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 118	2.63955E+02	1.99695E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 119	1.26027E+02	2.19342E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 120	4.40093E+01	4.23761E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 122	1.00998E+01	5.78401E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN 50 113	9.94473E+06	5.24472E-15	7.14409E-18	8.77870E-20	1.46942E-24	4.11676E-34	1.15338E-43	2.53639E-72	0.00000E+00
SN 50 121	9.72156E+04	1.95062E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN 50 123	1.07967E+07	2.76518E-13	6.33994E-16	1.10237E-17	4.59480E-22	6.98462E-31	1.11066E-39	4.45616E-66	0.00000E+00
SN 50 125	8.12599E+05	3.53085E-12	2.99256E-47	1.24399E-70	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
I 53 130	4.46981E+04	2.12372E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE 54 133	4.56018E+05	1.02234E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS 55 132	5.58990E+05	8.23341E-16	8.54900E-67	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS 55 134	6.47801E+07	1.45162E-10	5.27123E-11	2.68299E-11	4.95892E-12	1.69403E-13	5.78701E-15	2.30707E-19	3.14193E-25
EU 63 152	4.17559E+08	1.60899E-09	1.37500E-09	1.23823E-09	9.52897E-10	5.64337E-10	3.34218E-10	6.94236E-11	8.54035E-12
EU 63 154	2.69812E+08	1.51533E-10	1.18817E-10	1.01033E-10	6.73625E-11	2.99454E-11	1.33119E-11	1.16943E-12	4.56686E-14
LU 71 174	1.22687E+07	5.13196E-22	2.43983E-24	6.89833E-26	9.27276E-30	1.67547E-37	3.02730E-45	1.78575E-68	0.00000E+00
LU 71 177	1.38242E+07	1.91206E-19	1.65940E-21	7.00784E-23	2.56845E-26	3.45016E-33	4.63452E-40	1.12333E-60	0.00000E+00
HF 72 173	8.49653E+04	3.83635E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF 72 175	6.04840E+06	9.26337E-12	1.79841E-16	1.29908E-19	1.82185E-27	3.58296E-43	7.04647E-59	0.00000E+00	0.00000E+00
HF 72 178	9.78261E+08	1.64253E-20	1.55597E-20	1.46879E-20	1.31343E-20	1.05026E-20	8.39823E-21	4.29399E-21	1.75560E-21
HF 72 179	1.89384E+10	7.99515E-22	7.96750E-22	7.94911E-22	7.90334E-22	7.81258E-22	7.72286E-22	7.45985E-22	7.12304E-22
HF 72 180	1.96723E+04	1.65648E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF 72 181	3.66357E+06	5.56950E-11	9.26174E-19	6.03410E-24	6.53765E-37	7.67363E-63	0.00000E+00	0.00000E+00	0.00000E+00
HF 72 182	2.84077E+14	7.98880E-27	7.98880E-27	7.98880E-27	7.98880E-27	7.98879E-27	7.98879E-27	7.98877E-27	7.98874E-27
TA 73 180	2.93458E+04	1.80275E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA 73 182	2.89362E+06	7.80483E-11	1.02751E-13	1.23424E-15	1.95184E-20	4.88102E-30	1.22061E-39	1.90891E-68	0.00000E+00
W 74 181	1.20968E+07	1.33065E-15	5.86307E-18	1.57579E-19	1.86612E-23	2.61703E-31	3.67008E-39	1.01223E-62	0.00000E+00
W 74 185	6.47801E+06	4.19398E-12	1.67197E-16	1.95117E-19	9.07773E-27	1.96476E-41	4.25252E-56	0.00000E+00	0.00000E+00
W 74 187	8.59984E+04	8.22727E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG 80 203	4.02525E+06	5.55334E-18	4.61750E-25	8.79638E-30	1.39337E-41	3.49584E-65	0.00000E+00	0.00000E+00	0.00000E+00
HG 80 205	3.11967E+02	4.08546E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL 81 204	1.19282E+08	5.82891E-20	3.56251E-20	2.33013E-20	9.31479E-21	1.48853E-21	2.37872E-22	9.70736E-25	6.33057E-28
TL 81 206	2.52054E+02	9.84933E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL 81 207	2.86188E+02	8.26621E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB 82 203	1.86782E+05	1.99676E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB 82 205	4.76390E+14	9.12724E-21	9.12723E-21	9.12723E-21	9.12723E-21	9.12723E-21	9.12722E-21	9.12721E-21	9.12719E-21
PB 82 207	7.95989E-01	2.08854E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)		8.68846E-07	3.92747E-08	2.40277E-08	7.73783E-09	1.55533E-09	6.78834E-10	1.44019E-10	4.05213E-11
TOTAL (CURIES)		8.21428E+00	3.80061E-01	2.32516E-01	7.48789E-02	1.50509E-02	6.56908E-03	1.39367E-03	3.92124E-04

COMPONENT : CONCRETE - AXIAL DOWN - THIRD 6 INCHES - R5
VOLUME : 9.67700E+06 CC
: ABOVE VOLUME IS FOR THE THIRD 6 INCHES OF CONCRETE
: IN THE AXIAL DOWN DIRECTION.
:
: (INTERVALS 62-64 TOTGDNRS)

NUCLIDE SYM	Z	A	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	15.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	1.15551E-10	9.75388E-11	8.71189E-11	6.56826E-11	3.73358E-11	2.12227E-11	3.89787E-12	4.06938E-13
HE	2	6	8.04751E-01	1.78450E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	3.05428E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	4.66184E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	2.22714E-21	2.22714E-21	2.22713E-21	2.22713E-21	2.22713E-21	2.22712E-21	2.22710E-21	2.22708E-21
B	5	12	1.99754E-02	4.21383E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	5.65367E-14	5.65162E-14	5.65026E-14	5.64685E-14	5.64002E-14	5.63321E-14	5.61282E-14	5.58575E-14
F	9	20	1.10025E+01	1.97443E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	2.83347E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	5.76733E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	1.43308E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	6.38247E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	5.39858E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.94260E-12	1.66870E-35	6.99913E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	7.44035E-12	1.32488E-15	4.19114E-18	2.35901E-24	7.47315E-37	1.36743E-49	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	1.31288E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	5.30312E-15	5.30306E-15	5.30306E-15	5.30300E-15	5.30288E-15	5.30276E-15	5.30241E-15	5.30193E-15
AR	18	37	3.02684E+06	5.65648E-11	2.17276E-20	1.14812E-26	2.33049E-42	9.60111E-74	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	9.56544E-13	9.47189E-13	9.42317E-13	9.30248E-13	9.06571E-13	8.83496E-13	8.17735E-13	7.37605E-13
AR	18	41	6.60140E+03	6.81495E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	7.38899E-18	7.38899E-18	7.38899E-18	7.38899E-18	7.38899E-18	7.38899E-18	7.38899E-18	7.38899E-18
K	19	42	4.47192E+04	1.98742E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	1.58874E-12	1.58870E-12	1.58868E-12	1.58861E-12	1.58847E-12	1.58833E-12	1.58792E-12	1.58737E-12
CA	20	45	1.42623E+07	6.12237E-10	6.14736E-12	2.86111E-15	1.33707E-16	2.91998E-23	6.37689E-30	6.64199E-50	1.51981E-76
CA	20	47	3.91608E+05	3.16630E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	8.03509E-11	9.42569E-15	2.25871E-17	6.34957E-24	5.01747E-37	3.96478E-50	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	1.06777E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	2.83378E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	1.18707E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	4.74276E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	8.96308E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	7.93879E-18	7.95407E-19	1.71617E-19	3.70997E-21	1.73574E-24	8.10218E-28	8.26881E-38	3.94369E-51
V	23	52	2.02084E+02	2.368[illegible]E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	7.04564E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	8.45871E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	3.48038E-11	4.56188E-25	5.46366E-31	8.57751E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	6.42888E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	5.92140E-21	5.92139E-21	5.92139E-21	5.92138E-21	5.92137E-21	5.921[illegible]E-21	5.92133E-21	5.92128E-21
MN	25	54	2.61565E+07	7.81999E-12	6.36261E-13	1.19469E-13	1.82518E-15	4.26000E-19	9.9[illegible]	[illegible].26414E-33	3.75137E-48
MN	25	56	9.29152E+03	5.37216E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.15439E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.43508E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20792E+07	6.09536E-09	3.09833E-09	1.81764E-09	4.79138E-10	3.32937E-11	2.31348E-12	7.76199E-16	1.80962E-20
FE	26	59	3.89409E+06	8.22393E-11	3.94875E-18	5.21442E-25	3.30866E-35	1.33125E-59	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	1.38825E-26	1.38822E-26	1.38820E-26	1.38815E-26	1.38805E-26	1.38796E-26	1.38767E-26	1.38728E-26
FE	26	61	3.60001E+02	1.72860E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.54858E+07	5.48588E-17	3.35483E-18	5.28739E-19	4.94305E-21	4.45392E-25	4.01316E-29	2.93581E-41	1.93514E-57
CO	27	58	6.13405E+06	2.27982E-14	5.15801E-19	4.11544E-22	7.42903E-30	2.42075E-45	7.88800E-61	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.56835E-10	1.04272E-10	8.01127E-11	4.14510E-11	1.10969E-11	2.97077E-12	5.69992E-14	2.92776E-16
CO	27	61	5.94007E+03	1.97362E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	8.91855E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	4.72994E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	4.23972E-16	4.23961E-16	4.23954E-16	4.23935E-16	4.23899E-16	4.23862E-16	4.23752E-16	4.23604E-16
NI	28	63	2.90020E+09	6.15845E-14	6.01284E-14	5.92232E-14	5.74360E-14	5.28927E-14	4.90581E-14	3.91177E-14	2.89301E-14
NI	28	65	9.21738E+03	6.88914E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	1.08409E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	1.10057E-17	1.97585E-35	3.11000E-47	9.66720E-77	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	5.79581E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	3.67797E-16	1.71302E-22	1.02929E-26	2.88052E-37	2.25590E-58	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	8.78161E-21	8.15496E-21	7.76223E-21	6.86118E-21	5.36072E-21	4.18840E-21	1.99766E-21	7.44425E-22
SR	38	91	3.48315E+04	7.75122E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	3.50751E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	1.77725E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	6.78548E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	1.05673E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	9.35839E-17	2.39576E-22	4.40343E-26	2.14792E-35	4.92972E-54	1.13143E-72	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	2.79887E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12206E+03	5.83694E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	5.21728E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	1.48912E-19	1.65194E-23	3.81391E-26	9.76836E-33	6.40771E-46	4.20323E-59	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	1.55119E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	2.23857E-18	2.23857E-18	2.23857E-18	2.23856E-18	2.23855E-18	2.23854E-18	2.23851E-18	2.23847E-18
ZR	40	95	5.63534E+06	3.16519E-15	1.03881E-20	4.41610E-24	1.66567E-32	2.28442E-49	3.17150E-66	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	5.75809E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20880E+10	5.34929E-21	5.33342E-21	5.32287E-21	5.29650E-21	5.24438E-21	5.19271E-21	5.04071E-21	4.84494E-21
NB	41	92	8.30746E+05	2.23632E-16	9.80276E-49	2.62555E-78	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	2.31475E-16	2.81446E-16	2.81426E-16	2.81378E-16	2.81280E-16	2.81182E-16	2.80896E-16	2.80500E-16
NB	41	95	3.02684E+06	2.83019E-17	1.88710E-26	5.74437E-33	1.16601E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.20132E+04	5.32746E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	5.05495E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	1.46685E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	9.74270E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.86877E+11	6.02065E-19	6.01926E-19	6.01833E-19	6.01601E-19	6.01138E-19	6.00676E-19	5.99290E-19	5.97447E-19
MO	42	99	2.41515E+05	1.98395E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	1.06910E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	1.15494E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	6.54879E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	2.45257E-25	2.45257E-25	2.45257E-25	2.45257E-25	2.45257E-25	2.45257E-25	2.45256E-25	2.45255E-25
PD	46	109	4.83704E+04	6.46509E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	2.46009E-18	3.86549E-57	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	3.03540E-14	2.98725E-14	2.95557E-14	2.87784E-14	2.72847E-14	2.56685E-14	2.20458E-14	1.78128E-14
AG	47	110	2.15026E+07	4.28755E-12	2.04990E-13	2.70051E-14	1.70067E-16	6.74577E-21	2.67571E-25	1.66982E-38	4.13334E-56
CD	48	109	3.99508E+07	5.34514E-19	1.03419E-19	3.45960E-20	2.23920E-21	9.38045E-24	3.92970E-26	2.88904E-33	8.89779E-43
CD	48	111	2.92221E+03	1.30371E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	5.82144E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	1.17156E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	6.29120E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	1.78210E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	1.00005E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	1.85575E-19	4.05273E-26	1.46973E-30	1.16402E-41	7.30106E-64	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	2.15175E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	9.34366E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	1.37436E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	4.69698E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	5.96669E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	1.69631E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	1.37445E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	8.36052E-16	1.13883E-18	1.39940E-20	2.34238E-25	6.56246E-36	1.83850E-44	4.04322E-73	0.00000E+00
SN	50	121	9.72156E+04	1.74660E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	2.47253E-14	5.46895E-17	9.85697E-19	3.92968E-23	6.24539E-32	9.92575E-41	3.98453E-67	0.00000E+00

I	53	130	4.44981E+04	4.86868E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	2.30926E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	1.95647E-16	2.03147E-67	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	1.29632E-11	4.70729E-12	2.39595E-12	4.42839E-13	1.51279E-14	5.16788E-16	2.06025E-20	2.80579E-26
EU	63	152	4.17559E+08	1.41088E-10	1.20569E-10	1.08576E-10	8.35568E-11	4.94851E-11	2.93067E-11	6.08755E-12	7.48879E-13
EU	63	154	2.69812E+08	1.33382E-11	1.04586E-11	8.89312E-12	5.92939E-12	2.63585E-12	1.17174E-12	1.02936E-13	4.01985E-15
LU	71	174	1.22687E+07	1.12722E-22	5.35903E-25	1.51520E-26	2.03674E-30	3.68012E-38	6.64938E-46	3.92235E-69	0.00000E+00
LU	71	177	1.38242E+07	4.36688E-20	3.78984E-22	1.60050E-23	5.86601E-27	7.87970E-34	1.05846E-40	2.56555E-61	0.00000E+00
HF	72	175	8.49653E+04	9.11618E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	8.14835E-13	1.58194E-17	1.14271E-20	1.60255E-28	3.15168E-44	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	3.79015E-21	3.54425E-21	3.38924E-21	3.03074E-21	2.42348E-21	6.19829E-60	0.00000E+00	0.00000E+00
HF	72	179	1.89384E+10	1.83441E-22	1.82867E-22	1.82385E-22	1.81335E-22	1.79252E-22	1.93790E-21	9.90841E-22	4.05106E-22
HF	72	180	1.98723E+04	3.83302E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.77194E-22	1.71159E-22	1.63431E-22
HF	72	181	3.66357E+06	4.96346E-12	8.22067E-20	5.35583E-25	5.80278E-38	6.81107E-64	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	1.85778E-27	1.85778E-27	1.85778E-27	1.85778E-27	1.85778E-27	1.85778E-27	1.85777E-27	1.85777E-27
TA	73	180	2.93458E+04	4.27699E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	7.07497E-12	9.31295E-15	1.11867E-16	1.76908E-21	4.42398E-31	1.10632E-40	1.75016E-69	0.00000E+00
W	74	181	1.20968E+07	5.16183E-16	1.39315E-18	3.74437E-20	4.43419E-24	6.21845E-52	8.72068E-40	2.40522E-63	0.00000E+00
W	74	185	6.47801E+06	3.76364E-13	1.50041E-17	1.75096E-20	8.14628E-28	1.76316E-42	3.81618E-57	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	7.34999E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	1.29523E-18	1.07696E-25	2.05162E-30	3.24982E-42	8.15350E-66	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11947E+02	9.63702E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	1.34790E-20	7.77558E-21	5.38828E-21	2.15.99E-21	3.44215E-22	5.56966E-23	2.24477E-25	0.00000E+00
TL	81	206	2.52054E+02	2.30349E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.46391E-28
TL	81	207	2.86188E+02	1.92096E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	4.74470E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	2.16759E-21	2.16759E-21	2.16759E-21	2.16759E-21	2.16759E-21	2.16759E-21	2.16758E-21	2.16758E-21
PB	82	207	7.95989E-01	4.76020E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				7.47082E-08	3.44557E-09	2.10785E-09	6.78868E-10	1.36500E-10	5.95949E-11	1.26751E-11	3.59371E-12
TOTAL (CURIES)				7.22951E-01	3.33428E-02	2.03977E-02	6.56940E-03	1.32091E-03	5.76700E-04	1.22657E-04	3.47764E-05

COMPONENT : CONCRETE - AXIAL DOWN - FOURTH 6 INCHES - R5
VOLUME : 9.67700E+06 CC
: ABOVE VOLUME IS FOR THE FOURTH 6 INCHES OF CONCRETE
: IN THE AXIAL DOWN DIRECTION.
:
: (INTERVALS 65-67 TO 80685)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	1.24727E-11	1.05284E-11	9.40368E-12	7.08983E-12	4.03005E-12	2.29080E-12	4.20739E-13	4.39252E-14
HE	2	6	8.09751E-01	3.09151E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	3.29770E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.01953E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.08563E+13	3.61371E-22	3.61371E-22	3.61371E-22	3.61370E-22	3.61369E-22	3.61368E-22	3.61365E-22	3.61361E-22
B	5	12	1.99754E-02	4.54991E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	6.11019E-15	6.10797E-15	6.10649E-15	6.10281E-15	6.09544E-15	6.08807E-15	6.06604E-15	6.03678E-15
F	9	20	1.10023E+01	4.66607E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	6.46209E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	6.23792E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	3.23947E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	7.07455E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	1.18914E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	4.28734E-13	3.68285E-36	1.54472E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	[illegible]35128E-13	1.43251E-16	4.53162E-19	2.55065E-25	8.08025E-38	2.55975E-50	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	[illegible]09444E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	5.76864E-16	5.76861E-16	5.76858E-16	5.76851E-16	5.76839E-16	5.76826E-16	5.76787E-16	5.76735E-16
AR	18	37	3.02684E+06	1.27165E-11	4.88464E-21	2.58111E-27	5.23923E-43	2.15845E-74	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	1.12682E-13	1.11814E-13	1.11239E-13	1.09814E-13	1.07019E-13	1.04295E-13	9.65322E-14	8.70730E-14
AR	18	41	6.60140E+03	1.53955E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	7.97990E-19	7.97990E-19	7.97990E-19	7.97990E-19	7.97990E-19	7.97990E-19	7.97990E-19	7.97989E-19
K	19	42	4.47192E+04	2.15095E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	1.71224E-13	1.71220E-13	1.71217E-13	1.71209E-13	1.71194E-13	1.71180E-13	1.71135E-13	1.71076E-13
CA	20	45	1.42023E+07	6.62680E-11	6.65585E-13	3.09777E-14	1.44766E-17	3.16151E-24	6.90438E-31	7.19140E-51	1.63578E-77
CA	20	47	3.91608E+05	3.41251E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	8.71234E-12	1.02201E-15	2.44909E-18	6.88475E-25	5.44037E-38	4.29045E-51	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	2.35859E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	6.60970E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	2.66637E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	1.13187E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	9.66989E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.89601E-18	1.89968E-19	4.09873E-20	8.86050E-22	4.14068E-25	1.93504E-28	1.97483E-38	9.41868E-52
V	23	52	2.02084E+02	2.55889E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	1.61864E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	2.01938E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	3.82233E-12	5.01009E-24	6.00048E-32	9.42027E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	1.45033E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.41420E-21	1.41420E-21	1.41420E-21	1.41419E-21	1.41419E-21	1.41419E-21	1.41418E-21	1.41417E-21
MN	25	54	2.61565E+07	1.73211E-12	1.49931E-13	2.64621E-14	4.04274E-16	9.43581E-20	2.20227E-23	2.80005E-34	8.30921E-49
MN	25	56	9.29152E+03	5.82274E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	2.63156E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	3.41334E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	7.43357E-10	3.34017E-10	1.95952E-10	5.16537E-11	3.58925E-12	2.49405E-13	8.36786E-17	1.95087E-21
FE	26	59	3.89409E+06	8.91992E-12	4.28293E-19	5.65788E-24	3.58889E-36	1.44391E-60	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	3.31344E-27	3.31337E-27	3.31333E-27	3.31321E-27	3.31298E-27	3.31275E-27	3.31206E-27	3.31115E-27
FE	26	61	3.60001E+02	4.12822E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	1.30976E-17	8.00968E-19	1.24327E-19	1.18016E-21	1.06338E-25	9.58146E-30	7.00926E-42	4.62017E-58
CO	27	58	6.13495E+06	5.03864E-15	1.13820E-19	9.09555E-23	1.64189E-30	5.35010E-46	1.74333E-61	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.68431E-11	1.13429E-11	8.71477E-12	4.50910E-12	1.20714E-12	3.23164E-13	6.20046E-15	3.18487E-17
CO	27	61	5.94007E+03	4.45515E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	2.88091E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

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CO	27	64	2.99449E-01	1.12959E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	4.57915E-17	4.57903E-17	4.57896E-17	4.57876E-17	4.57836E-17	4.57796E-17	4.57677E-17	4.57518E-17
NI	28	63	2.90020E+09	6.74890E-15	6.59791E-15	6.49913E-15	6.25860E-15	5.80342E-15	5.38228E-15	4.29239E-15	3.17451E-15
NI	28	65	9.21738E+03	1.55536E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	1.17300E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	2.37298E-18	4.68601E-36	7.37579E-48	2.29271E-77	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	1.36257E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	8.42106E-17	3.92213E-23	2.35665E-27	6.59521E-38	5.16509E-59	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	2.04939E-21	1.90315E-21	1.81150E-21	1.60122E-21	1.25105E-21	9.77461E-22	4.66201E-22	1.73729E-22
SR	38	91	3.48315E+04	1.82182E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	8.35140E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	4.23958E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	1.61641E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	1.14122E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	2.16104E-17	5.83229E-23	1.03551E-26	4.95998E-36	1.13837E-54	2.61269E-73	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	6.54619E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	1.38131E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	1.24597E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	3.40593E-20	3.77834E-24	8.72322E-27	2.23423E-33	1.46558E-46	9.61367E-60	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	3.60775E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	2.43481E-19	2.43480E-19	2.43480E-19	2.43479E-19	2.43478E-19	2.43477E-19	2.43474E-19	2.43469E-19
ZR	40	95	5.63534E+06	2.82950E-16	2.48003E-21	1.05429E-24	3.92835E-33	5.45378E-50	7.57156E-67	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	9.33592E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	1.27065E-21	1.26688E-21	1.26437E-21	1.25813E-21	1.24573E-21	1.23346E-21	1.19735E-21	1.15085E-21
NB	41	92	8.80746E+05	5.25158E-17	2.30199E-49	6.16561E-71	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	3.16043E-17	3.16010E-17	3.15988E-17	3.15933E-17	3.15824E-17	3.15714E-17	3.15386E-17	3.14948E-17
NB	41	95	3.02684E+06	6.51845E-18	2.50386E-27	1.32308E-33	2.68562E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	1.24393E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.55217E+03	1.71138E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	3.46313E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	2.32544E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	1.20309E-19	1.20281E-19	1.20262E-19	1.20216E-19	1.20123E-19	1.20031E-19	1.19754E-19	1.19386E-19
MO	42	99	2.41515E+05	2.49962E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	1.30286E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	2.71875E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84815E+03	1.50992E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	5.68063E-26	5.68062E-26	5.68062E-26	5.68062E-26	5.68061E-26	5.68061E-26	5.68059E-26	5.68056E-26
PD	46	109	4.83704E+04	1.49534E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	5.89452E-19	9.23193E-58	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	3.32445E-15	3.27172E-15	3.23702E-15	3.15190E-15	2.98830E-15	2.83319E-15	2.41452E-15	1.95091E-15
AG	47	110	2.15826E+07	4.89369E-13	2.53969E-14	3.08206E-15	1.74110E-17	7.69943E-22	3.05398E-26	1.90589E-39	4.71768E-57
CD	48	109	3.99508E+07	1.23518E-19	2.38986E-20	7.99462E-21	5.17446E-22	2.16769E-24	9.08097E-27	6.67614E-34	2.05615E-43
CD	48	111	2.92221E+03	3.03971E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	9.06074E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	2.67855E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	1.50252E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	4.22714E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	2.49619E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	4.31691E-20	9.42761E-27	3.41894E-31	2.70780E-42	1.69840E-64	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	4.97554E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	2.19335E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	3.18722E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	0.63955E+02	1.11144E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	1.18123E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	2.40203E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	3.28255E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	1.66149E-16	2.26320E-19	2.78103E-21	4.65502E-26	1.30416E-35	3.65383E-45	8.03510E-74	0.00000E+00
SN	50	121	9.72156E+04	1.95315E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	2.77156E-15	4.35457E-18	1.10491E-19	4.40494E-24	7.00072E-33	1.11262E-41	4.46643E-68	0.00000E+00
SN	50	125	8.12599E+05	3.51666E-14	2.98052E-49	1.25898E-72	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
I	53	130	4.44981E+04	1.12636E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.54018E+05	5.28506E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	4.67264E-17	6.85174E-68	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	1.46775E-12	5.32981E-13	2.71281E-13	5.01403E-14	1.71285E-15	5.85132E-17	2.33271E-21	3.17485E-27
EU	63	152	4.17559E+08	1.52129E-11	1.50005E-11	1.17973E-11	9.00959E-12	5.33577E-12	3.16002E-12	6.56396E-13	8.07485E-14
EU	63	154	2.69812E+08	1.45528E-12	1.14109E-12	9.70289E-13	6.66930E-13	2.87586E-13	1.27844E-13	1.12309E-14	4.38588E-16
LU	71	176	1.22687E+07	2.51844E-23	1.19731E-25	3.38526E-27	4.55049E-31	8.22212E-39	1.48561E-46	8.76333E-70	0.00000E+00
LU	71	177	1.38242E+07	1.00882E-20	8.75517E-23	3.69741E-24	1.35514E-27	1.82054E-34	7.44522E-41	5.92683E-62	0.00000E+00
HF	72	173	8.49653E+04	2.17721E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	8.90440E-16	1.72872E-18	1.24874E-21	1.75125E-29	3.44411E-45	6.77340E-61	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	8.83018E-22	8.25728E-22	7.89615E-22	7.06091E-22	5.66614E-22	4.51485E-22	2.30843E-22	9.43803E-23
HF	72	179	1.89384E+10	4.25366E-23	4.23895E-23	4.22917E-23	4.20482E-23	4.15653E-23	4.10800E-23	3.96887E-23	3.78967E-23
HF	72	180	1.98725E+04	6.94966E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	5.60896E-13	9.32735E-21	6.07685E-26	6.58397E-39	7.72799E-65	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	4.35539E-28	4.35539E-28	4.35534E-28	4.35538E-28	4.35538E-28	4.35538E-28	4.35537E-28	4.35535E-28
TA	73	180	2.93458E+04	1.02007E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	8.30955E-13	1.09395E-15	1.31485E-17	2.37806E-22	5.19666E-32	1.29954E-41	2.03235E-70	0.00000E+00
W	74	181	1.20968E+07	7.55107E-17	3.32712E-19	8.94216E-21	1.05897E-24	1.48509E-32	2.08267E-40	5.74413E-64	0.00000E+00
W	74	185	6.47801E+06	4.26285E-14	1.69942E-18	1.98321E-21	9.22680E-29	1.99702E-43	4.32235E-58	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	8.34326E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	3.04368E-19	2.53669E-26	4.82099E-31	7.63658E-43	1.91595E-66	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11947E+02	2.28693E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	3.14603E-21	1.81484E-21	1.25764E-21	5.07746E-22	8.03404E-23	1.28386E-23	5.23923E-26	3.41679E-29
TL	81	206	2.52054E+02	5.42593E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	4.54017E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	1.33315E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	5.17420E-22	5.17420E-22	5.17420E-22	5.17419E-22	5.17419E-22	5.17419E-22	5.17418E-22	5.17417E-22
PB	82	207	7.95989E-01	1.13427E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				8.11851E-09	3.71693E-10	2.27379E-10	7.32568E-11	1.47453E-11	6.44171E-12	1.37574E-12	3.95110E-13
TOTAL (CURIES)				7.85628E-02	3.59688E-03	2.20034E-03	7.08906E-04	1.42690E-04	6.23364E-05	1.33131E-05	3.82348E-06

COMPONENT : CONCRETE - AXIAL DOWN - FIFTH 6 INCHES - R5
VOLUME : 9.67700E+06 CC
: ABOVE VOLUME IS FOR THE FIFTH 6 INCHES OF CONCRETE
: IN THE AXIAL DOWN DIRECTION.
:
: (INTERVALS 68-70 TOTGDMRS)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	1.61917E-12	1.36677E-12	1.22076E-12	9.20580E-13	5.23170E-13	2.97384E-13	5.46190E-14	5.70223E-15
HE	2	6	8.09751E-01	8.60268E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	4.28273E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	2.25608E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	6.90974E-23	6.90973E-23	6.90973E-23	6.90972E-23	6.90970E-23	6.90968E-23	6.90962E-23	6.90955E-23
B	5	12	1.99751E-02	5.90937E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	7.94602E-16	7.94314E-16	7.94122E-16	7.93642E-16	7.92684E-16	7.91726E-16	7.88860E-16	7.85056E-16
F	9	20	1.10023E+01	1.09849E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	1.48654E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	8.12251E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	7.39419E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	9.53747E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	2.64335E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	9.55558E-14	8.20831E-37	3.44285E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	1.04748E-13	1.86371E-17	5.89567E-20	3.31842E-26	1.05125E-38	3.33026E-51	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	6.93184E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	7.57418E-17	7.57413E-17	7.57410E-17	7.57401E-17	7.57384E-17	7.57367E-17	7.57316E-17	7.57249E-17
AR	18	37	3.02684E+06	2.88660E-12	1.10880E-21	5.85905E-28	1.18929E-43	4.89962E-75	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	1.63839E-14	1.62577E-14	1.61741E-14	1.59669E-14	1.55605E-14	1.51644E-14	1.40357E-14	1.26603E-14
AR	18	41	6.60140E+03	3.51305E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	1.03672E-19	1.03672E-19	1.03672E-19	1.03672E-19	1.03672E-19	1.03672E-19	1.03672E-19	1.03672E-19
K	19	42	4.47192E+04	2.80327E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	2.21718E-14	2.21713E-14	2.21709E-14	2.21699E-14	2.21680E-14	2.21661E-14	2.21603E-14	2.21526E-14
CA	20	45	1.42623E+07	8.64345E-12	8.67872E-14	4.03926E-15	1.88764E-18	4.12237E-25	9.00277E-32	9.37703E-52	2.13294E-78
CA	20	47	3.91608E+05	4.41905E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.13890E-12	1.33600E-16	3.20152E-19	8.99992E-26	7.11179E-39	5.61970E-52	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	5.26678E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	1.55098E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	6.05384E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	2.70967E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.25854E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	4.54202E-19	4.55128E-20	9.81876E-21	2.12259E-22	9.91926E-26	4.63551E-29	4.73084E-39	2.25631E-52
V	23	52	2.02084E+02	3.32673E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	3.74778E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	4.83586E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	5.09017E-13	6.67190E-25	7.99080E-33	1.25449E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	3.30485E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	3.38779E-22	3.38779E-22	3.38779E-22	3.38779E-22	3.38778E-22	3.38778E-22	3.38775E-22	3.38773E-22
MN	25	54	2.61565E+07	3.87626E-13	3.15386E-14	5.92191E-15	9.04717E-17	2.11162E-20	4.92842E-24	6.26619E-35	1.85950E-49
MN	25	56	9.29152E+03	7.60587E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	6.05319E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	8.14710E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	9.63002E-11	4.32711E-11	2.53851E-11	6.69161E-12	4.64979E-13	3.23099E-14	1.08404E-17	2.52730E-22
FE	26	59	3.89409E+06	1.16632E-12	5.60010E-20	7.39792E-25	4.69263E-37	1.88797E-61	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	7.93315E-28	7.93297E-28	7.93286E-28	7.93258E-28	7.93203E-28	7.93148E-28	7.92983E-28	7.92763E-28
FE	26	61	3.60001E+02	9.88903E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	3.13669E-18	1.91821E-19	2.97746E-20	2.82632E-22	2.54664E-26	2.29463E-30	1.67862E-42	1.10647E-58
CO	27	58	6.13405E+06	1.12552E-15	2.54250E-20	2.03174E-23	3.66762E-31	1.19509E-46	3.89421E-62	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	2.21204E-12	1.48968E-12	1.14453E-12	5.92190E-13	1.58536E-13	4.24418E-14	8.14318E-16	4.18275E-18
CO	27	61	5.94007E+03	1.01586E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	4.88317E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	2.70587E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	5.95009E-18	5.94993E-18	5.94983E-18	5.94957E-18	5.94906E-18	5.94854E-18	5.94699E-18	5.94493E-18
NI	28	63	2.90020E+09	8.95968E-16	8.75922E-16	8.62809E-16	8.30877E-16	7.70515E-16	7.14538E-16	5.69847E-16	4.21440E-16
NI	28	65	9.21738E+03	3.54840E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	1.52819E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	5.64924E-19	1.11557E-36	1.75592E-48	5.45815E-78	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	3.21845E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	1.94492E-17	9.05849E-24	5.44288E-28	1.52322E-38	1.19292E-59	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	4.81078E-22	4.46748E-22	4.25234E-22	3.75872E-22	2.93673E-22	2.29451E-22	1.09437E-22	4.07814E-23
SR	38	91	3.48315E+04	4.30228E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	1.99520E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	1.01457E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	3.86370E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	1.48262E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	5.02820E-18	1.28722E-23	2.40891E-27	1.15406E-36	2.64870E-55	6.07907E-74	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	1.53942E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	3.28206E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	2.98466E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	7.85432E-21	8.71312E-25	2.01164E-27	5.15231E-34	3.37973E-47	2.21698E-60	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	8.44547E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	3.19693E-20	3.19693E-20	3.19692E-20	3.19692E-20	3.19690E-20	3.19689E-20	3.19684E-20	3.19678E-20
ZR	40	95	5.63534E+06	6.77598E-17	5.93908E-22	2.52477E-25	9.40747E-34	1.30605E-50	1.81321E-67	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	1.82413E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	3.02923E-22	3.02024E-22	3.01427E-22	2.99938E-22	2.96982E-22	2.94056E-22	2.85448E-22	2.74362E-22
NB	41	92	8.80746E+05	1.24005E-17	5.43568E-50	1.45588E-71	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	4.33992E-18	4.33967E-18	4.33916E-18	4.33841E-18	4.33691E-18	4.33540E-18	4.33089E-18	4.32488E-18
NB	41	95	3.02684E+06	1.51325E-18	5.81266E-28	3.07150E-34	6.23463E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	2.92145E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	2.73362E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	8.21526E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	5.56775E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	2.61877E-20	2.61817E-20	2.61777E-20	2.61676E-20	2.61474E-20	2.61273E-20	2.60670E-20	2.59869E-20
MO	42	99	2.41515E+05	3.93482E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	1.97869E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	6.43006E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	3.50947E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	1.32535E-26	1.32535E-26	1.32534E-26	1.32534E-26	1.32534E-26	1.32534E-26	1.32534E-26	1.32533E-26
PD	46	109	4.83704E+04	3.48474E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	1.41207E-19	2.21157E-58	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	4.41019E-16	4.34023E-16	4.29421E-16	4.18127E-16	3.96424E-16	3.75848E-16	3.20308E-16	2.58806E-16
AG	47	110	2.15826E+07	6.88147E-14	3.29006E-15	4.33397E-16	2.72956E-18	1.08269E-22	4.29449E-27	2.68004E-40	6.63397E-58
CD	48	109	3.99508E+07	2.87583E-20	5.56420E-21	1.86136E-21	1.20475E-22	5.04694E-25	2.11429E-27	1.55438E-34	4.78726E-44
CD	48	111	2.92221E+03	7.13060E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92561E+05	2.15662E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	6.41648E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	3.59938E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	1.80648E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	5.81258E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	1.01077E-20	2.20740E-27	8.00518E-32	6.34010E-43	3.97667E-65	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	1.15913E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	5.17442E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	7.44312E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	2.64110E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	2.77674E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	5.75133E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	7.86355E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	3.61133E-17	4.91916E-20	6.04469E-22	1.01179E-26	2.83465E-36	7.94176E-46	1.74647E-74	0.00000E+00
SN	50	121	9.72156E+04	2.66997E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	3.79869E-16	8.70955E-19	1.51439E-20	6.03740E-25	9.59518E-34	1.52495E-42	6.12160E-69	0.00000E+00

I	53	130	4.44981E+04	2.62147E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]
XE	54	133	4.56018E+05	1.22067E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]
CS	55	132	5.58990E+05	1.11936E-17	1.16226E-68	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	2.04127E-13	7.41244E-14	3.77284E-14	6.97326E-15	2.38215E-16	8.13772E-18	3.24422E-22	4.41823E-28
EU	63	152	4.17559E+08	1.97159E-12	1.68486E-12	1.51727E-12	1.16764E-12	6.91514E-13	4.09537E-13	8.50687E-14	1.04650E-14
EU	63	154	2.69812E+08	1.92035E-13	1.50575E-13	1.28037E-13	8.53673E-14	3.79492E-14	1.68699E-14	1.48200E-15	5.78760E-17
LU	71	174	1.22687E+07	5.69623E-24	2.70809E-26	7.65682E-28	1.02923E-31	1.85969E-39	3.36015E-47	1.98210E-70	0.00000E+00
LU	71	177	1.38242E+07	2.34872E-21	2.03836E-23	8.60823E-25	[illegible]	4.23808E-35	5.69291E-42	1.37987E-62	0.00000E+00
HF	72	173	8.49653E+04	5.21566E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	1.17528E-14	[illegible]	1.65240E-22	2.31734E-30	4.55742E-46	8.96291E-62	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	2.07038E-22	1.95605E-22	1.85138E-22	1.65554E-22	1.32383E-22	1.05858E-22	5.41248E-23	2.21289E-23
HF	72	179	1.89384E+10	9.93395E-24	9.89959E-24	9.87674E-24	9.81987E-24	9.70710E-24	9.59563E-24	9.26883E-24	8.85035E-24
HF	72	180	1.96723E+04	2.10195E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	7.84029E-14	1.30379E-21	8.49432E-27	9.20318E-40	1.06423E-65	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	1.02646E-28	1.02646E-28	1.02646E-28	1.02646E-28	1.02646E-28	1.02646E-28	1.02645E-28	1.02645E-28
TA	73	180	2.93458E+04	2.46068E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.02645E-28
TA	73	182	9.89362E+06	1.21234E-13	1.59604E-16	1.91716E-18	3.03182E-23	7.58177E-33	1.89600E-42	2.96513E-71	0.00000E+00
W	74	181	1.26968E+07	1.80884E-17	7.97003E-20	2.14207E-21	2.53673E-25	3.55748E-33	4.98897E-41	1.37599E-64	0.00000E+00
W	74	185	6.47801E+06	5.92489E-15	2.36201E-19	2.75645E-22	1.28242E-29	2.77564E-44	6.00760E-59	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	1.16449E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	7.18640E-20	5.97535E-27	1.13831E-31	1.80311E-43	4.52385E-67	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11947E+02	5.44734E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	7.38810E-22	4.26195E-22	2.95342E-22	1.18064E-22	1.88671E-23	3.01502E-24	1.23840E-26	8.02396E-30
TL	81	206	2.52054E+02	1.28394E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	1.05977E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.66782E+05	2.71446E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	1.23895E-22	1.23895E-22	1.23895E-22	1.23895E-22	1.23895E-22	1.23895E-22	1.23895E-22	1.23894E-22
PB	82	207	7.95989E-01	2.71168E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				1.06437E-09	4.81996E-11	2.94843E-11	9.50452E-12	1.91616E-12	8.37850E-13	1.79956E-13	5.25937E-14
TOTAL (CURIES)				1.02999E-02	4.66428E-04	2.853?9E-04	9.19752E-05	1.85426E-05	8.10787E-06	1.74143E-06	5.08949E-07

COMPONENT : CONCRETE - AXIAL DOWN - SIXTH 6 INCHES - RS
VOLUME : 9.67700E+06 CC
: ABOVE VOLUME IS FOR THE SIXTH 6 INCHES OF CONCRETE
: IN THE AXIAL DOWN DIRECTION.
:
: (INTERVALS 71-73 TOTGDMRS)

NUCLIDE			HALF-LIFE	CONCENTRATION (CURIES/CC) AT TIME							
SYM	Z	M	(SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	2.66524E-13	2.24977E-13	2.00944E-13	1.51500E-13	8.61167E-14	4.89511E-14	8.99060E-15	9.38620E-16
HE	2	6	8.09751E-01	1.92384E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	7.05242E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	5.03940E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	1.45764E-23	1.45764E-23	1.45764E-23	1.45764E-23	1.45763E-23	1.45763E-23	1.45762E-23	1.45760E-23
B	5	12	1.99754E-02	9.73076E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	1.30990E-16	1.30942E-16	1.30910E-16	1.30831E-16	1.30673E-16	1.30515E-16	1.30043E-16	1.29416E-16
F	9	20	1.10023E+01	2.60659E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	3.44305E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	1.34059E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	1.70101E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	1.62424E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	5.92586E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23?56E+06	2.14855E-14	1.84562E-37	7.74117E-53	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	1.72780E-14	3.07416E-18	9.72482E-21	5.47368E-27	1.73402E-39	5.49321E-52	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	1.60962E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	1.25862E-17	1.25861E-17	1.25860E-17	1.25859E-17	1.25856E-17	1.25853E-17	1.25845E-17	1.25834E-17
AR	18	37	3.02684E+06	6.50539E-13	2.53725E-22	1.34072E-28	2.72144E-44	1.12118E-75	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.40405E+09	2.94906E-15	2.92633E-15	2.91128E-15	2.87399E-15	2.80084E-15	2.72955E-15	2.52639E-15	2.27882E-15
AR	18	41	6.60140E+03	8.08070E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	1.70752E-20	1.70752E-20	1.70752E-20	1.70752E-20	1.70752E-20	1.70752E-20	1.70752E-20	1.70752E-20
K	19	42	4.47192E+04	4.62849E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	3.64247E-15	3.64236E-15	3.64232E-15	3.64216E-15	3.64184E-15	3.64153E-15	3.64058E-15	3.63931E-15
CA	20	45	1.42623E+07	1.42773E-12	1.43355E-14	6.67206E-16	3.11801E-19	6.80934E-26	1.48708E-32	1.54890E-52	0.00000E+00
CA	20	47	3.91608E+05	7.26006E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.88535E-13	2.21164E-17	5.29983E-20	1.48986E-26	1.17730E-39	9.30293E-53	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	1.18599E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	3.65627E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	1.38644E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	6.50169E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	2.07616E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.09048E-19	1.09270E-20	2.35735E-21	5.09604E-23	2.38148E-26	1.11292E-29	1.13581E-39	5.41708E-53
V	23	52	2.02084E+02	5.48326E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	8.73086E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	1.16066E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	8.55928E-14	1.12190E-25	1.34368E-33	2.10946E-53	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	7.59107E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	8.13363E-23	8.13362E-23	8.13362E-23	8.13361E-23	8.13360E-23	8.13358E-23	8.13354E-23	8.13348E-23
MN	25	54	2.61565E+07	8.75251E-14	7.12134E-15	1.33716E-15	2.04283E-17	4.76800E-21	1.11283E-24	1.41489E-35	4.19872E-50
MN	25	56	9.29152E+03	1.25799E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.60229E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.94961E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.58261E-11	7.11124E-12	4.17182E-12	1.09971E-12	7.64153E-14	5.30966E-15	1.78152E-18	4.15341E-23
FE	26	59	3.89409E+06	1.93050E-13	9.26936E-21	1.22451E-25	7.76728E-38	3.12499E-62	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	1.90368E-28	1.90364E-28	1.90362E-28	1.90355E-28	1.90342E-28	1.90329E-28	1.90289E-28	1.90236E-28
FE	26	61	3.60001E+02	2.37413E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	7.52881E-19	4.60416E-20	7.14661E-21	6.78384E-23	6.11255E-27	5.50766E-31	4.02910E-43	2.65578E-59
CO	27	58	6.13405E+06	2.53637E-16	5.72953E-21	4.57855E-24	8.26500E-32	2.69315E-47	8.77562E-63	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	3.67368E-13	2.47401E-13	1.90079E-13	9.83487E-14	2.63291E-14	7.04858E-15	1.35239E-16	6.94656E-19
CO	27	61	5.94007E+03	2.33527E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	1.15098E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

CO	27	64	2.00000E-01	6.49612E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52063E+12	9.80135E-19	9.80110E-19	9.80092E-19	9.80050E-19	9.79965E-19	9.79880E-19	9.79625E-19	9.79285E-19
NI	28	63	2.90020E+09	1.50355E-16	1.46991E-16	1.44790E-16	1.39432E-16	1.29302E-16	1.19908E-16	9.56270E-17	7.07230E-17
NI	28	65	9.21738E+03	8.16303E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	2.52241E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	1.34871E-19	2.66334E-37	4.19210E-49	1.30308E-78	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	7.62954E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	4.52274E-18	2.16648E-24	1.26570E-28	3.54213E-39	2.77404E-60	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	1.13437E-22	1.05342E-22	1.00269E-22	8.86299E-23	6.92476E-23	5.41040E-23	2.58050E-23	9.61616E-24
SR	38	91	3.48315E+04	1.01967E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	4.77855E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	2.43357E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	9.25857E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	2.44192E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	1.17683E-18	3.01270E-24	5.63797E-28	2.70104E-37	6.19919E-56	1.42278E-74	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	3.63528E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	7.82199E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	7.16541E-22	0.00000E+00	0.00000E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	1.82301E-21	2.02234E-25	4.66907E-28	1.19587E-34	7.84445E-48	5.14568E-61	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	1.98692E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	5.51502E-21	5.51501E-21	5.51501E-21	5.51500E-21	5.51497E-21	5.51495E-21	5.51487E-21	5.51478E-21
ZR	40	95	5.63534E+06	1.62633E-17	1.42547E-22	6.05982E-26	2.25793E-34	3.15471E-51	4.35196E-68	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	3.78269E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	7.24123E-23	7.21976E-23	7.20547E-23	7.16988E-23	7.09923E-23	7.02927E-23	6.82351E-23	6.55851E-23
NB	41	92	8.80746E+05	2.94050E-18	1.28895E-50	3.45228E-72	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	7.44548E-19	7.44470E-19	7.44419E-19	7.44289E-19	7.44031E-19	7.43773E-19	7.42999E-19	7.41968E-19
NB	41	95	3.02684E+06	5.53472E-19	1.35775E-28	7.17457E-35	1.45632E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	6.89196E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	6.41425E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E 03	1.95503E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	1.33610E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	5.65801E-21	5.65670E-21	5.65583E-21	5.65365E-21	5.64930E-21	5.64495E-21	5.63193E-21	5.61460E-21
MO	42	99	2.41515E+05	7.35856E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	3.62285E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	1.52618E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84815E+03	8.20057E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	3.10960E-27	3.10960E-27	3.10960E-27	3.10960E-27	3.10959E-27	3.10959E-27	3.10958E-27	3.10957E-27
PD	46	109	4.83704E+04	8.16817E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	3.39019E-20	5.30963E-59	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	7.37995E-17	7.26288E-17	7.18587E-17	6.96689E-17	6.63371E-17	6.28939E-17	5.35999E-17	4.33083E-17
AG	47	110	2.15826E+07	1.20032E-14	5.73078E-16	7.55964E-17	4.76111E-19	1.88851E-23	7.49078E-28	4.67474E-41	1.15715E-58
CD	48	109	3.99508E+07	6.73476E-21	1.30305E-21	4.35901E-22	2.82134E-23	1.18192E-25	4.95134E-28	3.64012E-35	1.12110E-44
CD	48	111	2.92221E+03	1.68055E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	5.14797E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	1.34048E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	8.64163E-25	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	2.40319E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	1.36142E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	2.37853E-21	5.19443E-28	1.88377E-32	1.49194E-45	9.35785E-66	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	2.71614E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.60998E+01	1.22536E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	1.74760E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	6.29501E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	6.52959E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40095E+02	1.38020E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	1.88793E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	7.79296E-18	1.06152E-20	1.30440E-22	2.18336E-27	6.11696E-37	1.71577E-46	3.76873E-75	0.00000E+00
SN	50	121	9.72156E+04	4.56632E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	6.52696E-17	1.49649E-19	2.60204E-21	1.05735E-25	1.64865E-34	2.62019E-43	1.05183E-69	0.00000E+00
SN	50	125	8.12599E+05	8.20407E-16	6.95332E-51	2.89045E-74	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
I	53	130	4.44781E+04	6.12970E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	2.83961E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	2.68743E-18	2.79044E-69	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	3.53367E-14	1.28318E-14	6.53120E-15	1.20715E-15	4.12377E-17	1.40873E-18	5.61411E-23	7.64840E-29
EU	63	152	4.17559E+08	3.24111E-13	2.76975E-13	2.49425E-13	1.91949E-13	1.15670E-13	6.73241E-14	1.39845E-14	1.72834E-15
EU	63	154	2.69812E+08	3.20082E-14	2.50977E-14	2.13411E-14	1.42289E-14	6.32534E-15	2.81187E-15	2.47018E-16	9.64456E-18
LU	71	174	1.22687E+07	1.30120E-24	6.18613E-27	1.74906E-28	2.35109E-32	4.24810E-40	7.67564E-48	4.52772E-71	0.00000E+00
LU	71	177	1.38242E+07	5.50127E-22	4.77434E-24	2.01626E-25	7.38983E-29	9.92663E-36	1.33342E-42	3.23200E-63	0.00000E+00
HF	72	173	8.49653E+04	1.25221E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	1.96829E-15	3.82128E-20	2.76031E-23	3.87108E-31	7.61311E-47	1.49724E-62	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	4.87813E-23	4.56164E-23	4.36214E-23	3.90072E-23	3.11915E-23	2.49417E-23	1.27527E-23	5.21393E-24
HF	72	179	1.89384E+10	2.33276E-24	2.32469E-24	2.31933E-24	2.30597E-24	2.27949E-24	2.25331E-24	2.17657E-24	2.07830E-24
HF	72	180	1.98725E+04	4.95926E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	1.36221E-14	2.26527E-22	1.47584E-27	1.59900E-48	1.87684E-66	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	2.42885E-29	2.42885E-29	2.42864E-29	2.42864E-29	2.42864E-29	2.42864E-29	2.42883E-29	2.42883E-29
TA	73	180	2.93458E+04	5.85334E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	2.16631E-14	2.85195E-17	3.42574E-19	5.41752E-24	1.35478E-33	3.38793E-43	5.29836E-72	0.00000E+00
W	74	181	1.20968E+07	4.34264E-18	1.91344E-20	5.14266E-22	4.09815E-26	8.54076E-34	1.19775E-41	3.30346E-65	0.00000E+00
W	74	185	6.47801E+06	1.02572E-15	4.08932E-20	4.77196E-23	2.22014E-30	4.80519E-45	1.04004E-59	8.70408E-86	0.00000E+00
W	74	187	8.59984E+04	2.02089E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	1.70305E-20	1.41605E-27	2.69759E-32	4.27305E-44	1.07207E-67	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11947E+02	1.30114E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	1.74319E-22	1.80559E-22	6.96848E-23	2.78568E-23	4.45161E-24	7.11381E-25	2.90308E-27	1.89322E-30
TL	81	206	2.52054E+02	3.04876E-21	0.00000E 00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	2.58571E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	6.51695E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	2.97335E-23	2.97335E-23	2.97335E-23	2.97335E-23	2.97334E-23	2.97334E-23	2.97334E-23	2.97333E-23
PB	82	207	7.95989E-01	6.49847E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				1.76679E-11	7.92753E-12	4.84913E-12	1.56383E-12	3.15689E-13	1.38145E-13	2.98197E-14	8.84521E-15
TOTAL (CURIES)				1.70973E-05	7.67147E-05	4.69251E-05	1.51332E-05	3.05492E-06	1.33683E-06	2.88565E-07	8.55950E-08

COMPONENT : CONCRETE - AXIAL DOWN - SEVENTH 6 INCHES - RS
VOLUME : 9.67700E+06 CC
: ABOVE VOLUME IS FOR THE SEVENTH 6 INCHES OF CONCRETE
: IN THE AXIAL DOWN DIRECTION.
:
: (INTERVALS 74-76 TOTODNRS)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	4.94498E-14	4.17414E-14	3.72823E-14	2.81087E-14	1.59777E-14	9.08220E-15	1.66808E-15	1.74148E-16
HE	2	6	8.09751E-01	4.34445E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	1.30896E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.13555E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	3.20025E-24	3.20025E-24	3.20025E-24	3.20024E-24	3.20023E-24	3.20022E-24	3.20020E-24	3.20016E-24
B	5	12	1.99754E-02	1.80599E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	2.43332E-17	2.43244E-17	2.43185E-17	2.43038E-17	2.42744E-17	2.42451E-17	2.41574E-17	2.40409E-17
F	9	20	1.10023E+01	6.20341E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	8.01921E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	2.49324E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	3.93861E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	3.10265E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	1.33903E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	4.86990E-15	4.18329E-38	1.75462E-53	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	3.21101E-15	5.71314E-19	1.80750E-21	1.01725E-27	3.22256E-40	1.02068E-52	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	3.75739E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	2.35391E-18	2.35389E-18	2.35388E-18	2.35386E-18	2.35380E-18	2.35375E-18	2.35359E-18	2.35338E-18
AR	18	37	3.02684E+06	1.52200E-13	5.84629E-23	3.08926E-29	6.27069E-45	2.58339E-76	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	5.85753E-16	5.81240E-16	5.78250E-16	5.70844E-16	5.56314E-16	5.42154E-16	5.01800E-16	4.52629E-16
AR	18	41	6.60140E+03	1.87092E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	3.16971E-21	3.16971E-21	3.16971E-21	3.16971E-21	3.16971E-21	3.16971E-21	3.16971E-21	3.16971E-21
K	19	42	4.47192E+04	8.61026E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	6.74647E-16	6.74630E-16	6.74618E-16	6.74588E-16	6.74530E-16	6.74471E-16	6.74296E-16	6.74062E-16
CA	20	45	1.42623E+07	2.65689E-13	2.66773E-15	1.24162E-16	5.80238E-20	1.26716E-26	2.76734E-33	2.88238E-53	0.00000E+00
CA	20	47	3.91608E+05	1.34473E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	3.51524E-14	4.12361E-18	9.88156E-21	2.77785E-27	2.19507E-40	1.73453E-53	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	2.69234E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	8.65167E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	3.19793E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	1.56286E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	3.65936E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	2.62266E-20	2.62800E-21	5.66955E-22	1.22563E-23	5.72758E-27	2.67664E-30	2.73168E-40	1.30284E-53
V	23	52	2.02084E+02	1.01856E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	2.04416E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	4.79065E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	1.61717E-14	2.11969E-26	2.53871E-34	3.98558E-54	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	1.75511E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.95617E-23	1.95617E-23	1.95617E-23	1.95617E-23	1.95616E-23	1.95616E-23	1.95615E-23	1.95614E-23
MN	25	54	2.62565E+07	1.99197E-14	1.62073E-15	3.04320E-16	4.64924E-18	1.08514E-21	2.53266E-25	3.22012E-36	9.55578E-51
MN	25	56	9.29152E+03	2.34378E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	3.26746E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	4.67511E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	2.93216E-12	1.31753E-12	7.72929E-13	2.03747E-13	1.41577E-14	9.83777E-16	3.30069E-19	7.69517E-24
FE	26	59	3.89609E+06	3.59905E-14	1.72810E-21	2.28287E-26	1.44806E-38	5.82595E-63	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	4.57639E-29	4.57630E-29	4.57623E-29	4.57608E-29	4.57576E-29	4.57544E-29	4.57449E-29	4.57322E-29
FE	26	61	3.60001E+02	5.70974E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	1.81030E-19	1.10707E-20	1.71840E-21	1.63117E-23	1.46976E-27	1.32431E-31	9.68793E-44	6.38581E-60
CO	27	58	6.13405E+06	5.76222E-17	1.30166E-21	1.04017E-24	1.87768E-32	6.11840E-48	1.99368E-63	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	6.86866E-14	4.62565E-14	3.55391E-14	1.83882E-14	4.92274E-15	1.31787E-15	2.52856E-17	1.29880E-19
CO	27	61	5.94087E+03	5.40447E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	2.72273E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	1.56229E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	1.81966E-19	1.81962E-19	1.81958E-19	1.81950E-19	1.81935E-19	1.81919E-19	1.81872E-19	1.81808E-19
NI	28	63	2.90020E+09	2.83330E-17	2.76991E-17	2.72844E-17	2.62746E-17	2.43658E-17	2.25957E-17	1.80201E-17	1.33271E-17
NI	28	65	9.21738E+03	1.89068E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	4.69120E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	3.22731E-20	6.37307E-38	1.00312E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	1.81398E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	1.85758E-18	4.92569E-25	2.95965E-29	8.28275E-40	6.48669E-61	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	2.68465E-23	2.49307E-23	2.37301E-23	2.09755E-23	1.63884E-23	1.28045E-23	6.10710E-24	2.27580E-24
SR	38	91	3.48315E+04	2.42388E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	1.14675E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	5.84799E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	2.22306E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.30281E+05	4.53300E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	2.76746E-19	7.08479E-25	1.32585E-28	6.35187E-38	1.45783E-56	3.34568E-75	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	8.61401E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	1.86877E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80406E+00	1.72325E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20682E+06	4.25379E-22	4.71390E-26	1.98948E-28	2.79042E-35	1.83041E-48	1.20069E-61	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	4.69354E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74750E+13	9.95061E-22	9.95059E-22	9.95058E-22	9.95056E-22	9.95052E-22	9.95047E-22	9.95033E-22	9.95015E-22
ZR	40	95	5.63534E+06	3.91037E-18	3.42740E-23	1.45703E-26	5.42898E-35	7.53712E-52	1.04639E-68	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	8.28293E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	1.73474E-23	1.72959E-23	1.72617E-23	1.71764E-23	1.70072E-23	1.68396E-23	1.63466E-23	1.57118E-23
NB	41	92	8.80746E+05	6.99635E-19	3.06680E-51	8.21404E-73	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	1.43037E-19	1.43022E-19	1.43012E-19	1.42987E-19	1.42938E-19	1.42888E-19	1.42739E-19	1.42541E-19
NB	41	95	3.02604E+06	8.29812E-20	3.13747E-29	1.68430E-35	3.41866E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	1.63161E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	1.51171E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	4.66459E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	3.21201E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84877E+11	1.26803E-21	1.26773E-21	1.26754E-21	1.26705E-21	1.26607E-21	1.26510E-21	1.26218E-21	1.25830E-21
MO	42	99	2.41515E+05	1.50843E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	7.31468E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	3.63294E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	1.92469E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	7.32909E-28	7.32909E-28	7.32908E-28	7.32908E-28	7.32907E-28	7.32906E-28	7.32904E-28	7.32901E-28
PD	46	109	4.83704E+04	1.92361E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	8.15358E-21	1.27701E-59	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	1.38877E-17	1.36674E-17	1.35224E-17	1.31668E-17	1.24834E-17	1.18354E-17	1.00865E-17	8.14980E-18
AG	47	110	2.15826E+07	2.33639E-15	1.11704E-16	1.47146E-17	9.26736E-20	3.67593E-24	1.45806E-28	9.09925E-42	2.25236E-59
CD	48	109	3.99508E+07	1.58463E-21	3.06596E-22	1.02564E-22	6.63835E-24	2.78094E-26	1.16500E-28	8.56487E-36	2.63785E-45
CD	48	111	2.92221E+03	3.97587E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	1.23171E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	3.70486E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	2.07836E-25	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	5.75123E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	3.20582E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	5.61987E-22	1.22731E-28	4.45087E-33	3.52509E-44	2.21102E-66	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	6.39458E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	2.91082E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	4.12125E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	1.50409E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	1.54465E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	4.40093E+01	3.31813E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	4.54057E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	1.74606E-18	2.37839E-21	2.92258E-23	4.89195E-28	1.37054E-37	3.83980E-47	8.44408E-76	0.00000E+00
SN	50	121	9.72156E+04	8.75089E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.07967E+07	1.25656E-17	2.88102E-20	5.00942E-22	1.99711E-26	3.17398E-35	5.04436E-44	2.02498E-70	0.00000E+00
SN	50	125	8.12599E+05	1.57087E-16	1.33138E-51	5.53445E-75	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

I	53	130	4.44981E+04	1.43896E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	6.64410E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	6.46341E-19	6.71116E-70	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	6.83722E-15	2.48279E-15	1.26371E-15	2.33569E-16	7.97900E-18	2.72572E-19	1.08665E-23	1.47987E-29
EU	63	152	4.17559E+08	6.00658E-14	5.13305E-14	4.62246E-14	3.55729E-14	2.10675E-14	1.24768E-14	2.59168E-15	3.18821E-16
EU	63	154	2.69812E+08	4.90321E-15	4.70713E-15	4.00257E-15	2.66867E-15	1.18633E-15	5.27372E-16	4.63287E-17	1.80925E-18
LU	71	174	1.22687E+07	2.99633E-25	1.42451E-27	4.02764E-29	5.41397E-33	9.78233E-41	1.76751E-48	1.04262E-71	0.00000E+00
LU	71	177	1.38242E+07	1.29479E-22	1.12369E-24	4.74550E-26	1.73928E-29	2.33634E-36	3.13836E-43	7.60688E-64	0.00000E+00
HF	72	173	8.49653E+04	3.01162E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	3.60856E-16	7.18045E-21	5.18681E-24	7.27403E-32	1.45056E-47	2.81342E-63	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	1.15392E-23	1.07905E-23	1.03186E-23	9.22713E-24	7.37833E-24	5.89996E-24	3.01663E-24	1.23335E-24
HF	72	179	1.89384E+16	5.58232E-25	5.48329E-25	5.47064E-25	5.43913E-25	5.37667E-25	5.31493E-25	5.13392E-25	4.90213E-25
HF	72	180	1.98723E+04	1.17439E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	2.64343E-15	4.39587E-23	2.86394E-28	3.10294E-41	3.64211E-67	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	5.76607E-30	5.76607E-30	5.76607E-30	5.76607E-30	5.76606E-30	5.76606E-30	5.76605E-30	5.76603E-30
TA	73	180	2.93458E+04	1.40636E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	4.29558E-15	5.65514E-18	6.79292E-20	1.07424E-24	2.68639E-34	6.71794E-44	1.05061E-72	0.00000E+00
W	74	181	1.20968E+07	1.04440E-18	4.60178E-21	1.23680E-22	1.46467E-26	2.05404E-34	2.88056E-42	7.94477E-66	0.00000E+00
W	74	185	6.47801E+06	1.98516E-16	7.91400E-21	9.23557E-24	4.29681E-31	9.29980E-46	2.01287E-60	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	3.91784E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02525E+06	4.04806E-21	3.36589E-28	6.41204E-33	1.01568E-44	2.54826E-68	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11967E+02	3.11487E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	4.12863E-23	2.38167E-23	1.65043E-23	6.59769E-24	1.05433E-24	1.68486E-25	6.87575E-28	4.48396E-31
TL	81	206	2.52054E+02	7.25987E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	5.94395E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86762E+05	1.56733E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	7.14842E-24	7.14842E-24	7.14842E-24	7.14842E-24	7.14841E-24	7.14841E-24	7.14840E-24	7.14839E-24
PB	82	207	7.95989E-01	1.56035E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				3.30202E-11	1.46977E-12	8.99005E-13	2.90036E-13	5.86146E-14	2.56663E-14	5.56274E-15	1.66980E-15
TOTAL (CURIES)				3.19536E-04	1.42230E-05	8.69967E-06	2.80668E-06	5.67213E-07	2.48373E-07	5.38306E-08	1.61567E-08

COMPONENT : CONCRETE - AXIAL DOWN - EIGHTH 6 INCHES - RS
VOLUME : 9.67700E+06 CC
: ABOVE VOLUME IS FOR THE EIGHTH 6 INCHES OF CONCRETE
: IN THE AXIAL DOWN DIRECTION.
:
: (INTERVALS 77-79 TOTGDNRS)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	1.07192E-14	9.04824E-15	8.08164E-15	6.09308E-15	3.46348E-15	1.96874E-15	3.61588E-16	3.77498E-17
HE	2	6	8.09751E-01	9.89206E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.46178E-01	2.83789E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	6	3.00064E-16	2.57793E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	7.25379E-25	7.25378E-25	7.25378E-25	7.25377E-25	7.25375E-25	7.25373E-25	7.25366E-25	7.25358E-25
B	5	12	1.99754E-02	3.91495E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	5.27619E-18	5.27428E-18	5.27300E-18	5.26982E-18	5.26345E-18	5.25709E-18	5.23807E-18	5.21280E-18
F	9	20	1.10023E+01	1.48001E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	1.87660E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	5.40850E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	9.16984E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	6.80055E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	3.04778E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.11181E-15	9.55050E-39	4.00581E-54	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	6.96571E-16	1.23936E-19	3.92062E-22	2.20674E-28	6.99078E-41	2.21462E-53	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	8.81018E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	5.11133E-19	5.11130E-19	5.11128E-19	5.11122E-19	5.11111E-19	5.11099E-19	5.11065E-19	5.11019E-19
AR	18	37	3.02684E+06	3.52783E-14	1.35511E-23	7.16058E-30	1.45348E-45	5.98002E-77	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	1.29359E-16	1.28363E-16	1.27702E-16	1.26067E-16	1.22858E-16	1.19731E-16	1.10819E-16	9.99599E-17
AR	18	41	6.60146E+03	4.35557E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	6.87122E-22	6.87122E-22	6.87122E-22	6.87122E-22	6.87122E-22	6.87122E-22	6.87122E-22	6.87122E-22
K	19	42	4.47192E+04	1.86693E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	1.46231E-16	1.46227E-16	1.46224E-16	1.46218E-16	1.46205E-16	1.46195E-16	1.46155E-16	1.46104E-16
CA	20	45	1.42623E+07	5.76155E-14	5.78507E-16	2.69249E-17	1.25827E-20	2.74789E-27	6.08107E-34	6.25055E-54	0.00000E+00
CA	20	47	3.91608E+05	2.91475E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	7.62607E-15	8.94589E-19	2.14376E-21	4.02636E-28	4.76207E-41	3.75296E-54	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	6.15346E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	2.05366E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	7.42041E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	3.76228E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	8.36975E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	6.31655E-21	6.32943E-22	1.36549E-22	2.95187E-24	1.37946E-27	6.44656E-31	6.67914E-41	3.13785E-54
V	23	52	2.02084E+02	2.20884E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	4.80624E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	6.71943E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	3.52098E-15	4.61510E-27	5.52740E-35	8.67757E-55	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	4.08038E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	4.71136E-24	4.71135E-24	4.71135E-24	4.71135E-24	4.71134E-24	4.71133E-24	4.71130E-24	4.71127E-24
MN	25	54	2.61565E+07	4.56508E-15	3.71431E-16	6.97425E-17	1.06549E-18	2.48686E-22	5.20422E-26	7.37970E-37	2.18994E-51
MN	25	56	9.29152E+03	5.08237E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	7.65047E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.12299E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	6.35569E-13	2.85584E-13	1.67538E-13	4.41638E-14	3.06880E-15	2.13241E-16	7.15450E-20	1.66799E-24
FE	26	59	3.89409E+06	7.80460E-15	3.74740E-22	4.95044E-27	3.14015E-39	1.26337E-63	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	1.10176E-29	1.10173E-29	1.10172E-29	1.10168E-29	1.10160E-29	1.10153E-29	1.10136E-29	1.10099E-29
FE	26	61	3.60001E+02	1.37512E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	4.35909E-20	2.66575E-21	4.13780E-22	3.92776E-24	3.53909E-28	3.18887E-32	2.23280E-44	1.53767E-60
CO	27	58	6.13405E+06	1.31818E-17	2.97770E-22	2.37952E-25	4.29542E-33	1.39966E-48	4.56079E-64	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.48977E-14	1.00327E-14	7.70816E-15	3.98828E-15	1.06771E-15	2.85837E-16	5.48428E-18	2.81700E-20
CO	27	61	5.94007E+03	1.25783E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	4.46063E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

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CO 27 64	2.99999E-01	3.76258E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI 28 59	2.52053E+12	3.94468E-20	3.94457E-20	3.94452E-20	3.94433E-20	3.94399E-20	3.94365E-20	3.94262E-20	[illegible]
NI 28 63	2.90020E+09	6.17013E-18	6.03209E-18	5.94178E-18	5.77188E-18	5.30670E-18	4.92071E-18	3.92429E-18	2.90227E-18
NI 28 65	9.21758E+03	4.40393E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU 29 64	4.62098E+04	1.01710E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB 37 86	1.60972E+06	7.73733E-21	1.52792E-38	2.40495E-50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 87	1.00799E+04	4.32369E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 89	4.50096E+06	2.48443E-19	1.15713E-25	6.95273E-33	1.94576E-40	1.52384E-61	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 90	8.84577E+08	6.37323E-24	5.91844E-24	5.63342E-24	4.97948E-24	3.89053E-24	3.03972E-24	1.44980E-24	5.40264E-25
SR 38 91	3.48315E+04	5.77640E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 92	9.75604E+03	2.75644E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 93	4.50095E+02	1.40741E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 89	1.56998E+01	5.34641E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 90	2.36281E+05	9.82677E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 91	5.09667E+06	6.53400E-20	1.67271E-25	3.15031E-29	1.49967E-38	3.44191E-57	7.89958E-76	0.00000E+00	0.00000E+00
Y 39 92	1.27440E+04	2.84706E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 94	1.12200E+03	4.47393E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 96	9.80406E+00	4.15022E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR 40 88	7.20602E+06	9.97041E-23	1.10606E-26	2.55363E-29	6.54043E-36	4.29029E-49	2.81428E-62	0.00000E+00	0.00000E+00
ZR 40 89	2.82249E+05	1.11247E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR 40 93	4.74758E+13	2.16313E-22	2.16313E-22	2.16312E-22	2.16312E-22	2.16311E-22	2.16310E-22	2.16307E-22	2.16303E-22
ZR 40 95	5.63554E+06	9.41570E-19	8.25278E-24	3.50835E-27	1.30723E-35	1.81485E-52	2.51958E-69	0.00000E+00	0.00000E+00
ZR 40 97	6.04840E+04	1.81566E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 91	2.20888E+10	4.16331E-24	4.15096E-24	4.14275E-24	4.12228E-24	4.08166E-24	4.04144E-24	3.92314E-24	3.77078E-24
NB 41 92	8.80746E+05	1.66928E-19	7.31717E-52	1.95981E-73	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 94	6.30134E+11	3.10867E-20	3.10835E-20	3.10814E-20	3.10760E-20	3.10652E-20	3.10544E-20	3.10221E-20	3.09790E-20
NB 41 95	.02684E+06	1.95622E-20	7.51422E-30	3.97063E-36	8.05971E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 96	6.28132E+04	3.87549E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 97	4.33217E+03	3.57595E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 98	3.06025E+03	1.11538E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 100	3.09994E+00	7.73300E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO 42 93	2.84077E+11	2.79048E-22	2.78983E-22	2.78940E-22	2.78833E-22	2.78618E-22	2.78404E-22	2.77761E-22	2.76907E-22
MO 42 99	2.41519E+05	3.29673E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO 42 101	8.76292E+02	1.59556E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH 45 104	2.61565E+02	8.66911E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH 45 106	7.84813E+03	4.53432E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD 46 107	2.05134E+14	1.73391E-28	1.73391E-28	1.73391E-28	1.73391E-28	1.73391E-28	1.73391E-28	1.73390E-28	1.73389E-28
PD 46 109	4.83704E+04	4.54769E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG 47 106	7.34422E+05	1.96375E-21	3.07561E-60	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG 47 108	4.10389E+09	3.01353E-18	2.96573E-18	2.93428E-18	2.85711E-18	2.70881E-18	2.56821E-18	2.18876E-18	1.76845E-18
AG 47 110	2.15826E+07	5.08145E-16	2.42947E-17	3.20031E-18	2.01558E-20	7.99485E-25	3.17116E-29	1.97901E-42	4.89870E-60
CD 48 109	3.99508E+07	3.74306E-22	7.24213E-23	2.42266E-23	1.56805E-24	6.56888E-27	2.75186E-29	[illegible]	6.23089E-46
CD 48 111	[illegible].92221E+03	9.43618E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD 48 115	1.92541E+05	2.95268E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]	0.00000E+00
CD 48 117	1.22399E+04	8.92287E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD 48 119	5.97541E+02	5.00564E-26	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 111	2.42444E+05	1.37898E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 112	1.25400E+03	7.56914E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 114	4.27869E+06	1.33234E-22	2.90966E-29	1.05519E-33	8.35714E-45	5.24181E-67	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 115	1.61[illegible]97E+04	1.51136E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 116	1.40998E+01	6.93288E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 117	6.95931E+03	9.75419E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 118	2.63955E+02	3.60117E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 119	1.26027E+02	3.66574E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 120	4.40093E+01	7.98869E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 122	1.00998E+01	1.09358E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN 50 113	9.94473E+06	3.83787E-19	5.22775E-22	6.42388E-24	1.07526E-28	3.01247E-38	8.43995E-48	1.85602E-76	0.00000E+00
SN 50 121	9.72156E+04	1.90296E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN 50 123	1.07967E+07	2.74441E-18	6.29233E-21	1.09409E-22	4.36180E-27	6.93216E-36	1.10172E-44	[illegible]	0.00000E+00
SN 50 125	8.12599E+05	3.41306E-17	2.89272E-52	1.20248E-75	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
I 53 130	4.44981E+04	3.38966E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE 54 133	4.56018E+05	1.56201E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS 55 132	5.58990E+05	1.55668E-19	1.61635E-70	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS 55 134	6.47801E+07	1.48647E-15	5.39780E-16	2.74741E-16	5.07749E-17	1.73470E-18	5.92596E-20	2.36247E-24	3.21737E-30
EU 63 152	4.17559E+08	1.30194E-14	1.11268E-14	1.00193E-14	[illegible]	4.56641E-15	2.70438E-15	5.61751E-16	6.91055E-17
EU 63 154	2.69812E+08	1.30230E-15	1.02114E-15	8.68293E-16	[illegible]	2.57355E-16	1.14405E-16	1.00503E-17	3.92484E-19
LU 71 174	1.22687E+07	6.94574E-26	3.30214E-28	9.33640E-30	1.25500E-33	2.26762E-41	4.09723E-49	2.41688E-72	0.00000E+00
LU 71 177	1.38242E+07	3.05962E-23	2.65533E-25	1.12138E-26	4.10997E-30	5.52085E-37	7.41604E-44	1.79753E-64	0.00000E+00
HF 72 173	8.49653E+04	7.25335E-22	0.00000E+00	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF 72 175	6.04840E+06	8.02520E-17	1.55803E-21	[illegible]	1.57833E-32	3.10405E-48	6.10462E-64	0.00000E+00	0.00000E+00
HF 72 178	9.78261E+08	2.73857E-24	2.56090E-24	[illegible]	2.18986E-24	1.75108E-24	1.40023E-24	7.15932E-25	2.92709E-25
HF 72 179	1.89384E+10	1.30262E-25	1.29811E-25	1.29512E-25	1.28766E-25	1.27287E-25	1.25826E-25	1.21540E-25	1.16053E-25
HF 72 180	1.98723E+04	2.78962E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF 72 181	3.66357E+06	5.74718E-16	9.55722E-24	6.22660E-29	6.74622E-42	7.91844E-68	0.00000E+00	0.00000E+00	0.00000E+00
HF 72 182	2.84077E+14	1.37264E-30	1.37264E-30	1.37264E-30	1.37264E-30	1.37264E-30	1.37263E-30	1.37263E-30	1.37263E-30
TA 73 180	2.93458E+04	3.38422E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA 73 182	9.89362E+06	9.35456E-16	1.23153E-18	1.47931E-20	2.33939E-25	5.85019E-35	1.46298E-44	2.28794E-73	0.00000E+00
W 74 181	1.20968E+07	2.51531E-19	1.10829E-21	2.97869E-23	3.52750E-27	4.94692E-35	6.93750E-43	1.91341E-66	0.00000E+00
W 74 185	6.47801E+06	4.32108E-17	1.72264E-21	2.01030E-26	9.35283E-32	2.02430E-46	4.38140E-61	0.00000E+00	0.00000E+00
W 74 187	8.59984E+04	8.51872E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG 80 203	4.02525E+06	9.64659E-22	8.02095E-29	1.52800E-33	2.42039E-45	6.07254E-69	0.00000E+00	0.00000E+00	0.00000E+00
HG 80 205	3.11947E+02	7.47178E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL 81 204	1.19282E+08	9.80925E-24	5.65863E-24	3.92129E-24	1.56756E-24	2.50500E-25	4.00307E-26	1.63362E-28	1.06535E-31
TL 81 206	2.52054E+02	1.73290E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL 81 207	2.86188E+02	1.41393E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.30000E+00
PB 82 203	1.86782E+05	3.77479E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB 82 205	4.76390E+14	1.72110E-24	1.72110E-24	1.72110E-24	1.72110E-24	1.72110E-24	1.72110E-24	1.72110E-24	1.72110E-24
PB 82 207	7.95989E-01	3.75249E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)		7.17119E-12	3.18617E-13	1.94879E-13	6.28731E-14	1.27084E-14	5.56591E-15	1.20785E-15	3.63805E-16
TOTAL (CURIES)		6.93956E-05	3.08326E-06	1.88584E-06	6.08423E-07	1.22979E-07	5.38613E-08	1.16884E-08	3.52054E-09

COMPONENT : CONCRETE - AXIAL DOWN - NINTH 6 INCHES - RS
VOLUME : 9.67700E+06 CC
: ABOVE VOLUME IS FOR THE NINTH 6 INCHES OF CONCRETE
: IN THE AXIAL DOWN DIRECTION.
:
: (INTERVALS 86 ?? TOTGDHRS)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	2.32571E-15	1.96317E-15	1.75345E-15	1.32200E-15	7.51462E-16	4.27152E-16	7.84528E-17	8.19048E-18
HE	2	6	8.09751E-01	2.26672E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	6.15847E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	5.88872E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	1.65419E-25	1.65419E-25	1.65419E-25	1.65419E-25	1.65418E-25	1.65418E-25	1.65416E-25	1.65415E-25
B	5	12	1.99754E-02	8.49488E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	1.14519E-18	1.14478E-18	1.14450E-18	1.14381E-18	1.14243E-18	1.14105E-18	1.13692E-18	1.13144E-18
F	9	20	1.10023E+01	3.53722E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	1.40751E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	1.17462E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	2.14397E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	1.49381E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	6.97758E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	2.55285E-16	2.19292E-39	9.19787E-55	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	1.51233E-16	2.69078E-20	6.51205E-23	4.79106E-29	1.51777E-41	4.80816E-54	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	2.07291E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	1.11178E-19	1.11177E-19	1.11177E-19	1.11175E-19	1.11173E-19	1.11170E-19	1.11163E-19	1.11153E-19
AR	18	37	3.02684E+06	8.21523E-15	3.15562E-24	1.66748E-30	3.38470E-46	1.39442E-77	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	2.86683E-17	2.84475E-17	2.83011E-17	2.79387E-17	2.72275E-17	2.65345E-17	2.45595E-17	2.21529E-17
AR	18	41	6.60140E+03	1.01829E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	1.49105E-22	1.49105E-22	1.49105E-22	1.49105E-22	1.49105E-22	1.49105E-22	1.49105E-22	1.49105E-22
K	19	42	4.47192E+04	4.05387E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52053E+12	3.17136E-17	3.17130E-17	3.17125E-17	3.17111E-17	3.17083E-17	3.17056E-17	3.16973E-17	3.16863E-17
CA	20	45	1.4?623E+07	1.25114E-14	1.25624E-16	5.84682E-18	2.73236E-21	5.96712E-28	1.30315E-34	1.35732E-54	0.00000E+00
CA	20	47	3.91608E+05	6.32147E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25849E+06	1.65709E-15	1.94388E-19	4.65820E-22	1.30949E-28	1.03476E-41	8.17665E-55	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	1.41454E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	4.88615E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	1.72976E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	9.06476E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.81719E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.52255E-21	1.52565E-22	3.29138E-23	7.11521E-25	3.32587E-28	1.55389E-31	1.58584E-41	7.56344E-55
V	23	52	2.02084E+02	4.79494E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	1.13370E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	1.61929E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	7.68700E-16	1.00757E-27	1.20674E-35	1.89449E-55	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	9.52701E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.15760E+14	1.13563E-24	1.13563E-24	1.13563E-24	1.13562E-24	1.13562E-24	1.13562E-24	1.13561E-24	1.13561E-24
MN	25	54	2.61565E+07	1.05195E-15	8.55903E-17	1.60711E-17	2.45525E-19	5.73058E-23	1.33749E-26	1.70054E-37	5.04637E-52
MN	25	56	9.29152E+03	1.10395E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.79795E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	2.70042E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.37851E-13	6.19414E-14	3.63381E-14	9.57887E-15	6.65605E-16	4.62508E-17	1.55177E-20	3.61777E-25
FE	26	59	3.89409E+06	1.69552E-15	8.14111E-23	1.07547E-27	6.82187E-40	2.74463E-64	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	2.65472E-30	2.65467E-30	2.65463E-30	2.65454E-30	2.65436E-30	2.65417E-30	2.65362E-30	2.65288E-30
FE	26	61	3.60001E+02	3.31453E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	1.05052E-20	6.42435E-22	9.97192E-23	9.46573E-25	8.52906E-29	7.68503E-33	5.62194E-45	3.70571E-61
CO	27	58	6.13405E+06	3.03270E-18	6.85072E-23	5.47430E-26	9.88235E-34	3.22016E-49	1.04929E-64	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	3.23883E-15	2.18116E-15	1.67580E-15	8.67073E-16	2.32125E-16	6.21425E-17	1.19231E-18	6.12430E-21
CO	27	61	5.94007E+03	2.94017E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	8.34012E+02	1.53652E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	64	2.99999E-01	9.06918E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI	28	59	2.52053E+12	8.56007E-21	8.55984E-21	8.55969E-21	8.55932E-21	8.55858E-21	8.55784E-21	8.55561E-21	8.55264E-21
NI	28	63	2.90020E+09	1.34558E-18	1.31547E-18	1.29578E-18	1.24782E-18	1.15717E-18	1.07310E-18	8.55805E-19	6.32925E-19
NI	28	65	9.21738E+03	1.03024E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU	29	64	4.62098E+04	2.20822E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB	37	86	1.60972E+06	1.85735E-21	3.66777E-39	5.77308E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	87	1.00799E+04	1.03245E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	89	4.50096E+06	5.85672E-20	2.72778E-26	1.63901E-30	4.58687E-41	3.59224E-62	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	90	8.86377E+08	1.51643E-24	1.40822E-24	1.34040E-24	1.18481E-24	9.25703E-25	7.23264E-25	3.44961E-25	1.28549E-25
SR	38	91	3.48315E+04	1.37911E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	92	9.75604E+03	6.63238E-25	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR	38	93	4.50095E+02	3.39016E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	89	1.56998E+01	1.28707E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	90	2.50281E+05	2.13243E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	91	5.09667E+06	1.54723E-20	3.96093E-26	7.41249E-30	3.55118E-39	8.15036E-58	1.87060E-76	0.00000E+00	0.00000E+00
Y	39	92	1.27440E+04	4.87514E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	94	1.12200E+03	1.07259E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y	39	96	9.80496E+00	1.00034E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	88	7.20602E+06	2.34507E-23	2.60149E-27	6.06618E-30	1.53833E-36	1.00909E-49	6.61927E-63	0.00000E+00	0.00000E+00
ZR	40	89	2.82249E+05	2.64348E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR	40	93	4.74758E+13	4.71137E-23	4.71136E-23	4.71136E-23	4.71135E-23	4.71133E-23	4.71130E-23	4.71124E-23	4.71115E-23
ZR	40	95	5.63534E+06	2.26909E-19	1.98863E-24	8.45476E-28	3.15030E-36	4.37360E-53	6.07193E-70	0.00000E+00	0.00000E+00
ZR	40	97	6.04840E+04	4.09598E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	91	2.20888E+10	1.00034E-24	9.97374E-25	9.95400E-25	9.90484E-25	9.80724E-25	9.71060E-25	9.42636E-25	9.06027E-25
NB	41	92	8.80746E+05	3.99049E-20	1.74920E-52	4.68503E-74	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	94	6.30134E+11	6.30683E-21	6.80612E-21	6.80565E-21	6.80447E-21	6.80211E-21	6.79974E-21	6.79267E-21	6.78324E-21
NB	41	95	3.02684E+06	6.62610E-21	1.77697E-30	9.30978E-37	1.90597E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	96	8.28132E+04	9.22489E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	97	4.33217E+03	8.48205E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	98	3.06025E+03	2.67110E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB	41	100	3.09994E+00	1.86332E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	93	2.84077E+11	6.33878E-23	6.33732E-23	6.33634E-23	6.33390E-23	6.32902E-23	6.32415E-23	6.30956E-23	6.29016E-23
MO	42	99	2.41515E+05	7.33964E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO	42	101	8.76292E+02	3.53727E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	104	2.61565E+02	2.87227E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH	45	106	7.84813E+03	1.07134E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD	46	107	2.05134E+14	4.11348E-29	4.11348E-29	4.11348E-29	4.11347E-29	4.11347E-29	4.11346E-29	4.11345E-29	4.11343E-29
PD	46	109	4.83704E+04	1.07823E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	106	7.34422E+05	4.73345E-22	7.41347E-61	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG	47	108	4.10389E+09	6.56252E-19	6.45842E-19	6.38994E-19	6.22189E-19	5.89894E-19	5.59276E-19	4.76630E-19	3.85113E-19
AG	47	110	2.15826E+07	1.11581E-16	5.33473E-18	7.02739E-19	4.42589E-21	1.75554E-25	4.96338E-30	4.34561E-43	1.07568E-60
CD	48	109	3.99508E+07	8.86734E-23	1.71567E-23	5.73931E-24	3.71473E-25	1.55617E-27	6.51919E-30	4.79278E-37	1.47610E-46
CD	48	111	2.92221E+03	2.24481E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	115	1.92541E+05	7.08739E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	117	1.22399E+04	2.15075E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD	48	119	5.97541E+02	1.29656E-26	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	111	2.42444E+05	3.31055E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	112	1.25400E+03	1.79345E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	114	4.27869E+06	3.16653E-23	6.91533E-30	2.50785E-34	1.98622E-45	1.24581E-67	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	115	1.61497E+04	3.58242E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	116	1.40998E+01	1.65440E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	117	6.95931E+03	2.31485E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	118	2.63955E+02	8.63415E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	119	1.26027E+02	8.71995E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	120	6.40093E+01	1.92498E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN	49	122	1.00998E+01	2.63597E-25	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	113	9.94473E+06	8.71798E-20	1.18752E-22	1.45923E-24	2.44253E-29	4.84304E-39	1.91719E-48	4.21609E-77	0.00000E+00
SN	50	121	9.72156E+04	4.16329E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN	50	123	1.87967E+07	6.03108E-19	1.38277E-21	2.40432E-23	9.58530E-28	1.52338E-36	2.42109E-45	9.71910E-72	0.00000E+00
SN	50	125	8.12599E+05	7.46559E-18	4.32742E-53	2.63026E-76	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

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I	53	130	4.44981E+04	8.00665E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE	54	133	4.56018E+05	3.68528E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	132	5.58990E+05	3.75224E-20	3.89607E-71	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS	55	134	6.47801E+07	3.25946E-16	1.18360E-16	6.02439E-17	1.11348E-17	3.80377E-19	1.29942E-20	5.18030E-25	7.05429E-31
EU	63	152	4.17559E+08	2.82396E-15	2.41327E-15	2.17323E-15	1.67244E-15	9.90475E-16	5.86591E-16	1.21846E-16	1.49893E-17
EU	63	154	2.69812E+08	2.83346E-16	2.22172E-16	1.88918E-16	1.25959E-16	5.59937E-17	2.48915E-17	2.18667E-18	8.53940E-20
LU	71	174	1.22687E+07	1.61817E-26	7.69307E-29	2.17513E-30	2.92381E-34	5.28294E-42	9.54542E-50	5.63068E-73	0.00000E+00
LU	71	177	1.58242E+07	7.25130E-24	6.29312E-26	2.65766E-27	9.74064E-31	1.308 4E-37	1.75760E-44	4.26015E-65	0.00000E+00
HF	72	175	8.49653E+04	1.74836E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	175	6.04840E+06	1.74694E-17	3.39155E-22	2.44989E-25	3.43575E-33	6.75696E-49	1.32887E-64	0.00000E+00	0.00000E+00
HF	72	178	9.78261E+08	6.51504E-25	6.09235E-25	5.82590E-25	5.20965E-25	4.16581E-25	3.33112E-25	1.70320E-25	6.96352E-26
HF	72	179	1.89384E+10	3.09219E-26	3.08150E-26	3.07439E-26	3.05669E-26	3.02158E-26	2.98688E-26	2.88516E-26	2.75490E-26
HF	72	180	1.98723E+04	6.64140E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	181	3.66357E+06	1.26086E-16	2.09673E-24	1.36604E-29	1.48003E-42	1.73720E-68	0.00000E+00	0.00000E+00	0.00000E+00
HF	72	182	2.84077E+14	3.27416E-31	3.27416E-31	3.27416E-31	3.27416E-31	3.27415E-31	3.27415E-31	3.27414E-31	3.27413E-31
TA	73	180	2.93458E+04	8.15091E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA	73	182	9.89362E+06	2.06337E-16	2.71643E-19	3.26296E-21	5.16009E-26	1.29040E-35	3.22694E-45	5.04659E-74	0.00000E+00
W	74	181	1.20968E+07	6.06280E-20	2.67137E-22	7.17972E-24	8.50253E-28	1.19238E-35	1.67219E-43	4.61200E-67	0.00000E+00
W	74	185	6.47801E+06	9.48429E-18	3.78099E-22	4.41239E-25	2.05284E-32	4.44311E-47	9.61669E-62	0.00000E+00	0.00000E+00
W	74	187	8.59984E+04	1.86878E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	203	4.02526E+06	2.30305E-22	1.91494E-29	3.64799E-34	5.77851E-46	1.44978E-69	0.00000E+00	0.00000E+00	0.00000E+00
HG	80	205	3.11947E+02	1.79401E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	204	1.19282E+08	2.33593E-24	1.34752E-24	9.33796E-25	3.73289E-25	5.96528E-26	9.53271E-27	3.89021E-29	2.53697E-32
TL	81	206	2.52054E+02	4.14337E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL	81	207	2.86188E+02	3.37028E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	203	1.86782E+05	9.09866E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB	82	205	4.76390E+14	4.14735E-25	4.14735E-25	4.14735E-25	4.14735E-25	4.14735E-25	4.14735E-25	4.14734E-25	4.14733E-25
PB	82	207	7.95989E-01	9.03303E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)				1.55999E-12	6.91198E-14	4.22756E-14	1.36405E-14	2.75799E-15	1.20818E-15	2.62546E-16	7.93867E-17
TOTAL (CURIES)				1.50960E-05	6.68873E-07	4.09101E-07	1.31999E-07	2.6685?E-08	1.16916E-08	2.54066E-09	7.68225E-10

COMPONENT : CONCRETE - AXIAL DOWN - TENTH 6 INCHES - RS
VOLUME : 9.67700E+06 CC
: ABOVE VOLUME IS FOR THE TENTH 6 INCHES OF CONCRETE
: IN THE AXIAL DOWN DIRECTION.
:
: (INTERVALS 83-85 TOTGDNRS)

NUCLIDE SYM	Z	A	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	4.35000E-16	3.67191E-16	3.27964E-16	2.47266E-16	1.40553E-16	7.98943E-17	1.46738E-17	1.53194E-18
HE	2	6	8.09751E-01	5.08522E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	1.15244E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.31239E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	3.62086E-26	3.62085E-26	3.62085E-26	3.62085E-26	3.62084E-26	3.62083E-26	3.62080E-26	3.62076E-26
B	5	12	1.99754E-02	1.58906E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
C	6	14	1.80978E+11	2.14671E-19	2.14393E-19	2.14362E-19	2.14212E-19	2.13953E-19	2.13695E-19	2.12922E-19	2.11895E-19
F	9	20	1.10023E+01	8.35393E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NE	10	23	3.76710E+01	1.02237E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NA	11	24	5.41521E+04	2.20228E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MG	12	27	5.68153E+02	4.94285E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	2.98123E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SI	14	31	9.43057E+03	1.56053E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	5.73428E-17	4.92576E-40	2.06603E-55	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
S	16	35	7.60030E+06	2.03776E-17	5.04893E-21	1.59718E-23	8.98986E-30	2.84791E-42	9.02193E-55	0.00000E+00	0.00000E+00
S	16	37	3.04012E+02	4.81825E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CL	17	36	9.77641E+12	2.09382E-20	2.09381E-20	2.09380E-20	2.09378E-20	2.09373E-20	2.09368E-20	2.09354E-20	2.09336E-20
AR	18	37	3.02684E+06	1.58271E-15	7.23184E-25	3.82141E-31	7.75683E-47	3.19565E-78	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	5.77378E-18	5.72929E-18	5.69982E-18	5.62682E-18	5.48360E-18	5.34402E-18	4.94626E-18	4.46157E-18
AR	18	41	6.60148E+03	2.14848E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
K	19	40	4.10146E+16	2.78937E-23	2.78937E-23	2.78937E-23	2.78937E-23	2.78937E-23	2.78937E-23	2.78937E-23	2.78937E-23
K	19	42	4.47192E+04	7.59111E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CA	20	41	2.52853E+12	5.93055E-18	5.93040E-18	5.93029E-18	5.93004E-18	5.92952E-18	5.92901E-18	5.92746E-18	5.92541E-18
CA	20	45	1.42623E+07	2.36473E-15	2.35429E-17	1.09574E-18	5.12866E-22	1.11828E-28	2.44220E-35	2.54373E-55	0.00000E+00
CA	20	47	3.91608E+05	1.18217E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	3.10839E-16	3.64635E-20	8.73788E-23	2.45634E-29	1.94102E-42	1.53378E-55	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	3.17847E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	1.14868E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	3.97343E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.05147E+02	2.15645E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	3.40462E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	3.62340E-22	3.63079E-23	7.83292E-24	1.69338E-25	7.91309E-29	3.69798E-32	3.77403E-42	1.79997E-55
V	23	52	2.02084E+02	8.98099E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	53	1.19922E+02	2.64182E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	54	5.50117E+01	3.85287E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	1.46059E-16	1.91446E-28	2.29291E-36	3.59968E-56	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	2.19461E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	2.70259E-25	2.70259E-25	2.70259E-25	2.70259E-25	2.70258E-25	2.70258E-25	2.70256E-25	2.70254E-25
MN	25	54	2.61565E+07	2.37731E-16	1.93426E-17	3.63191E-18	5.54864E-20	1.29506E-23	3.02261E-27	3.84306E-38	1.14344E-52
MN	25	56	9.29152E+03	2.06762E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]
MN	25	57	1.01933E+02	4.17105E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	[illegible]
MN	25	58	6.60140E+01	6.41326E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	2.57827E-14	1.15851E-14	6.79641E-15	1.79156E-15	1.24490E-16	8.65040E-18	2.90232E-21	6.76641E-26
FE	26	59	3.89409E+06	3.17618E-16	1.52505E-23	2.01465E-28	1.27792E-40	5.14144E-65	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	60	3.15569E+12	6.31581E-31	6.31568E-31	6.31560E-31	6.31538E-31	6.31494E-31	6.31450E-31	6.31319E-31	6.31144E-31
FE	26	61	3.60001E+02	7.88783E-25	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	57	2.34838E+07	2.49965E-21	1.52863E-22	2.37775E-23	2.25231E-25	2.02943E-29	1.82860E-33	1.33770E-45	8.81749E-62
CO	27	58	6.13405E+06	6.83227E-19	1.54337E-23	1.23333E-26	2.22636E-34	7.25459E-50	2.36391E-65	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	6.87157E-16	4.88872E-16	3.14138E-16	1.62538E-16	4.35212E-17	1.16490E-17	2.23505E-19	1.14804E-21
CO	27	61	5.94007E+03	6.77432E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	62	6.34812E+02	3.61193E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

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CO 27 64	2.99999E-01	2.15822E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NI 28 59	2.52053E+12	1.60142E-21	1.60138E-21	1.60135E-21	1.60128E-21	1.60114E-21	1.60100E-21	1.60059E-21	1.60032E-21
NI 28 63	2.90020E+09	2.56620E-19	2.50879E-19	2.47123E-19	2.37977E-19	2.20688E-19	[illegible]0465E-19	1.63214E-19	1.20708E-19
NI 28 65	9.21738E+03	2.37611E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CU 29 64	4.62098E+04	4.13370E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RB 37 86	1.60972E+06	4.40439E-22	8.69750E-40	1.36899E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 87	1.00799E+04	2.43677E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 89	4.50096E+06	1.36270E-20	6.34680E-27	3.81354E-31	1.06724E-41	8.35817E-63	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 90	8.86377E+08	3.56565E-25	3.31120E-25	3.15174E-25	2.78589E-25	2.17665E-25	1.70064E-25	8.11122E-26	3.02263E-26
SR 38 91	3.48315E+04	3.25450E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 92	9.75604E+03	1.57597E-25	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SR 38 93	4.50095E+02	8.06329E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 89	1.56998E+01	3.05913E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 90	2.30281E+05	3.98956E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 91	5.09667E+06	3.61799E-21	9.26210E-27	1.73331E-30	8.30395E-40	1.90585E-58	4.37414E-77	0.00000E+00	0.00000E+00
Y 39 92	1.27440E+04	1.14754E-21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 94	1.12200E+03	2.54057E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y 39 96	9.80406E+00	2.38057E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR 40 88	7.20602E+06	5.44896E-24	6.04475E-28	1.39558E-30	3.57443E-37	2.34470E-50	1.53804E-63	0.00000E+00	0.00000E+00
ZR 40 89	2.82249E+05	6.20529E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ZR 40 93	4.74758E+13	8.89348E-24	8.89347E-24	8.89346E-24	8.89344E-24	8.89340E-24	8.89336E-24	8.89323E-24	8.89307E-24
ZR 40 95	5.63534E+06	5.39902E-20	4.73219E-25	2.01171E-28	7.49576E-37	1.04065E-53	1.44474E-70	0.00000E+00	0.00000E+00
ZR 40 97	6.04840E+04	7.98843E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 91	2.20888E+10	2.37409E-25	2.36705E-25	2.36237E-25	2.35070E-25	2.32754E-25	2.30460E-25	2.23714E-25	2.15026E-25
NB 41 92	8.80746E+05	9.41764E-21	4.12815E-53	1.10567E-74	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 94	6.30134E+11	1.28708E-21	1.28694E-21	1.28685E-21	1.28663E-21	1.28618E-21	1.28574E-21	1.28440E-21	1.28262E-21
NB 41 95	3.02684E+06	1.08004E-21	4.14863E-31	2.19220E-37	4.44980E-53	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 96	8.28132E+04	2.16981E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 97	4.33217E+03	1.98724E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 98	3.06025E+03	6.32074E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
NB 41 100	3.09994E+00	4.43306E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO 42 93	2.84077E+11	1.27026E-23	1.26997E-23	1.26977E-23	1.26928E-23	1.26831E-23	1.26733E-23	1.26441E-23	1.26052E-23
MO 42 99	2.41515E+05	1.41982E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MO 42 101	8.76292E+02	6.79001E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH 45 104	2.61565E+02	4.89498E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
RH 45 106	7.84813E+03	2.50247E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PD 46 107	2.05134E+14	9.63666E-30	9.63666E-30	9.63666E-30	9.63665E-30	9.63664E-30	9.63663E-30	9.63660E-30	9.63656E-30
PD 46 109	4.83704E+04	2.52413E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG 47 106	7.34422E+05	1.12648E-22	1.76428E-61	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AG 47 108	4.10389E+09	1.23241E-19	1.21286E-19	1.20000E-19	1.16844E-19	1.10779E-19	1.05029E-19	8.95085E-20	7.23221E-20
AG 47 110	2.15826E+07	2.11235E-17	1.00992E-18	1.33036E-19	8.37872E-22	3.32344E-26	1.31824E-30	8.22672E-44	2.03638E-61
CD 48 109	3.99508E+07	1.07447E-23	4.01373E-24	1.34268E-24	8.69043E-26	3.64060E-28	1.52513E-30	1.12125E-37	3.45328E-47
CD 48 111	2.92221E+03	5.27629E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD 48 115	1.92541E+05	1.68048E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD 48 117	1.22399E+04	5.11833E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CD 48 119	5.97541E+02	2.87141E-27	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 111	2.42444E+05	7.85107E-25	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 112	1.25400E+03	4.19588E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 114	4.27869E+06	7.43450E-24	1.62360E-30	5.88803E-35	[illegible]96332E-46	2.92495E-68	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 115	1.61497E+04	8.38382E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 116	1.40998E+01	3.90186E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 117	6.95931E+03	5.42596E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 118	2.63955E+02	2.04524E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 119	1.26027E+02	2.04949E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 120	4.40093E+01	4.57983E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
IN 49 122	1.00998E+01	6.27315E-26	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN 50 113	9.94473E+06	1.73611E-20	2.36484E-23	2.90592E-25	4.66407E-30	1.36273E-39	3.81792E-49	8.39596E-78	0.00000E+00
SN 50 121	9.72156E+04	7.88066E-19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SN 50 123	1.07967E+07	1.15664E-19	2.65193E-22	4.61108E-24	1.83830E-28	2.92159E-37	4.64325E-46	1.86396E-72	0.00000E+00
SN 50 125	8.12599E+05	1.40899E-18	1.19418E-53	4.96415E-77	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

I 53 130	4.44981E+04	1.87132E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE 54 133	4.56018E+05	8.57638E-22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS 55 132	5.58990E+05	8.92969E-21	9.27196E-72	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CS 55 134	6.47801E+07	6.16303E-17	2.23797E-1	1.13910E-17	2.10537E-18	7.19222E-20	2.45695E-21	9.79498E-26	1.33395E-31
EU 63 152	4.17559E+08	5.28043E-16	4.51250E-16	4.06364E-16	3.12724E-16	1.85206E-16	1.09685E-16	2.27836E-17	2.80280E-18
EU 63 154	2.69812E+08	5.31498E-17	4.16749E-17	3.54370E-17	2.36272E-17	1.05033E-17	4.66912E-18	4.10174E-19	1.60182E-20
LU 71 174	1.22687E+07	3.70934E-27	1.76349E-29	4.98607E-31	6.70230E-35	1.21102E-42	2.18811E-50	1.29073E-73	0.00000E+00
LU 71 177	1.38242E+07	1.69657E-24	1.47239E-26	6.21808E-28	2.27900E-31	3.06134E-38	4.11222E-45	9.96739E-66	0.00000E+00
HF 72 173	8.49653E+04	4.16079E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF 72 175	6.04840E+06	3.27858E-18	6.36509E-23	4.59784E-26	4.44805E-34	1.26811E-49	2.49395E-65	0.00000E+00	0.00000E+00
HF 72 178	9.78261E+08	1.55100E-25	1.63167E-25	1.36905E-25	1.22424E-25	9.78942E-26	7.82796E-26	4.00241E-26	1.63639E-26
HF 72 179	1.89384E+10	7.24854E-27	7.22347E-27	7.20680E-27	7.16530E-27	7.08302E-27	7.00168E-27	6.74322E-27	6.45787E-2
HF 72 180	1.98723E+04	1.56224E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HF 72 181	3.46357E+06	2.38300E-17	3.96279E-25	2.58179E-30	2.79724E-43	3.28329E-69	0.00000E+00	0.00000E+00	0.00000E+00
HF 72 182	2.84077E+14	7.71766E-32	7.71766E-32	7.71766E-32	7.71765E-32	7.71765E-32	7.71764E-32	7.71762E-32	7.71760E-32
TA 73 180	2.93458E+04	1.93845E-20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TA 73 182	9.89362E+06	3.92496E-17	5.16722E-20	6.29684E-22	9.81557E-27	2.45461E-36	6.13832E-46	9.59967E-75	0.00000E+00
W 74 181	1.20968E+07	1.44281E-20	6.35725E-23	1.70861E-24	2.02341E-28	2.83760E-36	3.97942E-44	1.09755E-67	0.00000E+00
W 74 185	6.47801E+06	1.80155E-18	7.18205E-23	8.38139E-26	3.89941E-33	8.43975E-48	1.82670E-62	0.00000E+00	0.00000E+00
W 74 187	8.59984E+04	3.53450E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HG 80 203	4.02525E+06	5.43443E-23	4.51862E-30	8.60801E-35	1.36353E-46	3.42096E-70	0.00000E+00	0.00000E+00	0.00000E+00
HG 80 205	3.11967E+02	4.25555E-23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL 81 204	1.19282E+08	5.49477E-25	3.16975E-25	[illegible].19656E-25	8.78083E-26	1.40321E-26	2.24237E-27	9.15890E-30	5.96768E-33
TL 81 206	2.52054E+02	9.79014E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TL 81 207	2.86188E+02	7.96006E-24	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB 82 203	1.86782E+05	2.16530E-28	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PB 82 205	4.76390E+14	9.86746E-26	9.86746E-26	9.86746E-26	9.86746E-26	9.86746E-26	9.86745E-26	9.86744E-26	9.86742E-26
PB 82 207	7.95989E-01	2.14723E-18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL (CURIES/CC)		2.93762E-13	1.29327E-14	7.98879E-15	2.55203E-15	5.16318E-16	2.26370E-16	4.94571E-17	1.51677E-17
TOTAL (CURIES)		2.84273E-06	1.25150E-07	7.65333E-08	2.46960E-08	4.99641E-09	2.19058E-09	4.78596E-10	1.46777E-10

COMPONENT : REMOVABLE TOP GRAPHITE REFLECTORS - R6
VOLUME : 9.34290E+06 CC
: ABOVE VOLUME IS THE TOTAL VOLUME OF TOP HALF LENGTH NON CONTROL
: ROD GRAPHITE REFLECTORS
: 210 HALF LENGTH BLOCKS AT 4.449E4 CC PER BLOCK
: (INTERVALS 22-28 GRPHUPR6)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	3.78506E-05	3.19503E-05	2.85371E-05	2.15154E-05	1.22299E-05	6.95183E-06	1.27681E-06	1.33299E-07
HE	2	6	8.09751E-01	9.67073E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	3.14959E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	3.14109E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	1.32552E-14	1.32552E-14	1.32552E-14	1.32552E-14	1.32552E-14	1.32551E-14	1.32550E-14	1.32549E-14
B	5	12	1.99754E-02	4.81693E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	3.89370E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.21350E-09	1.04241E-32	4.37221E-48	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	2.96131E-09	1.13750E-18	6.01070E-25	1.22007E-40	5.02643E-72	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	1.15772E-14	1.14880E-14	1.14290E-14	1.12826E-14	1.09954E-14	1.07155E-14	9.91795E-15	8.94608E-15
CA	20	41	2.52053E+12	2.21815E-08	2.21809E-08	2.21805E-08	2.21795E-08	2.21776E-08	2.21757E-08	2.21699E-08	2.21622E-08
CA	20	45	1.42623E+07	8.51195E-06	8.54468E-08	3.97780E-09	1.85892E-12	4.05965E-19	8.86581E-26	9.23437E-46	2.10049E-72
CA	20	47	3.91608E+05	4.42056E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	3.00435E-11	3.52430E-15	8.44541E-18	2.37413E-24	1.87605E-37	1.48244E-50	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	4.94582E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	6.08626E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	3.69562E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	6.90715E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	7.52192E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.14111E-14	1.14344E-15	2.46682E-16	5.53268E-18	2.49206E-21	1.16460E-24	1.18855E-34	5.66863E-48
V	23	52	2.02084E+02	4.51555E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	1.48606E-11	1.94784E-23	2.33288E-31	3.66244E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	4.88138E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.01311E-19	1.01311E-19	1.01311E-19	1.01311E-19	1.01311E-19	1.01311E-19	1.01310E-19	1.01310E-19
MN	25	54	2.61565E+07	3.47396E-10	2.62453E-11	5.30730E-12	8.10821E-14	1.89247E-17	4.41692E-21	5.61534E-32	1.66651E-46
MN	25	56	9.29152E+03	1.20233E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	3.48178E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	2.51406E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	6.85836E-05	3.06171E-05	1.80789E-05	4.76567E-06	3.31151E-07	2.30136E-08	7.72035E-12	1.79991E-16
FE	26	59	3.89409E+06	8.13770E-07	3.90734E-14	5.16172E-19	3.27417E-31	1.31729E-55	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	1.79767E-05	1.21022E-05	9.29817E-06	4.81096E-06	1.28795E-06	3.44798E-07	6.61554E-09	3.39807E-11
TOTAL (CURIES/CC)				5.86909E-04	7.49772E-05	5.59404E-05	3.11141E-05	1.38712E-05	7.34182E-06	1.30560E-06	1.55495E-07
TOTAL (CURIES)				5.48343E+03	7.00505E+02	5.22645E+02	2.90696E+02	1.29597E+02	6.85939E+01	1.21981E+01	1.45277E+00

COMPONENT : REMOVABLE TOP GRAPHITE REFLECTORS - R6
VOLUME : 1.26350E+07 CC
: ABOVE VOLUME IS THE TOTAL VOLUME OF TOP TRANSITION BLOCKS.
: 57 FULL LENGTH BLOCKS AT 8.8989E4 CC/BLOCK
: 218 HALF LENGTH BLOCKS AT 4.449E4 CC PER BLOCK
: (INTERVALS 16-21 GRPHUPR6)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	4.51927E-05	3.64597E-05	3.25648E-05	2.45520E-05	1.39560E-05	7.93299E-06	1.45781E-06	1.52112E-07
HE	2	6	8.09751E-01	4.37563E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	7.11433E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.90531E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	3.58022E-14	3.58022E-14	3.58022E-14	3.58422E-14	3.58020E-14	3.58020E-14	3.58017E-14	3.58013E-14
B	5	12	1.99754E-02	1.08939E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	1.36160E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	6.04839E-08	5.88282E-31	2.46744E-46	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	1.38083E-07	5.30404E-17	2.80273E-23	5.68968E-39	2.36378E-70	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	4.09646E-13	4.06490E-13	4.04599E-13	3.99220E-13	3.89058E-13	3.79156E-13	3.50934E-13	3.26546E-13
CA	20	41	2.52053E+12	4.96239E-08	4.96226E-08	4.96217E-08	4.96196E-08	4.96153E-08	4.96110E-08	4.95981E-08	4.95808E-08
CA	20	45	1.42623E+07	1.93582E-05	1.94372E-07	9.04447E-09	4.22763E-12	9.23259E-19	2.81629E-25	2.10011E-45	4.77700E-72
CA	20	47	3.91608E+05	9.89007E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.18358E-09	1.38642E-13	5.32713E-16	9.35305E-23	7.39884E-36	5.84020E-49	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	3.10127E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	1.97806E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	1.48774E-10	0.00000E+00	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	1.99750E-12	0.00000E+00	[illegible]	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.70635E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	3.29470E-13	3.30141E-14	[illegible]	1.53969E-16	7.19524E-20	3.36251E-23	3.43166E-33	1.63668E-46
V	23	52	2.02084E+02	1.02103E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	8.71710E-10	1.14259E-21	1.36845E-29	2.14836E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	1.43212E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	2.92514E-18	2.92514E-18	2.92514E-1[illegible]	2.92514E-18	2.92513E-18	2.92512E-18	2.92511E-18	2.92509E-18
MN	25	54	2.61565E+07	1.78601E-08	1.45316E-09	2.72856E-10	4.10854E-12	9.72943E-16	2.27080E-19	2.88718E-30	8.56777E-45
MN	25	56	9.29152E+03	4.17777E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.29626E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	7.32469E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.53577E-04	6.90075E-05	[illegible]	1.06716E-05	7.41534E-07	5.15269E-08	1.72879E-11	4.03047E-16
FE	26	59	3.89409E+06	1.88386E-06	9.84542E-14	[illegible]	7.57964E-31	3.04950E-55	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	4.22842E-05	2.84759E-05	[illegible]	1.13200E-05	3.03048E-06	8.11294E-07	1.55641E-08	7.99551E-11
TOTAL (CURIES/CC)				1.28531E-03	1.34189E-04	9.49853E-05	4.65931E-05	1.77776E-05	8.84543E-06	1.52219E-06	2.01773E-07
TOTAL (CURIES)				1.62406E+04	1.69547E+03	1.20014E+03	5.88704E+02	2.24620E+02	1.11762E+02	1.92329E+01	2.54940E+00

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COMPONENT : REMOVABLE SIDE REFLECTORS - R6
VOLUME : 4.53840E+07 CC
: ABOVE VOLUME IS THE TOT VOL OF SIDE REMOVABLE REFL. - 8.5 FULL
: LENGTH EQUIV. BLKS/COLUMN (60 COLS) 510 EQUIV BLKS AT 8.89896E4 CC
: (EXCLUDES MCB, HASTELLOY SIDE REFL AND BOTTOM SIDE TRANSITION BLK
: (INTERVALS 29-34 GRPHRDR6)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
				CONCENTRATION (CURIES/CC) AT TIME							
H	1	3	3.87233E+08	5.55465E-05	4.68877E-05	4.18788E-05	3.15741E-05	1.79476E-05	1.02019E-05	1.8737[illegible]	1.95618E-07
HE	2	6	8.09751E-01	6.68575E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	1.02264E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	2.93438E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	5.23626E-14	5.23626E-14	5.23625E-14	5.23625E-14	5.23623E-14	5.23622E-14	5.23617E-14	5.23612E-14
B	5	12	1.99754E-02	1.57525E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	2.08031E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.05399E-07	9.05382E-31	3.79749E-46	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	2.12169E-07	8.14981E-17	4.30648E-23	8.74144E-39	3.60129E-70	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	6.27349E-13	6.22516E-13	6.19314E-13	6.11381E-13	5.95820E-13	5.80655E-13	5.37435E-13	4.84772E-13
CA	20	41	2.52053E+12	7.16571E-08	7.16552E-08	7.16540E-08	7.16509E-08	7.16446E-08	7.16385E-08	7.16198E-08	7.15950E-08
CA	20	45	1.42623E+07	2.79711E-05	2.80852E-07	1.30715E-08	6.10861E-12	1.33404E-18	2.91339E-25	3.03450E-45	6.90240E-72
CA	20	47	3.91608E+05	1.42814E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.81025E-09	2.12355E-13	5.08874E-16	1.43052E-22	1.13040E-35	8.93238E-49	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	4.76809E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	3.00823E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	2.27591E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	3.04533E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	2.45894E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	5.03268E-13	5.04294E-14	1.08795E-14	2.35188E-16	1.09908E-19	5.13627E-23	5.24190E-33	2.50025E-46
V	23	52	2.02084E+02	1.47406E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	1.34344E-09	1.76091E-21	2.10900E-29	3.31096E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	2.19021E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	4.47229E-18	4.47229E-18	4.47229E-18	4.47228E-18	4.47228E-18	4.47227E-18	4.47224E-18	4.47221E-18
MN	25	54	2.61565E+07	2.74843E-08	2.23622E-09	4.19889E-10	6.41483E-12	1.49723E-15	3.49446E-19	4.44300E-30	1.31867E-44
MN	25	56	9.29152E+03	6.40074E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	1.98717E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.12006E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.28292E+07	2.21902E-04	9.97083E-05	5.64941E-05	1.54193E-05	1.87143E-06	[illegible]	2.49781E-11	5.82059E-16
FE	26	59	3.89409E+06	2.72639E-06	1.30908E-15	1.72934E-18	1.09449E-30	6.41334E-55	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	6.10396E-05	4.11066E-05	3.15824E-05	1.63410E-05	4.37467E-06	1.17115E-06	2.24705E-08	1.15420E-10
			TOTAL (CURIES/CC)	1.84911E-03	1.88057E-04	1.32040E-04	6.34061E-05	2.34654E-05	1.15193E-05	1.96785E-06	2.67529E-07
			TOTAL (CURIES)	8.39201E+04	8.53479E+03	5.99252E+03	2.87762E+03	1.06495E+03	5.22786E+02	8.93089E+01	1.21325E+01

COMPONENT : REMOVABLE BOTTOM GRAPHITE REFLECTORS - R6
VOLUME : 9.34290E+06 CC
: ABOVE VOLUME IS THE TOTAL VOLUME OF BOTTOM HALF LENGTH NON CR
: GRAPHITE REFLECTORS
: 210 HALF LENGTH BLOCKS AT 4.449E4 CC PER BLOCK
: (INTERVALS 16-24 GRPHDNR6)

NUCLIDE SYM	Z	N	HALF-LIFE (SECONDS)	SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
				CONCENTRATION (CURIES/CC) AT TIME							
H	1	3	3.87233E+08	4.07499E-05	3.39756E-05	3.03461E-05	2.28797E-05	1.30052E-05	7.39250E-06	1.35774E-06	1.41768E-07
HE	2	6	8.09751E-01	2.55145E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	3.83434E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.11402E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	1.96315E-14	1.96315E-14	1.96315E-14	1.96314E-14	1.96314E-14	1.96313E-14	1.96312E-14	1.96310E-14
B	5	12	1.99754E-02	5.89436E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	7.94627E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	6.20534E-08	3.44365E-32	1.44313E-46	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	5.06457E-08	3.10697E-17	1.64177E-23	3.33252E-39	1.37293E-70	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48403E+09	2.40622E-13	2.38768E-13	2.37540E-13	2.34497E-13	2.28529E-13	2.22712E-13	2.06135E-13	1.85934E-13
CA	20	41	2.52053E+12	2.68130E-08	2.68123E-08	2.68119E-08	2.68107E-08	2.68084E-08	2.68061E-08	2.67991E-08	2.67898E-08
CA	20	45	1.42625E+07	1.04819E-05	1.05246E-07	4.89843E-09	2.28913E-12	4.99917E-19	1.09176E-25	1.13715E-45	2.58660E-72
CA	20	47	3.91608E+05	5.34389E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	6.89987E-10	8.17544E-14	1.73960E-16	5.45269E-23	4.30859E-36	3.40462E-49	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	1.80140E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	1.15101E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	8.67122E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	1.16849E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48313E+02	9.17749E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.93076E-13	1.93470E-14	4.17384E-15	9.02289E-17	4.21456E-20	1.97054E-23	2.01183E-33	9.59130E-47
V	23	52	2.02084E+02	5.49898E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	5.09629E-10	6.67903E-22	8.00041E-30	1.25600E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	8.62581E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.72134E-18	1.72133E-18	1.72133E-18	1.72133E-18	1.72133E-18	1.72133E-18	1.72132E-18	1.72130E-18
MN	25	54	2.61565E+07	1.04470E-08	8.50052E-10	1.59602E-10	2.43832E-12	5.69187E-16	1.32827E-19	1.68881E-30	5.01154E-45
MN	25	56	9.29152E+03	2.45385E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	7.60567E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	4.39957E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.27292E+07	8.29406E-05	3.72681E-05	2.18634E-05	5.76329E-06	6.80475E-07	2.76276E-08	9.33649E-12	2.17669E-16
FE	26	59	3.89409E+06	1.02184E-06	4.90641E-16	4.48152E-19	4.11154E-31	1.45411E-55	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	2.29679E-05	1.54676E-05	1.18830E-05	6.14879E-06	1.64610E-06	4.40675E-07	8.45518E-09	4.34300E-11
			TOTAL (CURIES/CC)	7.09758E-04	8.68442E-05	6.42252E-05	3.48180E-05	1.56780E-05	7.88781E-06	1.59390E-06	1.68582E-07
			TOTAL (CURIES)	6.63120E+03	8.11377E+02	5.99115E+02	3.25302E+02	1.46677E+02	7.36950E+01	1.50147E+01	1.57504E+00

COMPONENT : REMOVABLE BOTTOM TRANSITION GRAPHITE REFLECTORS - R6
VOLUME : 1.18120E+07 CC
: ABOVE VOLUME IS THE TOTAL VOLUME OF BOTTOM TRANSITION BLOCKS.
: 37 3/4 LENGTH CR BLKS AT 6.6726E4 CC/BLOCK, 210 HALF LENGTH HCR
: BLKS AT 4.449E4 CC PER BLK (INCLUDES SIDE COLUMN TRANSITION BLKS)
: (INTERVALS 33-38 GRPHDHR6)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	1.18193E-07	9.97686E-08	8.91105E-08	6.71841E-08	3.81893E-08	2.17079E-08	3.98697E-09	4.16240E-10
HE	2	6	8.09751E-01	8.84134E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	3.12661E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	2.64223E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	1.97720E-17	1.97720E-17	1.97720E-17	1.97719E-17	1.97719E-17	1.97718E-17	1.97717E-17	1.97715E-17
B	5	12	1.99754E-02	4.80954E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	4.17962E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	1.07489E-10	9.23337E-34	3.87280E-49	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	2.6444[illegible]E-10	1.09259E-19	5.77342E-26	1.17191E-41	4.82801E-73	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	1.23979E-15	1.23024E-15	1.22391E-15	1.20823E-15	1.17748E-15	1.1475[illegible]E-15	1.06210E-15	9.58021E-16
CA	20	41	2.52053E+12	2.16003E-11	2.15998E-11	2.15994E-11	2.15985E-11	2.15966E-11	2.15947E-11	2.15891E-11	2.15816E-11
CA	20	45	1.42623E+07	8.60109E-09	8.63619E-11	4.01946E-12	1.87839E-15	4.10216E-22	8.95865E-29	9.33108E-49	2.12246E-75
CA	20	47	3.91608E+05	4.30528E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	2.99041E-12	3.50795E-16	8.40624E-19	2.36311E-25	1.86735E-38	1.47557E-51	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	4.12938E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	4.83125E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	3.62816E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	8.19225E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	7.56178E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	1.35660E-15	1.35937E-16	2.93264E-17	6.33970E-19	2.96266E-22	1.58452E-25	1.41300E-35	4.73908E-49
V	23	52	2.02884E+02	4.48843E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	1.30506E-12	1.71060E-24	2.04874E-32	3.21636E-52	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	5.79230E-16	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	1.20944E-20	1.20944E-20	1.20944E-20	1.20944E-20	1.20944E-20	1.20944E-20	1.20943E-20	1.20942E-20
MN	25	54	2.61565E+07	3.18041E-11	2.58769E-12	4.85884E-13	7.42306E-15	1.73255E-18	4.04349E-22	5.14131E-33	1.52569E-47
MN	25	56	9.29152E+03	1.30238E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	3.60325E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	2.99110E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	4.68911E-08	3.20566E-08	1.76328E-08	4.64607E-09	3.22979E-10	2.24428E-11	7.52943E-15	1.75549E-19
FE	26	59	3.89409E+06	8.45080E-10	4.15371E-17	5.48719E-22	3.48061E-34	1.40035E-56	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	2.00196E-08	1.34820E-08	1.03583E-08	5.35948E-09	1.43479E-09	3.84111E-10	7.56981E-12	3.78551E-14
TOTAL (CURIES/CC)				6.65916E-07	1.43418E-07	1.17127E-07	7.72131E-08	3.99687E-08	2.21360E-08	4.01593E-09	4.37860E-10
TOTAL (CURIES)				7.86580E+00	1.69405E+00	1.38351E+00	9.12042E-01	4.72110E-01	2.61471E-01	4.74342E-02	5.17201E-03

COMPONENT : REMOVABLE BOTTOM HASTELLOY GRAPHITE REFLECTORS - R6
VOLUME : 1.09890E+07 CC
: ABOVE VOLUME IS THE TOTAL VOLUME OF BOTTOM HASTELLOY [illegible]OCKS.
: 37 1/2 LENGTH CR BLKS AT 6.669E4 CC PER BLK. 210 1/2 [illegible]NGTH HCR
: BLKS AT 4.449E4 CC/BLK (INCLUDES SIDE COLUMN HASTELLOY BLKS)
: (INTERVALS 25-32 GRPHDHR6)

NUCLIDE SYM	Z	M	HALF-LIFE (SECONDS)	CONCENTRATION (CURIES/CC) AT TIME SHUTDOWN	3.00 YRS	5.00 YRS	10.00 YRS	20.00 YRS	30.00 YRS	60.00 YRS	100.00 YRS
H	1	3	3.87233E+08	3.00855E-07	2.53957E-07	2.26827E-07	1.71015E-07	9.72095E-08	5.52564E-08	1.01447E-08	1.05952E-09
HE	2	6	8.09751E-01	6.18875E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
LI	3	8	8.40178E-01	7.97237E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	8	3.00064E-16	1.97171E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
BE	4	10	7.88563E+13	8.60687E-17	8.60686E-17	8.60685E-17	8.60684E-17	8.60682E-17	8.60679E-17	8.60672E-17	8.60663E-17
B	5	12	1.99754E-02	1.23596E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AL	13	28	1.38629E+02	2.56846E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
P	15	32	1.23556E+06	7.78572E-10	6.61927E-33	2.77635E-46	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	37	3.02684E+06	1.91496E-09	7.35563E-19	3.86682E-25	7.88961E-41	3.25035E-72	0.00000E+00	0.00000E+00	0.00000E+00
AR	18	39	8.48405E+09	7.67195E-15	7.61284E-15	7.57368E-15	7.47668E-15	7.28637E-15	7.10091E-15	6.57230E-15	5.92834E-15
CA	20	41	2.52053E+12	5.36257E-11	5.36243E-11	5.36234E-11	5.36211E-11	5.36164E-11	5.36118E-11	5.35978E-11	5.35792E-11
CA	20	45	1.42623E+07	2.29211E-08	2.30146E-10	1.87115E-11	5.00573E-15	1.09519E-21	2.38739E-28	2.48664E-48	5.65621E-75
CA	20	47	3.91608E+05	1.86918E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	46	7.25049E+06	1.95118E-11	2.26687E-15	5.40490E-18	1.54188E-24	1.21841E-37	9.62779E-51	0.00000E+00	0.00000E+00
SC	21	47	2.96217E+05	3.60022E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	48	1.58253E+05	4.05321E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	49	3.44849E+03	2.39351E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
SC	21	50	1.03147E+02	4.65440E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TI	22	51	3.48315E+02	1.96674E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
V	23	49	2.85246E+07	7.78399E-15	7.71970E-16	1.66542E-16	3.60025E-18	1.68246E-21	7.86256E-25	8.02426E-35	3.82705E-48
V	23	52	2.02884E+02	1.15321E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	51	2.39843E+06	9.39870E-12	1.23088E-23	1.47420E-31	2.31437E-51	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CR	24	55	2.10045E+02	3.30511E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	53	1.16760E+14	6.86831E-20	6.86831E-20	6.86830E-20	6.86830E-20	6.86820E-20	6.86827E-20	6.86824E-20	6.86818E-20
MN	25	54	2.61565E+07	2.22244E-10	1.60825E-11	3.39530E-12	5.18716E-14	1.21069E-17	2.82569E-21	3.59269E-32	1.00614E-46
MN	25	56	9.29152E+03	7.96300E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	57	1.01933E+02	2.29816E-12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
MN	25	58	6.60140E+01	1.70318E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
FE	26	55	8.20292E+07	1.67815E-07	7.50457E-08	4.40250E-08	1.16054E-08	8.04420E-10	5.60356E-11	1.88006E-14	4.38314E-19
FE	26	59	3.89409E+06	2.62209E-09	1.25901E-16	1.66319E-21	1.05499E-33	4.24451E-56	0.00000E+00	0.00000E+00	0.00000E+00
CO	27	60	1.65983E+08	6.67773E-08	4.49706E-08	3.45511E-08	1.78771E-08	4.78589E-09	1.28124E-09	2.45827E-11	1.26269E-13
TOTAL (CURIES/CC)				1.72334E-06	3.74275E-07	3.05472E-07	2.00551E-07	1.02055E-07	5.66475E-08	1.02269E-08	1.11324E-09
TOTAL (CURIES)				1.89382E+01	4.11291E+00	3.35683E+00	2.20385E+00	1.13028E+00	6.22499E-01	1.12383E-01	1.22333E-02

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Attachments

EE-DEC-0010

REV D

Fort St. Vrain Activation Analysis

Attachment 1
EE-DEC-0010

Activation Analysis TSO Data Sets/Notes

Activation Analysis - R5

TSO Data Sets / Notes

ANISN - Neutron Flux Calculation - **R1
T8284

	Input	Output
Radial	ANISN.DATA(RADIALR1)	REBATE.DATA(RBTRADR1)
Axial Up	ANISN.DATA(AXUPR1)	REBATE.DATA(RBTUPR1)
Axial Down	ANISN.DATA(DOWNR.	REBATE.DATA(RBTDWNR1)

** The ANISN runs for the neutron flux were not redone for Rev. 5.

REBATE - Activation Calculations - R5
T136B

RADIAL	Input	Output
	RREBAT.DATAR5( )	RREBAT.L133R5( )
All Components (Large Reflector to Concrete)	TOTGRDR5 **TOTRDR5C	TOTGRDR5 **TOTRDR5C
Top of Core Barrel	RCBTOPR5	RCPTOPR5
Removable Side Reflectors	RREBAT.DATAR6(GRPHRDR6)	RREBAT.L133R6(GRPHRDR

AXIAL UP		
All Components (Top Non CR MCB to Concrete)	TOTGUPR5	TOTGUPR5
Top CR MCB	TOPREFR5	TOPREFR5
RCD	UPRCDR5	UPRCDR5
Upper Orifice Valve	UPOVR5	UPOVR5
Removable Top Graphite Reflectors	RREBAT.DATAR6(GRPHUPR6)	RREBAT.L133R6(GRPHUPR6)

AXIAL DOWN		
All Components (CSB to CSF)	TOTGDNR5 **TOTDNR5C	TOTGDNR5 **TOTDNR5C
Hastelloy Cans :		
Metal Only	HASTXMR5	HASTXMR5
Graphite Only	RREBAT.DATAR6(GRPHDNR6)	RREBAT.DATAR6(GRPHDNR6)
Removable Bottom Graphite Reflectors	RREBAT.DATAR6(GRPHDNR6)	RREBAT.DATAR6(GRPHDNR6

** TOTRDR5C and TOTDNR5C were added to correct impurity levels in HLM graphite used in the large side reflectors and core core support blocks.

SRCEDOS1 - Gamma Source Calculations - R5
T1368

RADIAL

All Components :	Input	Output
5 years	REBATE.L133R5(TOTGRDR5)	ANISN.DATAR5(TRAD5R5)
30 years	REBATE.L133R5(TOTGRDR5)	ANISN.DATAR5(TRAD30R5)
60 years	REBATE.L133R5(TOTGRDR5)	ANISN.DATAR5(TRAD60R5)
100 years	REBATE.L133R5(TOTGRDR5)	ANISN.DATAR5(TRAD00R5)
	RREBAT	RANISN

AXIAL UP

All Components :	Input	Output
5 years	REBATE.L133R5(TOTGUPR5)	ANISN.DATAR5(TUP5R5)
30 years	REBATE.L133R5(TOTGUPR5)	ANISN.DATAR5(TUP30R5)
60 years	REBATE.L133R5(TOTGUPR5)	ANISN.DATAR5(TUP60R5)
100 years	REBATE.L133R5(TOTGUPR5)	ANISN.DATAR5(TUP00R5)
	RREBAT	RANISN

AXIAL DOWN

All Components :	Input	Output
5 years	REBATE.L133R5(TOTGDNR5)	ANISN.DATAR5(TDWN5R5)
30 years	REBATE.L133R5(TOTGDNR5)	ANISN.DATAR5(TDWN30R5)
60 years	REBATE.L133R5(TOTGDNR5)	ANISN.DATAR5(TDWN60R5)
100 years	REBATE.L133R5(TOTGDNR5)	ANISN.DATAR5(TDWN00R5)
	RREBAT	RANISN

ANISN - Gamma Flux Calculations - R5

SRCEDOS2 - Dose Rate Calculations - R5

T\368

RADIAL	ANISN Input RANISN.DATAR5( )	ANIS. tput / SRCED.S2 Input RSDOS2.DATAR5( )	SRCEDOS2 Output RREBAT.L133R5( )
All Components :			
5 years	RALL5R5	RALL5R5	All outputs listed in member R5DOS2.
30 years	RALL30R5	RALL30R5	
60 years	RALL60R5	RALL60R5	
100 years	RALL00R5	RALL00R5	
Liner->Concrete (5 yrs)	RLIN5R5	RLIN5R5	
Liner->Concrete (60 yrs)	RLIN60R5	RLIN60R5	
Spacers->Concrete (5 yrs)	RNLG5R5	RNLG5R5	
Spacers->Concrete (60 yrs)	RNLG60R5	RNLG60R5	
Core Barrel->Concrete (5 yrs)	RCB5R5	RCB5R5	
Core Barrel->Concrete (60 yrs)	RCB60R5	RCB60R5	
Concrete Only (5 yrs)	RCON5R5	RCON5R5	
Concrete Only (60 yrs)	RCON60R5	RCON60R5	
Concrete (5 yrs) (Minus 11 int.)	R55M11	R55M11	
Concrete (5 yrs) (Minus 12 int.)	R55M12	R55M12	
Concrete (60 yrs) (Minus 3 int.)	R560M3	R560M3	
Concrete (60 yrs) (Minus 4 int.)	R560M4	R560M4	
Concrete (60 yrs) (Minus 5 int.)	R560M5	R560M5	

ANISN - Gamma Flux Calculations - R5

SRCEDOS2 - Dose Rate Calculations - R5

T1368

AXIAL UP	ANISN Input RANISN.DATAR5( )	ANISN Output / SRCEDOS2 Input RSDOS2.DATAR5( )	SRCEDOS2 Output RREBAT.L133R5( )
All Components :			
5 years	UALL5R5	UALL5R5	All outputs listed in member R5DOS2.
30 years	UALL30R5	UALL30R5	
60 years	UALL60R5	UALL60R5	
100 years	UALL00R5	UALL00R5	
Liner->Concrete (5 yrs)	ULIN5R5	ULIN5R5	
Liner->Concrete (60 yrs)	ULIN60R5	ULIN60R5	
Concrete Only (5 yrs)	UCON5R5	UCON5R5	
Concrete Only (60 yrs)	UCON60R5	UCON60R5	
Concrete (5 yrs) (Minus 17 int.)	U5R5M17	U5R5M17	
Concrete (5 yrs) (Minus 18 int.)	U5R5M18	U5R5M18	
Concrete (60 yrs) (Minus 8 int.)	U60R5M8	U60R5M8	
Concrete (60 yrs) (Minus 9 int.)	U60R5M9	U60R5M9	

ANISN - Gamma Flux Calculations - R5

SRCEDOS2 - Dose Rate Calculations - R5

T136B

AXIAL DOWN	ANISN Input RANISN.DATAR5( )	ANISN Output / SRCEDOS2 Input RSDOS2.DATAR5( )	SRCEDOS2 Output RREBAT .L133R5( )
All Components :			
5 years	DALL5R5	DALL5R5	All outputs listed in member R5DOS2.
30 years	DALL30R5	DALL30R5	
60 years	DALL60R5	DALL60R5	
100 years	DALL00R5	DALL00R5	
Liner->Concrete (5 yrs)	DLIN5R5	DLIN5R5	
Liner->Concrete (60 yrs)	DLIN60R5	DLIN60R5	
Concrete Only (5 yrs)	DCON5R5	DCON5R5	
Concrete Only (60 yrs)	DCON60R5	DCON60R5	
Concrete 5 yrs) (Minus 10 int.)	D5R5M10	D5R5M10	
Concrete (5 yrs) (Minus 11 int.)	D5R5M11	D5R5M11	
Concrete (60 yrs) (Minus 2 int.)	D60R5M2	D60R5M2	
Concrete (60 yrs) (Minus 3 int.)	D60R5M3	D60R5M3	
Concrete (60 yrs) (Minus 4 int.)	D60R5M4	D60R5M4	

Activation Analysis Notes
(From REBATE runs through Dose Rate Calcs)

Code	Function	JCL	Notes
REBATE	Computes Activation for input to SRCEDOS1	FT02-REBATE cross-sections FT06-Output FT01-ANISN neutron flux input FT05-REBATE input deck SYSUT1 - Decay Library	-Usually done for several time-periods -Sometimes has underflows
T1368.WALKER.CNTL(REBATE)			
SRCEDOS1	Calculates source for input to ANISN	FT01 - input (REBATE output FT05) FT06 - output FT05-'SOURCE'; Total Intervals;TIME	
T1368.WALKER.CNTL(SRCEDOS1)			
ANISN	Calculate flux input to SREEDOS2	FT04 - 8 cross-sections FT05 - Input Deck FT07 - Output Flux	-FT05 deck is a handma from SRCEDOS1 output-edit 17** array and 8$$array -Ends on "end of file" error -Be sure to edit outpu deck to change all "R to "*"'s
T1368.WALKER.CNTL(ANISNGAM)			
SRCEDOS2	Calculates Dose Rate	FT01 - Flux input (FT07 from ANISN) FT06 - Output FT05 - 'DOSE'; Total Intervals; Normalization Factor	-Get normalization factor from ANISN ru FT03 -Will end on "End of Record" error if out is written to 80 LRE file
T1368.WALKER.CNTL(SRCEDOS2)			
SITEREB	Activation of Components (5→100 yrs Edit)	FT01 - Input REBATE file FT02 - Decay Library FT06 - Output FT05 - Volume; Title/Comments; Desired Intervals	
SITEREB2	Activation of Components (3 → 60 yrs Edit)		
T1368.WALKER.CNTL(SITEREB/SITEREB2)			

POSTREB Activation of Components FT01 - Input REBATE file
FT02 - Decay Library
FT03 - Output

T1368.WALKER.CNTL(POSTREB)

Attachment 6
EE-DEC-0010

Public Service

FORT ST. VRAIN NUCLEAR GENERATING STATION

PUBLIC SERVICE COMPANY OF COLORADO

CALCULATION WORKSHEET

CALCULATION FOR: Index for Component Composition, Volume Calc.			CALCULATION NUMBER
PREPARED BY	DATE		
REVIEWED BY	DATE	CALC. REV.	PAGE OF

Component	Calc #
1 Perforated Posts in Support Blocks	C-01
2 Concrete	C-02
3 Core Barrel	C-03
4 Core Barrel Key *	C-04
5 Core Support Blocks Posts	C-05
6 Hastelloy X tubes in bottom reflector	C-06
7 Kaowool/Cover Plates - [illegible]	C-07
8 Kaowool/Cover Plates - Radial	C-08
9 Kaowool/Cover Plates - Top Head	C-09
10. Large Side Reflector	C-10
11. Metal Clad Block - CR element	C-11
12. Metal Clad Block - NCR element	C-12
13. Metal Jacket - Large Side Reflector	C-13
14. Orifice Valve - Lower Assembly	C-14
15. [illegible] Liner	C-15
16. Reflector Key (Core Barrel to Lg. Ref.)	C-16
17. Region Constraint Device	C-17
18. Silica Blocks	C-18
19. Steam generator *	C-19
20. Removable Graphite Reflectors	C-20

* Not modelled

Form (B) 344-24-4309

Attachment 2
EE-DEC-0010

Component Material Compositions and Volume Calculations