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**OPERABLE UNIT 3 BUILDING 4A IMPLEMENTATION PLAN FOR
ABOVE GRADE DECONTAMINATION AND DISMANTLEMENT -
DECEMBER 1994 - **DRAFT FINAL****

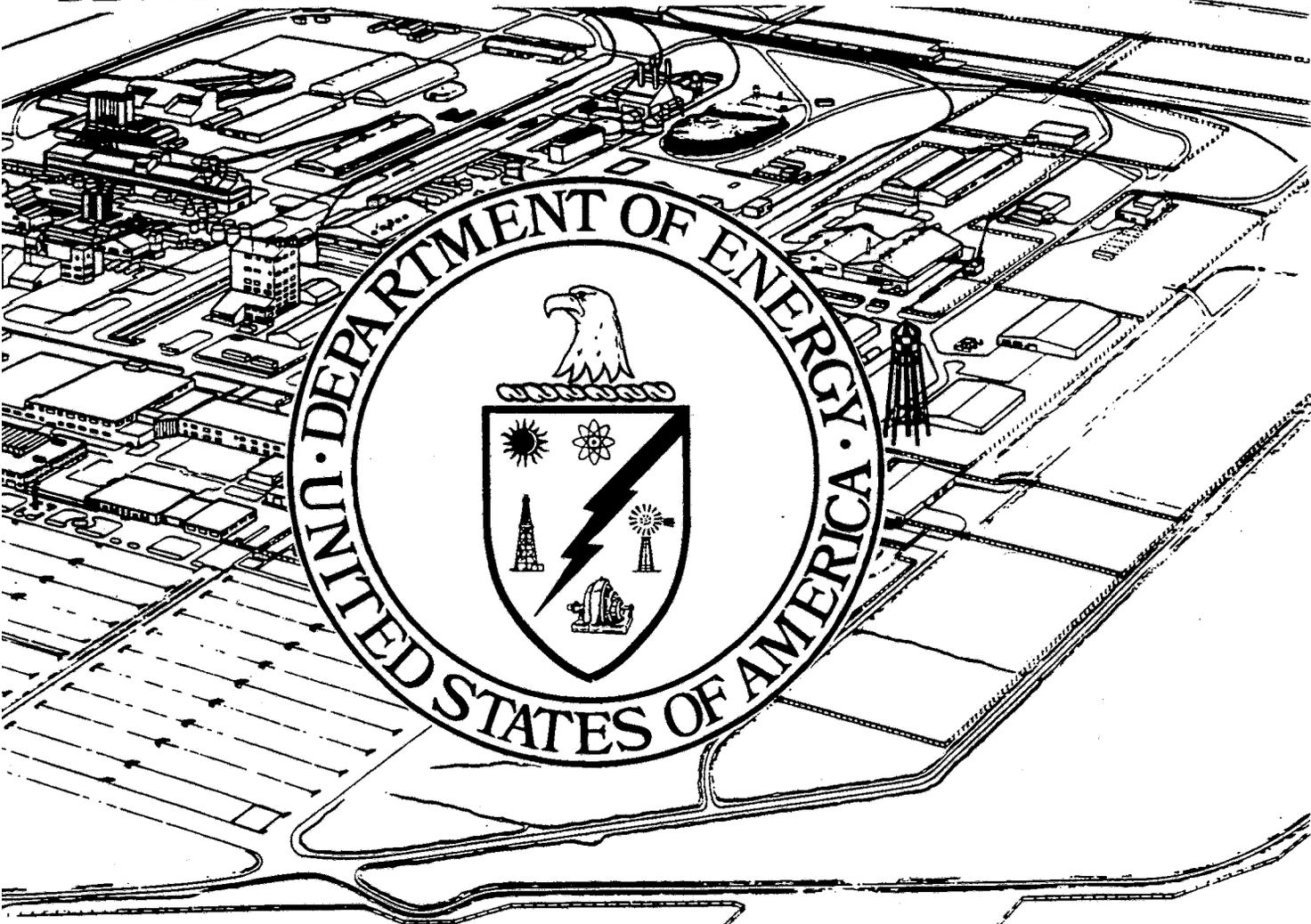
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OPERABLE UNIT 3

BUILDING 4A IMPLEMENTATION PLAN FOR ABOVE-GRADE DECONTAMINATION AND DISMANTLEMENT



DECEMBER 1994

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

U.S. DEPARTMENT OF ENERGY
FERNALD FIELD OFFICE

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**OPERABLE UNIT 3
INTERIM REMEDIAL ACTION**

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BUILDING 4A IMPLEMENTATION PLAN
FOR ABOVE-GRADE
DECONTAMINATION AND DISMANTLEMENT**

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**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO**

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DECEMBER 1994

**U. S. DEPARTMENT OF ENERGY
FERNALD FIELD OFFICE**

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CONTENTS

D

R

A

F

T

TABLE OF CONTENTS i

LIST OF FIGURES ii

LIST OF TABLES ii

LIST OF APPENDICES ii

NOTATION iii

GLOSSARY v

1.0 INTRODUCTION 1

1.1 Project Statement 1

1.2 Scope of Work 2

1.3 Plan Organization 3

1.4 Location of Building 4A 4

2.0 GENERAL PROJECT REMEDIATION APPROACH 6

2.1 Characterization of Building 4A 6

2.2 Materials Management 7

 2.2.1 Primary Materials Management 8

 2.2.2 Secondary Waste Management 9

 2.2.3 Estimates of Material Volumes 10

 2.2.4 Material Handling, Staging, Interim Storage, and Disposition 11

2.3 Environmental Monitoring 13

2.4 Remediation Activities 15

3.0 COMPONENT-SPECIFIC REMEDIATION 18

3.1 Preparatory Action: Inventory Removal (Phase I) 23

3.2 Preparatory Action: Safe Shutdown (Phase II) 23

3.3 Hazardous Waste Management Units (Phase III) 26

3.4 Asbestos Removal (Phase IV) 26

3.5 Surface Decontamination (Phase V) 28

3.6 Above-Grade Dismantlement (Phase VI) 29

4.0 SCHEDULE 37

5.0 MANAGEMENT 40

FIGURES

FIGURE 1-1 Building 4A	5
FIGURE 2-1 Proposed Locations For Building 4A Air Monitors	14
FIGURE 2-2 Building 4A Construction Zone	16
FIGURE 4-1 Building 4A Summary Schedule for Implementation and Deliverables ...	38
FIGURE 4-2 Remediation Schedule for Building 4A	39

TABLES

TABLE 2-1 Summary of Building 4A Radiological Data	7
TABLE 2-2 Building 4A Materials Management	10
TABLE 3-1 Building 4A Inventory Removal	24
TABLE 3-2 Building 4A Hold-up Material	25
TABLE 3-3 Building 4A Equipment Removal	32

LIST OF APPENDICES

APPENDIX A	Proposed Building 4A Sampling
APPENDIX B	Building 4A Summary of Potential Contaminants
APPENDIX C	Building 4A Performance Specifications
APPENDIX D	Design Drawings for Building 4A Project
APPENDIX E	Photographs of Building 4A

F

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NOTATION

Abbreviations, Acronyms, and Initials

ACM	asbestos-containing material(s)
CMU	concrete masonry unit
DOE	United States Department of Energy
EL	End-loading [box]
FEMP	Fernald Environmental Management Project
HEPA	high-efficiency particulate air [filter]
HVAC	heating, ventilating, and air conditioning
HWMU	Hazardous Waste Management Unit
IROD	Operable Unit 3 Record of Decision for Interim Remedial Action
N/A	not applicable
NTS	Nevada Test Site
OEPA	Ohio Environmental Protection Agency
OU3	Operable Unit 3
OU3 RI/FS WPA	OU3 RI/FS Work Plan Addendum
PCB(s)	polychlorinated biphenyl(s)
PLT	pressurized low-temperature
PPE	personal protective equipment
PVC	poly-vinyl chloride
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SOW	Statement of Work
TL	top-loading [box]
TSI	thermal system insulation
USEPA	United States Environmental Protection Agency
WMB	small (white) metal boxes

Units of Measure

cm	centimeter(s)
cm ²	square centimeter(s)
dpm	disintegration(s) per minute
ft.	foot (feet)
ft ²	square foot (feet)
ft ³	cubic foot (feet)
gal.	gallon(s)
in.	inch

Chemical Symbols

AHF	anhydrous fluoride
CaF ₂	calcium fluoride
DHF	dilute hydrofluoric acid
HF	hydrofluoric acid
KOH	potassium hydroxide
MgF ₂	magnesium fluoride
TBP	tributyl phosphate
THF ₄	thorium tetrafluoride
U	uranium
U ₃ O ₈	uranium oxide
UF ₄	uranium tetrafluoride
UF ₆	uranium hexafluoride
UO ₂	uranium dioxide
UO ₃	uranium trioxide

GLOSSARY

Amended water -

Water that contains an additive (e.g., surfactant) which changes the polarity of water from polar to non-polar. Such water has an increased ability to penetrate material thus allowing for better particle (e.g., asbestos fibers) holding properties.

Complex -

A set of components grouped for inclusion into a design package by location, scope of work required, availability for remediation, and cost of dismantlement to be remediated under one or more project(s).

Component -

The smallest physically distinct unit of OU3 that is considered separately in the development and implementation of this implementation plan including, but not limited to, buildings, pads, roads, piping/utilities, and ponds/basins.

Construction debris -

A category of bulk material to be removed from structures during dismantlement consisting of non-structural construction material such as interior walls, interior framing, suspended ceilings, floor tile, and doors.

Containment structure -

A barrier constructed to prevent or minimize the spread of contamination during decontamination and dismantlement activities.

Dynamic dismantlement -

A group of dismantlement techniques that incorporate the free fall of a structure. These techniques may include shape charges and pulling the structure over.

End-loading containers -

An end-loading metal box measuring approximately 8' x 8' x 20' with a gross weight capacity of 42,000 lbs. These containers have a volume capacity of 971 cubic feet (ft³) and a burial volume of 1,280 ft³. Also known as ISO or SEA/LAND containers.

Engineering controls -

Eliminate hazards by mechanical means or by process design; apparatus and/or mechanisms which physically prevent entry, minimize hazards, or create some kind of barrier.

Hold-up material -

Includes material (both liquid and solid) within any process equipment or reservoir other than residuals which are clinging to the walls of the various pumps, piping, vessels, or other surfaces of equipment.

Interim remedial action -

D

Course of action that may be pursued in the short term, before a final Record of Decision, to reduce existing risks at a Superfund site. Also refers to the OU3 interim remedial action to dismantle all OU3 structures.

Interim storage facility -

On-site area for temporary storage of material or debris generated during the OU3 interim remedial action.

Interval Period -

The period between the issuance of the OU3 Record of Decision for Interim Remedial Action and the issuance of the OU3 final remedial action Record of Decision.

Lay-down area -

A cleared area located near a jobsite that is used to place materials from dismantlement operations for immediate further handling.

Material -

Solids and liquids generated from decontamination and dismantlement operations; includes non-recoverable/non-recyclable material (waste) and recoverable/recyclable material.

Plant 4 complex -

A group of OU3 components that were included in one remedial design effort for eventual remediation project; includes: Green Salt Plant (4A), Plant 4 Warehouse (4B), and Plant 4 Maintenance Building (4C).

Primary material -

Material generated as a result of dismantlement activities of a specific project, including the structure, associated equipment, and contents of the building.

Process knowledge -

Information available about a specific process, based on documentation of past operations or on information obtained from individuals who participated in the operation. This information includes, but is not limited to, process chemistry, history of accidents/spills, maintenance chemicals/materials, and other uses of the process vessels or workspace.

Project -

A specific decontamination and dismantlement remedial design and remedial action effort; beginning with pre-design scoping activities and ending with the submittal of a remedial action report to the regulatory agencies.

Queuing Area -

An area established within the construction boundaries that is used for placement of full containers to await relocation by FEMP waste management for interim storage or disposition.

Remedial action -

An action that is consistent with the final remedy following a formal examination of the nature and extent of the release, or threat of release, assessment of the risk, and selection of the final remedy based on an evaluation of possible alternatives.

Remedial design -

The technical analysis and procedures that follow the selection of a site remedy, resulting in a detailed set of plans and specifications for implementation of the remedial action.

Remediation subcontractor -

The group, or groups, subcontracted to the FEMP environmental restoration management contractor who will be responsible for implementation of the remedial action.

Removal action -

Any action necessary to abate an immediate threat to health and the environment, including actions necessary to monitor, assess, or evaluate the threat.

Roll-off box -

A reinforced top-loading metal box measuring approximately 7' x 5.5' x 22' with the gross weight capacity of 42,000 lbs. These containers have a volume capacity of 810 ft³.

Safe Shutdown -

Program designated as Removal No. 12 at the FEMP which provides planning, engineering, and program control for the proper disposition of all known uranium product and in-process hold-up materials, excess supplies, chemicals, and associated process equipment. The program also is intended to ensure the proper characterization, emptying, and isolation of utilities for the majority of existing previously-operated, production-related equipment.

Secondary waste -

Waste other than primary waste associated with a remedial action generated as a result of occupying a jobsite, conducting decontamination and dismantlement activities, utilizing PPE, and demobilization activities.

Sequence -

The logical order, developed during the remedial design, in which components within a complex are planned to be remediated.

Staging area -

A temporary holding area established outside of the construction boundary for empty containers prior to use.

Surface decontamination -

D

The reduction of existing surface contamination levels, thereby reducing direct exposure potential, as well as reducing available sources for wind-borne or water-borne contamination.

Top-loading metal boxes -

A top-loading metal box measuring approximately 8' x 8' x 20' with a gross weight capacity of 42,000 lbs. These containers have a volume capacity of 971 ft³ and a burial volume of 1,280 ft³.

Transite -

R

Common construction material used as sheeting for walls and roofs for many OU3 components. It consists of a mixture of asbestos and cement.

Waste -

Material designated as non-recoverable or non-recyclable.

White metal boxes -

A top-loading metal box measuring approximately 3' x 4' x 6' with a gross weight capacity of 8,000 lbs. These containers have a volume capacity of 82 ft³ and a burial volume of 105 ft³. Also known as B-25s.

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1.0 INTRODUCTION

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1.1 Project Statement

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The purpose of this implementation plan is to summarize the *project*¹-specific design and planned field activities for decontamination and dismantlement of the above-grade portion of Building 4A (Green Salt Plant) in Operable Unit 3 (OU3) at the U.S. Department of Energy's (DOE) Fernald Environmental Management Project (FEMP) in Fernald, Ohio. At- and below-grade remediation is not included within the scope of this project. By design, Building 4A was included with a group of adjacent components identified as the *Plant 4 complex*, which also included the Plant 4 Warehouse (Building 4B) and the Plant 4 Maintenance Building (Building 4C). Building 4C has been removed under the Plant 7 Dismantling project (Removal No. 19), and Building 4B will continue to be utilized as an interim storage facility for existing inventories until it is available for remediation in another project. This implementation plan was developed in a manner that summarizes the remedial design through the pre-final stage and is being submitted to the U.S. Environmental Protection Agency (USEPA) and the Ohio Environmental Protection Agency (OEPA) as a deliverable specified in the OU3 Remedial Design/Remedial Action (RD/RA) Work Plan for Interim Remedial Action (DOE, Draft September 1994)². In so doing, this implementation plan replaces the submittal of multiple design and construction documents, as identified by Sections 4.5 and 4.6 of the OU3 RD/RA Work Plan, which have been prepared for this project.

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Specifically, the contents of this implementation plan were prepared based on program-specific information presented in the OU3 RD/RA Work Plan and project-specific information/developed for the remediation subcontract Statement of Work (SOW)(Part 6 of the bid document), performance specifications (Part 7 of the bid document), and project-specific strategies developed for the remediation support activities performed under existing FEMP programs.

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¹ Words that have been italicized are defined in the glossary.

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² December 1994 Draft Final OU3 RD/RA Work Plan for Interim Remedial Action (Volume 1, and Volume 2 changed pages) submitted to the USEPA/OEPA concurrent with this implementation plan.

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1.2 Scope of Work

This implementation plan includes the following project-specific decontamination and dismantlement activities for the above-grade portion of Building 4A:

- asbestos abatement/removal;
- *surface decontamination*;
- above-grade component dismantlement;
- *material/waste* management;
- environmental monitoring;
- proposed sampling;
- project schedule; and
- project management responsibilities.

As stated in Section 1.1, at- and below-grade remediation will be addressed in an implementation plan that will be prepared in sequence with Operable Unit 5 soil remediation for the former production area. The schedule for at- and below-grade dismantlement will be presented in the OU3 RD Prioritization and Sequencing Report which is due to be submitted to the regulatory agencies on March 17, 1995.

This plan also discusses two preparatory actions to be completed prior to initiation of decontamination and dismantlement; the removal of existing product and waste inventories, and *safe shutdown*. These preparatory actions will be performed under existing FEMP programs and not specifically within the scope of the *interim remedial action*.

In accordance with the Record of Decision for Interim Remedial Action (IROD) for OU3, remediation activities have been planned utilizing a performance-based methodology. The Building 4A remedial design has been prepared using performance-based specifications as described in Section 4.5 of the Draft OU3 RD/RA Work Plan for Interim Remedial Action (hereinafter referred to only as the OU3 RD/RA Work Plan). These performance specifications meet the remedial objectives stated in the IROD and were used as the basis for developing the

remediation approach in this implementation plan. The Building 4A performance specifications have been included in the OU3 RD/RA Work Plan as Appendix C. References have been made throughout this implementation plan, where appropriate, to these individual performance specifications. A list of the performance specifications for this project is provided in Appendix C. These specifications are appropriate for this project, based on media and activities to be undertaken. The use of performance specifications in the remedial design requires the *remediation subcontractor* to develop work plans, subject to DOE approval, that will specify remediation methods necessary to meet project objectives. The *sequence* of remedial activities and methods defined in the remediation subcontractor work plans may differ from that presented in this implementation plan. Substantive changes in the scope or intent of this plan will require USEPA and OEPA notification prior to implementation of the activities.

1.3 Plan Organization

The Building 4A implementation plan is comprised of five sections and five appendices. Section 1 provides the *remedial action* project statement, scope of work, an overview of this implementation plan, and describes the location of Building 4A. Section 2 describes the general approach to Building 4A remediation as developed during remedial design. This approach includes a summary of the characterization of Building 4A that was evaluated during the remedial design, a plan for materials management, environmental monitoring activities, and general remediation support activities. Section 3 describes the implementation of the six phases of remediation for Building 4A. Section 4 presents schedules for the finalization of this implementation plan and the initiation and completion of the project. Section 5 describes the project management approach.

Appendix A contains summary tables of the proposed sampling based on the assumptions in the Sampling and Analysis Plan (SAP) for the OU3 interim remedial action and on the remediation requirements presented in this plan. Appendix B summarizes potential contaminants for Building 4A. Appendix C lists the performance specifications for the OU3 interim remedial action, as applied to the Building 4A decontamination and dismantlement project. Appendix D provides selected copies of drawings showing the Building 4A floor plans, as well as some other general drawings. Appendix E contains selected photographs

of Building 4A so as to provide the reader with an overall perspective of the building and the equipment and appurtenances in and around it.

1.4 Location of Building 4A

Building 4A consists only of one structure known as the Green Salt Plant. Building 4A is located south of 2nd Street, between B and C Streets, near the central portion of the former production area, as shown in Figure 1-1.

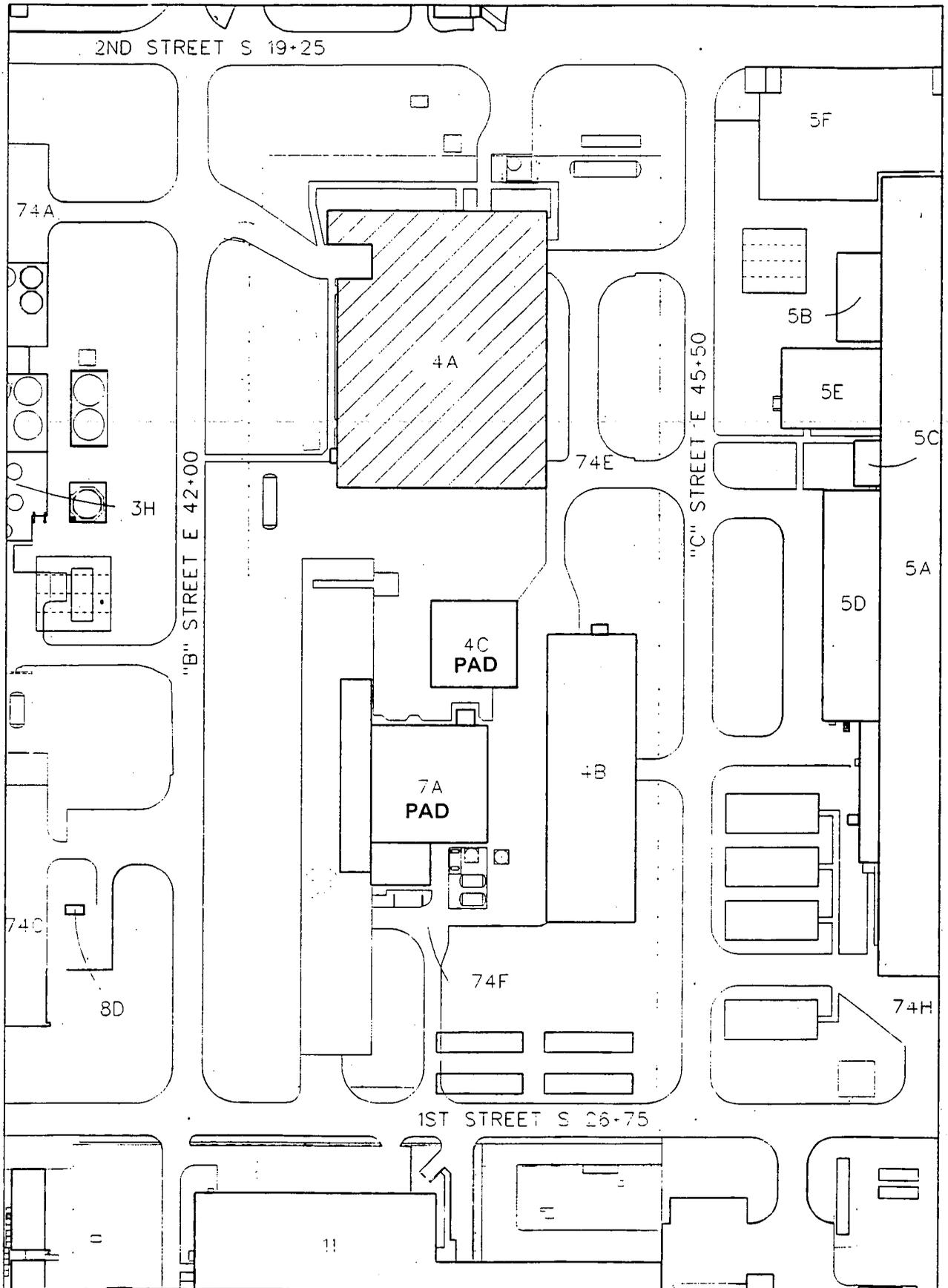


FIGURE 1-1 Building 4A

2.0 GENERAL PROJECT REMEDIATION APPROACH

The Building 4A general remediation approach, consistent with Section 3.3 of the OU3 RD/RA Work Plan is described in the subsections that follow: Section 2.1 summarizes the characterization of Building 4A; Section 2.2 describes management of materials to be generated during remediation; Section 2.3 describes environmental monitoring that will be performed to determine whether remedial activities are protective of human health and the environment; and Section 2.4 identifies several general aspects of the Building 4A project not included in the component-specific project description in Section 3.

2.1 Characterization of Building 4A

The processes and operations within the Green Salt Plant were developed to convert uranium trioxide (UO_3 , orange oxide) to uranium tetrafluoride (UF_4 , green salt), using a multi-step hydrofluorination process and other radioactive and chemical reactants for both primary and secondary operations. Section 3 of this plan describes relevant process information to provide a context for component remediation. Production operations generated a wide variety of waste materials containing both radiological and chemical constituents. During operations, material handling procedures resulted in chemical and radiological contamination within the building. Table A.3 of the OU3 Remedial Investigation/Feasibility Study (RI/FS) Work Plan Addendum (WPA) assessed this *process knowledge*, along with other historical information, such as quantities of material used, spill logs, incident reports, data from the *removal action*: Removal No. 1 - Contaminated Water Beneath FEMP Buildings, Resource Conservation and Recovery Act (RCRA) drummed waste determinations, RCRA reports, etc., to develop a list of potential contaminants for each of the components within OU3. Appendix B summarizes potential contaminants for Building 4A, based on Table A.3 of the OU3 RI/FS WPA. The background discussion for Building 4A provided in Section 3 identifies pertinent process information used during the remedial design. Current radiological survey data for Building 4A were evaluated during the remedial design and have been summarized in Table 2-1.

This summary provides alpha removable, total alpha, beta-gamma removable, and total beta-gamma radiological information. It has been utilized in support of the following Building 4A decontamination and dismantlement planning and design efforts including, but not limited to:

- developing the safety assessment documentation to support the proposed activities; 1
- enhancing the project-specific health and safety plan and determine potential concerns for worker protection and monitoring requirements based on the suggested decontamination and dismantlement techniques; 2
- enhancing the subcontractors understanding of expected contamination levels; 3
- aid in determining personnel monitoring requirements; 4
- in determining the number and location of project-specific radiological ambient air monitors; 5
- identifying potential gross radiological contamination that may require decontamination prior to the subcontractor activities; and 6
- aiding in the determination of disposition options for various primary and secondary material streams generated by the project activities. 7

TABLE 2-1 Summary of Building 4A Radiological Data

Component #	Alpha Removable (dpm/100 sq. cm)			Alpha Total (dpm/100 sq. cm)			Beta-Gamma Removable (dpm/100 sq. cm)			Beta-Gamma Total (dpm/100 sq. cm)		
	Avg Value	Max Value	Sample Size	Avg Value	Max Value	Sample Size	Avg Value	Max Value	Sample Size	Avg Value	Max Value	Sample Size
4A	345	2,101	40	N/A	N/A	N/A	1,527	11,773	40	83,127	1,400,000	185

N/A = Not Available

Data regarding chemical contamination in Building 4A was not available at the time of design; however, as analytical sampling results become available following OU3 RI data validation, they will also add to the current contaminant assessment to support remediation.

2.2 Materials Management

Outlined in this section are project-specific applications of the concepts and strategies for management of material that were presented in Section 3.4 and Appendix A of the OU3 RD/RA Work Plan.

The material management requirements summarized in this section were stipulated in Sections 3.4, 3.7, and Appendix A of the OU3 RD/RA Work Plan, and Section 01120 of the performance specifications (Waste Handling Criteria). Based on the requirements specified by the performance specifications (i.e., Part 1.5.A of Specification 01120), the remediation subcontractor will be required to submit for FEMP approval prior to mobilization a work plan that details waste handling methods and procedures. Waste minimization will be accomplished, in part, by the remediation subcontractor adhering to the following requirements: unpacking equipment and material prior to entering the radiation controlled area whenever possible (e.g., Part 1.6.B of Section 01120), limiting the number of tools and equipment, and not bringing any hazardous material to the construction zone (e.g., Part 1.6.B of Section 01120).

2.2.1 Primary Materials Management

Primary materials (including dismantlement debris and other bulk waste materials) from Building 4A will be managed in accordance with the management strategies presented in Section 3.4 and Appendix A of the OU3 RD/RA Work Plan.

Existing process knowledge and radiological survey data were the primary source of information evaluated to determine the primary material management requirements for interim storage and off-site disposition. Upon availability of RI characterization data, it will be used to supply most data needs and support material management decisions. Where data are insufficient, additional sampling will be performed to characterize materials to establish or verify whether or not materials meet the requirements for interim storage or material acceptance criteria for disposition. It is anticipated that for any materials requiring additional characterization, sampling would either occur prior to material dismantlement or following dismantlement but prior to containerization. Appendix A of this implementation plan summarizes sampling and analysis required to determine acceptance of material for all disposition options considered for this project.

2.2.2 Secondary Waste Management

Management of *secondary wastes* includes handling, potential sampling, storage, and disposition of waste materials generated during Building 4A remediation. Such waste includes vacuumed dust, filters, filter cake, personal protective equipment (PPE), spent consumables, and wash waters. If hydro-cleaning of component surfaces is used, wash waters generated will be controlled by the remediation subcontractor by minimizing its generation, providing proper containment, etc. (see Part 3.2 of Section 01517). Material volume estimates listed in Section 2.2.3 account for the use of hydro-washing to determine wash water volumes. If wash waters are generated, the floor will be sealed using a non-strippable coating to contain effluent to the building interior. The building's collection sump may be used for collection of wash waters. Once collected, wash waters will be pumped through twenty micron and five micron filters into 5,000-gallon temporary storage tanks (U.S. Department of Transportation - approved) and sampled for constituents of concern when the containers are full (Sampling described by the SAP - Volume 2 of the OU3 RD/RA Work Plan). Depending on contaminant concentration levels, pre-treatment may be required. Results of sampling will be forwarded to OU5 for review to determine acceptance of wash waters directly to the Advanced Waste Water Treatment Facility. Samples of wash waters will be collected for only those batches that have been determined (through a review of available process information and existing data) to have potentially elevated levels of contaminants of concern, such as volatile organic compounds, heavy metals, and uranium. These materials will be managed in accordance with the strategies presented in Section 3.4 and Appendix A of the OU3 RD/RA Work Plan.

2.2.3 Estimates of Material Volumes

Volume estimates for primary materials and secondary wastes for Building 4A are presented in Table 2-2. Materials are assumed to be low-level radiologically contaminated and were grouped in this table according to the material segregation and containerization criteria provided in Appendix A of performance specification for waste handling (Section 01120). This same criteria is also included in Appendix A to the OU3 RD/RA Work Plan. Table 2-2, however, is not intended to define the disposition of materials (e.g., off-site disposal, off-site processing/disposition, or on-site interim storage). Rather, the table groups materials according to a preferred disposition for the *interval period* and lists volume estimates. The

TABLE 2-2 Building 4A Materials Management*

Material Segregation Categories	Volume (ft ³)	Weight (Tons)	No. of Containers	Type of Containers(1)
Off-Site Disposal				
^(W) Category A - non-regulated/non-friable ACM	57	2	1	WMB
^(V) Category B - construction debris	8,033	60	9	TL
^(V) Category C - compactible waste	3,510	41	4	EL
^(W) Category D - transite	5,593	261	15	TL
^(V) Category E - residues, hold-up material, sludges (2)	N/A	N/A	N/A	drum
^{(W)(V)} Category F - masonry, concrete, asphalt	N/A	0	0	WMB
^(V) Category G - acid brick	N/A	0	0	WMB
^{(W)(V)} Category I - restricted use metal	99,017	757	104	TL
^(V) Category M - furnaces and dissociators	27,780	936	59	TL
SUB - TOTAL	143,990	2,057	192	
Off-Site Processing/Disposition				
^(W) Category H - specialty metals	26	5	2	WMB
^(W) Category J - process piping	3,141	109	7	TL
^(W) Category K - non-process piping	1,047	36	3	TL
^(W) Category L - ductwork	2,135	37	3	TL
^(V) Category N - unrestricted use metals	138,500	1,432	171	RO
SUB - TOTAL	144,849	1,619	186	
On-Site Interim Storage				
Category O - salvageable equipment (3)	N/A	N/A	N/A	N/A
^(V) Category P - regulated, friable ACM	3,864	6	4	EL
Category R - soils	N/A	N/A	N/A	pile
SUB - TOTAL	3,864	6	4	
On-Site Treatment				
Category Q - wash waters	45,000 gallons	N/A	N/A	N/A
TOTAL (not including wash water)	292,703	3,682	382	

* Does not include below-grade materials such as concrete foundations and utilities, or materials removed under the inventory removal and safe shutdown removal actions.

(W), (V) - Indicates if calculations for container requirements were weight or volume restricted.

- (1) TL: top loading boxes; WMB: white metal boxes; EL: end loading boxes (also referred to as ISO or Sea-Land containers), RO: roll-off boxes.
- (2) Residues, hold-up material, sludges (Category E) quantity is unknown but has been estimated to be less than 100 ft³.
- (3) All salvageable equipment (Category O) will have been removed under safe shutdown.

Assumptions:

- All materials are assumed to be low-level radiologically contaminated. Segregation by contaminant type is also required for hazardous wastes, mixed-wastes, and PCB wastes.
- 100% of piping and ductwork insulation is assumed to be ACM; building insulation is assumed to be non-ACM.
- 75% of piping is considered to be Category J and 25% is considered Category K.
- Piping is assumed to contain no significant quantities of Category H specialty metals (stainless, copper, inconel, monel, nickel)
- Electrical fixtures and miscellaneous electrical items are assumed to be Category I materials.
- Category B is assumed to contain miscellaneous debris.
- Currently, all equipment is assumed to be Category I materials with insignificant quantities of Category O (salvageable) equipment.
- Category C materials will be used, to the extent practical, as void filler; however, for this estimate, Category C materials are assumed to be segregated and boxed separately.

volume estimates associated with each material segregation category are listed according to general material type, volume, and weight, and the type and number of containers needed based on bulked volumes (using bulking factors for each category). Estimates for PPE and spent consumables are included in category A or C, depending on the activity undertaken when these materials were generated.

The volumes and weights in Table 2-2 were developed by reviewing engineering drawings and performing field inspections to identify and quantify materials. Estimates of secondary waste have been extrapolated from experience with the Removal No. 19 - Plant 7 Dismantling project. Bulking factors were applied to each category to obtain bulked volumes. Container types are based on the category of material, characteristics of the material, and anticipated disposition. The material/container combination is either weight or volume restricted; the appropriate quantity is used to calculate the number of containers required.

2.2.4 Material Handling, Staging, Interim Storage, and Disposition

All materials generated as a result of Building 4A decontamination and dismantlement will be segregated according to material segregation and packaging criteria included as Appendix A of Section 01120 of the performance specifications. Size reduction operations will be performed by the remediation subcontractor within the project boundaries as required by Section 01120 of the performance specifications.

The remediation subcontractor will be responsible for establishing a container queuing area within the construction boundary (see Part 3.1 of Section 01120). FEMP workforces will disposition full containers placed in this area. The remediation subcontractor will also be responsible, pursuant to Part 3.1 of Section 01120, for identifying a satellite accumulation area and a 90-day storage area where all generated /removed hazardous waste will be taken once a day. These areas will be controlled by FEMP personnel and will be located to minimize disruption of construction activities. For containers designated for packaging of asbestos containing material (ACM), container preparation will include lining the container with one layer of 6-mil polyethylene sheeting while allowing enough excess material to permit wrapping around ACM after loading the container.

The remediation subcontractor will be responsible for material packaging, segregating, loading, weighing, inspecting, container sealing, container labelling and container transportation in accordance with the Section 01120 of the performance specifications. Packaging done within a local containment area or building enclosure will not necessitate decontamination of materials per Section 01517 of the performance specifications (Removal/Fixing Radiological Contamination). Waste materials that require packaging outside will be required to meet the decontamination requirements of Section 01517 of the performance specifications. If that requirement cannot be attained, the material may be wrapped in 6-mil polyethylene sheeting and sealed prior to movement to prevent migration of contaminants. Compressed gases, explosives, free-liquids, fine particulates, hazardous wastes, corrosive materials and etiological agents will not be allowed in containers that hold debris. Sampling of waste containers designated for off-site shipment to the DOE Nevada Test Site (NTS) disposal facility or to the Envirocare of Utah, Inc. disposal facility (for mixed wastes) in Clive, Utah will be performed by FEMP waste management personnel in accordance with the OU3 RD/RA SAP and waste acceptance criteria of those facilities.

Materials not identified for immediate off-site disposition will be placed in a *queuing area* by the remediation subcontractor to allow FEMP waste management to transport them to the Plant 1 Storage Pad or another comparable storage location with engineering controls. These materials will remain in interim storage until FEMP waste management can disposition them under existing arrangements or until final disposition is determined by the OU3 final remedial action ROD.

The project-specific material disposition strategy for Building 4A does not differ from the strategy presented in the OU3 RD/RA Work Plan (Section 3.4 and Appendix A). The project-specific strategy includes the use of NTS for disposal of low-level radioactive waste listed in Table 2-2 under categories B, C, I; disposal of a limited volume of mixed waste at Envirocare of Utah, Inc. (for specific materials such as fluorescent bulbs, lead paint chips, paint remover, and hydraulic fluid/oil/grease; all of which may have to be treated to meet standards specified by land disposal restrictions codified under 40 Code of Federal Regulations (CFR) 268.38); and the interim storage of all other remaining material until either a recycling/reuse contract is executed (for materials listed in Table 2-2 under categories H, J, K, L, or N) or a final disposition determination is made under the OU3 final ROD. Based on a review of

characterization data during remedial design, all materials are radiologically contaminated and, as a result, will not qualify for disposal at a municipal landfill. The material acceptance criteria referenced in Section 3.4 and Appendix A of the OU3 RD/RA Work Plan also applies to the disposition strategy for this project. Materials that have been accepted for immediate off-site disposal at the NTS or potentially for off-site recycling will be prepared (containerized) for off-site shipment loading at the queuing area.

2.3 Environmental Monitoring

The OU3 RD/RA Work Plan sufficiently addresses groundwater and surface water monitoring (Sections 3.7.1 and 3.7.2, respectively) that will be performed in support of the Building 4A remediation project. Air quality monitoring that will be performed during Building 4A decontamination and dismantlement project includes two programs: the current site-wide monitoring program as discussed in Section 3.7.3 of the OU3 RD/RA Work Plan and the air monitoring program specifically designed for this decontamination and dismantlement project. The only aspect of environmental monitoring that requires elaboration beyond the discussion in the OU3 RD/RA Work Plan (Section 3.7.3) is the supplemental radiological air monitoring program developed for this project.

Based on the factors listed in Section 3.7.3 of the OU3 RD/RA Work Plan, air emissions modeling was performed to determine the potential emissions from remediation. The results of that modelling effort indicate levels of radiological emission will not exceed the 0.1 mrem/year threshold at the project boundary that would require continuous emissions monitoring. However, as a conservative measure to ensure protection of human health and the environment, eight continuous air monitors will be employed to supplement current site-wide air monitoring on a continual basis surrounding the project boundaries during the interim remedial action. These monitoring locations for Building 4A are identified in Figure 2-1.

Approximately eight weeks before the start of remediation, the eight supplemental air monitors will be set up and continuously operated over a typical work day/work week schedule (i.e., 10 hours/day, 4 days/week). Samples will then be collected once a week. The data collected over the eight weeks will be used to establish a baseline concentration for comparison during the project.

As described in Sections 3.4.1 and 4.1.3 of the OU3 RD/RA SAP, air samples will be taken once a week during remedial activities. Preliminary air monitoring results will be provided to the FEMP Construction Manager within seven calendar days. Preliminary results will be evaluated against the baseline. If the results are elevated in comparison to the established baseline, the decontamination and dismantlement activities will be reviewed to determine the effectiveness of *engineering controls* during remediation and to identify any need for additional mitigative measures. Validated data will be compiled and reported monthly. Validated data will be used to trend sample results and to further evaluate the effectiveness of engineering controls and any need for mitigative measures.

2.4 Remediation Activities

A general approach to above-grade dismantlement of Building 4A has been incorporated into the component-specific remediation approach in Section 3 of this plan. Section 3 identifies specific areas of interest for the six remedial tasks that will be performed prior to and during the project.

Although the six remedial tasks are generally described in the order in which they will be performed, the actual sequence for performing the activities within these tasks may differ from the sequence presented in this plan as a result of evaluation and selection of alternate methods by the remediation subcontractor and approved by the FEMP.

As required by Section 01515 of the performance specifications (Mobilization), the following activities will take place prior to the implementation of remediation activities discussed in Section 3. FEMP Construction Management will establish a break room, clean room, and shower facilities. The remediation subcontractor will mobilize in preparation for the decontamination and dismantlement activities by establishing a material-handling and packaging area, access and egress roadways to and from the jobsite, and the construction zone boundary. The proposed construction zone boundary that was delineated in the project design is depicted in Figure 2-2. The remediation subcontractor will also deliver equipment, materials, and office and storage trailers to the site as necessary to perform remediation activities. All equipment will be inspected by FEMP Construction Management and surveyed

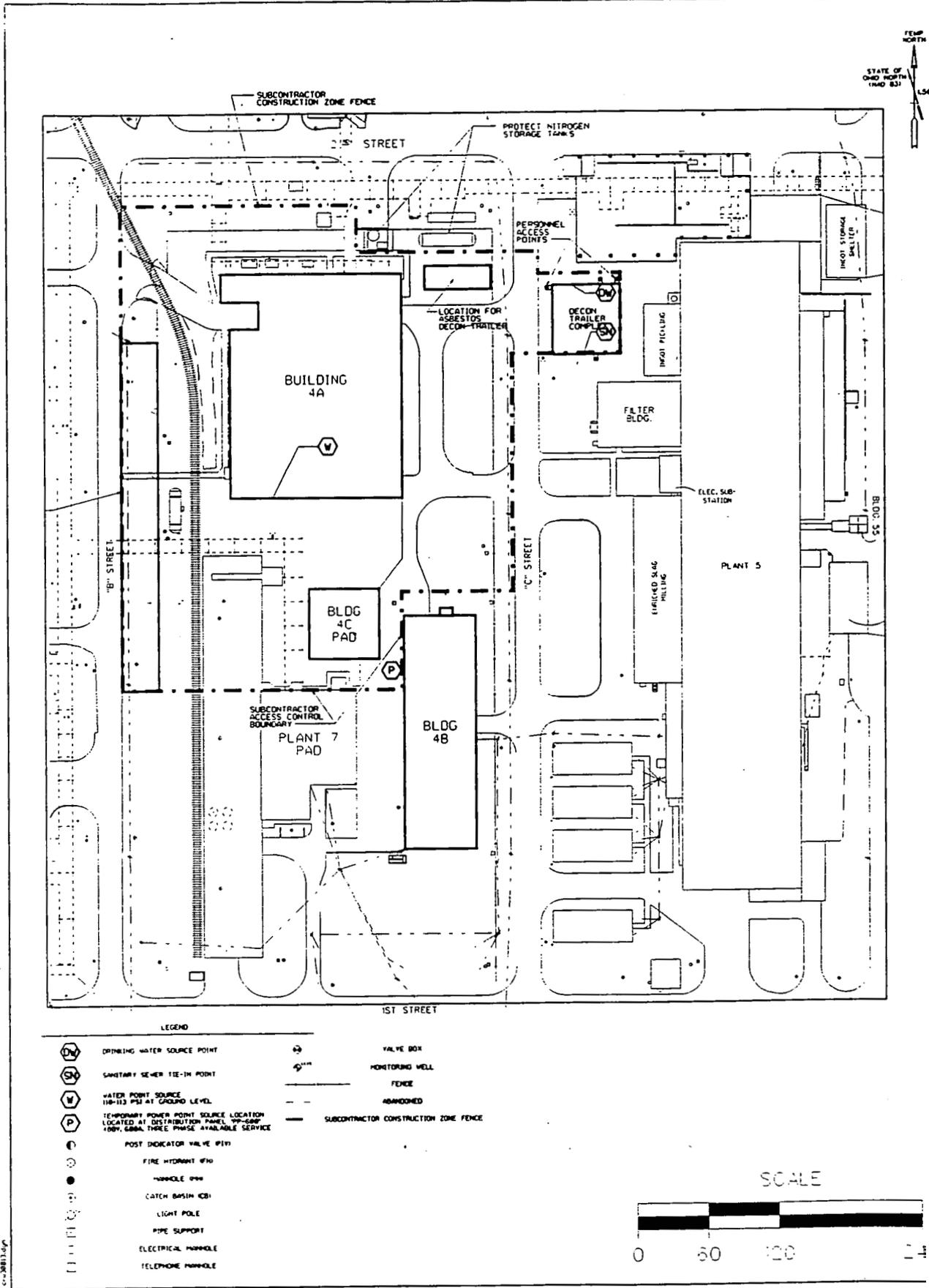


FIGURE 2-2 Building 4A Construction Zone

000026

by radiological control technicians to ensure that no contamination or items prohibited by the FEMP are brought onsite. A sign station will be established at the entrance to the jobsite for posting of permits and health and safety plans. Additional radiological control boundaries will be established prior to starting remediation activities in order to locate contaminated material staging areas as well as access and egress points to and from contaminated areas.

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Additionally, the remediation subcontractor is required to develop and submit work plans covering various aspects of the project. One such plan provides details relative to how the remediation subcontractor will protect adjacent facilities (e.g., Part 3.2.A.2 of Section 01515). Other plans are required for controlling fugitive emissions (e.g., Part 1.5.A.2 of Section 03315), stormwater run-off protection (Part 1.5.A.1.c of Section 01515), and controlling erosion (Part 1.5.A.3 of Section 01515).

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3.0 COMPONENT-SPECIFIC REMEDIATION

This section presents a detailed background description of Building 4A and specific remediation concerns identified for the Building 4A decontamination and dismantlement project. Background information provided in this section was obtained primarily from the OU3 RI/FS WPA and remediation subcontract SOW, including figures showing notable features of the building. Information regarding the remediation approach was obtained from the remediation subcontract SOW, performance specifications, the OU3 RD/RA Work Plan, and project-specific strategies developed by FEMP organizations for managing certain activities that do not fall within the scope of work for the remediation subcontractor.

Background

Building 4A (Green Salt Plant) is a seven-level, five-story, rectangular structure measuring 146 ft. × 194 ft. and 92 ft. It is constructed of a structural steel frame enclosed by transite siding and roofing panels, and is supported by a reinforced concrete base. The floors of the first level (ground floor) are concrete. The floors of the other six levels are either steel diamond plating or steel catwalks. Figures D-1 through D-13 in Appendix D of this implementation plan provide drawings prepared during design of Building 4A floor plans, as well as other general drawings. Figures E-1 through E-24 in Appendix E of this implementation plan provide photographs of Building 4A and selected equipment and appurtenances.

Building 4A housed the hydrofluorination process for the conversion of uranium trioxide to uranium tetrafluoride. Building 4A was also briefly used for the hydrofluorination of thorium oxide in 1954.

Building 4A contained 11 processes, some of which were in use for a limited time. The building is also equipped with a dust collection system and dust collector drumming stations. Fourteen dust collectors serviced the work areas, chemical reactor banks, and the three UF₄ packaging stations. Several dust collector drumming stations were also located on the first floor. The processes are described in detail in the following sections and have been segregated into three process areas.

Process Area 1 - Hydrofluorination Process Area. This process area includes most of the Building 4A facility, including the 12 reactor banks (see Figures E-18, E-19, E-20, and E-21 in Appendix E for photographs of Chemical Reactors 1, 2, 8 and 9). Figures D-3 through D-9 in Appendix D delineate Process Area 1 on areal views for each elevation that is physically accessible (ranging in elevation from 580'-0" to 629'-6") and identify the location of the main process equipment discussed below.

Hydrofluorination Banks. The hydrofluorination process involved reacting UO_3 with hydrogen gas (generated from dissociated ammonia) at a high temperature in a two-stage fluidized bed reactor to form uranium dioxide (UO_2 , brown oxide). The UO_2 passed through a Cocoa reactor while in a hydrogen atmosphere and was then processed through a bank of heated, four-zone reactors (Talcum reactors) with countercurrent anhydrous hydrofluoric acid (AHF) to produce UF_4 . The UF_4 was packaged, and the excess hydrofluoric acid from the conversion of UO_3 to UF_4 was scrubbed and stored in the original Bulk Tank Farm located north of Building 4A.

Twelve chemical reactor banks were used in Building 4A for the production of UF_4 . Chemical Reactor Banks 1 through 6 and 7 through 12 (east and west, respectively), were composed mainly of a fluid bed reactor, a Cocoa reactor (Figures E-20 and E-21), and three Talcum reactors (Figures E-18, E-19, E-22 and E-23) with a countercurrent Anhydrous fluoride (AHF) stream and were used for the conversion of UO_3 to UF_4 . Chemical Reactor Banks 7, 8, and 9 were used most recently. Bank 8 was reconfigured for processing UO_3 to U_3O_8 (black oxide). Each chemical reactor bank spans several floors within Building 4A because of the numerous equipment pieces that make up each bank. All banks have been emptied and abandoned in place.

Thorium Tetrafluoride Production. In 1954 only, dry thorium oxide from the Special Products Plant (Component 9A) was hydrofluorinated in Bank 7 to produce dry thorium tetrafluoride. Due to the significant volume of uranium processed through Bank 7 since that time, the presence of residual thorium-containing products is not likely, and therefore does not constitute concern.

Moving Bed Experimental Reactor. A vertical packed-bed reactor was tested for use in the hydrofluorination process. The reactor is located on the second level within the

hydrofluorination area (Figure E-24), although ancillary equipment associated with the reactor has been removed.

UF₄ Packaging. The three packaging stations located on the first floor of Building 4A within the hydrofluorination area were used for packaging or repackaging of depleted and enriched UF₄ (refer to Figures E-5 and E-15). Packaging station components include weigh hoppers, blenders, package hoppers, and a series of conveyors and feed screws. UF₄ was transferred to any of the three packaging stations from T-hoppers, drums, or cans. UF₄ was also delivered to Packaging Station 2 by conveyor from the Talcum weigh bins under Banks 7, 8, and 9. In the packaging stations, green salt was weighed, blended according to specification, sampled, and packaged into 10-gal cans.

Depleted UF₄, received in 55-gal drums, was blended and repackaged into 10-gal cans to ensure quality control. Packaging Station 1 and its associated dust collector were used for this process.

Storage. Drummed materials and hoppers with residual material have been stored in Building 4A. This storage location has been identified as Hazardous Waste Management Unit (HWMU) No. 6 and is shown in Figure D-3. As discussed in Section 3.3, this HWMU has been closed and no hazardous waste residues remain.

Water Treatment (Plant 4 Sump System). The sump system comprises six floor sumps and one sump tank. The six floor sumps are located on the first floor. The collection sump tank is located in the hydrofluoric acid (HF) recovery area of Building 4A (area shown in Figures E-9 through E-12). Originally, two sump tanks, the collection sump tank, and a filtrate sump tank (also known as the west sump tank) were located in the HF recovery area. Floor sump liquids were neutralized with lime in the collection sump tank and filtered through a plate-and-frame filter; then, the filtrate was collected in the filtrate sump tank, which has been removed. The collection sump tank also received water from the HF filters via the potassium hydroxide (KOH) recirculation tank and wash waters from the UF₄ hoppers. Filtrate collected in the filtrate sump tank was subsequently discharged to the General Sump (Building 18B). Solids collected during filtration were drummed, sampled, and sent to the Recovery Plant

(Component 8A) for recovery. Water from the HF scrubber was directed to the KOH recirculation tank and discharged directly to the General Sump.

Process Area 2 - Ammonia Dissociation and Nitrogen Generation Process Area. This process area is located in the northwestern section of the first floor of Building 4A. Anhydrous ammonia provided the feed material for both subprocesses. Figure D-3 in Appendix D delineates Process Area 2 on an areal view drawing showing elevation 580'-0". As depicted, this process area is confined to that elevation. The main equipment that make up this process area are also identified in Figure D-3. The two subprocesses contained within Process Area 2 are described below.

Ammonia Dissociation System. Hydrogen gas was required in the hydrofluorination system fluid bed reactors to reduce UO_3 to uranium dioxide (UO_2 , brown oxide). Hydrogen was generated for the fluid bed reactors by passing vaporized ammonia over an electrically heated nickel catalyst bed at a controlled temperature. The vaporized ammonia was cracked to hydrogen and nitrogen in a 3-to-1 ratio, and the hot gases were passed through a heat exchanger to heat fresh ammonia entering the ammonia dissociation system (see Figure E-13) before introducing the hydrogen and nitrogen into the hydrofluorination system. The supply of ammonia was normally stored in storage tanks located in the Bulk Tank Farm; however, for a certain period, ammonia was supplied to the ammonia dissociation system by the Pilot Plant Ammonia Tank Farm (Component 19B). A large, above-grade horizontal tank, located outside Plant 4 at the southwestern corner, also stored anhydrous ammonia for use in the ammonia dissociation system. The newly constructed ammonia dissociator system was never used in the production process.

Nitrogen Generation. The nitrogen generation system used dissociated ammonia (hydrogen and nitrogen gas), supplied by the Plant 4 ammonia dissociation system, to produce and store nitrogen gas for use during plant purging operations. The original nitrogen generator system was replaced with a new system, located along the north outside wall of the nitrogen generation room (see Figure E-4), but it was never used.

Process Area 3 - Hydrofluoric Acid Recovery Processes. This process area includes the subprocesses associated with hydrofluoric acid handling, and is located on multiple

floors/elevations in the northeastern section of Building 4A as shown in Figures D-3 through D-9 in Appendix D.

AHF Vaporization System. Vaporized AHF was required in the hydrofluorination system fluid bed reactors to convert UO_3 or U_3O_8 to UF_4 . Liquid AHF was vaporized with four vaporizers, and the vaporized AHF was then heated, using two of three superheaters to obtain the required hydrofluorination process temperature. Upon exiting the superheaters, the vaporized AHF entered the hydrofluorination process at the end of the Talcum A and C reactors. The vaporizers and superheaters are located in the HF recovery area on the third and fourth levels, respectively.

Hydrofluoric Acid Recovery System. The hydrofluoric acid recovery system w(depicted in Figures E-9 through E-12) as designed and used to collect unreacted hydrogen fluoride (HF) gas exiting the production process. AHF vapor, which moved countercurrent to the production flow, exited each chemical reactor bank as dilute hydrogen fluoride. The HF exited each chemical reactor bank at the beginning of the first chemical reactor in the series (the Talcum A reactor shown in Figure E-18), and the vapors were routed through Adams filters and through carbon-tubed Karbate condensers. Residual vapors that passed through the Karbate condensers were scrubbed with water to form dilute hydrofluoric acid (DHF). The gas stream was further processed through KOH scrubber units for recovery and neutralization of previously unrecovered HF vapors from the HF scrubber and recovery system and for the recovery and neutralization of fugitive KOH vapors from the KOH recirculation system. The KOH scrubber system consists of two Venturi scrubbers (which were operated in series), a KOH recirculation tank, and an extensive network of pipes, valves, and pumps.

HF Refrigeration. The HF refrigeration system was used to reclaim HF fumes as AHF from Building 4A and Plant 7 (Component 7A) operations. The equipment used during this process has been removed from Building 4A.

Removed Processes. Some of the unit processes formerly operated in Building 4A have been removed. The names of these processes and brief descriptions follow:

- **Moving Bed Experimental Reactor.** Equipment related to the vertical hydrofluorination reactor.

- **Water Treatment (Plant 4 Sump System).** One of the two steel tanks used for receiving floor sump liquids.
- **HF Refrigeration.** The HF refrigeration system.

3.1 Preparatory Action: Inventory Removal (Task I)

Existing waste/product inventories from Building 4A will be removed by FEMP waste management personnel, under Removal No. 9 prior to decontamination and dismantlement operations, and transported to alternate temporary storage facilities or disposal facilities as determined by the FEMP waste management organization. Table 3-1 identifies the quantity of containerized material that will be removed from Building 4A as part of inventory removal activities.

3.2 Preparatory Action: Safe Shutdown (Task II)

Safe shutdown activities for Building 4A will be accomplished by FEMP personnel under Removal No. 12. Safe shutdown will consist of:

- removal of all salvageable equipment;
- removal of loose, gross contamination;
- removal of *hold-up* material;
- general clean-up; and
- disconnection of all utilities.

Hold-up materials must be removed from the Green Salt Plant (4A) during safe shutdown. The purpose of hold-up material removal is to establish a safe work environment for the remediation subcontractor; to provide FEMP Health and Safety and Waste Management organizations with known starting conditions that are needed to develop the Safety Analysis, work permits, and Health and Safety Plan for remediation activities; and to aid in determining disposition options for the remediation materials. All systems will be inspected to ensure these quantities are removed and any currently unknown material is located, quantified and

TABLE 3-1 Building 4A Inventory Removal

No. of Drums	Lot Mark. Code	Description of Material
822	211	UF ₄ from Pilot Plant UF ₆
174	210	UF ₄ or ThF ₄
100	154	U ₃ O ₈ Rotexed Plant 8 Furnace Product
99	076	Zirnlö Ends - To Be Classified for Recovery
60	123	Calcium Uranate
31	079	Unfired Reduction Charges Plus MGF ₂ from Liner Cave-ins
31	101	Scrap U ₃ O ₈ or ThO ₂ , High Fluoride
18	113	Zirconium Clad Metal, From Off-site, To Be declared by Zirnlö System
12	103	Ingot Crops (Top Crops) from Primary Ingots
10	165	U ₃ O ₈ - Not Requiring Re-Oxidation
7	062	Dust Collector Residues - High Fluoride
7	122	U ₃ O ₈ + 8 Mesh - Low Fluoride
5	200	UO ₃ Product
4	082	Off spec UF ₄ or ThF ₄
3	069	Wet Sump or Filter Cake, Non-Oily and Non-Halide
2	315	Pickled Primary Ingot Sections Containing No Top Crop Metal
1	238	Solid Metal for Pickling and Double Melting, Other than First Generation Top Crops
1	314	Pickled Primary Ingot Sections Containing First Generation Top Crops
1	102	Scrap UO ₂
1	044	Sludges, Salt, Soft, Chloride, (For Plant 8 Recovery)
1	047	Samples Non-metallic, Miscellaneous
1	065	Scrap Salts, High Fluoride, including Floor Sweepings
1	110	Non-briquettable chips and turnings for oxidation
1	130	Partially Oxidized Metal for Dissolver

000034

removed. Techniques used for this inspection may include visual inspection or non-destructive analysis. Table 3-2 identifies approximate amounts of hold-up material by process area in Building 4A.

TABLE 3-2 Building 4A Hold-up Material

PROCESS AREA	HOLDUP VOLUME (FT ³)
1	79,975
2	6,131
3	1,682

Footnote: Hold-up material in each Process Area is assumed to contain a mixture of compounds and residues from their respective processes described in Section 3.0.

All equipment that has been identified as being PCB-contaminated will be containerized and managed in accordance with appropriate procedures. Material surfaces with PCB contamination will be cleaned and sampled to verify that the materials are no longer considered "PCB material" per 40 CFR 761.

A general cleaning operation will be performed to remove visible dust and loose debris (including pigeon debris) from the building surfaces, walls, and floors. The intention of this activity is to remove the loose radiological contamination held within the dust and other hazards (e.g., biological and chemical), thereby reducing the potential personnel exposure during aggressive remediation activities. Building penetrations that allow animal access will be sealed to ensure no further intrusion from animals.

All steam, potable water, electrical power, fire protection systems, compressed air, communication systems, and radiation detection alarms will be de-energized and terminated either at the equipment or at the building exterior to establish the known condition of each energy source within the remediation area. The fire alarm and radiation detection alarm systems will be re-routed and activated prior to remediation.

3.3 Hazardous Waste Management Units (Task III)

Two inactive Hazardous Waste Management Units (HWMUs) are located in the Building 4A complex. Consistent with the Director's Final Findings and Orders currently under negotiation, both HWMUs will be closed under the RCRA closure process independent of the Building 4A decontamination and dismantlement project. HWMU No. 6 (Drummed HF Residue Storage Inside of Plant 4A) is shown in Figure D-3 in Appendix D and consists of a concrete storage area located on the first floor of Building 4A. This HWMU has been closed in accordance with Closure Plan Information and Data approved by the OEPA. Certification of closure for this HWMU was submitted to OEPA on January 24, 1994. HWMU No. 6 currently requires post-certification inspection and approval by OEPA.

Documentation shows that the drums stored in HWMU No. 6 never leaked and a visual inspection of the concrete does not show stains or evidence of spills. Therefore, it has been determined that the concrete from this HWMU does not contain hazardous waste and will not require treatment in accordance with 40 CFR 268 prior to disposal.

HWMU No. 7 (Drummed HF Residue Storage NW of Plant 4A) is located in a gravel area northwest of Building 4A. Documentation has been submitted to OEPA to close this HWMU "administratively" (i.e., field activities will not be required). The documentation establishes that no releases occurred from the hazardous waste drums (USEPA Hazardous Waste No. U134) stored in HWMU No. 7 (and HWMU No. 6).

3.4 Asbestos Removal (Task IV)

The removal of ACM in Building 4A will be conducted by a remediation subcontractor qualified to conduct asbestos abatement operations. This activity will involve removing all friable types of asbestos consisting typically of thermal system insulation (TSI) on pipes and equipment. The requirements for ACM removal are specified in Section 01516 of the performance specifications and are summarized in this section.

The preferred method for removing ACM on piping is to remove the pipe and ACM as a single unit. A glovebag will be placed around the pipe cut location and the ACM will be removed

to allow for a pipe cut without disturbing adjacent ACM. The preferred method for cutting the pipe includes using reciprocating saws, portable band saws or mechanical shears. This method requires the use of secondary containment and the use of air cleaning units.

The standard procedure to be followed for non-pipe insulation in Building 4A, or where the glove-bag method is not practical for pipe insulation, is as follows:

- 1) isolate the work area;
- 2) install a containment barrier, which includes covering the walls, ceiling, and floor with polyethylene sheeting;
- 3) install an air cleaning unit in the containment area;
- 4) wet the ACM with an *amended water* solution;
- 5) remove the ACM by cutting it into manageable sections;
- 6) after completing all removal work, surfaces from which ACM have been removed shall be wet brushed or cleaned by an equivalent method to remove all visible ACM residue;
- 7) wet-clean all work area surfaces to remove all visible ACM;
- 8) wet clean all work area surfaces a second time twenty-four hours after the wet cleaning operation to remove any remaining visible ACM;
- 9) apply encapsulants to all surfaces in work area;
- 10) perform asbestos clearance testing to release the area; and
- 11) perform additional wipe-downs or apply a second application of encapsulant if the fiber count is elevated.

By erecting individual asbestos abatement *containment structures*, the total asbestos treatment area will be minimized. Removal of non-friable ACM (e.g., floor tile, transite siding, roof materials) will be performed, as described in Section 3.6 of this plan, in a manner that does not release asbestos fibers to the environment.

Most of the ACM in Building 4A is in good condition, and therefore there is no need for designating any areas within the building as "asbestos contaminated". Approximately 7,409 lineal ft. of pipe and pipe insulation will be removed as a part of asbestos removal activities.

3.5 Surface Decontamination (Task V)

Interior surface decontamination will be performed prior to exterior building removal. The surface decontamination requirements summarized in this section are specified in Section 01517 of the performance specifications prepared for this project. In accordance with DOE Order 5400.5, radiological contamination exceeding 1,000 dpm/100cm² removable or greater than 50,000 dpm/100cm² total contamination for uranium will be removed prior to opening the interior of a building to the environment. These decontamination levels were derived by conservatively extrapolating the free-release limits established by DOE Order 5400.5 down to a safe and attainable level. Methods used for determining adherence to those action levels are described in Sections 2.3.3 (Table 2-5) and 4.1 of the OU3 RD/RA SAP. Methods such as abrasive blasting, scarification, grinding and planing, and high-pressure steam and water sprays are proven techniques to reduce contamination levels. Technique-specific engineering and administrative controls will be applied to reduce the spread of contamination. These techniques include establishing containments and using air cleaning units for abrasive blasting, grinding and planing operations, the use of dikes and sumps to collect wash waters, or the use of high-efficiency particulate air (HEPA) ventilated scarification equipment. Additional administrative controls include limiting access to the area and use of work permits. If total contamination levels are below the action limit and the removable contamination levels are elevated, then contamination will be locked down using an encapsulant. If the action limits cannot be met, the proposed exterior building demolition technique or the use of additional engineering controls may require modification to ensure that exposure potentials are minimized. These techniques may include selective member cutting and piece-by-piece dismantlement. Whatever method of removing or fixing contamination is selected by the subcontractor, Part 1.6.A of Section 01512 of the performance specifications requires the subcontractor to demonstrate the effectiveness of the method prior to commencement of work.

Sampling during this remedial task is described in the RD/RA SAP, contained in the OU3 RD/RA Work Plan, and will include sampling of contact wastes and decontamination waters. Component surfaces will be surveyed to assess the levels of radioactivity for worker protection, building release, and material segregation planning.

3.6 Above-Grade Dismantlement (Task VI)

The requirements for above-grade dismantlement provided in this section have been summarized from the performance specifications that are referenced below for each discrete activity. Above-grade dismantlement of Building 4A will generally follow the order of subtasks listed below:

- 1) bulk removal operations (electrical; piping; *construction debris*; and Heating, Ventilation and Air Conditioning (HVAC) systems) (Section 15066 of performance specifications);
- 2) equipment removal (interior and exterior) (Section 15065 of performance specifications);
- 3) interior panel removal (Section 07415 of performance specifications);
- 4) exterior transite removal (Section 07415 of performance specifications);
- 5) structural steel removal (Section 05126 of performance specifications); and
- 6) Concrete Masonry Unit (CMU) containment and pier removal (Section 03315 of performance specifications).

Other activities that support this remedial task include lifting and rigging (Section 14955 of performance specifications), and ventilation and containment (Section 15066 of performance specifications).

Above-grade dismantlement tasks are described in the following discussion.

Bulk Removal

Prior to breaching any system, the remediation subcontractor and FEMP construction management will verify that all the systems are de-energized.

All piping, valves, electrical components, conduit, wire, cable trays, construction debris, and HVAC systems will be removed and reduced in size for loading into containers. During removal of piping, pumps, and HVAC ductwork, internal surfaces will be visually inspected to ensure the absence of free liquids or solid materials. If free liquids or solid materials are found, an evaluation will be made by the FEMP Construction Manager to determine the

requirements for material handling and removal (see Part 1.6.A of Section 15066 of the performance specifications). The evaluation will identify the contents and requirements for containerizing, storage, and disposal. Options for disposal will depend on the waste acceptance criteria of potential disposal facilities. If hold-up material remains at this stage of remediation (i.e., following safe shutdown), either the whole or portion of those affected systems will be removed and handled according to appropriate FEMP waste management procedures.

Methods such as reciprocating saws, portable band saws, shears are the preferred methods for bulk removal. Methods that volatilize the paint and contamination can be used; however, additional safety and health requirements for worker protection must be met. These methods include the use of respiratory protection and portable air cleaning units. Periodic radiological surveys will be performed to ensure that the potential for airborne radioactivity is minimized and to reduce the potential for cross-contamination. Surface wiping or vacuuming may be required to minimize transferrable contamination.

Approximately 29,635 lineal ft. of piping, and 27,756 lineal ft. of conduit/wire will be removed from Building 4A. Approximately 26,708 ft² of ductwork and 2,671 ft² of associated insulation will be removed.

Equipment Removal

The equipment within Building 4A have been identified and classified based on size and disposition requirements. The equipment have been classified into the following five categories listed below. Based on the equipment to be removed and the requirements for removal as specified by Section 15065 of the performance specifications, the subcontractor is required to submit for approval a detailed work plan including the sequence, methods of removal and dismantlement, equipment required, catalog cut sheets, drawings and method and materials to control possible generation of airborne contaminants from cutting operations, etc. (Part 1.4.A.1 of Section 15065).

As equipment is removed, the internal building surfaces and floor area previously covered by the equipment will be visually inspected to ensure the absence of free liquids or solids. If these materials are found, an evaluation will be conducted by FEMP construction management

to determine the requirements for removal and material handling (see Part 1.6.A of Section 15065 of the performance specifications).

An estimated 86,637 ft³ of equipment will be removed from Building 4A. The equipment described in the Building 4A background discussion in Section 3.0 and all ancillary equipment will be removed and transported concurrently from several areas of the building. Staging of removed equipment and size reduction will occur within the south-central portion of Building 4A. Table 3-3 lists the various types of equipment to be removed from Building 4A. Certain equipment may be classified as more than one type due to variances in size or weight.

Type RA Equipment: Type RA equipment is bulk equipment that is small enough to be handled by one or two individuals (without lifting devices) as it is loaded into a container or onto a skid. Removal of this type of equipment involves the use of hand tools, both manual and powered, or an oxy-acetylene torch, to disconnect or cut equipment from its location and hand-carry it to a container or skid.

Type RB Equipment: This equipment is small enough to fit in a container but requires a fork-lift or other mechanical means to handle. The objective of this removal is to disconnect the equipment and remove it intact to the extent practicable. This equipment will be disconnected from mounts by the use of hand tools or an oxy-acetylene torch.

Type RC Equipment: This equipment should be disassembled for placement into a container. The objective of this removal is to dismantle large, bulky equipment in manageable sections that can be handled and contained safely. This equipment will be disconnected from its mounts by the use of hand tools or an oxy-acetylene torch. The equipment will be further dismantled whenever possible, using shears and mechanical cutting or disassembling at assembly joints.

Type RD Equipment: This equipment must be removed in one piece along with the building. This equipment will be removed by unbolting, cutting, or any other means necessary. This equipment will be disconnected from mountings by use of hand tools, both manual and powered, or by use of mechanical cutting or shearing. This activity will take place when convenient and if the equipment can be proven to be stable and secure. If the equipment

cannot remain stable and secure after removal from its mountings, then it shall be disconnected when prepared for removal from the building.

Table 3-3 Building 4A Equipment Removal

Type RA Equipment	Type RB Equipment	Type RC Equipment	Type RD Equipment	Type RE Equipment
Drum Station	Tanks	Air Handlers	Talcum Furnaces	T-Hopper Turner
Small Pumps	Motor Control Centers	Blowers	Ammonia Dissociators	
Computer Equipment	Compressors	Dust Collectors	HF Tanks	
Small Motors	Blowers	Duct Blowers		
	Dryers	Tanks		
	Weigh Bin Feeders	Reduction Reactors		
	Transformers	HF Scrubbers		
	Weigh Bins	Refrigeration Units		
	Pumps			
	Dissociators			

Type RE Equipment: This equipment will be removed for salvage or beneficial re-use. The equipment will be removed and transported intact or in sub-assemblies and turned over to FEMP construction management. Type RE equipment will be specifically identified for staging in a separate turnover location.

The steps required for removal of this equipment, which must take place prior to opening the building include:

1. Remove all process piping, ducts, conduit and any other appurtenances from the equipment.

2. Disassemble equipment in place to the extent necessary so that it will fit into a container when removed from the building.

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3. Perform additional radiological survey before removal of interior and exterior equipment to aid in determining the engineering controls and preferred methods to complete dismantlement. Elevated levels of radiological contamination (as specified in Section 3.5) will require decontamination or the use of encapsulants, enclosures and/or air cleaning units to control potential airborne emissions. The surveys required for this activity will be performed at the completion of safe shutdown operations and prior to equipment removal.

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When the building is opened, the equipment will be placed into a container inside the building, if possible, or removed from the building and placed into a container. Depending on the size and configuration of the equipment, a rigging plan may be necessary prior to removal.

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Interior Panel Removal

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Transite Panel Removal: Prior to removing the transite panels, a coating of amended water will be applied to lock-down any loose fibers. A screw gun is the preferred method for removing the panels. If the fasteners cannot be removed with a screw gun the area around the fastener will be sprayed with a fixative allowing the fastener to be pried out. Prior to any fixation, Part 1.6 of Section 07415 of the performance specifications requires the remediation subcontractor to demonstrate the proposed method to be utilized. After the screw is pried out the fixative will be reapplied. If a broken panel is encountered the area around the break will be sprayed with amended water and the fragmented pieces will be encapsulated with the fixative. HEPA vacuums will be available to collect any loose material. The batt insulation will be removed and bagged. As the insulation is removed, a visual inspection and a radiological survey will be performed on the newly exposed surfaces. Indications of friable asbestos will require gathering the loose material and locking the remaining fibers in place. If radiological survey results indicate the need to perform decontamination or lock-down of the areas to levels consistent with surrounding building surfaces these activities will be performed. Fasteners and molding that hold the panels and insulation in place will also be removed as part of this operation. An estimated 81,803 ft² of interior transite panels will be removed.

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Metal Panel Removal: Screw guns are the preferred method to remove the metal panels. Optional methods of drilling out the fastener or prying the fastener out may also be used to remove the panels. As the panels are removed, a radiological survey will be performed on the newly exposed surfaces to ensure contamination levels are within the established guidelines. Surface decontamination may be performed to reduce contamination levels as required. Louvers, gutters, downspouts, and flashing will be removed as they are encountered. An estimated 2,624 ft² of interior metal wall panels will be removed.

Exterior Transite Removal

Part 3.1 of Section 07415 of the performance specifications specifies that the subcontractor shall maintain the integrity of the exterior of the building until the transite and insulation has been removed and encapsulant, lock-down, or surfactant has been applied to the interior surface of exterior panels. Prior to removing the transite panels a coating of amended water will be applied to lock-down any loose fibers. A screw gun is the preferred method to remove the panels. If the fasteners cannot be removed with a screw gun, the area around the fastener will be sprayed with a fixative, thus allowing the fastener to be pried out. After the screw is pried out, the fixative will be reapplied. If a broken panel is encountered, the area surrounding the break will be sprayed with amended water and the fragmented pieces will be encapsulated with a fixative. HEPA vacuums will be available to collect any loose material. A wall climbing device is the preferred method to remove the wall panels the panels can be removed and stacked on the wall climber for transport to the ground level for packaging and loading into a container. An estimated 81,440 square ft. of exterior transite panels will be removed.

Structural Steel Removal

In order to prepare the component for the dismantlement all remaining items, such as non-structural steel members, windows and frames, doors, gutters and down spouts, will be removed using hand tools and oxy-acetylene torches. As these items are removed, the exposed component surfaces have the potential of holding debris and contamination. These areas will be radiologically surveyed to determine if these surfaces exceed the contamination guidelines identified in Section 3.5. Additional decontamination may be performed as detailed in Section 3.5. Use of shape charges or the pull over technique are the preferred dynamic dismantlement techniques for Building 4A. The area surrounding Building 4A and the steel

structure will be sprayed with amended water to reduce fugitive dust emissions. The Remediation subcontractor will be required pursuant to Part 1.5.A of Section 05126 of the performance specifications to specify in a structural steel removal work plan the following methods:

- detailed sequence of dismantlement, including equipment;
- methods for contamination control, including fugitive emissions during size reduction;
- methods for size reduction;
- protection of lay-down and size reduction areas from contamination by lead paint chips;
- methods and materials to be used for cutting lead painted steel; and
- calculations to verify structural integrity of partially dismantled structure, as applicable.

If controlled explosive methods are used, Part 1.5.A.3 of Section 05126 further states that a detailed work plan will need to satisfy the following key requirements:

- methods and materials to be used;
- means to protect adjacent structures and equipment, material, and underground utilities from damage, including protection from projectiles;
- methods and materials to control fugitive emissions;
- contingency plan for detonation failure;
- proof of Ohio blaster's license; and
- evidence of previous work experience using controlled explosives to take down multi-story structures near other structures within the last five years.

Section 05126 provides direction to the subcontractor in several other ways relative to the removal of structural steel. Part 3.2.D reemphasizes the subcontractor's responsibility for avoiding damage to adjacent structures, material, and equipment during dismantlement activities. Part 3.2.I specifies that lead-based paint chips and debris, released during

structural steel dismantlement, shall be collected and managed in accordance with Section 01120.

Hydraulic shears and acetylene torches will be used to reduce the size of the structural steel frame. An estimated 1,432 tons of structural and miscellaneous steel will be removed.

CMU Containment and Pier Removal

The CMU containment and above-grade concrete platforms (piers) will be removed down to the elevation of the base slab. Part 1.5.A of Section 03315 of the performance specification requires the remediation subcontractor to develop a concrete removal work plan containing information quite similar to that of the structural steel removal work plan discussed above. Pursuant to Part 3.2.J of Specification 03315, interior concrete/CMU walls shall be removed using non-explosive methods prior to opening the shell of the structure. The CMU containment and piers will be radiologically surveyed prior to removal to determine the need for engineering controls such as an enclosure with ventilation or water sprays to minimize fugitive dust during removal operations. The remaining CMU will be leveled to within one inch of the remaining slab to minimize the chance for water accumulation and potential personnel hazards.

The base slab of the structure will remain in place as part of this remedial action. Part 3.3 of Section 01515 of the performance specification addresses requirements relative to the preparation of the base slab at completion of work. Specifically, all penetrations, trenches, and other voids in the slab will be filled with granular material and grout to provide a flat uniform surface to minimize the chance for water accumulation and migration, and potential personnel hazards. All wire and cable will be removed from the conduit embedded in the concrete. Conduit and other slab obstructions will be cut to grade level, plugged, and covered with grout to grade level. The base slab will be characterized to determine if elevated contamination levels exist that require the slab to be encapsulated. If the slab indicates elevated contamination levels the surface will be prepared and an encapsulant will be applied.

4.0 SCHEDULE

This section presents the planning and implementation schedules for the Building 4A remedial action project. Figure 4-1 presents a schedule for the submittal, review, and approval of the implementation plan. Figure 4-2 presents the schedule for implementation of field activities for the Building 4A remediation project. Since inventory removal and safe shutdown activities are preparatory actions and not part of remedial action, they are not specifically represented in the schedule. Figures 4-1 and 4-2 reflect the primary milestones of the project, including preparation and approval of this implementation plan, contract award, initiation and duration of remediation field activities, project completion ("Certification of Construction Completion"), and the preparation and submittal of the remedial action report to USEPA and OEPA. These schedules are based on the IROD issuance date of July 22, 1994, and the submittal of this plan to the regulatory agencies concurrent with the December 1994 Draft Final OU3 RD/RA Work Plan.

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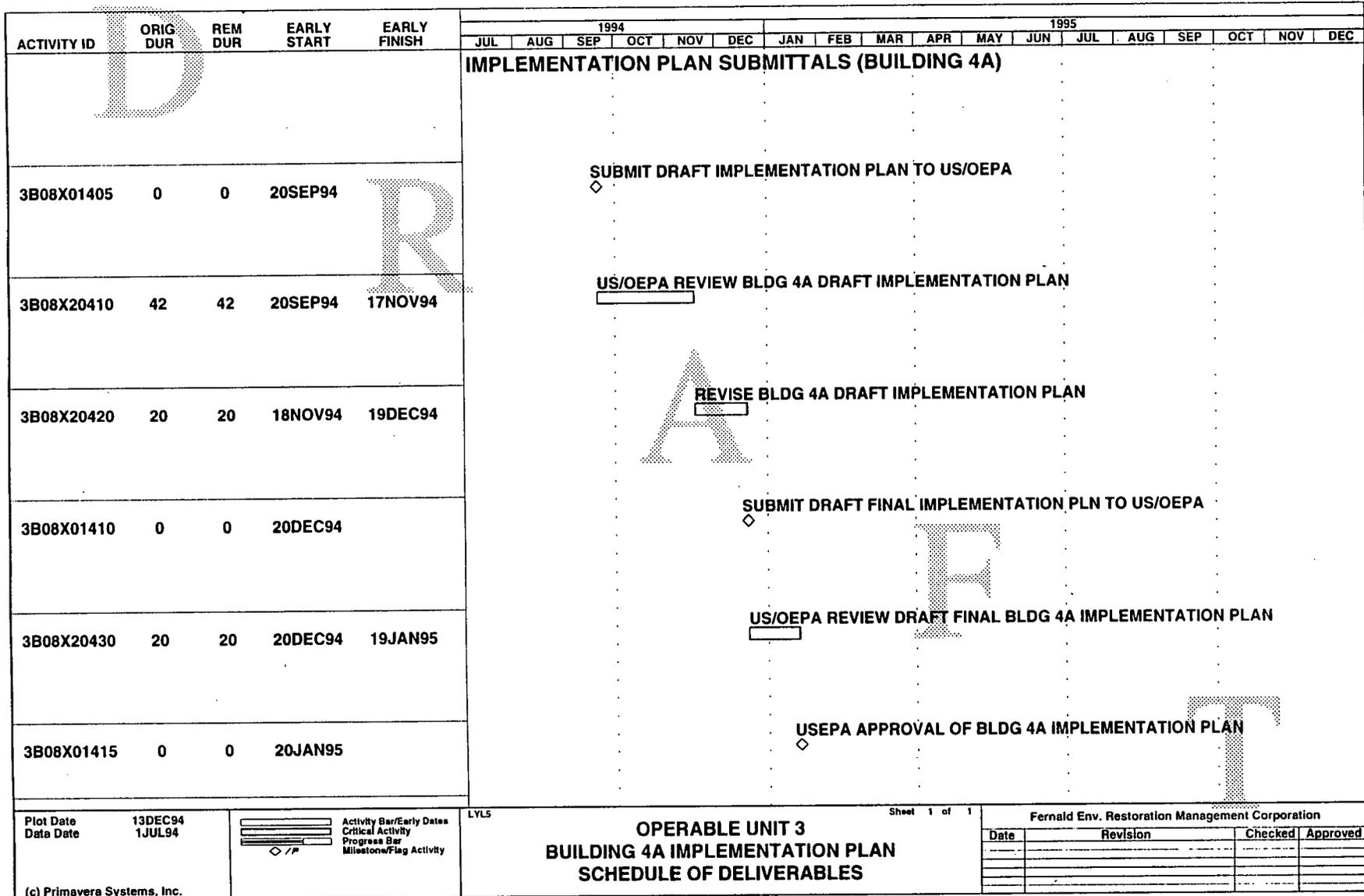
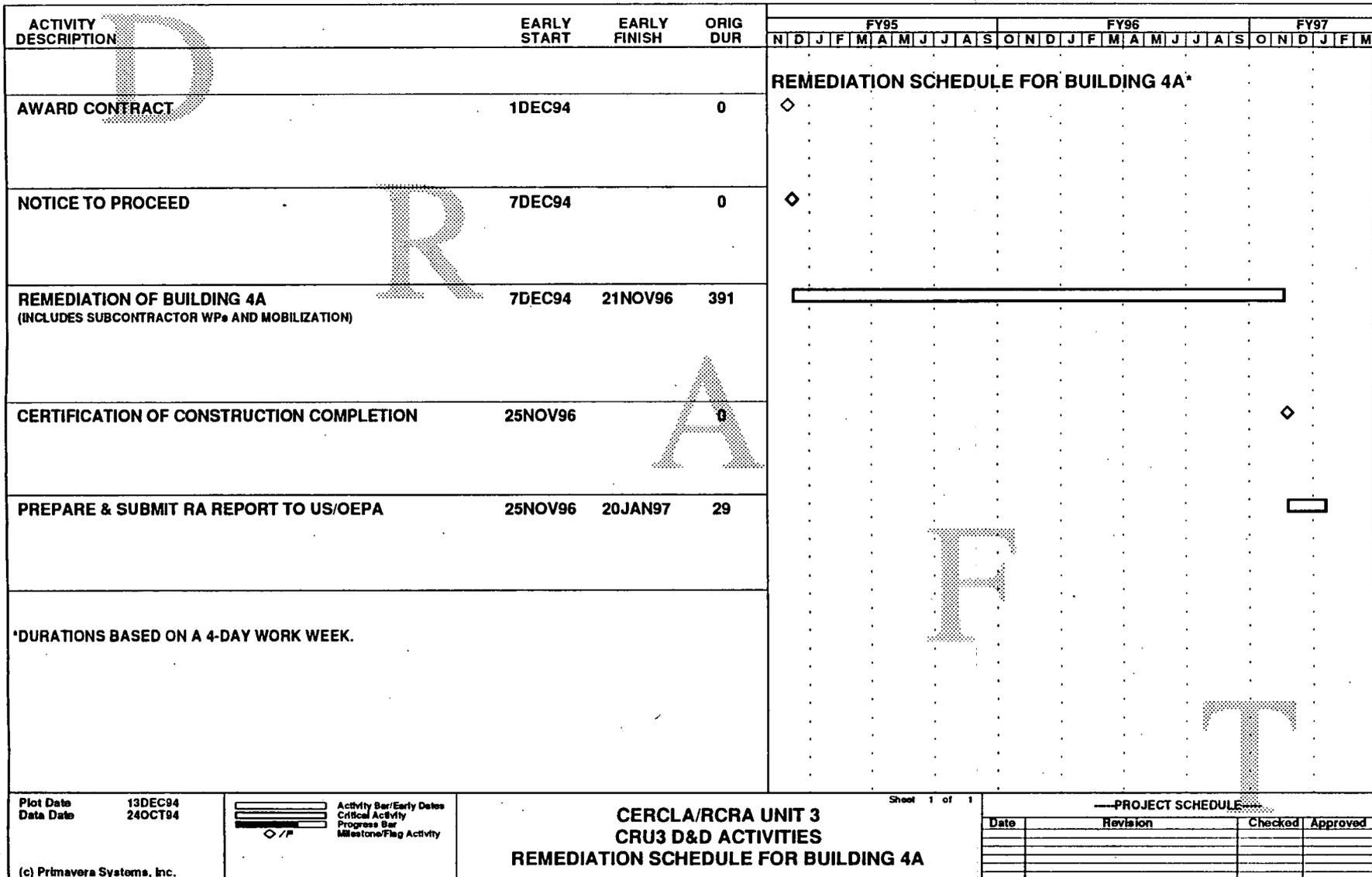


FIGURE 4-1 Building 4A Summary Schedule for Deliverables



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FIGURE 4-2 Remediation Schedule for Building 4A

5.0 MANAGEMENT

The implementation of Building 4A remediation action will be performed through a coordinated effort by the remediation subcontractors, FEMP organizations, remedial design subcontractor, and DOE project management. Section 7 of the OU3 RD/RA Work Plan provides the overall management structure applied to this remediation project. A description of project management responsibilities that have been highlighted for Building 4A is outlined in this section.

DOE will provide direct project oversight in two ways, both of which become a concerted effort that ensures performance of remedial activities in adherence to project specifications and requirements. The Environmental Restoration Division within DOE (operating out of DOE Headquarters in Washington, D.C.) will assign an individual from DOE Facilities Representative Department that will perform independent field oversight of all remedial activities performed under this project. This individual will be experienced/knowledgeable in the areas of engineering, construction, quality assurance/quality control, and health and safety; and will be responsible for daily inspections of all field activities and necessary reporting to the DOE Program Manager at the Fernald Field Office. The Facilities Representative will have the authority to stop work if conditions warrant such action. DOE Fernald Field Office will also conduct field oversight through technical leads responsible for construction, engineering, quality assurance and quality control, and health and safety. The DOE Facilities Representative and technical leads will immediately notify the DOE Program Manager of any issues or problems that arise in an effort to seek prompt resolution.

The DOE Program Manager and the environmental management contractor will oversee the remedial action through its Design-Engineering-Construction (DEC) team review and approval process and by performing the following functions:

- assuring the selection of qualified subcontractor(s) that meet prequalification criteria, demonstrate a good safety record, possess similar work experience, and rank high on a detailed technical proposal assessment;
- assuring that the apparent low bidder is responsive and responsible;
- reviewing, commenting, and approving of remediation subcontractor work plans;

- conduct an alignment meeting, pre-construction meetings, and weekly coordination meetings with the remediation subcontractor to address all concerns, schedule status, planning, progress, deviations; 1
- performing quality assurance of all remediation tasks to determine adherence to performance specifications by conducting inspections of the remedial activities performed by the remediation subcontractor and those performed by FEMP workforces/labor support contractors in support of the remedial action; and 4
- performing pre-final and final inspections. 8

In addition to the isolation of utilities and removal of hold-up material, personnel within the FEMP Safe Shutdown program will perform gross cleaning during preparatory actions. Personnel within the FEMP Waste Management program will be responsible for removal of stored materials (non-holdup) not associated with the project during Task I (Inventory Removal) activities. FEMP waste management personnel will also remove containerized material from the queuing area for certification, packaging, and disposition.

The subcontracting strategy calls for several subcontractors, each with specific remediation tasks. One remediation subcontract will include decontamination and dismantlement of Building 4A. A labor support subcontract will be used to provide temporary power and water for use by the remediation subcontractors, provide decontamination trailers and associated utilities. A Honeywell subcontract will be issued for re-routing alarm and communication systems.

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APPENDIX A

PROPOSED BUILDING 4A SAMPLING

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PROPOSED BUILDING 4A SAMPLING

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With the exception of NTS and Envirocare of Utah required sample numbers, Table A-1 summarizes the various types of sampling anticipated during the remediation activities identified within this implementation plan. NTS and Envirocare of Utah sample numbers are addressed in text in the discussion under the appropriate heading. The sample types and numbers were developed based on the data needs identified in the SAP for the for the interim remedial action. In summary, the sample types and numbers are based on the assumptions outlined below.

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Characterization Screening

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The estimates provided are based on the assumption that the RI characterization data and process knowledge will be sufficient for the characterization of media within the components. The only components which will be characterized are those that were not characterized during the RI. Sample numbers represent one intrusive sample at both the radioactive and chemical "hot spots", with these hot spots located by screening techniques. The need for a polychlorinated biphenyl (PCB) sample is also indicated where existing data, process knowledge, etc., reflect the need for such sampling. The sample represents a confirmatory intrusive sample based on PCB surveying.

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Asbestos

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This category represents samples needed to verify whether certain a material is ACM and whether the ACM is regulated or non-regulated.

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Secondary Waste (Decon)

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The sample numbers listed in Table A-1 are based on the assumption that one sample of wash water will be taken per component. The total number of samples in this category may change, based on the need to segregate areas within a component (the number would increase), or based on the need to combine wash water for components with similar characteristics (thus, the number would decrease).

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HWMUs

Since there will be no HWMU closure actions performed in Building 4A within the scope of this project, no sampling for verifying HWMU clean closure will be necessary.

NTS Confirmatory

Sampling requirements for shipment of materials to NTS require that one percent of each material waste stream be sampled; three samples for each container. Based on the material segregation categories (waste streams) and material volume and container estimates provided in Table 2-2 of this implementation plan, a total of twelve samples will be required for qualifying material shipments from remediation of Building 4A to NTS. The total of twelve samples is based on disposal of Categories B, C, and I at NTS; and sampling one container each for Categories B and C, and two containers for Category I.

Envirocare of Utah

As of the preparation of this version of the Building 4A Implementation Plan, specific data quality objectives are being finalized and sample estimates are being determined. As a result, sample estimates are not available for this version of the document. It is anticipated that the eventual sample estimates will be included in the final version of this document.

Asbestos Air Monitoring

Environmental sample numbers represent the number of samples to be taken per period of time over the duration of the asbestos removal activity, with the interior decontamination and dismantlement (Interior D&D) samples representing perimeter monitoring during interior asbestos removal activities, and exterior decontamination and dismantlement (Exterior D&D) samples representing perimeter monitoring during exterior asbestos removal activities. Occupational sample numbers represent breathing zone samples taken during interior asbestos removal within enclosed components. There may be situations where asbestos removal is required and was not originally accounted for in these assumptions. Therefore, some components may require asbestos air monitoring sampling, but were not so designated in Table A-1. Refer to Section 3.4.1 of the SAP for the interim remedial action.

Radiological Air Monitoring

Environmental sample numbers for Exterior D&D represent samples from eight air monitoring stations (shown in Figure 2-1) located around the construction zone. The exterior sampling is expected to begin at least one month prior to the onset of remediation activities, to establish a baseline, then last through the expected duration of remediation. Occupational sample numbers for the Interior D&D represent samples to be taken from general air samplers operated within the components during remediation (i.e., in an enclosed environment). The numbers may increase if activities are performed within distinct areas of a component (e.g., on multiple floors). The occupational air monitoring represents the need for monitoring 30% of the work force per day and is based on experience from the Plant 7 Dismantling project. Refer to Section 3.4.1 of the SAP for the OU3 RD/RA Work Plan for further information on radiological air monitoring.

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TABLE A-1 Building 4A Sampling Summary

Component Number	Characterization Screening			Asbestos	Secondary Waste (Decon)	HWMUs		NTS Confirmatory	Asbestos Air Monitoring			Rad Air Monitoring		
	Rad	Chem	PCB			Active	Inactive		Environmental		Occupational	Environmental	Occupational	
									Interior D&D	Exterior D&D	Breathing Zone	Exterior D&D	Interior D&D	Breathing Zone
4A	0	0	0	0	1	N/A	N/A	12	4/wk**	7/d**	6-10/d**	6 to 10/wk**	1/d**	4/d**

Footnotes:

Sample estimates for Envirocare of Utah are addressed in text preceding this table.

d = day

wk = week

N/A = not applicable

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APPENDIX B

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BUILDING 4A

SUMMARY OF POTENTIAL CONTAMINANTS

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APPENDIX B

SUMMARY OF BUILDING 4A POTENTIAL CONTAMINANTS

Table B-1 identifies potential contaminants for each component in Building 4A. Where applicable, potential contaminants are listed for each process that existed within a component. For each component or process, the table lists the historical information sources that indicate the possible presence of the contaminants. Historical information sources are process knowledge, significant quantities of use, spill logs, history of the FEMP, incident reports, data from the perched water removal action, RCRA drummed waste determinations, RCRA reports, and material distribution information. For every component, potential contaminants of concern include uranium, asbestos, lead (in paints and building structure) PCBs, and mercury. These contaminants are in addition to any other potential contaminants listed in Table B-1. Related by-products, decay products, or breakdown products may also be possible for many of the listed potential contaminants. The listing is presented as a best summary of currently available information. The OU3 RI/FS Work Plan Addendum is the source of the information provided in Table B-1.

The following legend applies to Table B-1:

Uranium	=	U-235/236, U-234, U-238, + daughters (where it is known, the maximum enrichment is given in parenthesis as %E). This designation refers to purified process material.
Ore	=	Pitchblende, Q11, or other unrefined uranium-bearing ores.
Ore concentrates	=	Uranium ore material which was refined somewhat at the mine site (i.g., Kerr McGee, Australian, Colorado, Canadian ore feed materials).
Ore raffinate	=	Material stripped from uranium ores by the FEMP refinery extraction process (including but not limited to: radium, thorium, protactinium, and a variety of other radionuclides and metals).

- Thorium or thorium compounds = Material which originated as thorium 232. May include metal or any or all of the following compounds: thorium tetrafluoride, thorium hydroxide, thorium oxalate, thorium oxide, or thorium nitrate.
- Uranium compounds = Any or all of the following compounds; U_3O_8 , UO_3 , UF_4 , UO_2 , UNH (where possible, the specific compound is identified).
- Solvent residues = The residual material from solvents used at the FEMP (primarily 1,1,1 trichloroethane, trichloroethylene, and perchloroethylene).
- Sump cake = Precipitants from the filtration of uranium or thorium solutions.
- High grade residues = UF_4 , U_3O_8 , UO_3 , UO_2 , uranyl ammonium phosphate (UAP), ammonium diuranate (ADU).
- Low grade residues = Residual material from magnesium fluoride (MgF_2), sump cakes, heat treating salts.
- Prill = Metallic beads and blobs of uranium, and magnesium from FEMP reduction process.
- Metals = Aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, cyanide, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, silver, sodium, thallium, vanadium, zinc.
- = No contaminants other than those common to all components.

TABLE B-1 Potential Contaminants

Structure/Facility	Associated Process	Potential Contaminants	Reference Source/Comments
Green Salt Plant (4A)	Ammonia Dissociation - Catalytically cracked anhydrous ammonia to H ₂ and N ₂ (dissociated ammonia - DA) for use in the hydrofluorination process.	Anhydrous ammonia, catalyst (nickel)	Process knowledge of significant quantities, Spill log
	Hydrofluorination - UO ₃ , produced at the FMPC; Port Hope, Canada; Mallenerodt Chemical Works at Weldon Spring, Mo.; and the DOE Hanford works (UO ₃ first converted to U ₃ O ₈), was reduced to UO ₂ with DA in heated fluid bed reactors and passed countercurrent to anhydrous hydrofluoric acid (AHF) in 3-stage heated horizontal continuous-flow reactor banks to produce UF ₄ product.	UF ₄ , U ₃ O ₈ , UO ₃ , UO ₂ , anhydrous HF, mercury	Process knowledge of significant quantities, Spill log, Incident report, History of the FEMP
	AHF Vaporization - AHF provided from the main tank farm is vaporized for use in the hydrofluorination process.	Anhydrous HF, mercury, ammonia	Process knowledge of significant quantities, Spill log, Incident report
	Hydrofluoric Acid Recovery - Excess HF from the hydrofluorination process is filtered and scrubbed for recovery. Aqueous HF is transferred to the main tank farm.	UF ₄ , HF (up to 30 wt%), KOH, KF	Process knowledge of significant quantities, Spill log, Incident report, History of the FEMP
	UF ₄ Repackaging - UF ₄ received from the DOE Paducah facility and FMPC operations are blended and repackaged for quality control.	UF ₄ (depleted and enriched up to 1.25% E)	Process knowledge of significant quantities, Incident report
	Moving Bed Experimental Reactor - (1955-1958) Vertical reactor for hydrofluorination.	UO ₃ , UF ₄	Process knowledge of significant quantities, The reactor was tested experimentally but never placed into product use
Green Salt Plant (4A)	Nitrogen Generation - Produced and stored nitrogen gas for purging operations in Plant 4.	Ammonia	Process knowledge of significant quantities
	HF Refrigeration - Used to reclaim HF fumes as anhydrous from Plant 4 and Plant 7 operations.	HF (anhydrous and aqueous)	Process knowledge of significant quantities, Refrigerants were also used in this process; refrigeration system operated from 1954-1956, then was removed

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TABLE B-1. Potential Contaminants

Structure/Facility	Associated Process	Potential Contaminants	Reference Source/Comments
<p>Thorium Tetrafluoride - (1954) Thorium oxide from Plant 9 was hydrofluorinated in bank 7 and returned to Plant 9.</p>	None anticipated	Process knowledge of significant quantities, Process only operated in 1954	
<p>Water Treatment - Originally, one of two steel tanks received floor sump liquids, was lime neutralized, and filtered to the second tank, which pumped to the general sump. Filter cake was drummed and sent for sampling. In more recent years, no processing was done. Collected liquids were transferred to the general sump or Plant 8 directly.</p>	UF ₄ , UO ₃ , UO ₂ , HF	Process knowledge of significant quantities, Incident report, History of the FEMP	
<p>Storage - Drummed materials and hoppers (UF₄, UO₃, HF residues, etc.) have been stored at various times in many areas of the plant.</p>	UF ₄ , UO ₃ , depleted UF ₄ , U ₃ O ₈ , aqueous HF residues	Process knowledge of significant quantities, Incident report, History of the FEMP	

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APPENDIX C

BUILDING 4A PERFORMANCE SPECIFICATIONS

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APPENDIX C

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BUILDING 4A PERFORMANCE SPECIFICATIONS

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The performance specifications listed on the following page were prepared during the remedial design for Building 4A. Since remedial design - Certified for Construction (CFC), these performance specifications have been revised and their most recent revision designation (REV) has been included in this list. A complete set of the original CFC performance specifications for this project are provided as Appendix C in the RD/RA Work Plan.

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<u>SECTION</u>	<u>TITLE</u>	<u>REV.</u>	<u>DATE</u>
DIVISION 1 - GENERAL REQUIREMENTS			
01120	WASTE HANDLING CRITERIA	3	11/30/94
01515	MOBILIZATION AND DEMOBILIZATION	3	11/30/94
01516	ASBESTOS ABATEMENT	3	11/30/94
01517	REMOVING/FIXING RADIOLOGICAL CONTAMINATION	3	11/30/94
DIVISION 2 (NOT USED)			
DIVISION 3 - CONCRETE			
03315	CONCRETE REMOVAL	3	11/30/94
03900	FOUNDATIONS	3	11/30/94
DIVISION 4 - (NOT USED)			
DIVISION 5 - METALS			
05125	NEW STRUCTURAL STEEL	3	11/30/94
05126	STRUCTURAL STEEL DISMANTLEMENT	3	11/30/94
DIVISION 6 (NOT USED)			
DIVISION 7 - THERMAL AND MOISTURE PROTECTION			
07415	TRANSITE REMOVAL	3	11/30/94
DIVISION 8 - 13 (NOT USED)			
DIVISION 14 - CONVEYING SYSTEMS			
14955	LIFTING AND RIGGING	3	11/30/94
DIVISION 15 - MECHANICAL			
15065	EQUIPMENT DISMANTLEMENT	3	11/30/94
15066	INTERIOR DISMANTLEMENT	3	11/30/94
15067	VENTILATION AND CONTAINMENT	3	11/30/94
DIVISION 16 (NOT USED)			

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APPENDIX D

DESIGN DRAWINGS FOR BUILDING 4A PROJECT

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APPENDIX D

DESIGN DRAWINGS FOR BUILDING 4A PROJECT

The following drawings are copies of the blueprint drawings that were prepared during the remedial design for the Building 4A project. Figures D-1 and D-2 show areal views of the site and project area, respectively. Figures D-3 through D-9 are areal views of each accessible elevation within the building, showing the three Process Areas, related equipment, and other significant features. Figures D-10 through D-13 are copies of 1952 as-built profile drawings for each side of the building. The key features shown in these drawings (Process Areas and related equipment) are discussed in Section 3 of this Implementation Plan.

FIGURES

		10
FIGURE D-1	Production Area Site Map - Building 4A	11
FIGURE D-2	Dismantlement Area Plan - Building 4A	12
FIGURE D-3	Floor Plan of Building 4A - First Level (ELEV. 580'-0")	13 14
FIGURE D-4	Floor Plan of Building 4A - Second Level (ELEV. 588'-6")	15 16
FIGURE D-5	Floor Plan of Building 4A - Third Level (ELEV. 597'-0")	17 18
FIGURE D-6	Floor Plan of Building 4A - Fourth Level (ELEV. 605'-0")	19 20
FIGURE D-7	Floor Plan of Building 4A - Fifth Level (ELEV. 610'-0")	21 22
FIGURE D-8	Floor Plan of Building 4A - Sixth Level (ELEV. 619'-8")	23 24
FIGURE D-9	Floor Plan of Building 4A - Seventh Level (ELEV. 629'-9")	25 26
FIGURE D-10	West Elevation of Building 4A	27
FIGURE D-11	East Elevation of Building 4A	28
FIGURE D-12	North Elevation of Building 4A	29
FIGURE D-13	South Elevation of Building 4A	30

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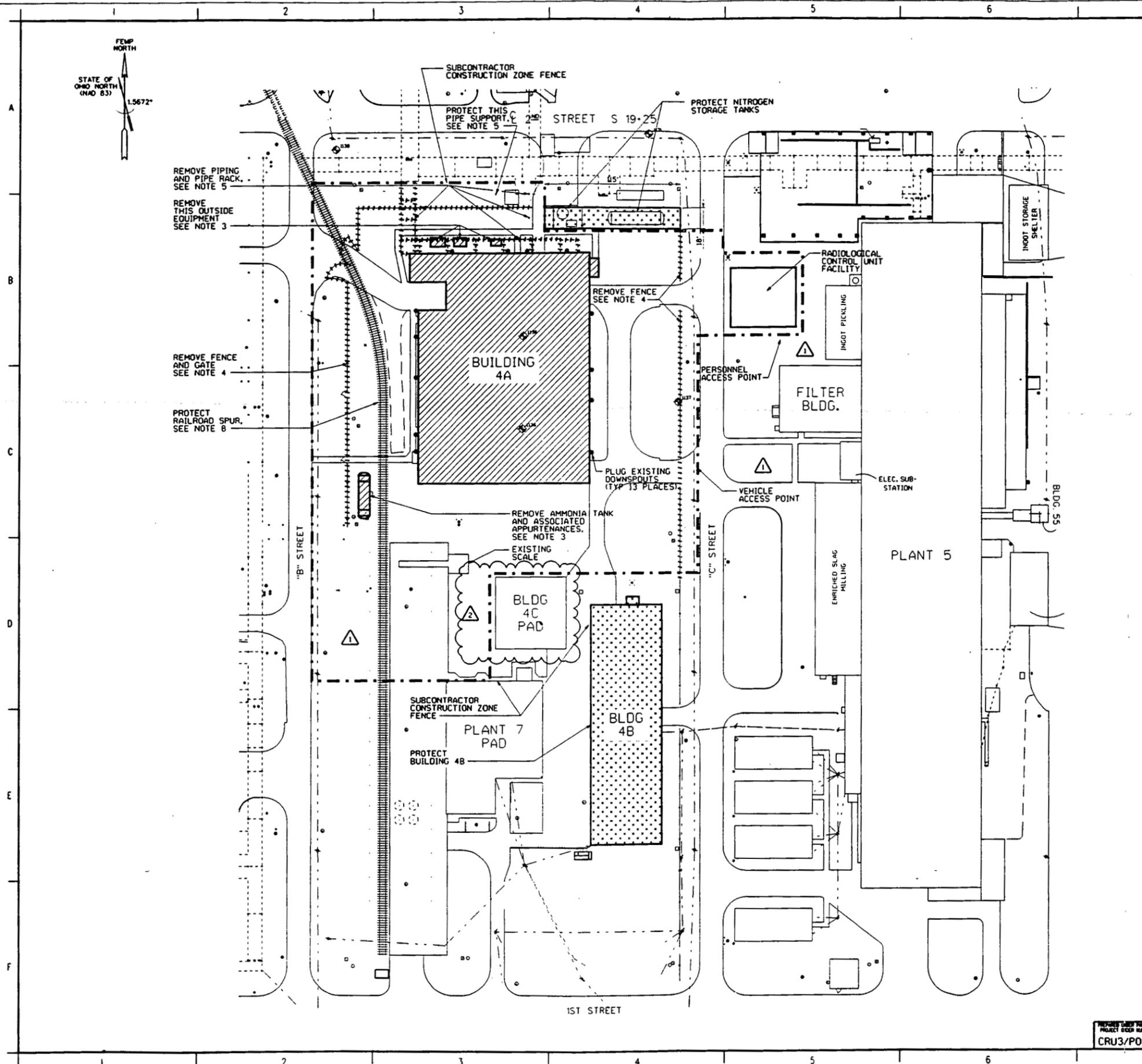
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R93g010619.m(6459.ws314) pol121@ws314 Wed Dec 7 16:20:49 EST 1994

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- NOTES**
1. INFORMATION ON THE LOCATIONS OF EXISTING FEATURES SHOWN ON THIS PLAN WERE TAKEN FROM FERMCO SITE DRAWINGS. NO FIELD VERIFICATION BY SURVEY HAS BEEN PERFORMED.
 2. SUBCONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS, INCLUDING ELEVATIONS, BEFORE STARTING CONSTRUCTION AND/OR FABRICATION. ANY DEVIATIONS NOTED SHALL BE BROUGHT IMMEDIATELY TO FERMCO CONSTRUCTION MANAGER'S ATTENTION IN WRITING AND RESOLVED BEFORE CONTINUING WITH CONSTRUCTION.
 3. REMOVAL AND DISPOSAL OF OUTSIDE EQUIPMENT AND ASSOCIATED APPURTENANCES SHALL BE PERFORMED BY THE SUBCONTRACTOR. FOUNDATIONS TO BE REMOVED FLUSH WITH GRADE.
 4. SUBCONTRACTOR TO REMOVE EXISTING CHAINLINK FENCE AND GATES AS REQUIRED.
 5. SUBCONTRACTOR TO REMOVE PIPING AND PIPE RACK WITHIN THE CONSTRUCTION ZONE FENCE AT THE NEAREST SUPPORT BENT, EXCEPT WHERE NOTED OTHERWISE.
 6. EXISTING HARD SURFACE PAYEMENTS (ASPHALT, CONCRETE, ETC.) TO REMAIN UNDISTURBED UNLESS APPROVED BY FERMCO CONSTRUCTION MANAGER.
 7. SUBCONTRACTOR SHALL PROTECT ALL UNDERGROUND UTILITIES AND MONITORING WELLS. SEE DRAWING 93X-5900-G-00625 FOR UTILITIES.
 8. EXISTING RAILROAD SPUR TO REMAIN IN SERVICE. UPON COMPLETION OF THE PROJECT, SUBCONTRACTOR SHALL REPAIR ANY DAMAGE CAUSED BY HIS FORCES.
 9. EROSION CONTROL MEASURES SHALL BE INSTALLED ON CATCH BASIN AND DOWNSPOUTS PRIOR TO BEING PLUGGED AND AT ALL OTHER APPLICABLE LOCATIONS.
 10. LAYDOWN AREAS AND OVERHEAD CRANE LOCATION SHALL BE DETERMINED BY SUBCONTRACTOR WITH APPROVAL BY FERMCO CONSTRUCTION MANAGER.
 11. PROVIDE POSITIVE SURFACE DRAINAGE BY UTILIZING EXISTING AND NEW FACILITIES TOGETHER WITH MINIMAL SURFACE REGRADING TO ELIMINATE LOW POINTS. WORK TO BE COORDINATED AND APPROVED BY FERMCO CONSTRUCTION MANAGER.
 12. AT THE COMPLETION OF THE PROJECT, SUBCONTRACTOR SHALL REMOVE AND STORE THE TEMPORARY CONSTRUCTION FENCE AND GATES IN THE LOCATION DESIGNATED BY FERMCO CONSTRUCTION MANAGER.

LEGEND

- MONITORING WELL LOCATIONS
- - - SUBCONTRACTOR CONSTRUCTION ZONE FENCE
- FENCES OR PIPE RACK TO BE REMOVED
- ▨ BUILDINGS/COMPONENTS TO BE REMOVED BY SUBCONTRACTOR
- ▤ DENOTES ITEMS REQUIRING SPECIAL ATTENTION FOR PROTECTION FROM DAMAGE

REF DWG NO.	DRAWING TITLE
93X-5900-G-00625	UTILITY PLAN

2	DELETED BLDG 4C FROM DWG TITLE & SCOPE, MODIFIED SUBCONTRACTOR CONSTR ZONE FENCE			
1	REMOVED CONTAINER QUEUING AREA; REVISED CONST. ZONE AREA; ADDED NOTES 9, 10, 11, 12; ADDED RADIOLOGICAL CONTROL FACILITY AND ACCESS POINTS	SYB	CG	7-22-94
0	CERTIFIED FOR CONSTRUCTION	SYB	WP	7-8-94

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
 CINCINNATI, OHIO

PROJECT NAME
D & D DESIGN FOR CRU3 PROJECT
PLANT 4 COMPLEX

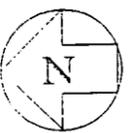
DRAWING TITLE
CIVIL DISMANTLEMENT AREA PLAN
BUILDING 4A

DESIGNED BY L.J. GEORGE	DATE 06/08/94	LEAD DESIGNER M.S. FREEBURG	DATE 7-11-94	CHECKED BY J. WILLIAMS	DATE 06/27/94
PLANT/AREA NO. PLANT 4 AREA	FLOOR	SCALE 1"=30'	CLASS		
DESIGNED FOR APPROVAL S.Y. BARRERAS 7-11-94	FERMCO DWG APPROVAL WILLIAM PARENTE JR. 7-11-94				

PROJECT CODE NO. 93X-5900-G-00619 SHEET NO. 2

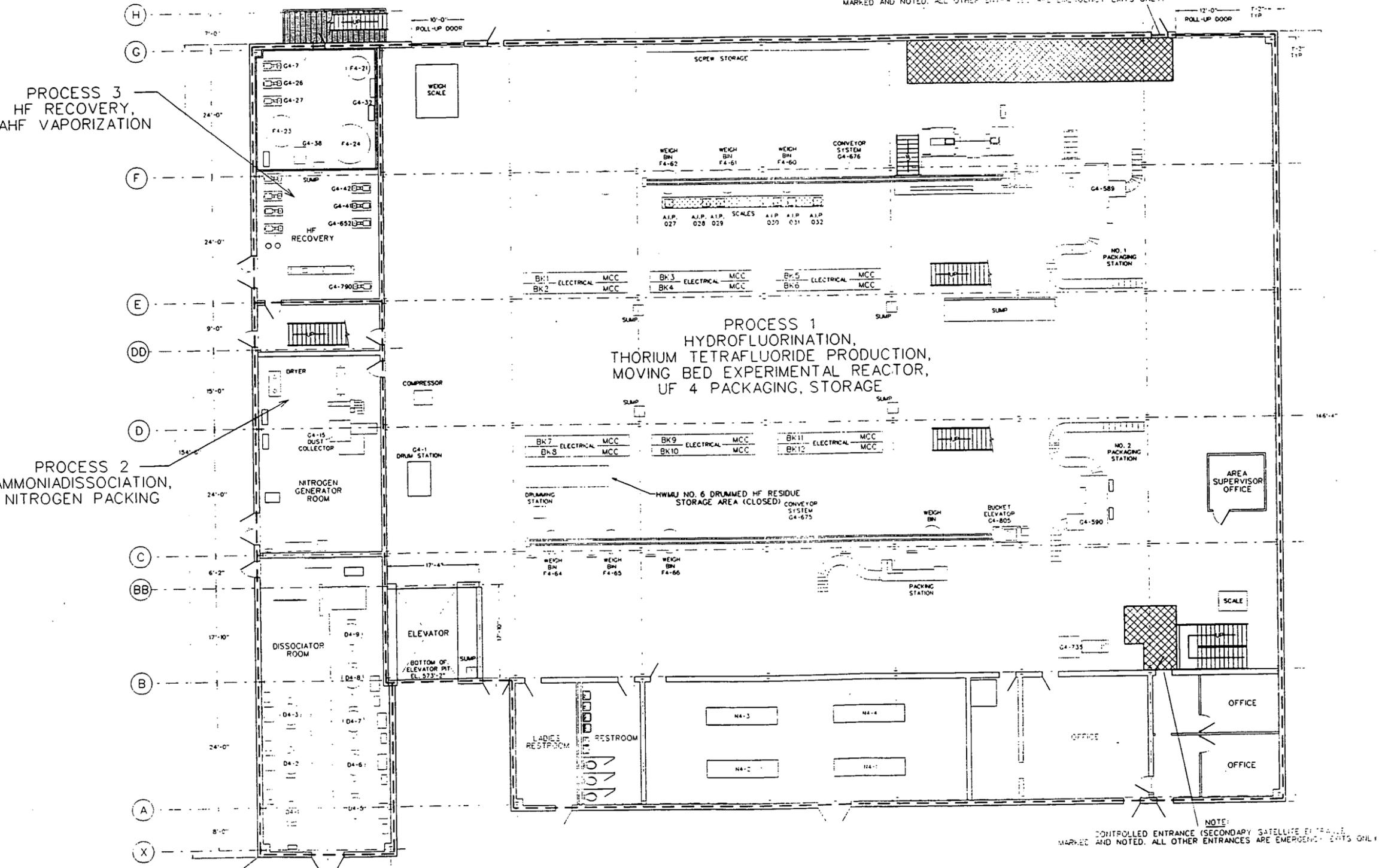
FIGURE D-2 Dismantlement Area Plan - Building 4A

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PROCESS 3
HF RECOVERY,
AHF VAPORIZATION

PROCESS 2
AMMONIADISSOCIATION,
NITROGEN PACKING



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FERNALD ENVIRONMENTAL RESTORATION MANAGEMENT CORPORATION
 Environmental Management Project
 U.S. DEPARTMENT OF ENERGY

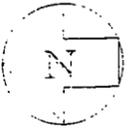
PLANT 4
 GREEN SALT PLANT
 PROCESS AREA
 1" = 20'

EL 530' - 0"

CRU3-0036

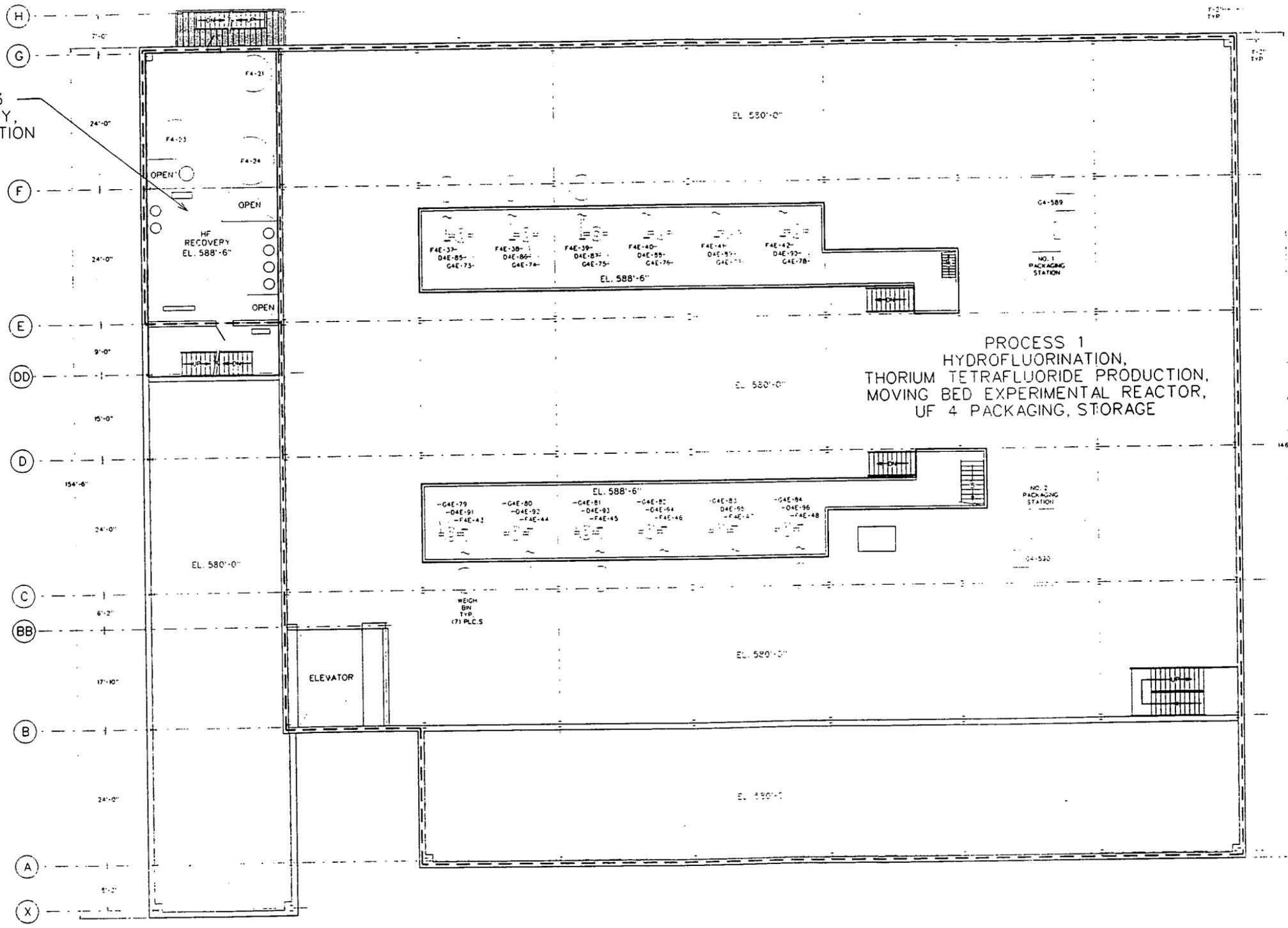
DATE 12-9-94
 DRAWN WILLIAMS

FIGURE D-3 Floor Plan of Building 4A - First Level (ELEV. 580'-0")



1 (1,2) 2 3 4 5 6 7 8 9

PROCESS 3
HF RECOVERY,
AHF VAPORIZATION



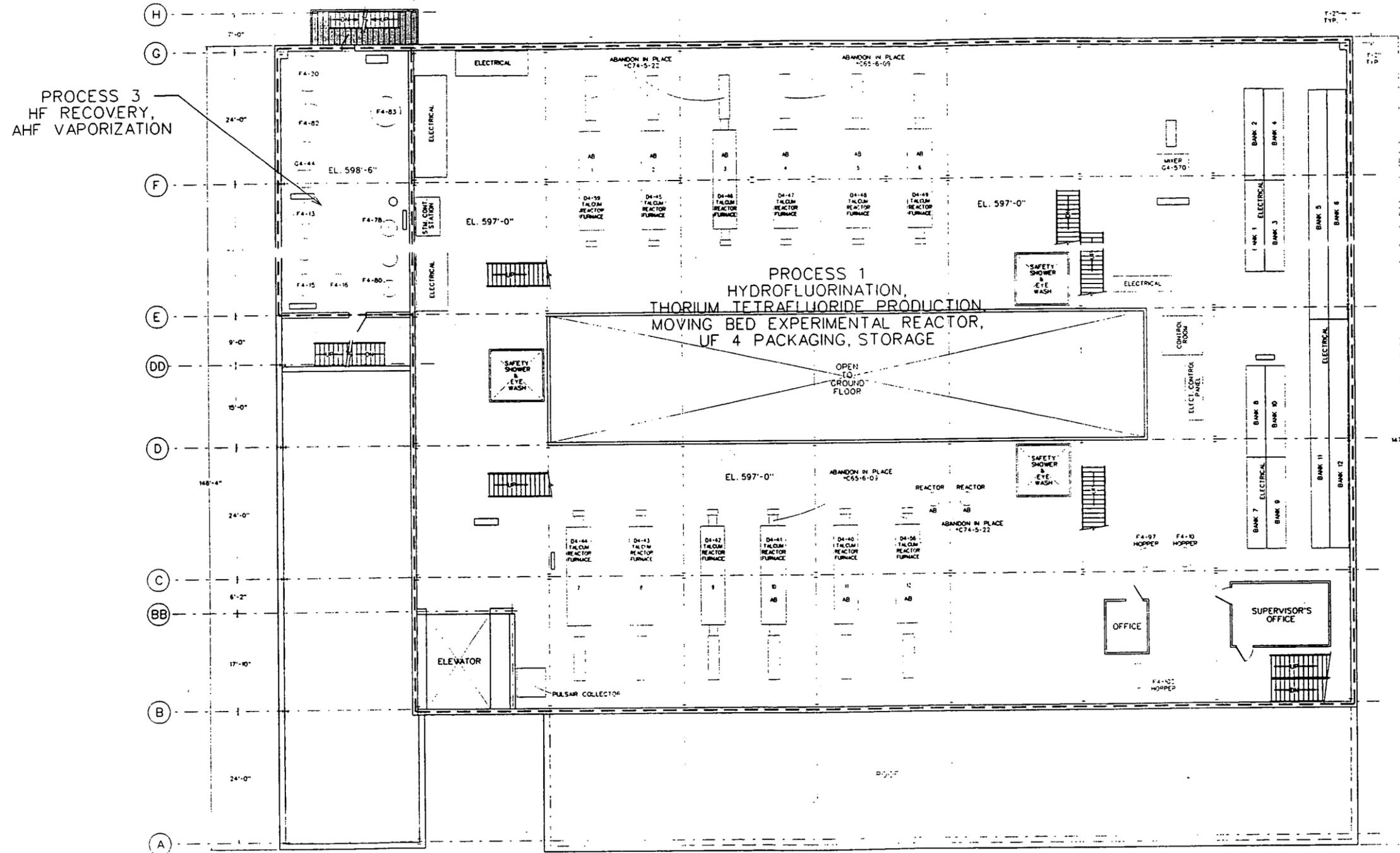
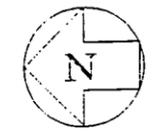
FERNALD ENVIRONMENTAL RESTORATION MANAGEMENT CORPORATION
 Environmental Management Project
 U.S. DEPARTMENT OF ENERGY

PLANT 4 EL. 588'-6"
 GREEN SALT PLANT
 PROCESS AREA
 1" = 20'

DATE 12-9-94
 DRAWN WILLIAMS

CRU3-0037

FIGURE D-4 Floor Plan of Building 4A - Second Level (ELEV. 588'-6")



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Environmental Management Project
U.S. DEPARTMENT OF ENERGY

PLANT 4 EL. 597'-0"

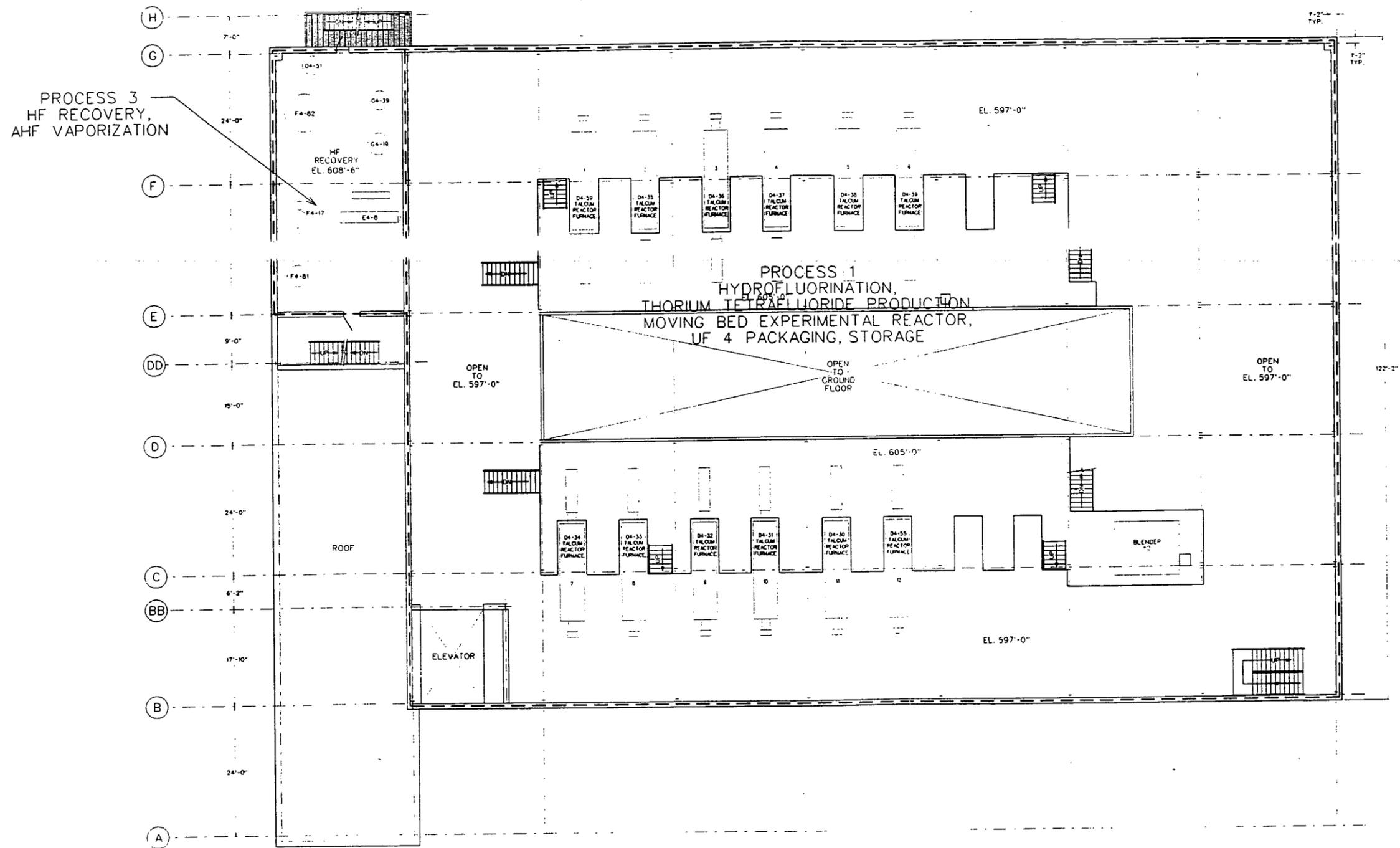
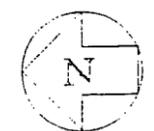
**GREEN SALT PLANT
PROCESS AREA**

1" = 20'

DATE 12-9-94 CRU3-0038

DRAWN WILLIAMS

FIGURE D-5 Floor Plan of Building 4A - Third Level (ELEV. 597'-0")



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 Fernald Environmental Management Project
 U.S. DEPARTMENT OF ENERGY

PLANT 4
 GREEN SALT PLANT
 PROCESS AREA
 1" = 20'

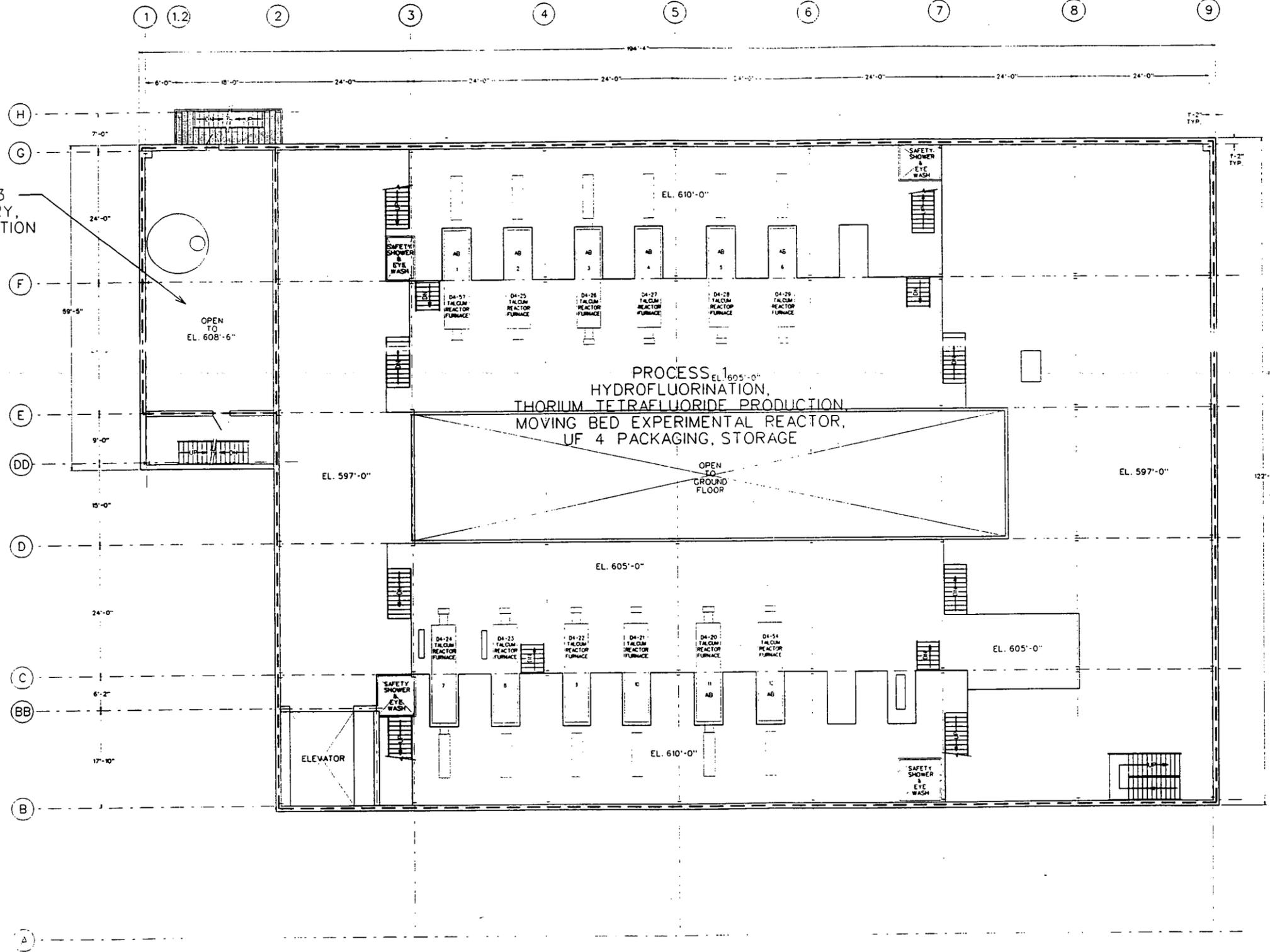
DATE: 12-9-94
 DRAWN: WILLIAMS

EL. 605'-0"
 CRU3-0039

FIGURE D-6 Floor Plan of Building 4A - Fourth Level (ELEV. 605'-0")



PROCESS 3
HF RECOVERY,
AHF VAPORIZATION



**FERNALD ENVIRONMENTAL
RESTORATION MANAGEMENT
CORPORATION**

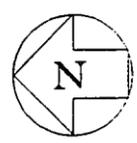
FERNALD
Environmental Management Project
U.S. DEPARTMENT OF ENERGY

PLANT # EL. 610' - 0"
**GREEN SALT PLANT
PROCESS AREA**
1" = 20'

DATE 12-5-94
EDSON WILLIAMS

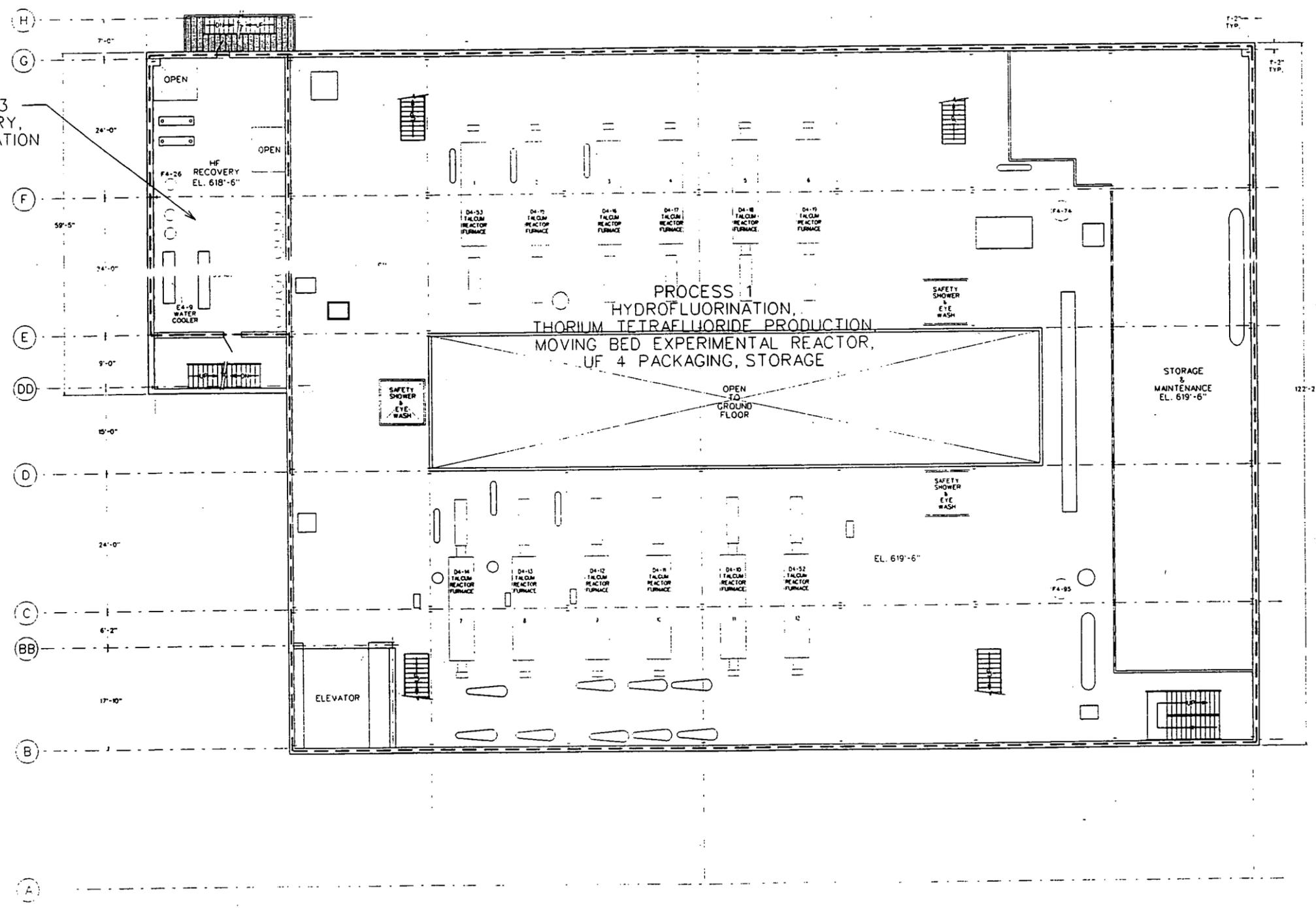
CRU3-0040

**FIGURE D-7 Floor Plan of Building 4A - Fifth Level
(ELEV. 610'-0")**



1 1.2 2 3 4 5 6 7 8 9

6'-0" 18'-0" 24'-0" 24'-0" 24'-0" 24'-0" 24'-0" 24'-0" 24'-0"



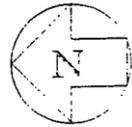
FERNALD ENVIRONMENTAL RESTORATION MANAGEMENT CORPORATION
 Environmental Management Project
 U.S. DEPARTMENT OF ENERGY

PLANT 4 EL. 619'-6"
 GREEN SALT PLANT
 PROCESS AREA
 1" = 20'

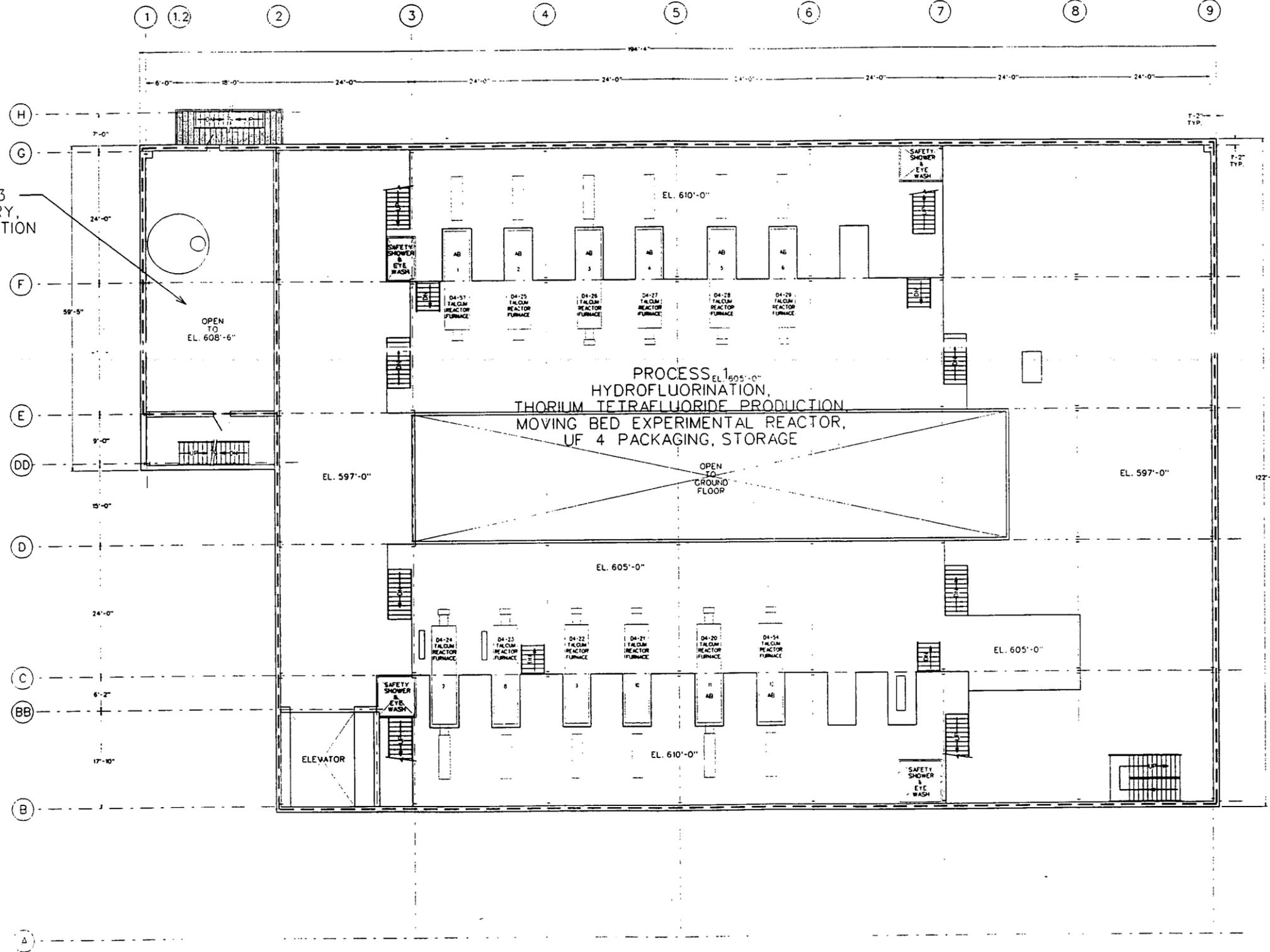
DATE 12-9-94
 DRAWN WILLIAMS

CRU3-0041

FIGURE D-8 Floor Plan of Building 4A - Sixth Level (ELEV. 619'-6")



PROCESS 3
HF RECOVERY,
AHF VAPORIZATION



FERNALD ENVIRONMENTAL RESTORATION MANAGEMENT CORPORATION

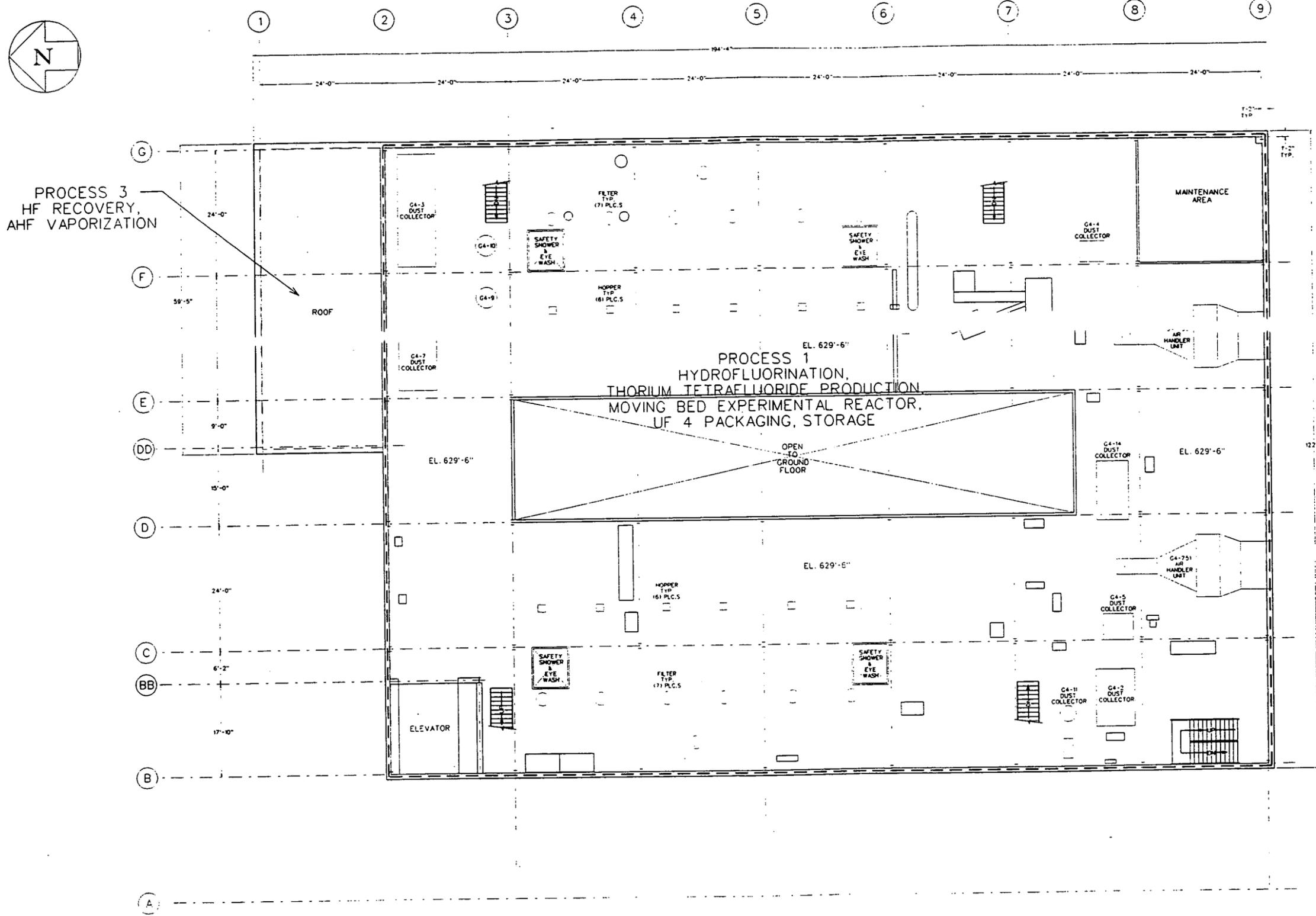
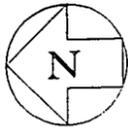
Fernald
Environmental Management Project
U.S. DEPARTMENT OF ENERGY

PLANT # EL. 610'-0"
GREEN SALT PLANT
PROCESS AREA
1" = 20'

DATE 12-9-84
LIZAN WILLIAMS

CRU3-0040

FIGURE D-7 Floor Plan of Building 4A - Fifth Level (ELEV. 610'-0")



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 Fernald Environmental Management Project
 U.S. DEPARTMENT OF ENERGY

PLANT # EL. 629'-6"
 GREEN SALT PLANT
 PROCESS AREA
 1" = 20'

DATE: 10-9-94
 DRAWN: WILLIAMS
 CRU3-0042

FIGURE D-9 Floor Plan of Building 4A - Seventh Level (ELEV. 629'-6")

000081

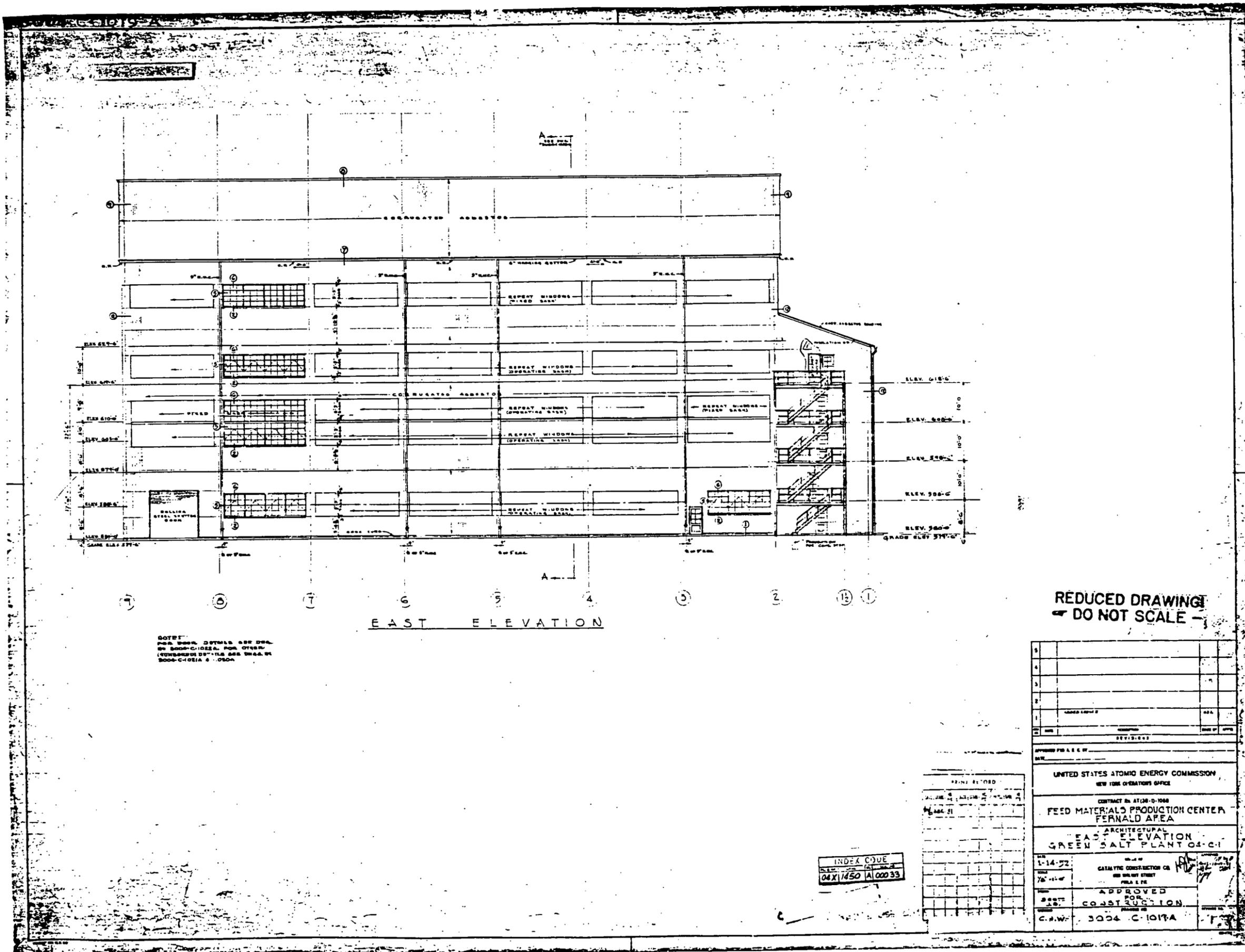


FIGURE D-11 East Elevation of Building 4A

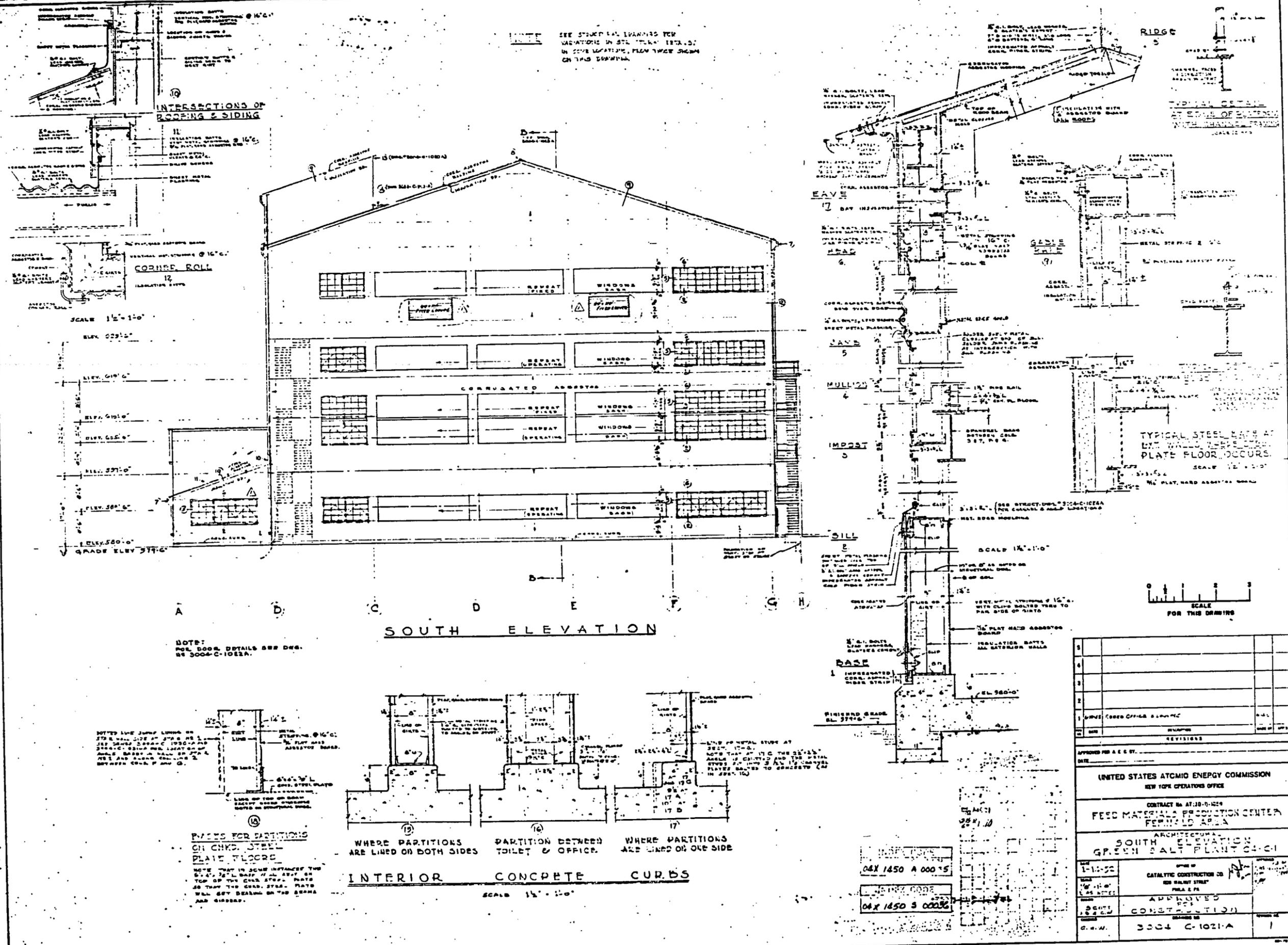


FIGURE D-13 South Elevation of Building 4A

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APPENDIX E

PHOTOGRAPHS OF BUILDING 4A

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APPENDIX E

PHOTOGRAPHS OF BUILDING 4A

Twenty-four photographs of key features/areas within Building 4A were selected from a larger collection of photographs cataloged during the remedial design and copied for this appendix. The photographs selected for this appendix show key features of Building 4A that are either referenced or described in this Implementation Plan.

FIGURES

FIGURE E-1	Aerial View of Building 4A and Surrounding Facilities (Including Recently Dismantled Plant 7), from NNE	1
FIGURE E-2	Ground-Level View of Building 4A from the East	2
FIGURE E-3	Ground-Level View of Building 4A from NNE	3
FIGURE E-4	Nitrogen Generator Located along the North Outside Wall	4
FIGURE E-5	Packing Station No. 1, Located in the SE Corner of the First Floor (ELEV. 580' - 0")	5
FIGURE E-6	East Electrical Panels on First Floor (ELEV. 580' - 0")	6
FIGURE E-7	East Weigh Bins on First Floor (ELEV. 580' - 0")	7
FIGURE E-8	Dust Collector in NE Corner of First Floor (ELEV. 580' - 0")	8
FIGURE E-9	HF Recovery Area in NE Corner of Building 4A - First Level (ELEV. 580' - 0")	9
FIGURE E-10	HF Recovery Area in NE corner of Building 4A - Second Level (ELEV. 588' - 6")	10
FIGURE E-11	HF Recovery Area in NE Corner of Building 4A - Third Level (ELEV. 598' - 6")	11
FIGURE E-12	HF Recovery Area in NE Corner of Building 4A - Fifth Level (ELEV. 618' - 6")	12
FIGURE E-13	Dissociator Tanks in NW Corner of Building 4A - First Level (ELEV. 580' - 0")	13
FIGURE E-14	Control Panels on South End of Second Level of Hydrofluorination Process Area (ELEV. 597' - 0")	14
FIGURE E-15	Blender, Packaging Station No. 1 in SE Corner of Hydrofluorination Process Area (Photo Taken from 605' ELEV.)	15

- FIGURE E-16** Air Handler in SE Corner of Fourth Level of Hydrofluorination Process Area (ELEV. 629' - 6")
- FIGURE E-17** View Looking South Down Center Bay from Second Level (ELEV. 597' - 0")
- FIGURE E-18** Chemical Reactor Banks 1 & 2 - Talcum Furnaces A & B are in the Upper Part of the Photo at ELEV. 605' - 0" and 610' - 0", respectively, and Talcum Furnaces are Located in the Center of the Photo at ELEV. 597' - 0"
- FIGURE E-19** Chemical Reactor Banks 1 & 2 - Same as Figure E-18, with Focus of Photo being Furnaces A & B (Top Half of Photo)
- FIGURE E-20** Chemical Reactor Banks 8 & 9 - Cocoa Reactors Located in Top of Photo (ELEV. 619' - 6"), Directly Above Talcum Furnaces A & B
- FIGURE E-21** Example of Cocoa Reactors (ELEV. 619' - 6")
- FIGURE E-22** Example of Talcum Furnace C (ELEV. 597' - 0")
- FIGURE E-23** Example of Talcum Furnaces A & B (ELEV. 605' - 0")
- FIGURE E-24** Example of Moving Bed Reactor (ELEV 605' - 0")

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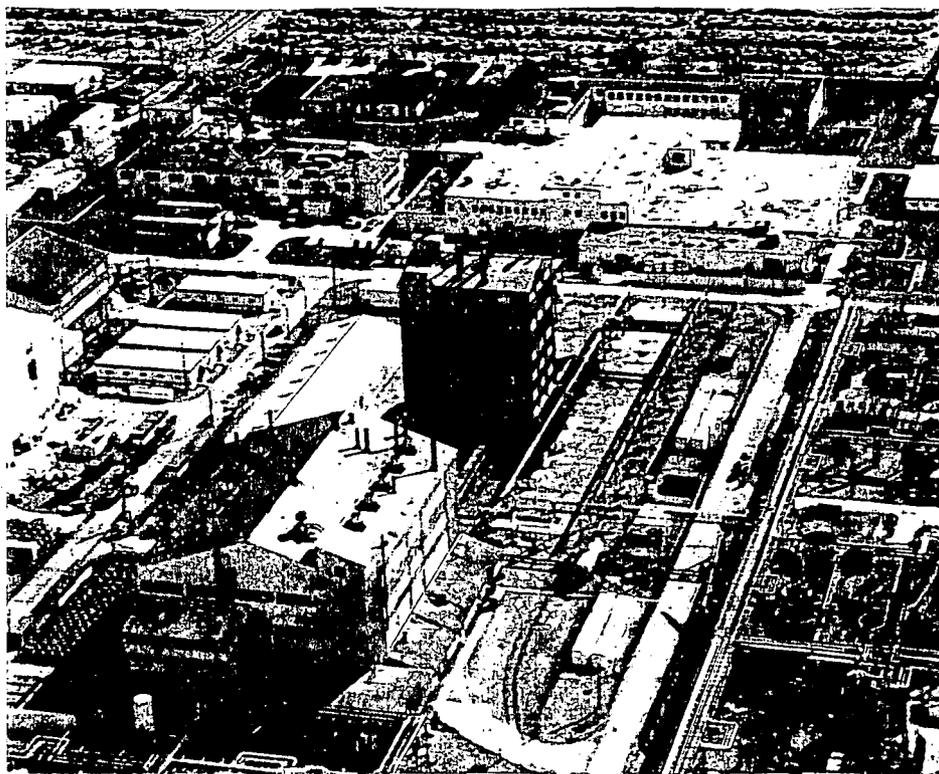


FIGURE E-1 Aerial View of Building 4A and Surrounding Facilities (Including Recently Dismantled Plant 7), from NNE

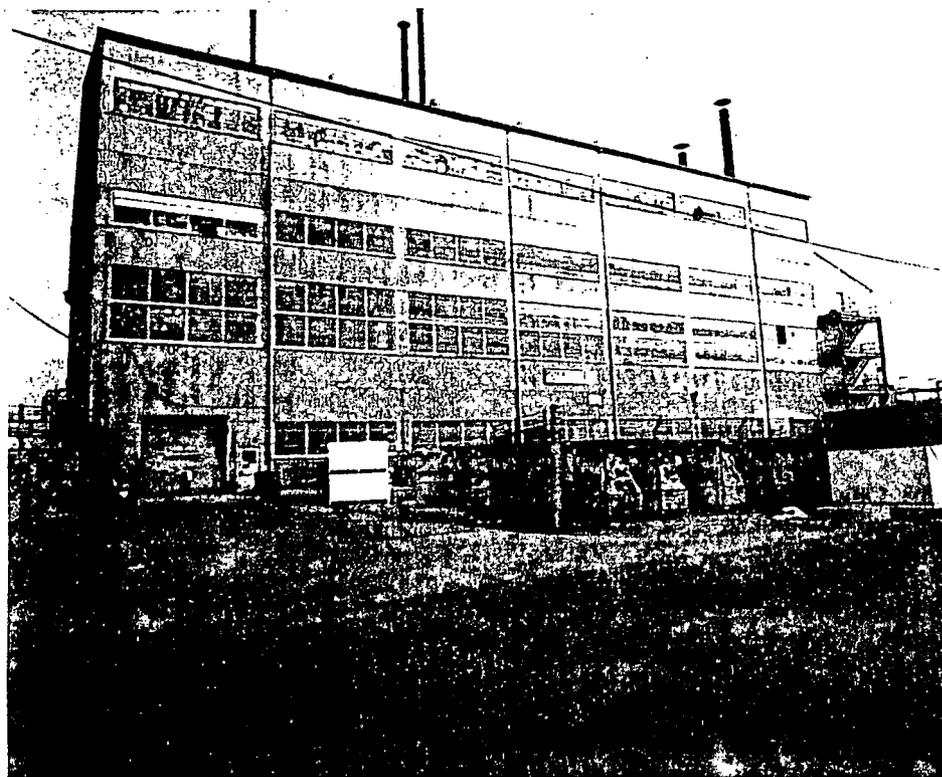


FIGURE E-2 Ground-Level View of Building 4A from the East

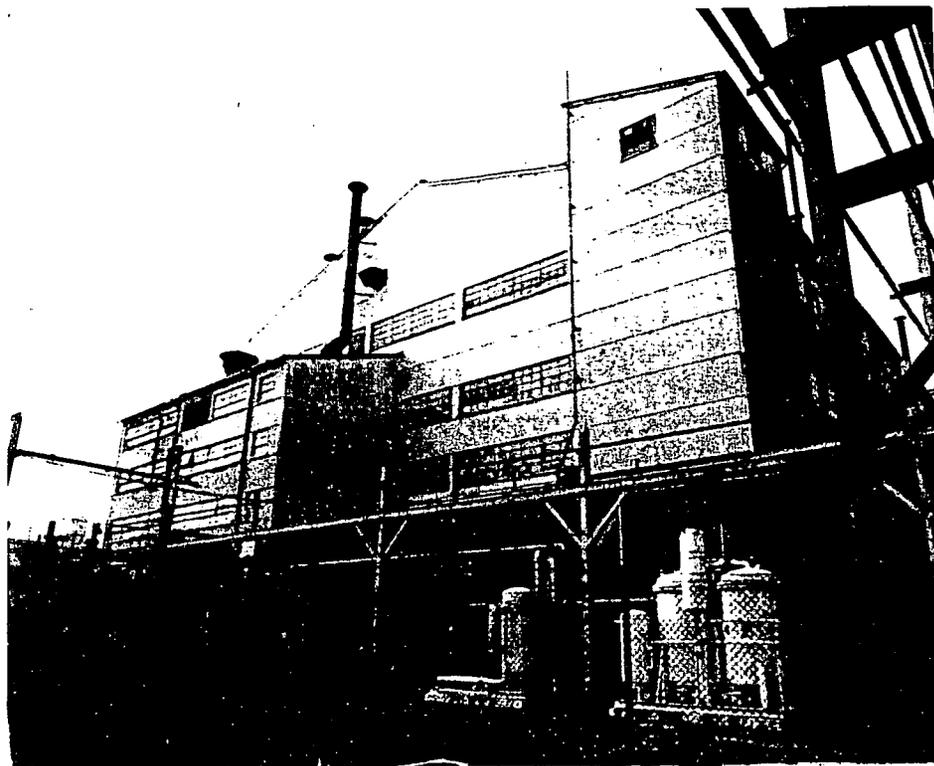


FIGURE E-3 Ground-Level View of Building 4A from NNE



FIGURE E-4 Nitrogen Generator Located along the North Outside Wall

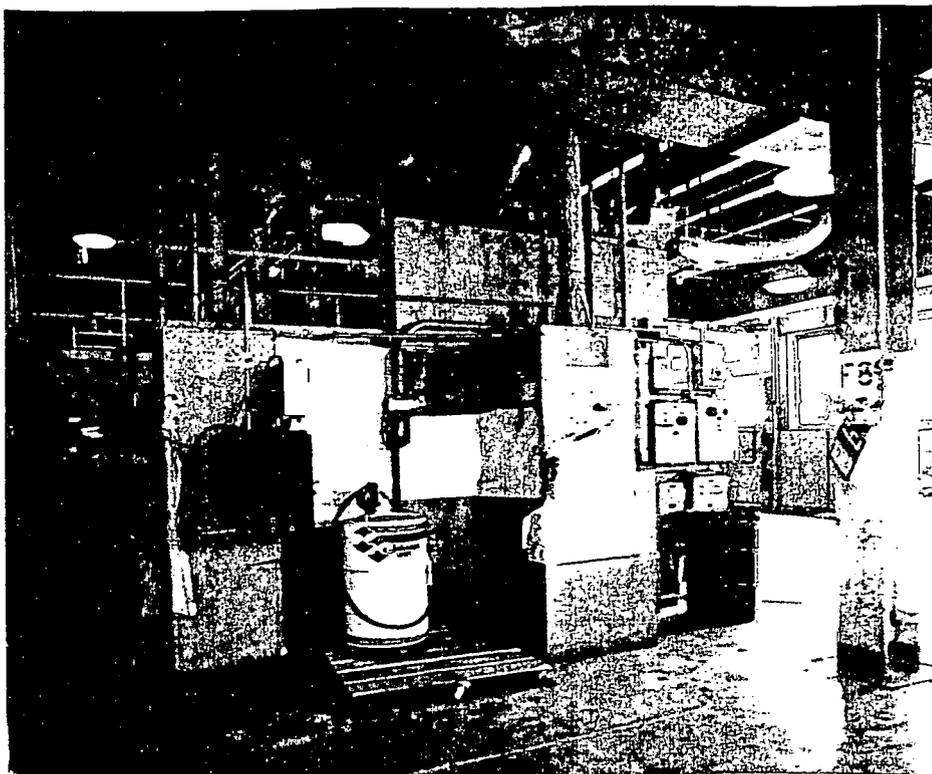


FIGURE E-5 Packing Station No. 1, Located in the SE Corner of the First Floor (ELEV. 580' - 0")

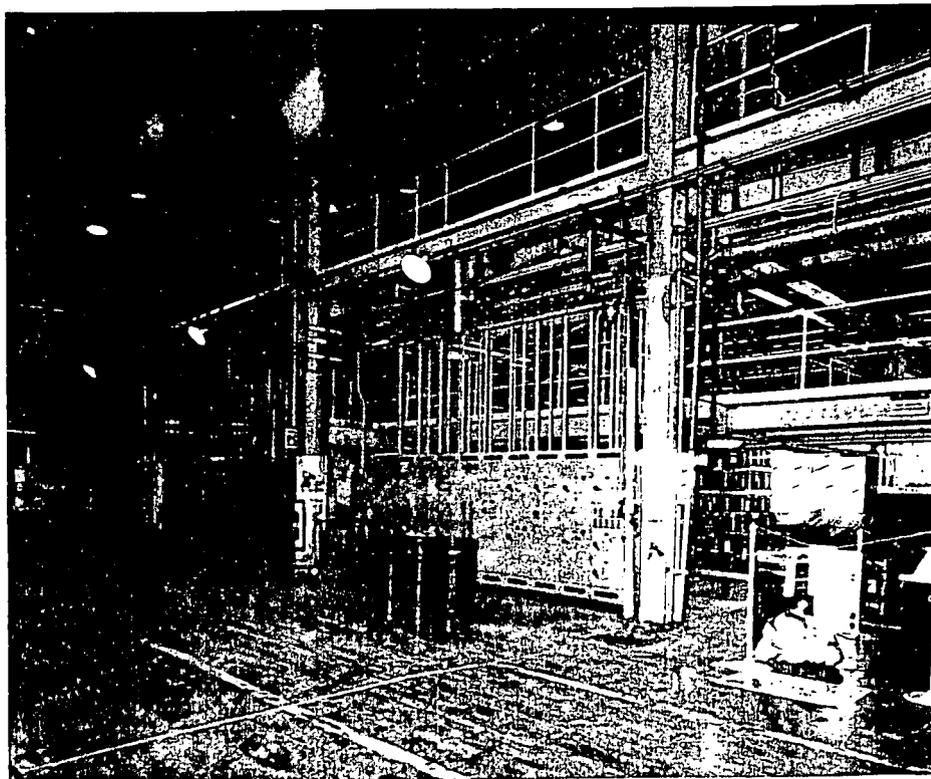


FIGURE E-6 East Electrical Panels on First Floor (ELEV. 580' - 0")

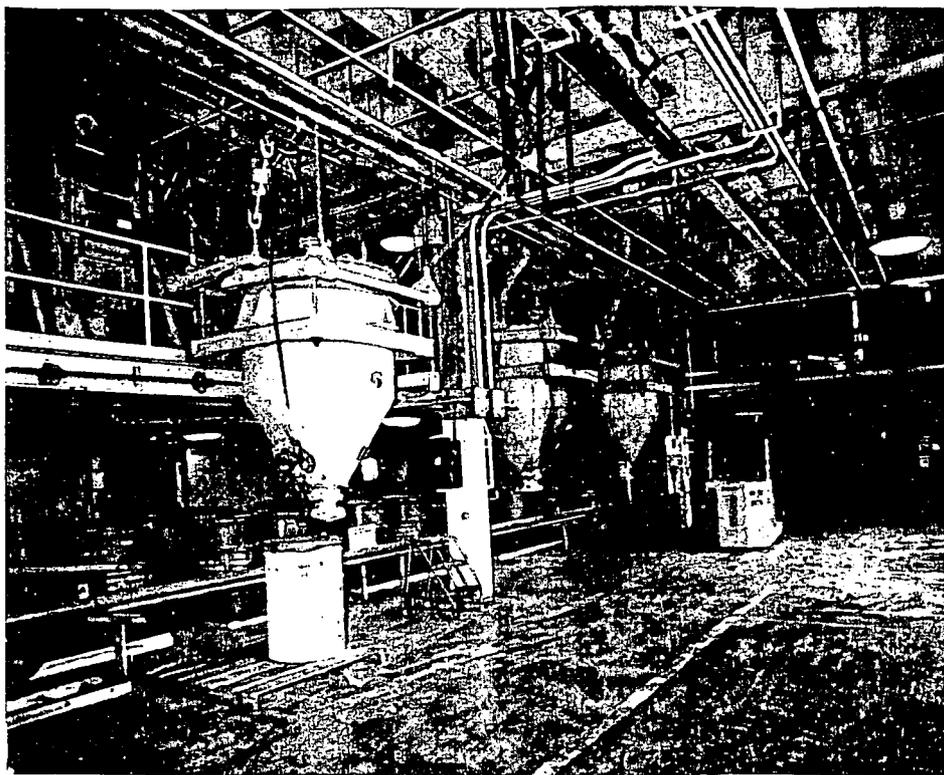


FIGURE E-7 East Weigh Bins on First Floor (ELEV. 580' - 0")

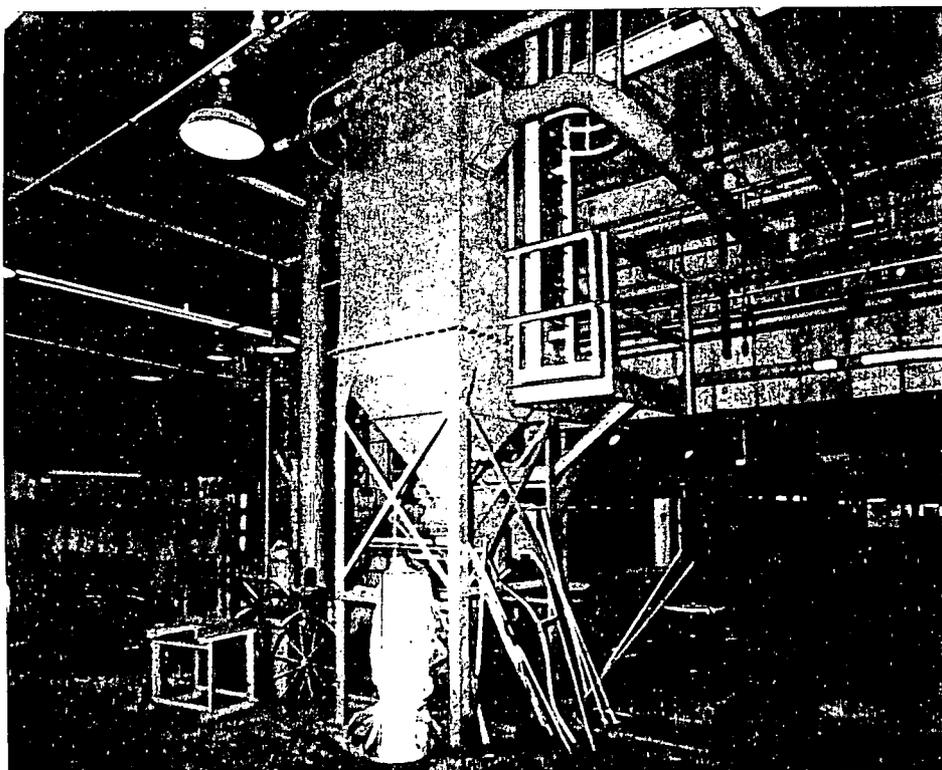


FIGURE E-8 Dust Collector in NE Corner of First Floor (ELEV. 580' - 0")

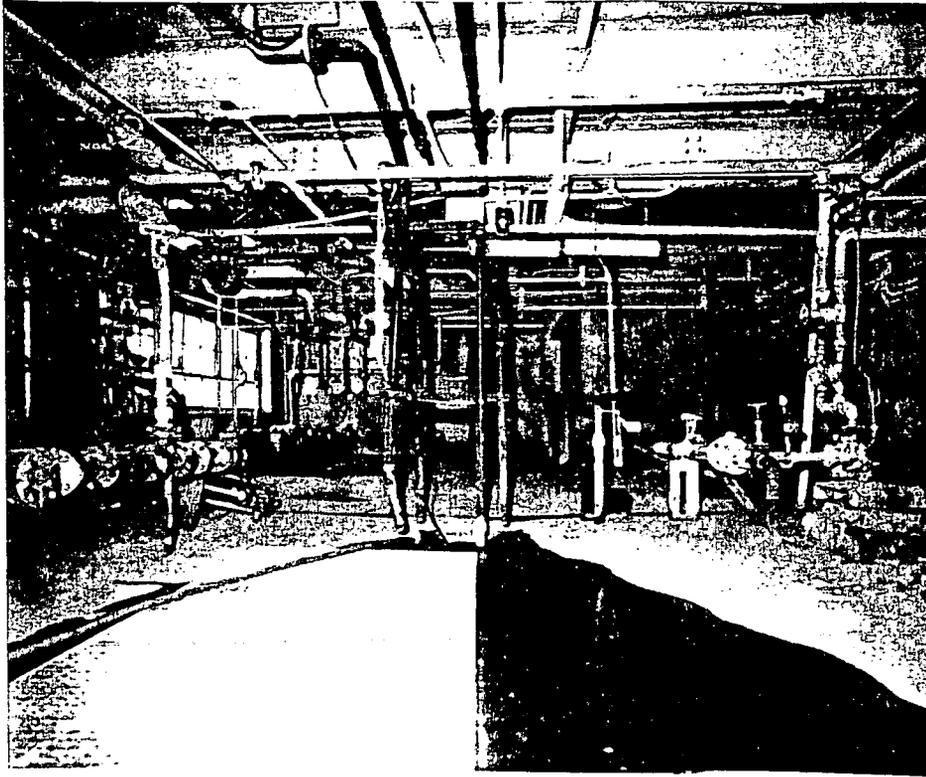


FIGURE E-9 HF Recovery Area in NE Corner of Building 4A - First Level (ELEV. 580' - 0'')



FIGURE E-10 HF Recovery Area in NE corner of Building 4A - Second Level (ELEV. 588' - 6'')



FIGURE E-11 HF Recovery Area in NE Corner of Building 4A - Third Level (ELEV. 598' - 6")

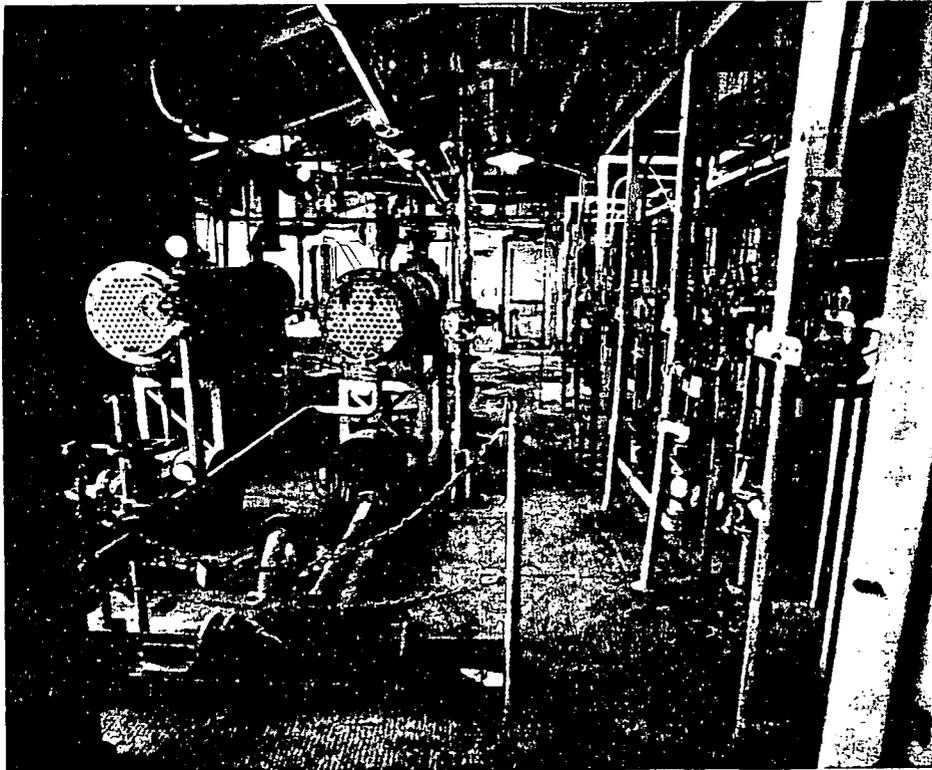


FIGURE E-12 HF Recovery Area in NE Corner of Building 4A - Fifth Level (ELEV. 618' - 6")

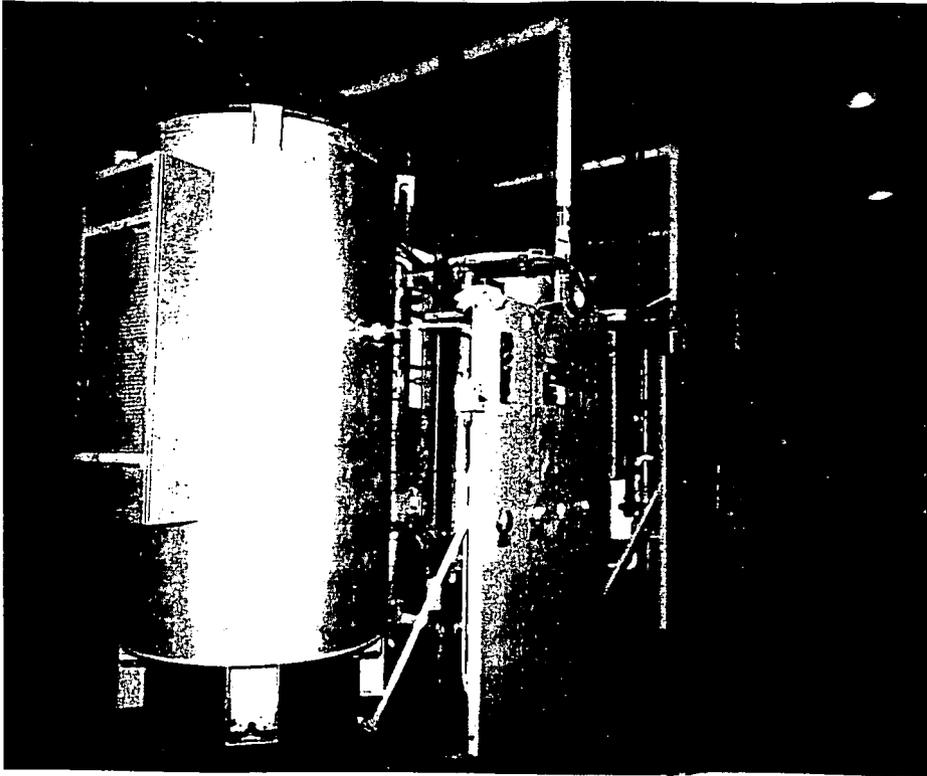


FIGURE E-13 Dissociator Tanks in NW Corner of Building 4A - First Level (ELEV. 580' - 0")

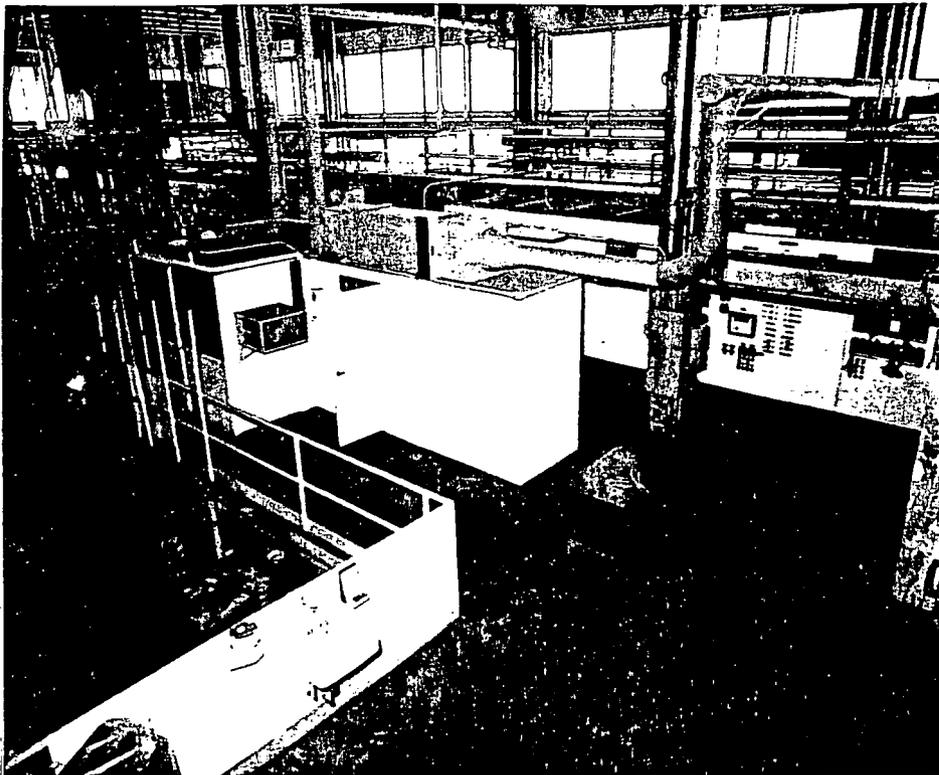


FIGURE E-14 Control Panels on South End of Second Level of Hydrofluorination Process Area (ELEV. 597' - 0")

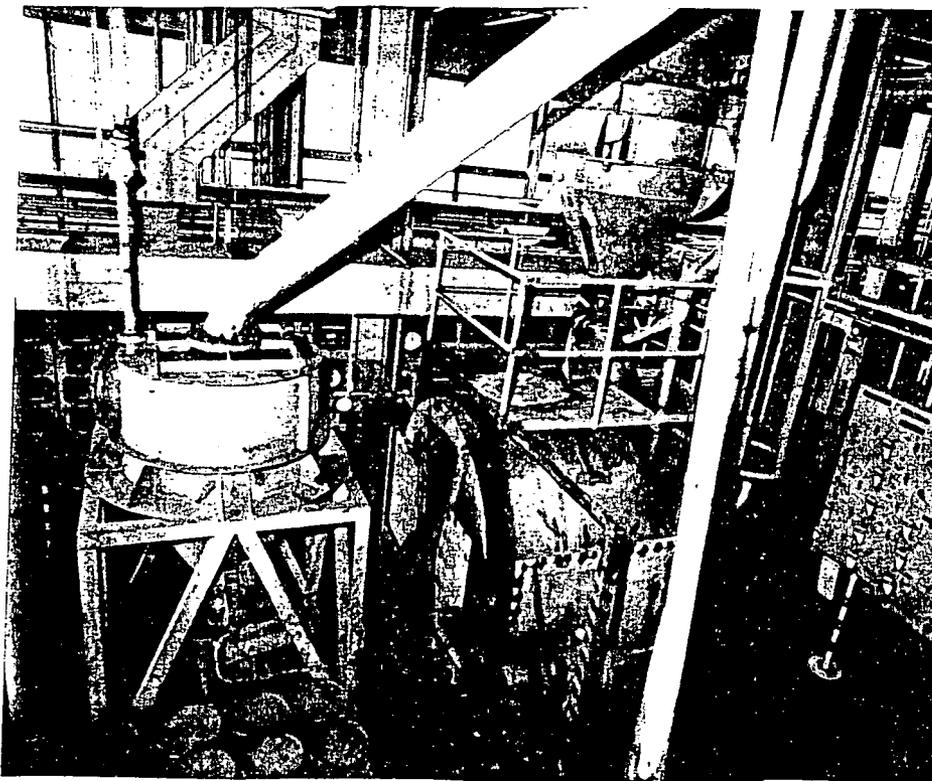


FIGURE E-15 Blender, Packaging Station No. 1 in SE Corner of Hydrofluorination Process Area (Photo Taken from 605' ELEV.)



FIGURE E-16 Air Handler in SE Corner of Fourth Level of Hydrofluorination Process Area (ELEV. 629' - 6")



FIGURE E-17 View Looking South Down Center Bay from Second Level (ELEV. 597' - 0")

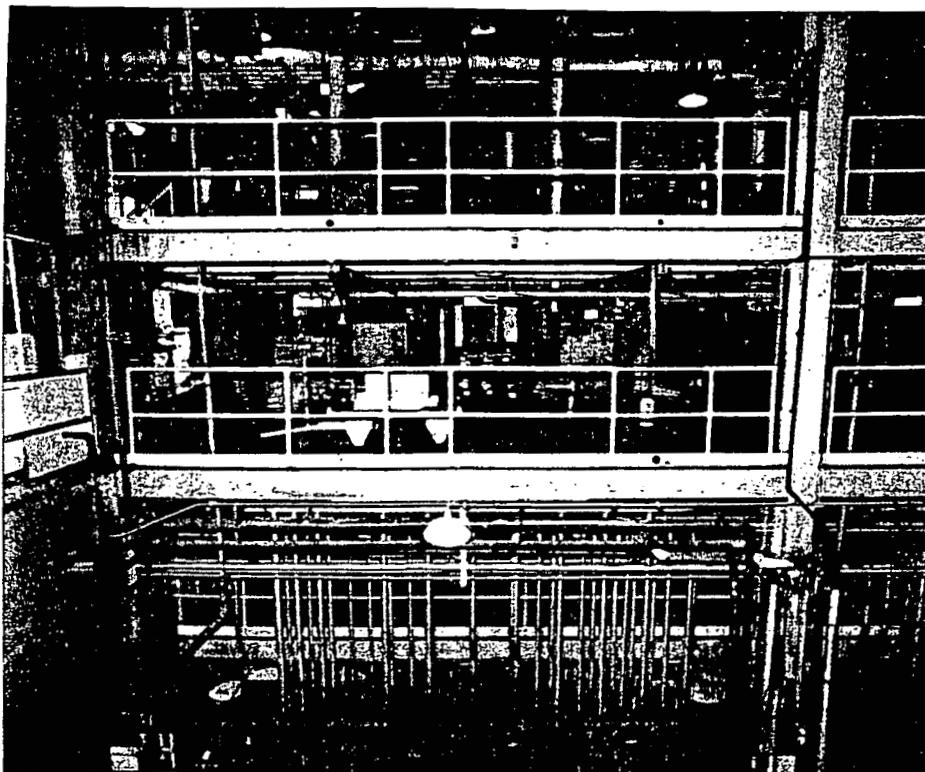


FIGURE E-18 Chemical Reactor Banks 1 & 2 - Talcum Furnaces A & B are in the Upper Part of the Photo at ELEV. 605' - 0" and 610' - 0", respectively, and Talcum Furnaces are Located in the Center of the Photo at ELEV. 597' - 0"

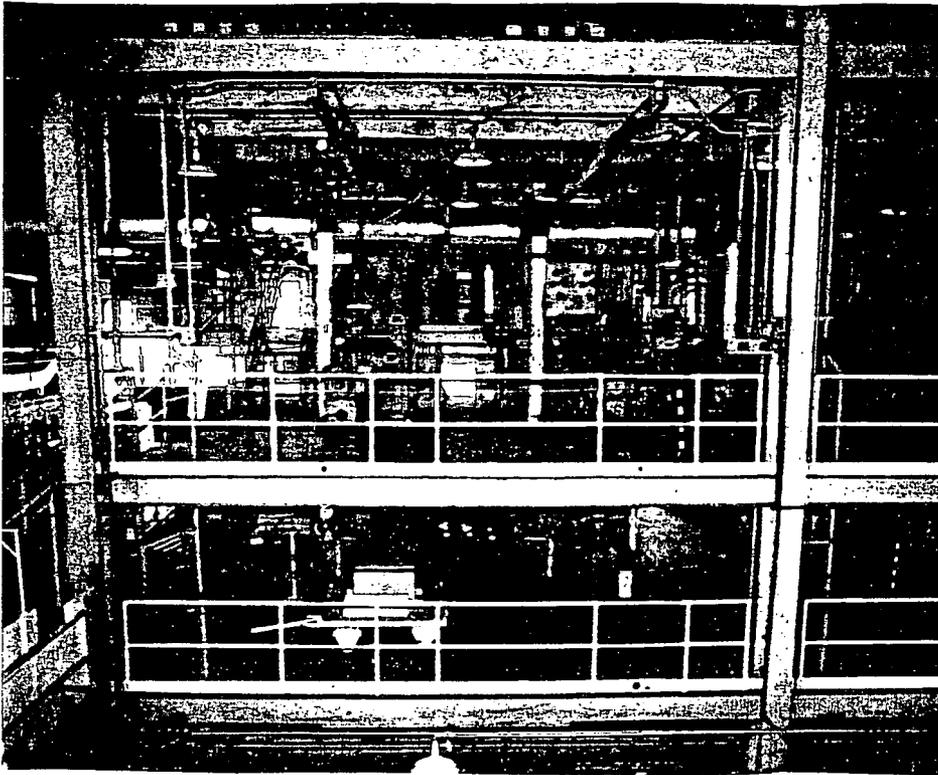


FIGURE E-19 Chemical Reactor Banks 1 & 2 - Same as Figure E-18, with Focus of Photo being Furnaces A & B (Top Half of Photo)

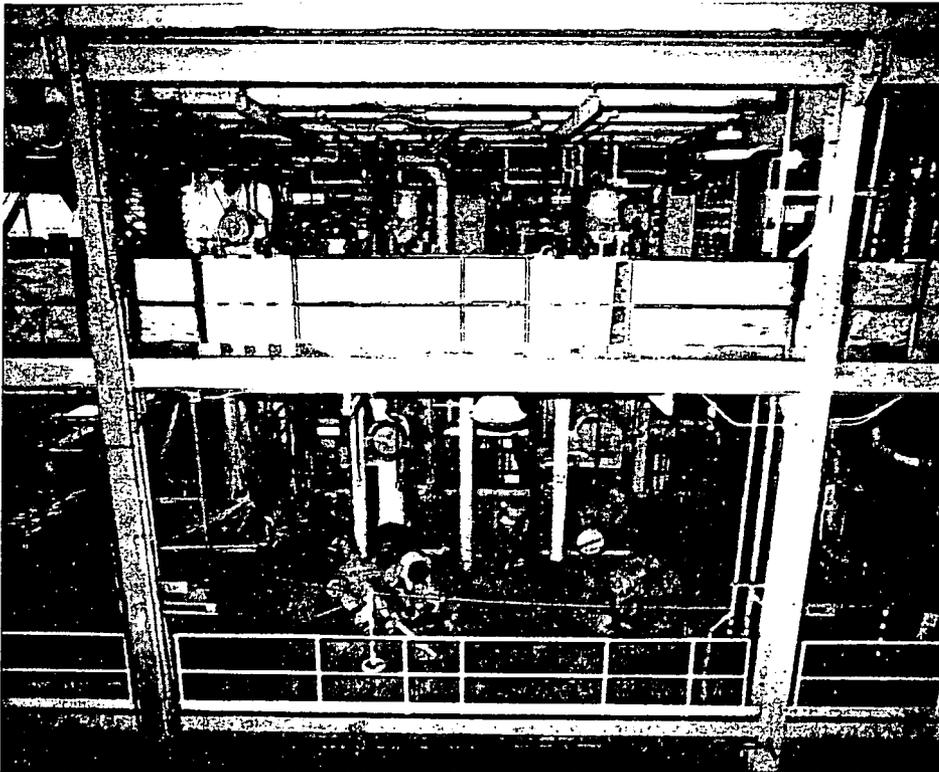


FIGURE E-20 Chemical Reactor Banks 8 & 9 - Cocoa Reactors Located in Top of Photo (ELEV. 619' - 6''), Directly Above Talcum Furnaces A & B

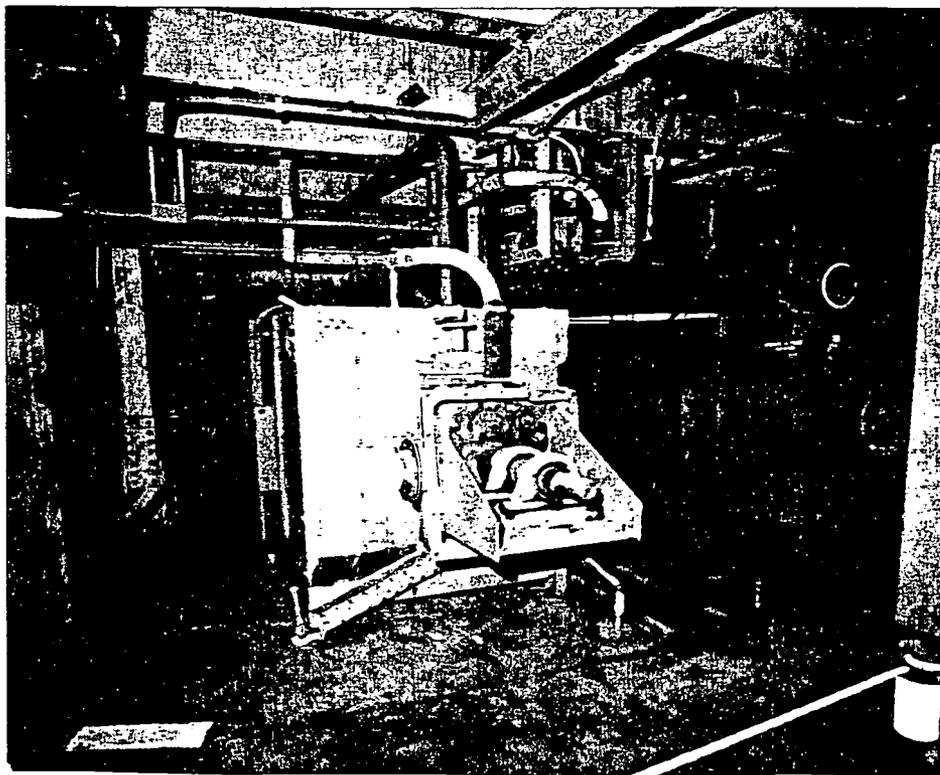


FIGURE E-21 Example of Cocoa Reactors (ELEV. 619' - 6")

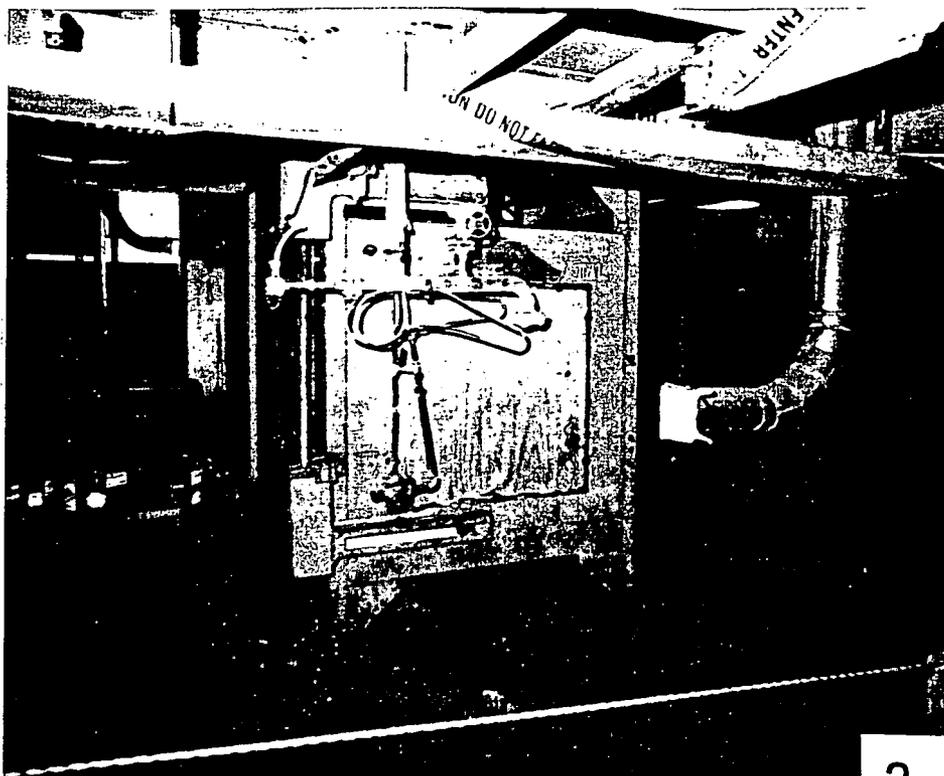


FIGURE E-22 Example of Talcum Furnace C (ELEV. 597' - 0")

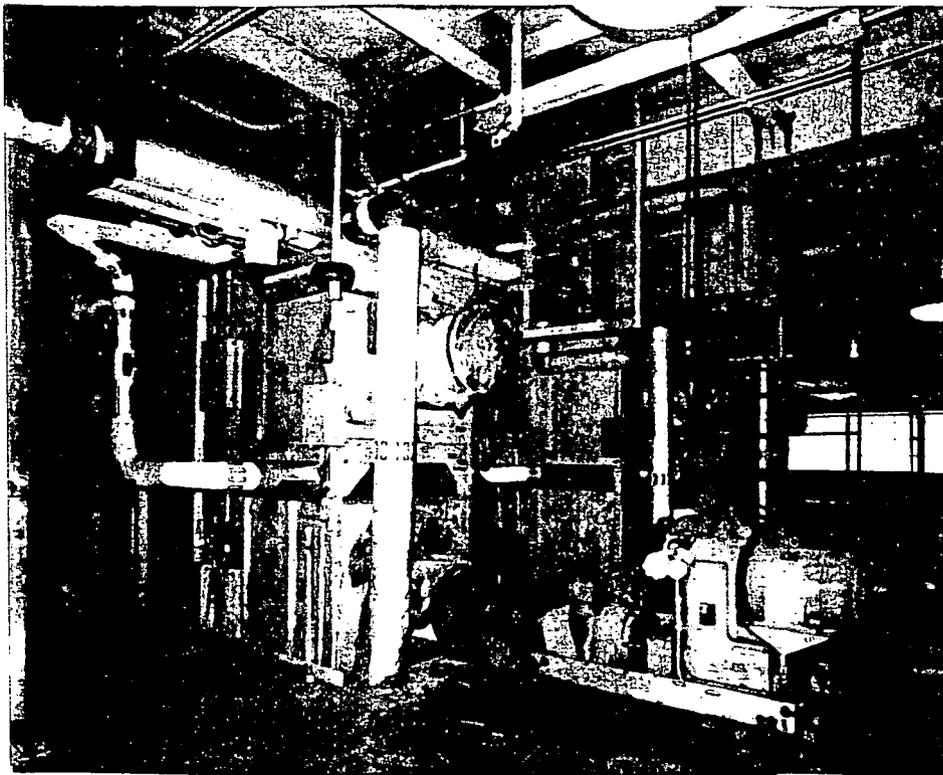


FIGURE E-23 Example of Talcum Furnaces A & B (ELEV. 605' - 0'')



FIGURE E-24 Example of Moving Bed Reactor (ELEV 605' - 0'')