U-006-301.1

91

SAMPLING AND ANALYSIS PLAN FOR STORAGE SILOS 1, 2, AND 3 AT THE U.S. DEPARTMENT OF ENERGY'S FMPC

4-1-88

ASI/WMCO
PRE1256COV
215
PLAN

[redacted]

Date: 04/01/88

SAMPLING AND ANALYSIS PLAN

FOR

STORAGE SILOS 1, 2, AND 3
AT THE
U.S. DEPARTMENT OF ENERGY'S
FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO

PROPERTY OF
U.S. DEPT. OF ENERGY
REFERENCE MATERIAL

DO NOT REMOVE

PRE1256COV
03/31/88 F3

a1

SAMPLING AND ANALYSIS PLAN

FOR

STORAGE SILOS 1, 2, AND 3
AT THE
U.S. DEPARTMENT OF ENERGY'S
FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO

2

CONTENTS

LIST OF TABLES
LIST OF FIGURES

1.0 INTRODUCTION
- 1.1 Purpose
- 1.2 Scope

2.0 SITE HISTORY

3.0 SAMPLING RATIONALE
- 3.1 Statistical Basis for Sampling Strategy
- 3.2 Recommended Number of Samples
- 3.3 Recommended Number of Analyses

4.0 SAMPLING METHODOLOGY
- 4.1 Location Preparation
  - 4.1.1 Preparation of Trailers and Laydown Area
  - 4.1.2 Delivery and Preparation of Sampling Equipment
  - 4.1.3 Delivery and Setup of Crane
  - 4.1.4 Marking of Sampling Ports
- 4.2 Sampling Operations
  - 4.2.1 General Sampling Procedure
  - 4.2.2 Mock Sampling Run on Silo 4
  - 4.2.3 Silo 3 Sampling
  - 4.2.4 Silos 1 and 2 Sampling
- 4.3 Sample Handling
- 4.4 Decontamination Requirements
- 4.5 Chain-of-Custody and Request for Analysis
- 4.6 Sample Packaging and Shipping
- 4.7 Sample Analysis
  - 4.7.1 Radiological and Chemical Analyses
  - 4.7.2 Physical Analyses

5.0 FACILITY AND EQUIPMENT REQUIREMENTS
- 5.1 WMCO Facilities
- 5.2 Equipment

6.0 ENVIRONMENTAL HEALTH AND SAFETY PROTECTION

7.0 QUALITY ASSURANCE

8.0 WASTE MANAGEMENT

9.0 MANAGEMENT PLAN

91

TABLES

Number	
1-1	K-65 Sampling Procedures
2-1	Characteristics of the K-65 Residues Stored in Silos 1 and 2 at the RMPC, Fernald, Ohio
2-2	Elemental Characterization of the FMPC K-65 Wastes
2-3	Nonradioactive, Inorganic Constituents of FMPC, Silo 3
3-1	Determination of Number of Samples: Method SW-846
4-1	Recommended Maximum Contamination Limits for Items Given Radiation Clearance
4-2	Engineering Properties Parameters

FIGURES

Number	
2-1	FMPC Waste Storage Area
2-2	Typical Cross Section Through Silos 1 and 2
4-1	K-65 Metal Oxide Sampling
4-2	Conceptual Positioning of Crane and Sampler
4-3	Conceptual Sketch of Truck-Mounted Core Holder
4-4	Chain-of-Custody Record
4-5	Request for Analysis
9-1	Westinghouse Materials Co. of Ohio Sampling of K-65 Silos Time-Scaled Logic Diagram

91

SAMPLING AND ANALYSIS PLAN
STORAGE SILOS 1, 2, AND 3

1.0 INTRODUCTION

This plan covers the provisions for the sampling and analysis of materials contained in three concrete silos located in the Waste Storage Area at the U.S. Department of Energy's (DOE's) Feed Materials Production Center (FMPC). These storage silos have been used to store waste raffinate slurries (K-65 residues) and waste calcined raffinate powder (metal oxides) since 1952. Previous studies have been conducted on the K-65 residues in Silos 1 and 2. These studies have produced results with some variability, indicating that the residues are not a totally homogeneous material. Because of the variability in the analytical results, the data from previous sampling and analysis studies are not complete enough to adequately characterize the K-65 residues for purposes of evaluating remedial actions. Previous analyses conducted on the metal oxides in Silo 3 are likewise not sufficiently documented to adequately characterize those materials.

1.1 PURPOSE

The purpose of this Sampling and Analysis Plan is to define a statistically sound sampling and analysis approach to characterize the residue materials in Silos 1, 2, and 3. The plan will:

- Develop an efficient and safe method for collecting samples from the three silos
- Specify analyses of the samples that will provide data sufficient to characterize the waste materials and evaluate final disposition options
- Specify methods to ensure that the public and the environment are protected
- Specify controls for ensuring the quality of the data resulting from laboratory analyses and physical tests, as well as controls to satisfy environmental protection requirements.

91

1.2 SCOPE

The sampling, analysis, and testing of materials contained in Storage Silos 1, 2, and 3 are required to obtain accurate chemical, radiological, and physical characteristics to support the assessment of alternatives for final disposition of the material. The work scope to accomplish this objective involves the furnishing of all facilities, labor, technical and professional services, supervision, equipment, materials, and supplies necessary to conduct the full scope of the sampling, analysis, and testing tasks.

This Sampling and Analysis Plan provides a summary of the technical approach to be utilized in completing the required tasks. Detailed methodological procedures for conducting the tasks have also been prepared and are submitted as Part 2.0 of the Implementation Plan. A listing of these procedures is provided in Table 1-1. Procedure K6501 provides a sequential overview of the sampling and analysis procedural requirements.

6

91

Table 1-1. K-65 Sampling Procedures

K6501	SAMPLING OPERATION SEQUENCE
K6502	LOCATION AND MARKETING OF SAMPLING POINTS
K6503	RECEIPT, PREPARATION AND SET-UP OF SAMPLING EQUIPMENT
K6504	SET-UP AND POSITIONING OF THE CRANE
K6505	REMOVAL OF MANHOLE FLANGES
K6506	MOCK RUN USING VIBRA CORER EQUIPMENT
K6507	TAKING OF SAMPLES USING VIBRA CORER EQUIPMENT
K6508	REPLACEMENT OF FLANGES ON SILO ACCESS PORTS
K6509	TRANSPORT OF VIBRA CORER SAMPLING DEVICE
K6510	OPERATION PROCEDURES FOR RADON REMOVAL SYSTEM
K6511	INITIAL ON-SITE CORE HANDLING AND INSPECTION
K6512	VISUAL INSPECTION
K6513	VIDEO RECORDING
K6514	RADIOLOGICAL SCANNING
K6515	SECTIONING AND PACKAGING OF SAMPLE CORES
K6516	DECONTAMINATION OF SAMPLING EQUIPMENT
K6517	LONG-TERM STORAGE OF ARCHIVE SAMPLES
K6518	SHIPMENT TO OFF-SITE LABORATORIES
K6519	OFF-SITE PREPARATION OF SAMPLES FOR ANALYSIS
K6520	ANALYSIS OF SAMPLE EXTRACT FOR INORGANIC CONSTITUENTS
K6521	ANALYSIS OF SAMPLES AND EXTRACTS FOR ORGANIC CONSTITUENTS
K6522	ISOTOPIC ASSAYS OF SAMPLES
K6523	DETERMINATION OF ENGINEERING PROPERTIES OF SAMPLES
K6524	RADIOACTIVE WASTE HANDLING
K6525	ABNORMAL OCCURRENCES

7

91

2.0 SITE HISTORY

The three silos to be sampled are located west of the Production Area within the plant security fence as shown in Figure 2-1. The two reinforced concrete K-65 silos were constructed in 1951 and 1952. The silos are cylindrical, 27 feet high and 80 feet in diameter, and are covered with a concrete dome.

The K-65 silos (Silos 1 and 2) are used for the storage of radium-bearing residues formed as by-products of uranium ore processing. The K-65 silos primarily received the waste residues between 1952 and 1958. The sources include slurry from the FMPC; 25,000 drums from a plant in St. Louis, Missouri; and 6000 drums from Niagara Falls, New York. The K-65 silos also received a small quantity of soil excavated from a drum handling area previously located to the east of and adjacent to Silo 3.

The FMPC slurry was reported to contain an average concentration of radium of 311 mg/ton; the St. Louis drums, an average radium concentration of 500 mg/ton; and the New York drums, an average radium concentration of 624 mg/ton. Based on these values, it is estimated that the K-65 silos contain a combined total of 4.6 kg, or approximately 4600 Ci, of radium. This value differs from previous estimates of between 1.6 and 1.7 kg of radium in the silos. The silos are also estimated to contain 11,200 kg of uranium. Radon flux measurements made in 1984 at various locations ranged from 13 $pCi/m^2/sec$ to greater than 3×10^7 $pCi/m^2/sec$.

Table 2-1 provides a comparison of the analytical results from three previous sampling efforts of the raffinate slurry. The results vary slightly, indicating some degree of nonhomogeneity and uncertainty regarding the characteristics of the silo contents. Table 2-2 provides elemental characterization data of the K-65 waste. Approximately 40 percent of the waste is composed of silicates. Other constituents comprising 1 percent or more of the waste include calcium, iron, magnesium, and lead. No data are available regarding organic constituents.

8

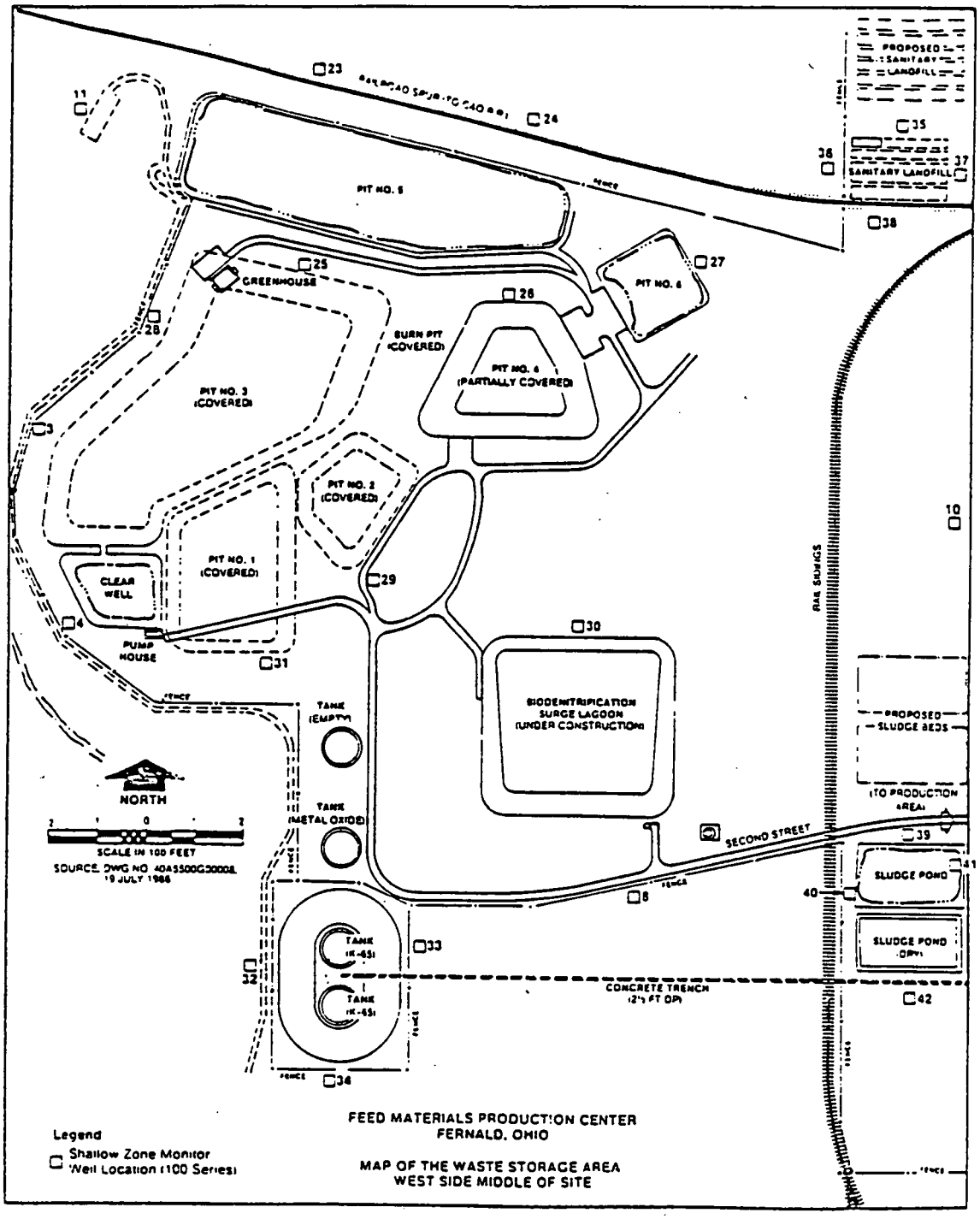


Figure 2-1. FMPC Waste Storage Area

91

Table 2-1. Characteristics of the K-65 Residues Stored in Silos 1 and 2 at the FMPC, Fernald, Ohio

Characteristic	Reported Values		
	Litz[a]	NLO[b]	Vitro[c]
Dry wt, kg (tons)	-	8.79×10^6 (9690)	1.59×10^6
Estimated volume, m^3 (ft^3)	-	5,522 (195,000)	3,155
Density, kg/m^3 (lb/ft^3)	-	-	1,179
Uranium, ppm	1,800-3,200	600	2,110
Lead, ppm	60,000-70,000	48,000-52,000	94,900
Radium, ppb	280-360	200	300
Barium, ppm	50,000	-	45,300
Iron, ppm	13,000-18,000	-	-
Gold, ppm	65-78	<40-60	-
Platinum, ppm	0.9-1.4	-	-
Palladium, ppm	13-18	-	-
Silver, ppm	18	<20	-
Copper, ppm	500-800	400-600	-
Cobalt, ppm	1,600-2,000	1,500-2,000	-
Nickel, ppm	3,500-3,700	2,000-3,000	-

[a]Source: Litz, 1974.
[b]Source: NLO, Inc., and Battelle Columbus Laboratories, 1980.
[c]Source: Vitro Corp., 1952.

10

91

Table 2-2. Elemental Characterization of the FMPC K-65 Wastes[a]
September 1970

Constituent	Percentage	Weight (Metric Tons)
Metals:		
Ag	<0.002	0.176
Al	<0.875	77
As	<0.03	2.64
Au	<0.005	0.44
B	0.015	1.32
Ba	0.07	6.16
Be	ND*	-
Bi	ND*	-
Ca	3.89	342
Cd	ND*	-
Cl	No data	-
Co	0.175	15.4
Cr	0.012	1.06
Cu	0.05	4.4
F	No data	-
Fe	1.2	105.6
Hg	ND*	-
La	0.089	7.83
Mg	1.25	110
Mn	0.02	1.76
Mo	0.02	1.76
Na	0.7	61.6
Ni	0.225	19.8
Pb	5.1	448.8
PO_4	ND*	-
Sb	ND*	-
Se	No data	-
SiO_2	40.76	3,587
Sn	0.008	0.7
SO_4	No data	-
Ti	0.07	6.16
V	0.021	1.85
Zn	ND*	-
Zr	0.02	1.76

11

91

Table 2-2. (Continued)

Constituent	Percentage	Weight (Metric Tons)
Rare Earths:		
Dy	0.003	0.26
Er	ND*	-
Eu	ND*	-
Gd	0.004	0.35
Ho	<0.0015	0.13
Lu	ND*	-
Sm	0.0048	0.42
Tb	ND*	-
Tm	<0.0008	0.07
Y	0.004	0.35
Yb	0.0006	0.05

[a]Percentage and weight are based on sample analysis and do not account for total reported amount (8800 metric tons) of K-65 residues.

*ND = not detected.

12

91

The materials in the K-65 silos have continuously generated radon gas. The gas accumulates under the silo dome, where it decays or escapes to the environment. The silos exchange gas freely with the surrounding atmosphere by diffusion through the concrete and release through existing cracks in the concrete. Gamma exposure rate measurements were made near the storage silos in 1986 and 1988 by Weston and WMCO. The results show a strong radiation field emanating from Silos 1 and 2. More detail on the strength of the field can be found in the Addendum No. 2 to the RI/FS Health and Safety Plan (Revision 3), dated April 1988.

As early as 1963 external deterioration of the K-65 silos was observed. Large areas of concrete spalling occurred, exposing reinforcing wires which corroded and cracked. In 1964 an asphaltic sealant was applied to the external walls, and an earthen embankment was constructed around the silos to counterbalance the internal load and to reduce direct radiation from the residues in the vicinity of the silos. A structural evaluation of the silos (Camargo, 1985) concluded that the base slabs and walls are structurally stable under existing static loads and have a life expectancy of 5 to 10 years. The centermost 20-foot diameter portion of the dome was determined to be structurally unsound for any load greater than the existing static dead load, and there is no assigned life expectancy. Severe dome cracks have a high probability of eventually occurring due to weathering processes and may lead to partial dome collapse.

Several interim stabilization projects have recently been implemented at the K-65 silos. The center dome portion has been covered with a 30-foot diameter plywood cap to provide secondary containment in the event of collapse of this section. The exterior dome surfaces have also been coated with rigid foam to provide weather protection and insulation. A radon treatment system has been installed to reduce radon gas levels in the dome during recent and future remediation activities.

In addition to the interim projects already completed, it is anticipated that the void space above the solid residues in the silos will be filled with a combination of rigid and flexible polyurethane foam prior to sampling. This action is proposed to attenuate radon escape from the silos and to provide

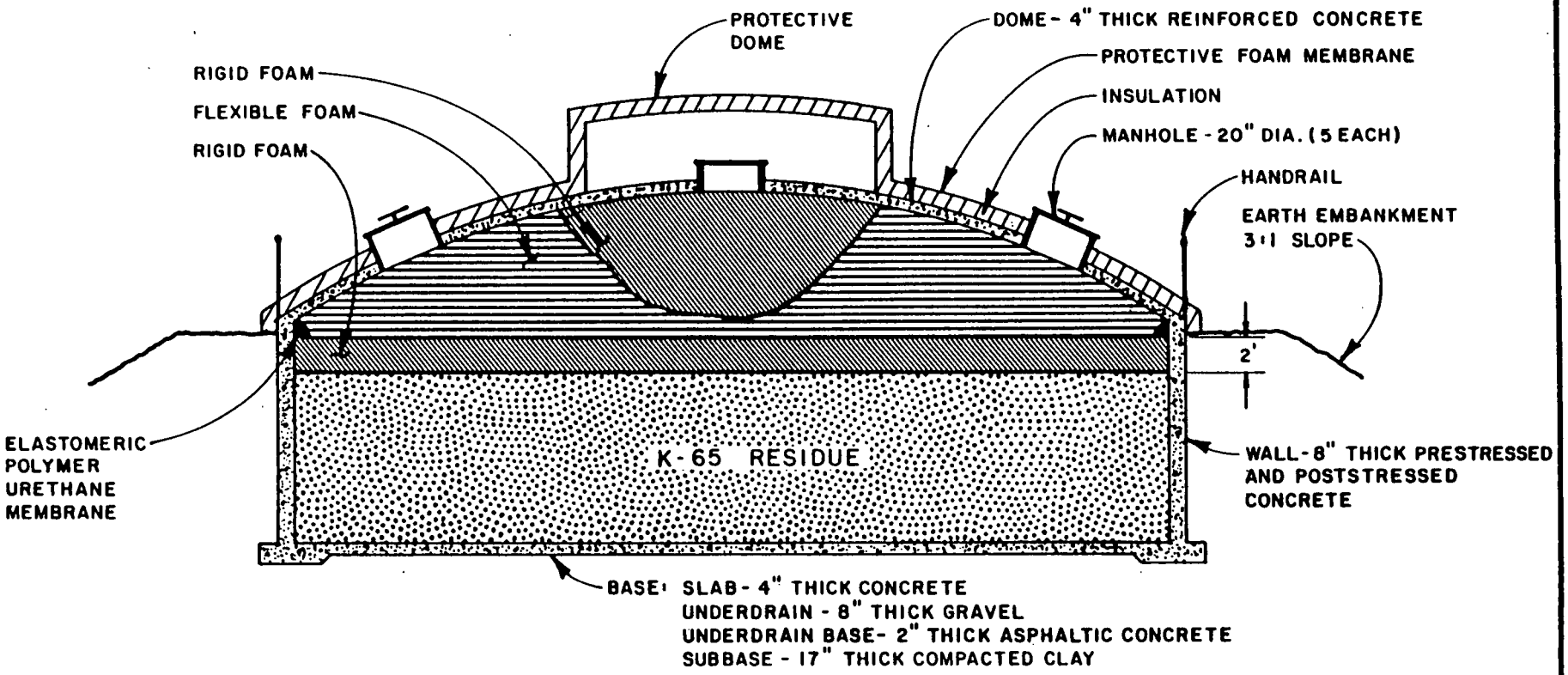
internal structural support. A typical cross-section of the silos showing their anticipated condition prior to sampling is shown in Figure 2-2.

Silos 3 and 4 were constructed in mid-1952 and were designed to receive dry materials only. The waste raffinate slurries from refinery operations were dewatered in an evaporator and spray calcined to produce a dry waste form. The waste was blown into Silo 3 under pressure.

Silo 3 contains approximately 5,100 CY of calcined residues. Silo 3 is estimated to contain 18,000 kg of uranium, 15 Ci of radium, and an unknown quantity of thorium-230. Table 2-3 lists the elemental constituents from Silo 3.

BRUNING 72425

STARTING DATE: 3-24-88	DATE LAST REV.:	INITIATOR: K. SHELL	DRAWING NO.: 303317-A-C09
DRAWN BY: WALT McGILL	DRAWN BY:	PROJ. MGR. D. HARMER	PROJECT NO.: 303317.03



TYPICAL CROSS-SECTION THROUGH SILOS 1 AND 2

INTERNATIONAL TECHNOLOGY CORPORATION

Figure 2-2

Table 2-3. Nonradioactive, Inorganic Constitutents of FMPC Silo 3

Constituent	Silo 3 (metric ton)
Metals:	
Ag	<0.07
Al	98.67
Au	<0.14
B	0.70
Ba	0.70
Co	8.81
Cr	1.76
Cu	8.81
Fe	225.52
Mg	229.52
Mn	17.27
Mo	2.11
Na	133.90
Ni	22.90
Pb	8.81
PO_4	683.62
Sb	<0.53
SiO_2	461.62
Sn	1.41
SO_4	692.08
Ti	2.11
V	3.52
Rare Earths:	
Dy	<0.11
Gd	<0.21
Ho	<0.11
Sm	<0.21
Tm	<0.07
Y	0.28
Yb	0.14

Ref: NLO, 1985

91

3.0 SAMPLING RATIONALE

The objective of the overall silo sampling program is to adequately characterize the radiological and chemical composition of the silo contents to allow for the development and evaluation of alternative actions for the long-term disposition of the materials. As such, it is not only important to quantify the mean concentration of each contaminant of concern for comparison to regulatory standards, but also to determine the spatial variability of the concentrations and the degree of confidence in any resultant conclusions.

3.1 STATISTICAL BASIS FOR SAMPLING STRATEGY

Two approaches can be postulated for the statistical design of the silo sampling and analysis program. The first, referred to as procedure SW-846, is the statistical method recommended by the U.S. EPA for the determination of whether a solid waste is or is not hazardous in relation to regulatory threshold values. In particular, the upper limit of an 80 percent confidence interval for the population mean of a contaminant concentration is used to determine whether the contaminant exceeds the respective regulatory threshold value for that contaminant.

A requirement for the effective use of SW-846 in establishing an appropriate sample size is a prior estimation of the mean and standard deviation of the population to be sampled. Further, because the assumed mean must be compared to the regulatory threshold for use in the equation, any available data for use in approximating the mean must be consistent with the basis of the regulatory threshold. In the case of SW-846, this implies measured concentrations in an aqueous solution generated from EPA-approved extraction procedures. This latter constraint is important to the K-65 sampling program, since no data exists on leachate quality from the silo contents.

An alternative procedure, termed the tolerance limit approach, can be applied without previous data if it is assumed that random sampling occurs. Under this assumption, the confidence level associated with a given tolerance limit being exceeded by at most a small percentage of concentrations can be determined as a function of sample size. Because this procedure has no basis

91

in prior knowledge of the concentrations, it can result in a higher number of samples or less confidence for a given number of samples compared to SW-846.

3.2 RECOMMENDED NUMBER OF SAMPLES

A determination of the number of samples to be collected from the silos is dependent on both the spatial variability of silo contents and the closeness of the mean concentrations to the regulatory threshold values. The latter issue cannot be addressed by the historical database on the composition of the silo contents because all data are in terms of percent by weight of the solid matrix. All that can be done in this respect is to include each regulated contaminant (under EPA's classification of hazardous) for which data are available in the determination of the number of samples, as discussed below.

The spatial variability of the silo contents must consider both horizontal and vertical variability. The waste material was disposed in the silos from the top, so there is a high probability that the waste will be relatively homogeneous in the horizontal direction. It is being assumed, therefore, that the four sampling locations per silo will provide sufficient horizontal coverage to account for any compositional variability in the horizontal direction.

The most appropriate available data for evaluating vertical variability are the laboratory results on four samples of K-65 residues collected between 1955 and 1958. These samples are believed to have been collected from the transfer line to the silos, and due to the 3-year time frame can be expected to be representative of the variability in vertical composition as the silos were being filled.

The mean and standard deviation of these four samples for several metals (expressed as percent by weight) are presented in Table 3-1. Also given in the table is the recommended number of samples to be taken from each vertical core in accordance with the statistical procedure of SW-846. An underlying assumption in this calculation is that the expected mean concentration of each metal is equal to 50 percent of the regulatory threshold (since no actual data

18

91

Table 3-1. Determination of Number of Samples: Method SW-846

Parameter (%)	Mean ($\bar{X}$)	Standard Deviation (S)	No. of Samples[a]
Ag	<0.002	N/A	--
Al	0.875	0.750	2.0
As	<0.03	N/A	--
Ba	0.073	0.032	0.5
Cd	ND	N/A	--
Cr	0.012	0.006	0.7
Ca	3.88	1.44	0.4
Cu	0.048	0.010	0.1
Hg	ND	N/A	--
Ni	0.225	0.055	0.2
Pb	5.10	0.20	<0.1
U	0.087	0.055	1.1
Radium (mg/ton)	277	148	0.8

[a]Assumes that regulatory threshold = $2\bar{X}$

91

are available). The recommended number of samples would increase or decrease as the mean concentration is closer to or further from the threshold, respectively.

The resultant small number of samples can be explained primarily by the small standard deviation in the analyses, which would indicate a general lack of vertical variability. Given these results, it is proposed that four vertical samples from each core will be sufficient to characterize the vertical composition of silo contents. The samples will be taken from near the top, middle, and bottom of each core, as well as from the section with the highest reading during the radiological scan of the core in the Examination Trailer. The latter sample will not only provide a measure of the "worst-case" condition, but will also establish a degree of conservatism in the decision to take only four vertical samples. It must be noted that the results of the visual characterization, field screening, or laboratory analyses could increase the number of vertical samples to be analyzed from a given core. The remaining sections of each core will be archived and can be retrieved for additional analyses.

Assuming a random sampling in a vertical direction along the core, the tolerance limit approach would indicate that one could be 94 percent confident that at most 50 percent of all vertical concentrations would exceed the highest value observed in the four samples, and 34 percent confident that at most 10 percent of all concentrations would exceed the highest observation. The biased sample from the zone of the highest radiological activity would significantly increase these levels of confidence for radionuclides.

3.3 RECOMMENDED NUMBER OF ANALYSES

The sampling program just described will result in a 4-by-4 matrix of samples from each silo, resulting in 16 total samples from each silo. A total of 48 samples will, therefore, be collected from the three silos. Each of these samples will be analyzed for radiological parameters, Hazardous Substance List (HSL) inorganics, and TCLP metals, as defined in Section 4.7.1.

There is presently no evidence that the residue materials contain wastes that would result in significant levels of HSL organics, PCBs, or pesticides.

Consequently, only four samples from a single core will be analyzed for these chemicals to confirm their presence or absence in each silo. The vertical sequencing of the samples is considered appropriate due to the greater potential for vertical nonhomogeneity rather than horizontal nonhomogeneity (i.e., a single sample from each core). This results in a total of 12 analyses. Additional samples will be analyzed if these chemicals are found.

Composite samples will be utilized for the physical testing program described in Section 4.7.2. The composite samples will be formed from individual samples taken from the same horizontal strata in each of the four cores from a given silo. This compositing strategy will take advantage of the expected similarity of properties within each horizontal strata and can be accommodated since sample holding times are of little consequence to physical testing. Twelve composite samples will again result, representing four horizontal layers in each of three silos.

91

4.0 SAMPLING METHODOLOGY

Detailed operational procedures have been prepared for this sampling effort and are presented as Part 2.0 of the Implementation Plan. These procedures have been written in a detailed stepwise fashion so that the K-65 Sampling Task Manager, K-65 Sampling Task Team Leader, and sampling team members will have a clear understanding regarding the methodological approach. Included in the following sections are summaries of each major step in the sampling process: (1) Location Preparation, (2) Sampling Operations, (3) Sample Handling, (4) Decontamination Requirements, (5) Chain-of-Custody and Request for Analysis, (6) Sample Packaging and Shipping, and (7) Sample Analysis.

4.1 LOCATION PREPARATION

4.1.1 Preparation of Trailers and Laydown Area

Two enclosed, 40-foot long trailers with rear access doors will be used as controlled handling areas for the sample cores. One trailer will be designated as the Preparation Trailer, the other designated as the Examination Trailer. The locations of the trailers and laydown area are shown in Figure 4-1. The Preparation Trailer will be located close to the silos. The Examination Trailer and laydown area will be located away from the Preparation Trailer and Silos 1 and 2 in an area of comparatively low background radiation. This is necessary to increase the sensitivity of radiation measuring instruments during radiological scanning of the cores. A duct connection will be made from this trailer to the existing radon absorption treatment system to provide controlled ventilation during sample cutting and packaging. Temporary power will be required at both locations.

4.1.2 Delivery and Preparation of Sampling Equipment

All sampling equipment will be brought into the FMPC through the Main Security Gate and will be transferred through the plant to the laydown area. All incoming equipment will be inspected and inventoried prior to being used. Required sampling equipment is discussed in Section 5.0. Procedure K6503 will be followed for preparing the sampling equipment for use.

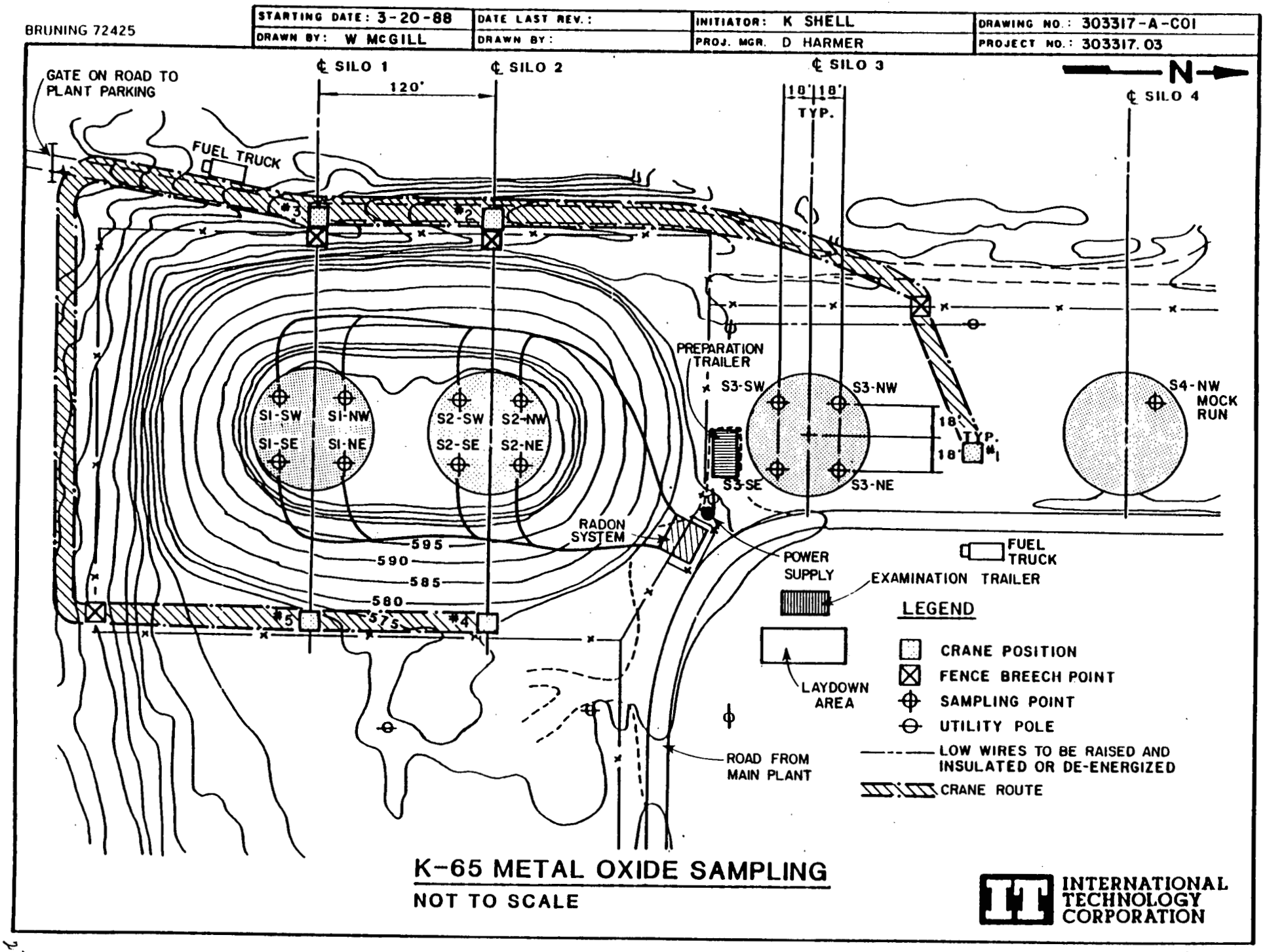

BRUNING 72425
STARTING DATE: 3-20-88
DRAWN BY: W MCGILL
DATE LAST REV.:
DRAWN BY:
INITIATOR: K SHELL
PROJ. MGR. D HARMER
DRAWING NO.: 303317-A-C01
PROJECT NO.: 303317.03
GATE ON ROAD TO PLANT PARKING
FUEL TRUCK
℄ SILO 1
℄ SILO 2
℄ SILO 3
℄ SILO 4
120'
18' 18' TYP.
N
#3
#2
#5
#4
PREPARATION TRAILER
S1-SW
S1-NW
S1-SE
S1-NE
S2-SW
S2-NW
S2-SE
S2-NE
S3-SW
S3-NW
S3-SE
S3-NE
18'
18'
TYP.
S4-NW
MOCK RUN
RADON SYSTEM
595
590
585
580
575
POWER SUPPLY
FUEL TRUCK
EXAMINATION TRAILER
LAYDOWN AREA
ROAD FROM MAIN PLANT
LEGEND
CRANE POSITION
FENCE BREECH POINT
SAMPLING POINT
UTILITY POLE
LOW WIRES TO BE RAISED AND INSULATED OR DE-ENERGIZED
CRANE ROUTE
K-65 METAL OXIDE SAMPLING
NOT TO SCALE
INTERNATIONAL TECHNOLOGY CORPORATION

Figure 4-1

91

4.1.3 Delivery and Setup of Crane

Sampling operations require the use of a 165-ton crane equipped with a 140-foot long boom. An example of the required crane is shown in Figure 4.2. Due to its size, the crane will be delivered to the site in pieces and assembled near Silo 4 at the site of the mock run. Setup and positioning of the crane will follow Procedure K6504. A safety inspection of the crane must be conducted by WMCO prior to operation. Any identified deficiencies must be corrected prior to use.

The security fence in the immediate vicinity of the silos will be breached at several locations to allow access for the crane. WMCO personnel will perform the dismantlement and reconstruction of the fence. Only authorized personnel will be allowed access through the security fence.

4.1.4 Marking of Sample Ports

Prior to the actual sampling operations, metal identification tags will be permanently affixed to all manhole ports on the silo domes in accordance with Procedure K6502. This will provide positive identification of the sampling locations for future reference. The ports will be assigned a unique number, consisting of the silo number and a 2-digit directional identifier such as, for example, S1-SW (Silo 1, southwest quadrant).

4.2 SAMPLING OPERATIONS

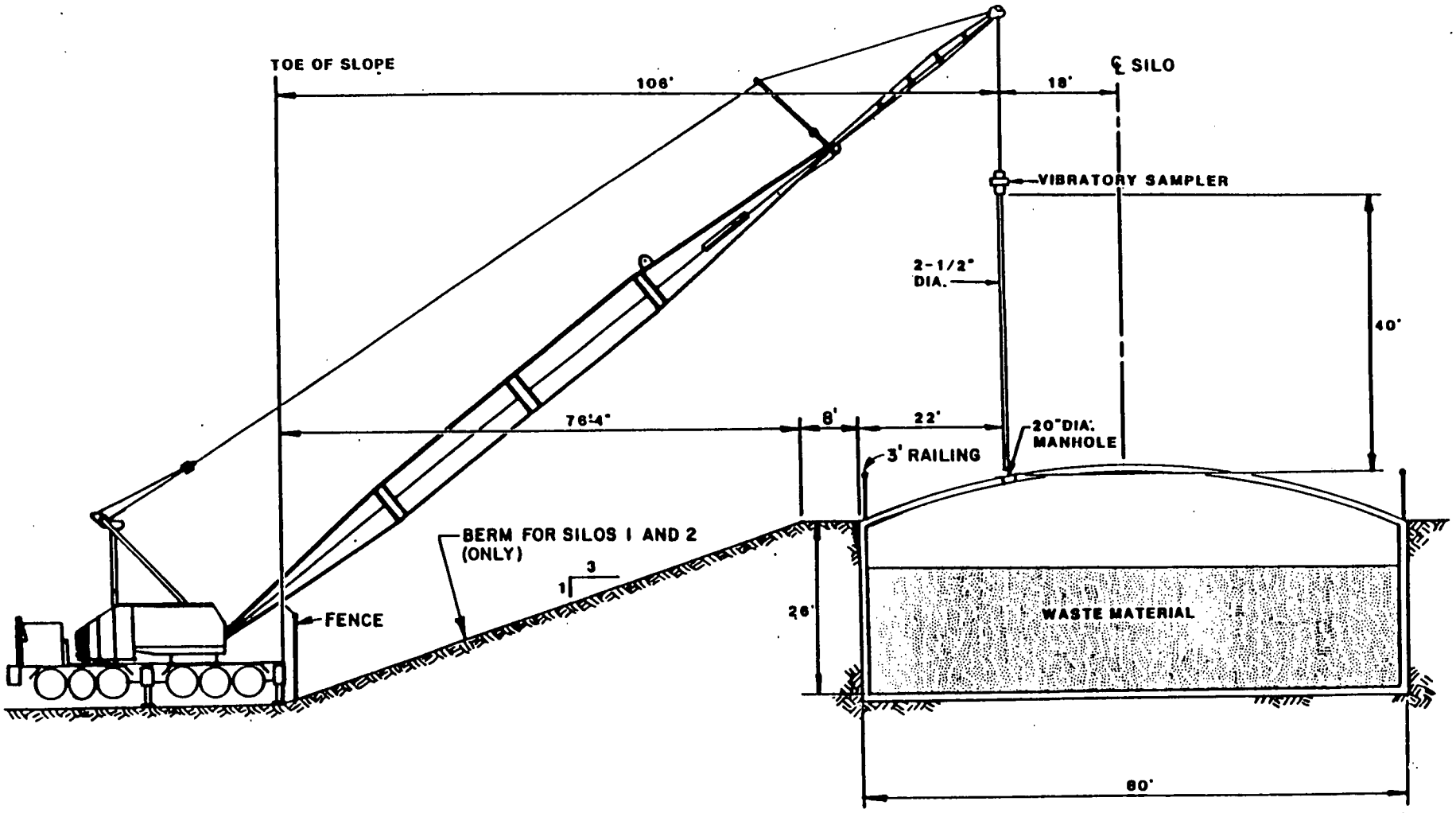
Sampling operations will be conducted as three distinct activities. The activities are:

- Mock Sampling of Silo 4
- Sampling of Silo 3
- Sampling of Silos 1 and 2

This progression of sampling was chosen because of the radiological and possibly hazardous nature of the K-65 residues in Silos 1 and 2. The mock sampling run will be conducted on Silo 4, which is empty, to demonstrate and refine the specialized sampling techniques, to test equipment operation, and to train personnel adequately. The sampling of Silo 3 will be done next because the metal oxides do not represent as great of a health and safety

BRUNING 22425

STARTING DATE: 3-24-88	DATE LAST REV.:	INITIATOR: K. SHELL	DRAWING NO.: 303317-A-G11
DRAWN BY: WALT McGILL	DRAWN BY:	PROJ. MGR. D. HARMER	PROJECT NO.: 303317.03



CONCEPTUAL POSITIONING OF CRANE AND SAMPLER

NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

Figure 4-2

91

concern as the K-65 residues. This sequence will further train the sampling personnel. The last activity will be the sampling of Silos 1 and 2.

4.2.1 General Sampling Procedure

The sampling team will consist, at a minimum, of the nine persons listed below:

- K-65 Sampling Task Team Leader
- Crane Operator
- Two Crane Riggers
- Vibra Corer Operator
- Two Sampling Technicians
- Health and Safety Officer
- Health Physics Technician.

The two riggers will help to direct the crane operator to initially position the Vibra Corer unit as shown in Figure 4-2. One rigger will be located on the ground at the Vibra Corer pickup area, while the other will be located on the dome near the sample port. The rigger in the pickup area will guide the crane operator when picking up the clean Vibra Corer and when lowering the completed sample core onto a flatbed truck in the pickup area. The rigger on the silo will guide the crane operator while positioning the Vibra Corer over the open manhole during sampling operations, in accordance with Procedure K6507. Prior to this point, the manhole flanges on the silos will have been removed in accordance with Procedure K6505.

During the sampling of Silos 1 and 2, a bagout system will be used to minimize any release of radon gas from the silos. The containment bag will consist of a 50-foot long plastic sleeve connected to a glovebag. The containment bag will be initially positioned around the clean Vibra Corer prior to lifting the unit into position. When the Vibra Corer unit is positioned over the sampling port, it will be joined to a glovebag and secured to the open manhole port. Procedure K6507 details the assembly of the polyethylene bag/glovebag system.

The Vibra Corer unit will then be turned on to vertically penetrate the foam and residue, thereby collecting the continuous core sample. The polyethylene bag will remain positioned around the core barrel as sampling takes place. When the Vibra Corer has reached the bottom of the silo, it will be turned

91

off. Once the Vibra Corer is withdrawn from the silo, the containment bag extending over the core barrel will be heat sealed twice, and cut between the seals, thereby maintaining complete containment. The Vibra Corer and core sample will then be raised from the silo using a crane.

A remote-reading dynamometer or load cell will be placed between the Vibra Corer and the crane. It will be observed by the Vibra Corer operator during the sample extraction process. The purpose of the dynamometer is to detect any buildup of force between the Vibra Corer and crane should any binding occur during extraction of the core. If excessive forces are detected, the Vibra Corer will be turned on and operated momentarily to relieve the binding forces. The dynamometer will be monitored and operated in accordance with Procedure K6507.

As the crane lowers the core to the pickup area, the core will be directly placed on a specially designed truck bed as shown in Figure 4-3. Technicians will transport the bagged core to the Preparation Trailer.

4.2.2 Mock Sampling Run on Silo 4

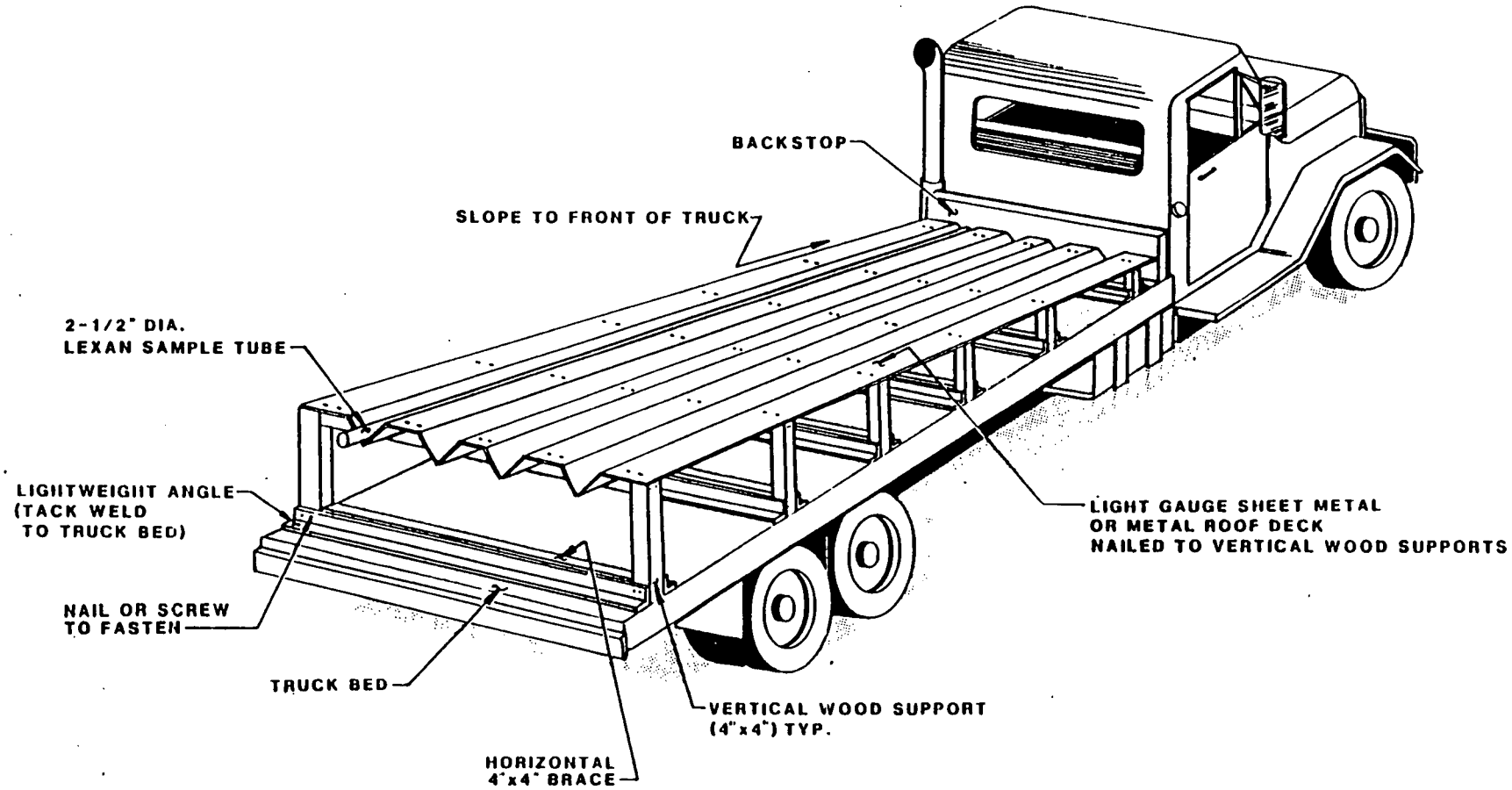
A full-scale mock sampling run is planned as the first activity in the sampling project. This will be done to test the Vibra Corer sampling device, the crane, and the overall implementability of the detailed sampling procedures. Particular attention will be given to the execution time of each activity and ways that procedure execution can be streamlined to minimize the time spent on the silos. Improved equipment or procedures to minimize the chance of malfunctions will also be considered. The mock sampling run will be accomplished following Procedure K6506.

Deficiencies identified in the detailed sampling procedures will be immediately evaluated and an alternative course of action identified. The K-65 Sampling Task Manager will make a determination as to the level of approval required prior to implementing any change. If required, multiple mock sampling runs will be performed until the K-65 Sampling Task Manager is satisfied that all sampling personnel are adequately trained.

27

BRUNING 72425

STARTING DATE: 3-24-88	DATE LAST REV.:	INITIATOR: K. SHELL	DRAWING NO.: 303317-A-G10
DRAWN BY: WALT McGILL	DRAWN BY:	PROJ. MGR. D. HARMER	PROJECT NO.: 303317.03



CONCEPTUAL SKETCH OF TRUCK MOUNTED CORE HOLDER

INTERNATIONAL TECHNOLOGY CORPORATION

Figure 4-3

91

All health and safety protective clothing required for sampling Silos 1 and 2 will be worn during the mock sampling run. This will be done to simulate actual conditions that will be encountered during the sampling of Silos 1 and 2.

4.2.3 Silo 3 Sampling

The sampling of Silo 3 will proceed upon successful completion of the mock sampling run on Silo 4. Sampling will be done in accordance with Procedure K6507. When sampling Silo 3, however, two exceptions will be taken to the requirements established in Procedure K6507 for sampling Silos 1 and 2. These exceptions are: (1) the radon removal system will not be utilized during sample core cutting and (2) the sample holes remaining in the residues in the silos after sampling will not be filled with foam. The reason for these two exceptions is that the metal oxide residues in Silo 3 do not generate significant quantities of radon gas. The two activities were originated solely for the purpose of containing radon gas that may be present in Silos 1 and 2. Access to manhole S3-SW on Silo 3 is currently obstructed by a steel structure. This manhole may not be sampled if WMCO is unable to remove the structure.

4.2.4 Silos 1 and 2 Sampling

The sampling of Silos 1 and 2 will proceed upon completion of sampling Silo 3. Sampling will be done in accordance with Procedure K6507. All manhole flanges will be replaced and resealed as per Procedure K6508 upon completion of the sampling program.

Since sampling of Silos 1 and 2 represent an increased health concern, extreme care will be exercised by all field personnel during sampling operations. The sample team members will be well trained through the mock run and as a result of Silo 3 sampling, will be ready to carry out the remaining sampling. Personnel dosimetry will be read daily to ensure personnel exposures are minimized.

4.3 SAMPLE HANDLING

When the 35-foot long cores are removed from the silos, the following activities will be performed:

91

prepared flatbed truck, in accordance with Procedures K6507 and K6509

- Removal of core containment bag
- Decontamination and removal of the Vibra Corer lower cutting unit and outer steel barrel, in accordance with Procedure K6516
- Capping, decontamination, labeling, and bagging of the Lexan core barrels (Procedure K6516)
- Transportation of the bagged cores to the Examination Trailer using the flatbed truck (Procedure K6509)
- Visual inspection, video recording, and radiological scanning of cores at the Examination Trailer, in accordance with Procedures K6512, K6513, and K6514, respectively
- Analysis of radiological scanning data and reevaluation of number of samples required from each core
- Sectioning the Lexan core and packaging and shipping individual samples, in accordance with Procedures K6515 and K6518
- Labeling of the core and core sections with unique five-digit identification numbers as specified in the Introduction to the Sampling Plan in the RI/FS Work Plan, Revision 3; upon completion of sectioning, all core sections will be accounted for
- Capping, decontamination, and packaging the remaining core sections for long-term archiving, in accordance with Procedure K6517
- All waste generated will be handled in accordance with Procedure K6524.

4.4 DECONTAMINATION REQUIREMENTS

During sampling of Silos 1, 2, and 3, the sampling devices and some measurement equipment may become contaminated. All equipment used during sampling must be screened for external radiological contamination before leaving the regulated sampling site, as defined in Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), dated April 1988. The maximum radiological surface contamination limits for the equipment are shown in Table 4-1. Procedure K6516 will be followed for decontamination of these items.

Equipment to be used for more than one sample extraction must be decontaminated to prevent personnel exposure and cross contamination of samples. All

Table 4-1. Recommended Maximum[a] Contamination Limits for Items Given Radiation Clearance

Parameter	Recommended Limit (dpm/100 cm^2)	Recommended Limit (mrad/hr)
Alpha	20	300
Beta/gamma	200	0.05

[a]No 100 cm^2 area to average greater than this value.

samplers must be decontaminated before use. New samplers fabricated for this project must be cleaned before use to remove fabrication oil and dirt. The new samplers will be cleaned with mild detergent and deionized water, and rinsed with methanol and/or acetone. The sampling equipment that must be routinely decontaminated includes, but is not necessarily limited to:

- Vibra Corer lower cutting unit
- Vibra Corer outer steel barrel
- Lexan inner sample barrel (external surface only)
- Sample container exteriors.

The sampling personnel will be responsible for decontaminating the equipment. Clean rubber gloves will be used for the decontamination activities. The health physics technician will survey the equipment before and after cleaning to determine whether the radiological contaminants have been removed. The procedures will be repeated a maximum of three times if necessary. If the equipment is not clean below the levels defined in Table 4-1 after the third attempt, then another piece of equipment will be used.

The decontamination solutions to be used are mild detergent and deionized water for aqueous wastes and methanol and acetone for organic materials. The equipment will be wiped with clean cloth towels after being moistened with the decontamination solutions. A long-handled swab may be required for cleaning the inside of the tubular equipment. A catch basin will be used to collect the excess decontamination solution. The catch basin will be emptied by pouring the collected liquids into a 55-gallon drum. The used towels, gloves, shoecovers, wash solutions, and equipment that cannot be decontaminated will be disposed of as described in Section 8.0.

4.5 CHAIN OF CUSTODY AND REQUEST FOR ANALYSIS

A formal Chain-of-Custody procedure will be implemented for the silo sampling program. A sample is defined as being "in custody" when:

- It is in the physical possession of the designated responsible party;
- It is in the view of the designated responsible party;
- It is placed in a secure area by the designated responsible party; or
- It is in a secure area restricted to access by authorized personnel only.

91

The full-length core samples collected from the silos will be labeled and numbered and a Chain-of-Custody Form will be completed. After the cores have been sectioned, each section will be labeled and numbered. A separate Chain-of-Custody Form will be completed for all sections, including those to be archived by WMCO, and a Request for Analysis Form will be completed for those sections to be sent to the laboratory.

Sample Chain-of-Custody and Request for Analysis Forms are shown in Figures 4-4 and 4-5, respectively.

4.6 SAMPLE PACKAGING AND SHIPPING

Shipment of samples off site will be done in accordance with Procedure K6518. Samples for shipment will be packaged using package type 37A or 39, depending on hazard class determined by the preliminary screening. Overpacks will be used as much as possible to consolidate sample packages for shipment of samples with compatible hazard classifications.

Department of Transportation (DOT) labeling for packages will comply with the requirements of 49 CFR. The labeling class requirements will be determined by the hazard class assigned to the samples during screening. All samples will be transported by a licensed, sole-usage contractor to ensure prompt delivery of samples and to provide a tracking mechanism for undelivered sample shipments.

All paperwork to accompany each sample will be inserted into a Ziploc plastic bag to be enclosed with the sample.

4.7 SAMPLE ANALYSIS

The K-65 and metal oxide samples will be analyzed for physical, chemical, and radiological parameters as described in the following subsections. The proposed number of samples to be selected for each type of analysis was presented in Section 3.3.

INTERNATIONAL TECHNOLOGY CORPORATION

CHAIN-OF-CUSTODY RECORD

R/A Control No. _____

C/C Control No. 62910

PROJECT NAME/NUMBER _____ LAB DESTINATION _____

SAMPLE TEAM MEMBERS _____ CARRIER/WAYBILL NO. _____

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.

Special Instructions: _____

Possible Sample Hazards: _____

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: _____

   Received By: _____

2. Relinquished By: _____

   Received By: _____

3. Relinquished By: _____

   Received by: _____

4. Relinquished By: _____

   Received By: _____

WHITE - To accompany samples
YELLOW - Field copy

Figure 4-4

34

INTERNATIONAL TECHNOLOGY CORPORATION

REQUEST FOR ANALYSIS

R/A Control No. 61198

C/C Control No. _____

PROJECT NAME _____

PROJECT NUMBER _____

PROJECT MANAGER _____

BILL TO _____

PURCHASE ORDER NO. _____

DATE SAMPLES SHIPPED _____

LAB DESTINATION _____

LABORATORY CONTACT _____

SEND LAB REPORT TO _____

DATE REPORT REQUIRED _____

PROJECT CONTACT _____

PROJECT CONTACT PHONE NO. _____

Sample No.	Sample Type	Sample Volume	Preservative	Requested Testing Program	Special Instructions

TURNAROUND TIME REQUIRED: (Rush must be approved by the Project Manager.)

Normal _____ **Rush** _____ (Subject to rush surcharge)

POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances)

Nonhazard _____ **Flammable** _____ **Skin Irritant** _____ **Highly Toxic** _____ **Other** _____ **(Please Specify)**

SAMPLE DISPOSAL: (Please indicate disposition of sample following analysis. Lab will charge for packing, shipping, and disposal.)

Return to Client _____ **Disposal by Lab** _____

FOR LAB USE ONLY

Received By _____ **Date/Time** _____

WHITE - Original, to accompany samples
YELLOW - Field copy

Figure 4-5

91

4.7.1 Radiological and Chemical Analyses

Selected K-65 and metal oxide samples will be analyzed for radiological and chemical constituents to characterize the materials for the evaluation of disposal options. The required radiological analyses are listed below:

- Isotopic uranium
- Isotopic thorium
- Isotopic radium
- Pb-210.

Selected samples will also be analyzed for the following chemical parameters:

- HSL inorganics
- HSL volatiles
- HSL semivolatiles
- HSL pesticides and PCBs
- TCLP metals.

The off-site preparation of samples for laboratory analysis will be performed in accordance with Procedures K6519 through K6523. Chemical analyses will be conducted using CLP protocols when possible. The only modification to CLP protocols will be for conflicts that arise between procedures established for handling radioactive materials and nonradioactive CLP procedures. These modifications are detailed in Procedures K6520 and K6521, and in Section 7.0.

4.7.2 Physical Analyses

Physical properties of the K-65 and metal oxide residues will be determined to enable the prediction of the expected behavior of the wastes during treatment and/or disposal operations. The proposed physical analyses and ASTM Standard Procedures are provided in Table 4-2.

91

Table 4-2. Engineering Properties Parameters

Physical Analysis	ASTM Standard
Particle size distribution	D 422-63
Atterberg limits - plastic limit	D 424-54
- liquid limit	D 423-66
Moisture content	D 2216-80
Specific gravity	D 854-58

37

91

5.0 FACILITY AND EQUIPMENT REQUIREMENTS

5.1 WMCO FACILITIES

WMCO will provide electric utilities to the two trailers for use during preparation and examination of the sample cores. The locations of the trailers are described in Section 4.1. The electrical requirements are 110 VAC and 220 VAC.

WMCO will provide personnel clearances and escorts as necessary. WMCO will provide training for contract personnel in FMPC safety and emergency procedures, including respirator certifications. They will also provide clothing in the form of coveralls and shoes, laundry services, locker facilities, and showers.

5.2 EQUIPMENT

Procedure K6503 provides a detailed listing of the minimum equipment requirements for the sampling program. This listing does not include, however, either the equipment listed in Section 5.1 above or the health and safety equipment. The required health and safety equipment is listed in Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), dated April 1988.

91

6.0 ENVIRONMENTAL HEALTH AND SAFETY PROTECTION

The health and safety of workers and the protection of the environment will be ensured by following Addendum No 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), dated April 1988. This addendum was prepared specifically for this sampling project, and is presented as Part 3.0 of the Implementation Plan. The Health and Safety Plan and addendum describe applicable policies, requirements, and procedures for the recognition and elimination of hazards to ensure the health and safety of personnel performing the work and the general public.

All activities will be conducted with the lowest reasonable risk of personal injury, and radiation exposures will be kept as low as reasonably achievable (ALARA). An ALARA review has been conducted for this project and is presented as Part 4.0 of the Implementation Plan.

91

7.0 QUALITY ASSURANCE

The quality of the work to be performed in this sampling and analysis program will be ensured by following the Fernald RI/FS Quality Assurance Project Plan (QAPP), Revision 3, dated March 1988. The only exceptions that will be taken to this QAPP are the following:

1. The samples will be received and will have the initial CLP preparation performed at IT's Bear Creek laboratory facility, which is not a CLP-approved laboratory. Although the sample preparation will be done at a non-CLP facility, the personnel performing this work will be experienced in the CLP procedures to be used and will have been qualified under the CLP.

2. Holding times for organic analyses may not be met due to existing procedures that must be followed for shipping and handling of radioactive materials. Due to the activity of the materials, all samples must be transferred from DOE's Radioactive Material License to IT Corporation's License. To accomplish this, WMCO must initiate shipping procedures and IT Corporation's Bear Creek facility must be the receipt point. This will cause delays in the shipment of samples since this step does not exist in a normal CLP sample transfer and the Bear Creek facility is not the laboratory to perform the organic analyses. Another reason for delays in the analysis process will be the extensive on-site sample preparation and examination processes. All of the samples will be collected from the silos in approximately a 2-week period. To meet the holding time, all samples (projected to be twelve) would have to be examined, screened on site, transported, screened at the laboratory, transferred to IT's Mixed Waste Laboratory, and analyzed within this short time period.

All other aspects of the sampling project will be subject to the requirements of the RI/FS QAPP. The QAPP was prepared to meet the requirements of QAMS-005/80 and includes the following:

- Definition of the QA objectives for the collected data in terms of precision, accuracy, completeness, and representativeness as defined in Section 4.0 and 14.0 of the QAPP

- Definition of project personnel and their responsibilities to ensure quality as defined in Section 3.0 of the QAPP and in Revision 3 of the RI/FS Project Management Plan

- Internal QC checks and frequency as defined in Section 11.0 of the QAPP

- Nonconformance/corrective action procedures and variances as defined in Section 16.0 of the QAPP
- Preventative maintenance procedures and schedules as defined by Section 13.0 of the QAPP
- Equipment calibration and maintenance as defined by Section 8.0 of the QAPP
- Sampling procedure distribution and control as defined by Section 15.0 of the QAPP
- Chain-of-custody procedures as defined in Section 7.0 of the QAPP
- Procedures for controlling sampling as defined by the K-65 sampling Procedure K6507
- Procedures for controlling the evaluation and reporting of data as defined in Section 10.0 of the QAPP.

Specific references to the pertinent QAPP sections are provided in the individual, detailed procedures that have been prepared for the sampling program (Part 2.0 of the Implementation Plan).

91

8.0 WASTE MANAGEMENT

Waste management, handling and packaging requirements for the K-65 sampling program are provided in Procedure K6521. The wastes that will be generated are expected to contain both radioactive as well as hazardous waste materials and will be handled as mixed waste. These wastes will be packaged in appropriately labeled containers and transferred to WMCO for further handling and/or disposal. No liquid wastes are expected to be generated during the sampling program other than decontamination fluids. However, if any liquid waste is generated, it will be handled in accordance with WMCO provisions and transferred to WMCO for disposal after appropriate containment and packaging.

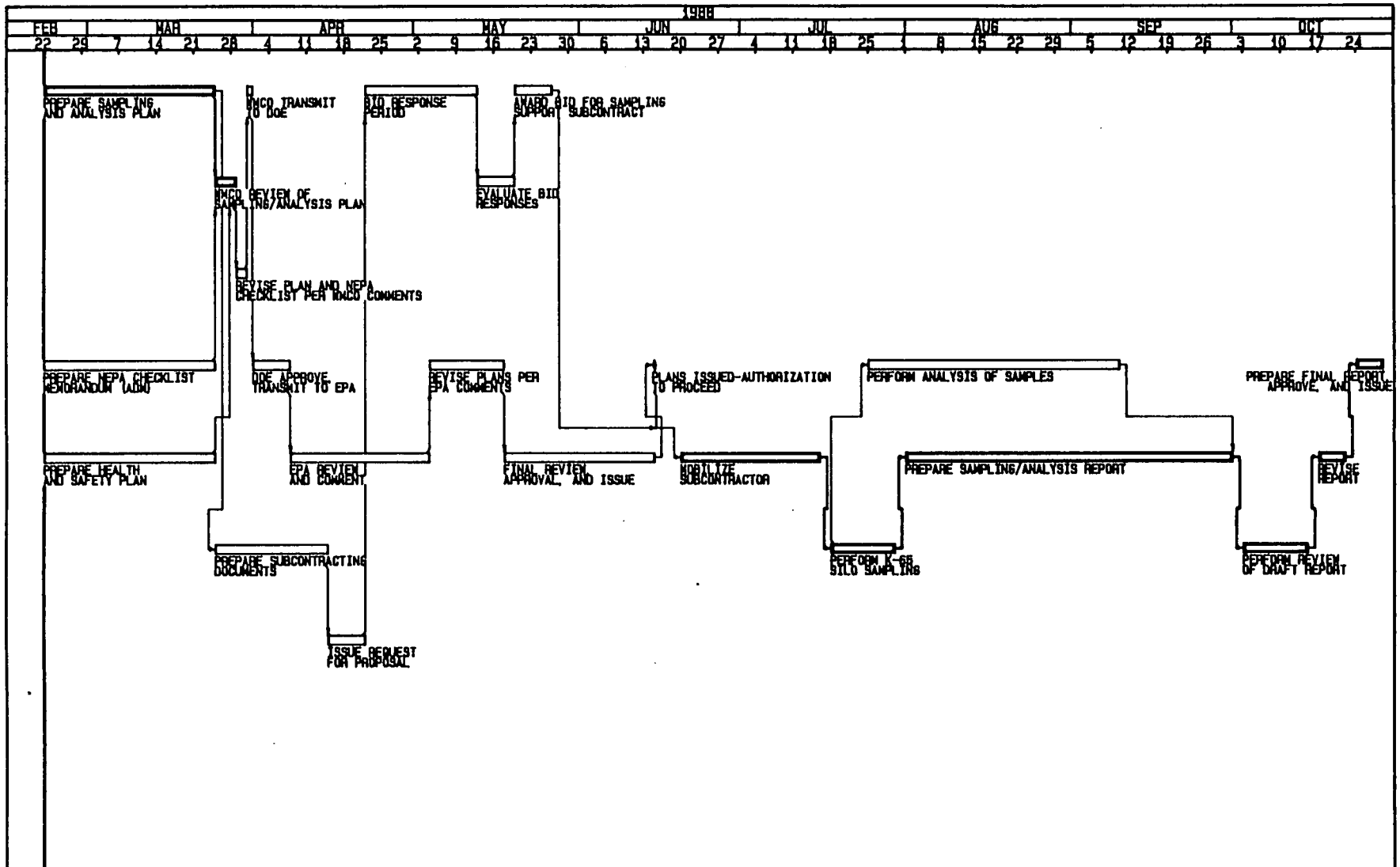
Individuals who will be performing and/or directing activities that produce or have the potential to produce waste materials will have appropriate training on WMCO waste management practices. This will ensure that the waste materials are handled properly and safely as well as contribute to an effort to minimize the volume of waste generated. These individuals will also have appropriate training and knowledge for performing waste characterizations.

42

9.0 MANAGEMENT PLAN

The FMPC RI/FS Project Management Plan (March 1988) governs all managerial responsibilities and activities for the K-65 sampling program. The key individuals on this task are David Harmer, Sampling Task Manager, and Cathy Johnson, Sampling Task Team Leader.

Figure 9-1 presents the proposed schedule for the sampling program.



Activity Bar/Early Dates
Critical Activity
Progress Bar

Primavera Systems, Inc. 1984, 1985, 1986, 1987

WESTINGHOUSE MATERIALS CO. OF OHIO
SAMPLING OF K-65 SILOS
TIME-SCALED LOGIC DIAGRAM

Sheet 1 of 1

Project Start : 22FEB88
Project Finish: 28OCT88

Data Date: 22FEB88
Plot Date: 24MAR88

RI/FS TASK 3.7 - K-65 SILO SAMPLING

Date	Revision	Checked	Approved

TABLE OF CONTENTS

Section	Title
1.0	Sampling and Analysis Plan
2.0	Detailed Operational Procedures
	K6501 Sampling Operation Sequence
	K6501 Location and Marking of Sampling Points
	K6503 Receipt, Preparation and Set-up of Sampling Equipment
	K6504 Set-up and Positioning of the Crane
	K6505 Removal of Manhole Flanges
	K6506 Mock Run Using Vibra Corer Equipment
	K6507 Taking of Samples Using Vibra Corer Equipment
	K6508 Replacement of Flanges on Silo Access Ports
	K6509 Transport of Vibra Corer Sampling Device
	K6510 Operation Procedures for Radon Removal System
	K6511 Initial On-site Core Handling and Inspection
	K6512 Visual Observation
	K6513 Video Recording
	K6514 Radiological Scanning
	K6515 Sectioning and Packaging of Sample Cores
	K6516 Decontamination of Sampling Equipment
	K6517 Long-term Storage of Archive Samples
	K6518 Shipment to Off-site Laboratories
	K6519 Off-site Preparation of Samples for Analysis
	K6520 Analysis of Sample Extract for Inorganic Constituents
	K6521 Analysis of Samples and Extracts for Organic Constituents
	K6522 Isotopic Assays of Samples
	K6523 Determination of Engineering Properties of Samples
	K6524 Radioactive Waste Handling
	K6525 Abnormal Occurrences
3.0	Addendum No. 2 RI/FS Health and Safety Plan (Revision 3)
4.0	ALARA Review
5.0	NEPA Checklist
6.0	Structural Integrity of Silo Domes During K-65 Sampling Operations

TITLE: K-65 SAMPLING OPERATION SEQUENCE

1.0 PURPOSE

This procedure provides the overall sequence of operational events that ties together the individual procedure documents for the sampling of contents of Storage Silos 1, 2, and 3 at the FMPC, also known as the K-65 Silos and the Metal Oxide Silo. Also included is a mock sampling of the existing empty Silo 4 at the FMPC.

2.0 SCOPE

This procedure applies to all steps in the sampling, observation, handling, storage, shipping, and analysis of the contents of Silos 1, 2, and 3. The procedure serves as the master sequence for all of the above operations which hereinafter are referred to as the K-65 sampling operations.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Manager to see that this procedure is followed during the execution of the K-65 sampling program.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel who are experienced and/or have been trained in the use of the stated equipment and handling of the samples.

3.3 It is the responsibility of each individual performing this procedure to follow it and to report any unusual occurrences to the K-65 Sampling Task Team Leader or his designee.

4.0 REFERENCES

4.1 Metal Oxide and Empty Silo Study and Evaluation Report, Camargo Associates, Limited, May 1986.

4.2 K-65 Silos Study and Evaluation Report, Camargo Associates, Limited, February 1986.

4.3 Final Safety Analysis Report for K-65 Silos Radon Mitigation and Dome Reinforcement, ASI, October 30, 1987.

4.4 FMPC Environmental Monitoring Annual Report for 1986, WMCO, April 30, 1987.

4.5 Engineering Study of the K-65 Storage Silo Radon Mitigation and Dome Reinforcement Project at the Feed Materials Production Center, IT Corp., August 20, 1987.

4.6 Conceptual Design Report, K-65 Storage Silo Radon Mitigation and Dome Reinforcement Study, WMCO, May, 1987.

4.7 Statement of Work, K-65 Sampling, WMCO.

4.8 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

4.9 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

4.10 Occupational Safety and Health Standards for the Construction Industry, 29 CFR Part 1926.

5.0 SAFETY AND PRECAUTIONS

5.1 Good field safety rules are to be observed at all times while equipment is handled and samples are taken in accordance with "Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3)," dated April 1988.

5.2 Protective clothing and dosimetry must be worn in accordance with "Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3)," dated April 1988.

6.0 PREREQUISITES

6.1 Safety and radiation training for all workers in accordance with procedures of WMCO and Contractor.

6.2 Craft labor available for removal of flanges and other project support.

6.3 Crane scheduled for sample equipment lifting.

6.4 Truck with core transport racks at hand.

6.5 Two areas, a Preparation Trailer and an Examination Trailer, set aside and prepared for the field operations.

6.6 Area for archived core samples designated and prepared by WMCO.

6.7 Radon removal system operable and connected to the Examination Trailer and the glove bags of the sampling assemblies above the silos.

7.0 PROCEDURE

Diagram representation of the K-65 Sampling Operation Sequence for Procedure K6501 is attached as Figure 1.

7.1 Mark location of points to be sampled, using Procedure K6502. This step may be accomplished anytime up to the start of flange removal (Procedure K6505).

91

7.2 Prepare sampling equipment and procure supplies in accordance with Procedure K6503. Place these in a controlled area under lock and key, or with a designated person to guard against tampering or contamination. Ensure that the equipment cannot be accessible to unauthorized parties. This step may be accomplished any time up to the start of flange removal (Procedure K6505).

7.3 Position crane for sample taking at each silo, in accordance with Procedure K6504. The crane may be positioned for the first sample anytime up to the removal of the first flange from that particular silo (Procedure K6505).

7.4 Once Steps 7.1 through 7.3 are completed for the particular location to be sampled, remove the flange from the sample point as given in Procedure K6505.

7.5 Sample as per Procedures K6506 or K6507, and replace flanges after each sample as per Procedure K6508. For Silos 1 and 2, remove radon with Procedure K6510.

7.6 After each sample core is withdrawn from the sample location, it must be placed in a temporary carrier and transported to the Preparation Trailer under Procedure K6509. At the Preparation and Examination Trailers, activities are controlled by Procedures K6510, K6511, K6512, K6513, K6514, and K6515.

7.7. Equipment is to be decontaminated according to Procedure K6516 after each usage, as well as before reuse, before storage outside of the designated examination area, or before transportation to any other location.

7.8 Sample cores that remain after examination and sectioning are to be placed in archive storage according to Procedure K6517.

7.9 Shipping of samples for analysis in off-site laboratories and in other parts of the FMPC facilities is to be done in accordance with Procedure K6518 and Section 7.0 of the Quality Assurance Project Plan. The designation of analyses to be performed on the samples in these shipments and the associated analytical methods are found in Procedures K6519, K6520, K6521, K6522, and K6523.

7.10 Waste materials and supplies from the entire sampling operation are to be accumulated in appropriately labeled containers. As indicated by storage considerations and as mandated at the end of the sample handling operations, these wastes will be handled and removed from the work area in accordance with Procedure K6524.

7.11 If any emergencies, spills, or other abnormal situations arise during the carrying out of these sampling operations, the responsible parties should refer to Abnormal Occurrences Procedure, No. K6525.

48

K-65 SAMPLING OPERATION SEQUENCE

BLOCK DIAGRAM

(For Procedure K6501)

DEH
3/25/88
Rev. 0

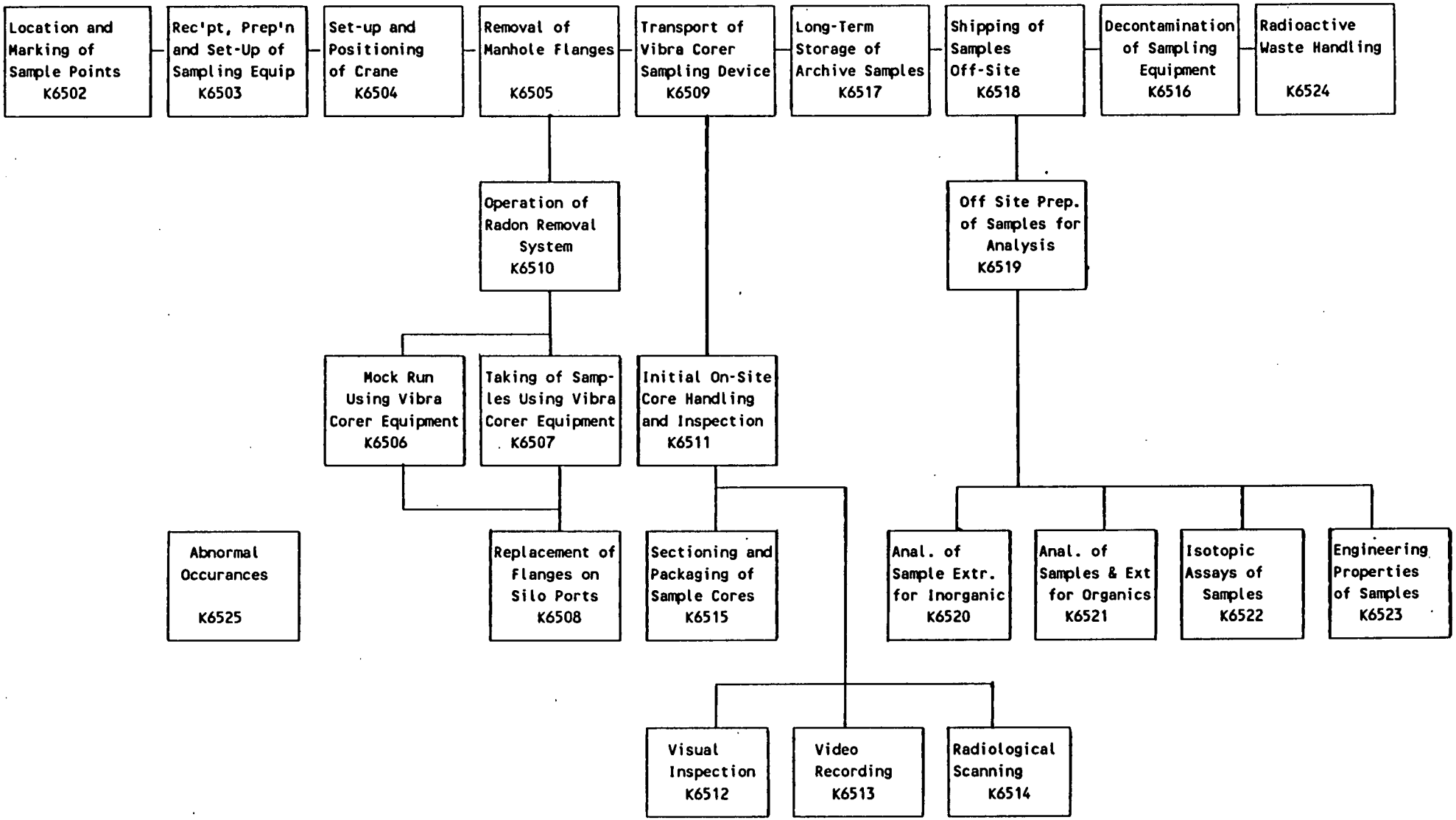


Figure 1

91

TITLE: LOCATION AND MARKING OF SAMPLING POINTS

1.0 PURPOSE

This procedure provides the methodology to locate and mark sample points to aid in identification and characterization of samples taken from the silos.

2.0 SCOPE

This procedure applies to Storage Silos 1, 2, and 3. Each of these silos is equipped with five manways (manholes). Sampling will be conducted through four of these manholes. The fifth manhole, located at the center of each domed roof, will be excluded. A total of twelve sampling points will be located and marked with metal tags. Two samples will be taken from one point on Silo 1; thus, thirteen total samples will be taken. One additional location has been identified on Silo 4 for the mock sampling run.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to see that this procedure is followed during the location, identification, and marking phase.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel that are experienced with this procedure and the use of the identification and fastening equipment.

3.3 It is the responsibility of each individual performing this procedure to follow it and to report unusual occurrences to the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 Statement of Work, K-65 Sampling; WMCO.

4.2 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3); April 1988.

4.3 K-65 Sampling Operation Sequence, Procedure K6501.

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing and dosimetry must be worn in accordance with "Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3)", dated April 1988.

5.2 To minimize man-rem exposure, work on the K-65 silos must be well planned and performed such that no more time than necessary is spent on the domes.

5.3 Silo domes are sloped, resulting in poor footing. Proper footwear should be worn and care exercised when maneuvering on top of the silos.

NOTE: At no time should personnel walk or equipment be placed on the center cap of the silos.

5.4 Review of safety and operational procedures has taken place with personnel involved.

6.0 PREREQUISITES

6.1 Safety and radiation training for all workers in accordance with procedures of WMCO and the contractor.

6.2 Forms

- Field Activity Daily Log (1)

6.3 Metal tags (12). The tags are to be pre-punched with the manhole location identification numbers shown on Drawing No. 303317-A-C01.

6.4 Epoxy cement (Epoxy 88) (2 1-pint containers)

6.5 Backpacks (2)

6.6 Wooden or plastic spatulas (12)

6.7 Polyethylene bags (12)

6.8 Plastic square mixing surfaces (12 2-inch squares)

6.9 Wire brush (1)

6.10 Field logbook (1)

6.11 Protective clothing per "Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3)", dated April, 1988.

6.12 Duct tape.

6.13 Two-way radios (1 set)

6.14 Disposable latex gloves (2 pairs)

7.0 PROCEDURE

7.1 PRELIMINARY PROCEDURE

7.1.1 Prior to transit to the silos in the field, the epoxy cement components should be transferred from the 1-gallon containers to resealable 1-pint containers. The components should not be mixed at this time.

7.1.2 Transfer 1-pint of Epoxy 88 Component A into a 1-pint resealable container. This may be done by pouring or other means. Seal this container. Label this 1-pint container as Component A.

7.1.3 Transfer 1-pint of Epoxy 88 Component B into another 1-pint resealable container. This may be done by pouring or other means. Seal this container. Label the 1-pint container as Component B. Do not allow any utensils used with Component A to come in contact with Component B.

7.2 FIELD ACTIVITY

7.2.1 Collect required supplies and equipment including a working set of two-way radios from the trailers.

7.2.2 Begin field work. Routinely update the Field Activity Daily Log (Section 5.0 of the Quality Assurance Project Plan) to indicate the location identified, unique sample location number, and other relevant information.

7.2.3 Locate the designated manhole to be marked. A metal tag will be used on each of four manholes on each silo.

7.2.4 Disposable latex gloves will be worn when affixing metal tags to the manhole.

7.2.5 Open the 1-pint container of Epoxy 88 Component A. Using a spatula, transfer a small amount of Component A onto the 2-inch square plastic mixing surface. Use only enough component to cement one tag onto the manhole surface. Reseal the 1-pint container of Component A.

7.2.6 Open the 1-pint container of Epoxy 88 Component B. Using the other end of the spatula used in procedure 7.2.5 above, transfer an equal amount of Component B to the plastic square mixing surface. Reseal the 1-pint container of Component B.

7.2.7 Using the spatula, thoroughly mix Component A with Component B to form a completely homogeneous mixture. At this point, the mixture will appear to stiffen in consistency and lighten in color.

7.2.8 Apply a small amount of epoxy mixture on the back side of the metal tag, using the spatula to spread out the epoxy and being careful not to apply too much cement.

7.2.9 Verify the correct association of tag number to flange location per sample logbook and Drawing No. 303317-A-C01.

7.2.10 The metal tag will be affixed to a flat, clean surface of the manhole. Preferably, the tag should be located in a conspicuous location on the manhole nozzle itself and not on the removable manhole flange (cover). If the nozzle neck is covered with foam, affix tag to the flange.

7.2.11 The surface where the tag is to be affixed should be clean, dry and free of any loose paint, rust, oil or debris. If necessary, wire brush the surface.

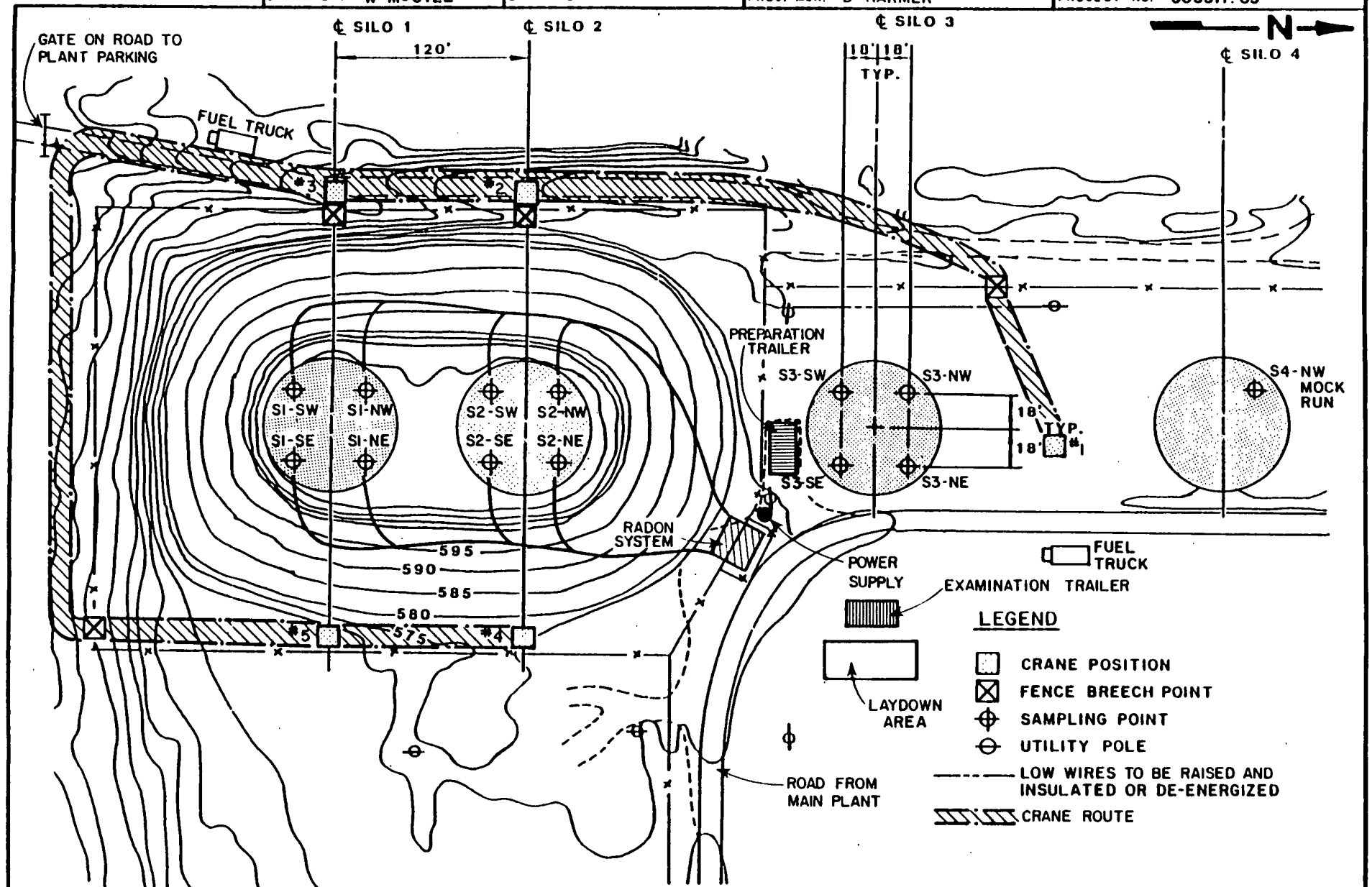
7.2.12 Carefully position the tag in place and hold for a few seconds. The cement should be tacky enough for the tag to remain in place. If necessary, the tag may be held in place with duct tape to minimize personnel exposure until the epoxy sets. (This may take a few minutes.)

7.2.13 Place used spatula, cement, and mixing surface in a polyethylene bag and seal.

7.2.14 Proceed to the next manhole. Steps 7.2.2 through 7.2.13 should be performed for each manhole to affix the metal tags for identification purposes.

BRUNING 72425

STARTING DATE: 3-20-88	DATE LAST REV.:	INITIATOR: K SHELL	DRAWING NO.: 303317-A-C01
DRAWN BY: W McGILL	DRAWN BY:	PROJ. MGR. D HARMER	PROJECT NO.: 303317.03



K-65 METAL OXIDE SAMPLING

NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

91

TITLE: RECEIPT, PREPARATION AND SETUP OF SAMPLING EQUIPMENT

1.0 PURPOSE

The purpose of this procedure is to furnish the required steps for the receipt, preparation, and setup of the equipment needed for the sampling of Silos 1, 2, and 3, in addition to the mock sampling run on Silo 4.

2.0 SCOPE

This procedure will be required for the assembly, collection, and placement of all equipment necessary to perform the designated sampling tasks.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to see that the following procedures are followed during the field program phase.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to assign the following tasks to persons experienced and/or trained in the handling of the sampling equipment to be used.

3.3 It is the responsibility of each individual designated to perform the following tasks to report any unusual circumstances to the K-65 Sampling Task Team Leader. Faulty or missing equipment, or any nonconformance to the procedures should be reported.

4.0 REFERENCES

4.1 Statement of Work, K-65 Sampling; WMCO.

4.2 K-65 Sampling Operation Sequence, Procedure K6501.

4.3 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

4.4 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Good field safety rules will be observed at all times during the handling and assembly of the sampling equipment in accordance with the Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

91

5.2 Protective clothing and dosimetry will be worn in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

5.3 To minimize man-rem exposure, any preparation and setup of equipment near the K-65 silos must be well planned and performed such that no more time than necessary is spent near the silos and on the domes.

6.0 PREREQUISITES

6.1 Safety and radiation training for all workers in accordance with procedures of WMCO and the Contractor.

6.2 Necessary equipment has been shipped to a designated location and addressed to the K-65 Sampling Task Team Leader.

6.3 Equipment received by the K-65 Sampling Task Team Leader will be stored in a designated, controlled area before the initiation of field activities.

6.4 Calibration of any equipment used in the sampling procedure will have been accomplished per manufacturer's recommendations and per Section 13.0 of the Quality Assurance Project Plan.

7.0 EQUIPMENT LIST

7.1 Vibra Corer Equipment

7.1.1 (1) 2-3/4 inch outer diameter (O.D.) Vibra Corer Head Assembly

7.1.2 (2) 2-3/4 inch O.D. Couplers

7.1.3 (6) 10-foot sections of 2-3/4 inch O.D. stainless steel outer casing

7.1.4 (4) 5-foot sections of 2-3/4 inch O.D. stainless steel outer casing

7.1.5 (2) 2-3/4 inch O.D. cutting shoes

7.1.6 (4) Core retainers for above

7.1.7 (15) 36-foot sections of 2-1/8 inch O.D. Lexan tubing

7.1.8 (1000) Plastic caps for Lexan tubing

7.1.9 Oiler attachment for head assembly.

7.2 Other Equipment Required for Sampling of Silos

91

7.2.1 Air compressor or drive unit of sufficient capacity to deliver the required vibration frequency to Vibra Corer head assembly per manufacturer's specifications.

7.2.2 Airline or drive cable (for above) of sufficient length to meet sampling requirements (see Procedure K6507).

7.2.3 Correct fittings for airline or drive cable attachment to Vibra Corer head assembly in accordance with manufacturer's requirements

7.2.4 Heavy duty polyethylene bags for core transport between trailers

7.2.5 Prefab polyethylene bag with attached glovebag for core retrieval from silos

7.2.6 Foam injection hoses - one for each core and one for mock run, 14 total

7.2.7 Expansion rings - for 20-inch diameter openings

7.2.8 Three hand-held heat sealers for closing of polyethylene sample transport bag and polyethylene bags with glovebag attached (one heat sealer at silo locations and two heat sealers in sample handling trailers)

7.2.9 Electrical extension cord for heat sealer to be used at each silo sample port

7.2.10 Knife or scissors to cut sealed overbag after sealing is complete

7.2.11 Duct tape for taping of overbag to top of Vibra Corer head assembly

7.2.12 40-foot flatbed truck for delivery of coring apparatus from equipment preparation area

7.2.13 Core troughs for flatbed truck, core Preparation Trailer, and core Examination Trailer

7.2.14 Dynamometer or load cell of sufficient capacity

7.2.15 Connection fittings
- 7.2.15.1 Between crane line and dynamometer
- 7.2.15.2 Between dynamometer and Vibra Corer head

7.2.16 Hand tools (including at least two large pipe wrenches)

7.2.17 Permanent ink markers

7.2.18 4-inch clear adhesive tape and 4-inch see-thru red adhesive tape

7.2.19 3-inch adhesive surgical tape

7.2.20 Thread adhesive (Locktite or equal vibration proof anaerobic)

7.2.21 Adhesive "up" (↑) arrows

7.2.22 Hack saws or band saw for cutting Lexan tubing

7.2.23 Five dozen (60) rolls of electrical tape

7.2.24 Wooden or metal support horses for core trough support

7.2.25 Diesel fuel tank or tank truck

7.2.26 Portable electric generator (or tie-in to existing power supply)

7.2.27 Radon removal hose.

8.0 PROCEDURE

8.1 Finalize the complete equipment and materials list and check off each piece of equipment in a logbook or the Field Activity Daily Log (Section 5.0 of the Quality Assurance Project Plan) as it arrives on site or is acquired.

8.2 Once all of the Vibra Corer equipment has arrived on site, assemble the Vibra Corer steel outer casing by connecting the threaded head assembly to the coupler. A thread adhesive (Locktite or equivalent) will be used on the threaded portions of the sampling device.

8.3 Connect three 10-foot sections and one 5-foot section of the outer casing by screwing together and connect these sections to the coupler. Reinforce these threaded connections with thread adhesive.

8.4 Attach the threaded cutting shoe to the bottom section of the casing, again using the thread adhesive.

8.5 Starting at the bottom of the cutting shoe, mark each 1 foot increment on the outer casing with a permanent ink marker by drawing a complete circle around the casing. Mark the casing all the way to the top of the outer casing. This should reach 35 feet.

8.6 Using 3-inch surgical tape wrapped around the barrel and a permanent ink marker, indicate each foot increment up to the 35-foot mark. The numbers should be clear and 2 inches in height so

91

as to be readable from a distance. The bottom of the white surgical tape should correspond with the exact foot marker made around the barrel in Step 8.5.

8.7 Wrap 4-inch clear adhesive tape over each foot marker made with the white surgical tape to protect the numbers. On every fifth foot marker (5 foot, 10 foot, 15 foot, etc.) wrap 4-inch red see-thru adhesive tape around the indicated foot marker. This will help the K-65 Sampling Task Team Leader keep track of the depth of the rod from a distance if needed.

8.8 Stick adhesive "up" (↑) arrows along the length of a 36-foot section of clear Lexan tubing at an increment of 4 to 5 feet.

8.9 Remove the cutting shoe from the steel outer casing and insert the Lexan tubing inside the casing with the arrows pointing toward the vibratory head assembly. Push the tubing up inside the casing as far as it will go. About 1 foot of tubing should be sticking out of the casing.

8.10 While holding the cutting shoe beside the steel casing, cut the Lexan tubing at the point where it would meet the tapered end of the cutting shoe if the shoe was attached. (This will reduce the opportunity for materials being sampled to enter the annular space between the Lexan tubing and outer steel casing.) The Lexan tubing should fit as far down into the cutting shoe as possible.

8.11 Prepare a second assembly of steel outer casing and Lexan tubing as described in Steps 8.1 through 8.10. This will serve as a backup assembly in the event of equipment breakdown or scheduling impacts caused by sample core preparation and examination.

8.12 Before the assembled Vibra Corer apparatus can be loaded onto the 40-foot flatbed truck for delivery to the silo area for sampling, fabricate and securely attach core troughs to the truck bed.

8.13 Fabrication of a polyethylene bag with attached glovebag for the Vibra Corer sampling apparatus must also be completed before sampling activities commence. The details on the overbag fabrication are provided as an attachment to this procedure. See Drawing No. 303317-A-M06.

8.13.1 A foaming hose will accompany each polyethylene bag/glovebag at every silo sampling location. See details in Drawing No. 303317-A-M06.

8.13.2 A hose tied into the Radon Removal System will also be connected to the polyethylene bag/glovebag by a throttling needle value. Ensure that an appropriate length of hose is available for each sample location. Details of the quick-connect assembly on the polyethylene bag/glovebag are also found in Drawing 303317-A-M06.

91

8.14 Once the crane has arrived on site, obtain and install appropriate fittings/connection devices. Attach the crane line to a dynamometer or load cell that will then be attached to the Vibra Corer sampling device.

8.15 Variable lengths of airline hose or Vibra Corer drive cable will be required for sampling at the different silo manholes. Before each sampling event, determine the length of cable or airline required to deliver the required vibration frequency at the head assembly based on the designated location of the crane for that specific silo sampling location. See attached map of silo sample locations (Drawing No. 303317-A-C01.)

8.16 Check to ensure that the correct fittings which connect the Vibra Corer apparatus to the airline or drive cable are available and in place.

8.17 Variable lengths of electrical cord will also be required to connect the heat sealer for the closure of polyethylene overbags at each sample location. Determine the source of electricity and the length of electrical cord required before each individual sampling event.

8.18 Variable lengths of hose will be required to operate the Radon Removal System at each sample location. Prior to each sampling event, determine the required length of hose to run between the Radon Removal System to the sample location and ensure its placement on top of the silo before sampling begins.

8.19 Other equipment required to be in place before sampling at each silo location includes:

8.19.1 Expansion rings to secure the polyethylene bag/glovebag inside the flange

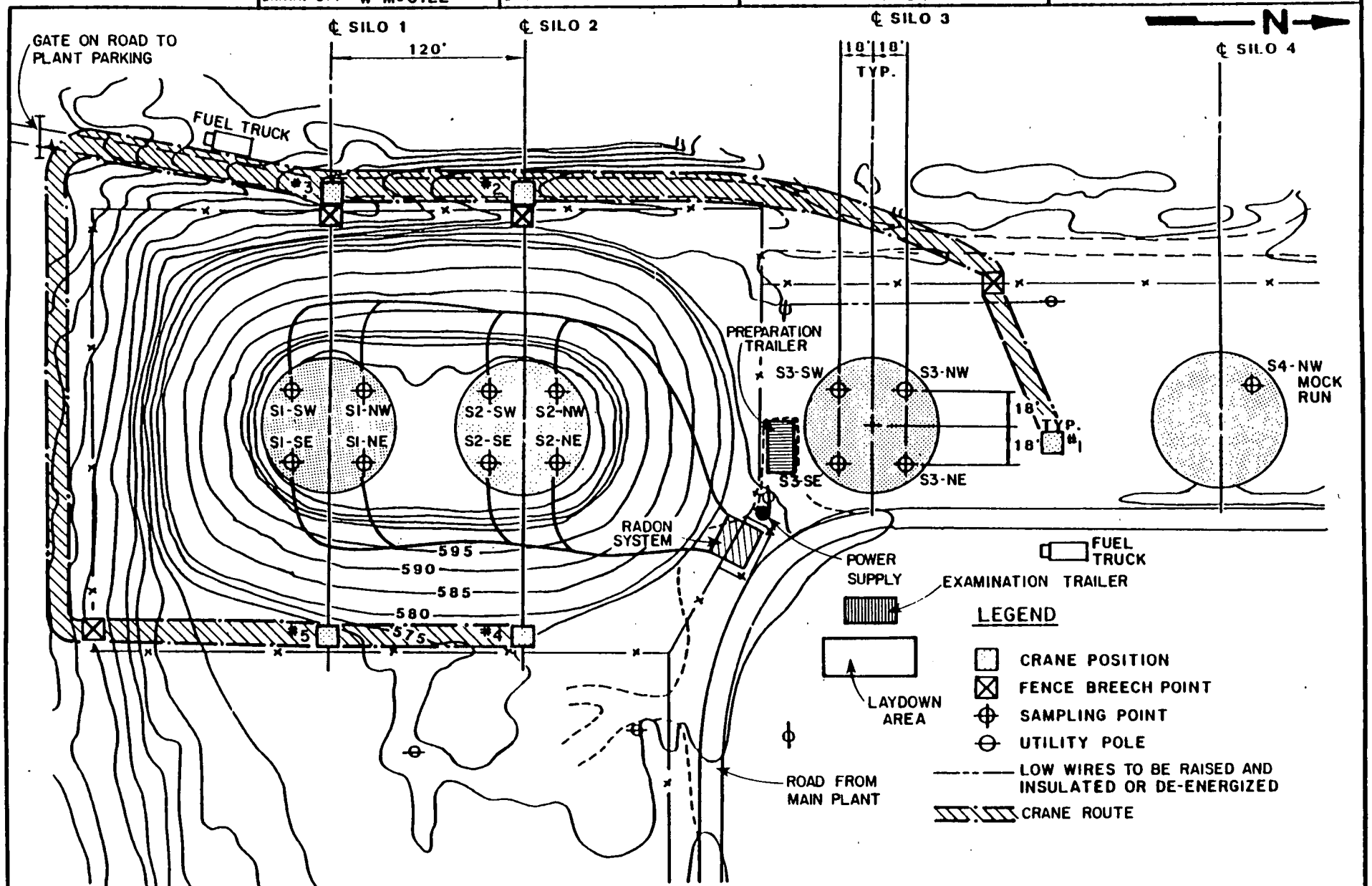
8.19.2 Duct tape for taping the polyethylene bag to the top of the Vibra Corer apparatus

8.19.3 Scissors or utility knife to cut the polyethylene bag once it has been properly sealed.

60

BRUNING 72425

STARTING DATE: 3-20-88	DATE LAST REV.:	INITIATOR: K SHELL	DRAWING NO.: 303317-A-C01
DRAWN BY: W McGILL	DRAWN BY:	PROJ. MGR. D HARMER	PROJECT NO.: 303317.03

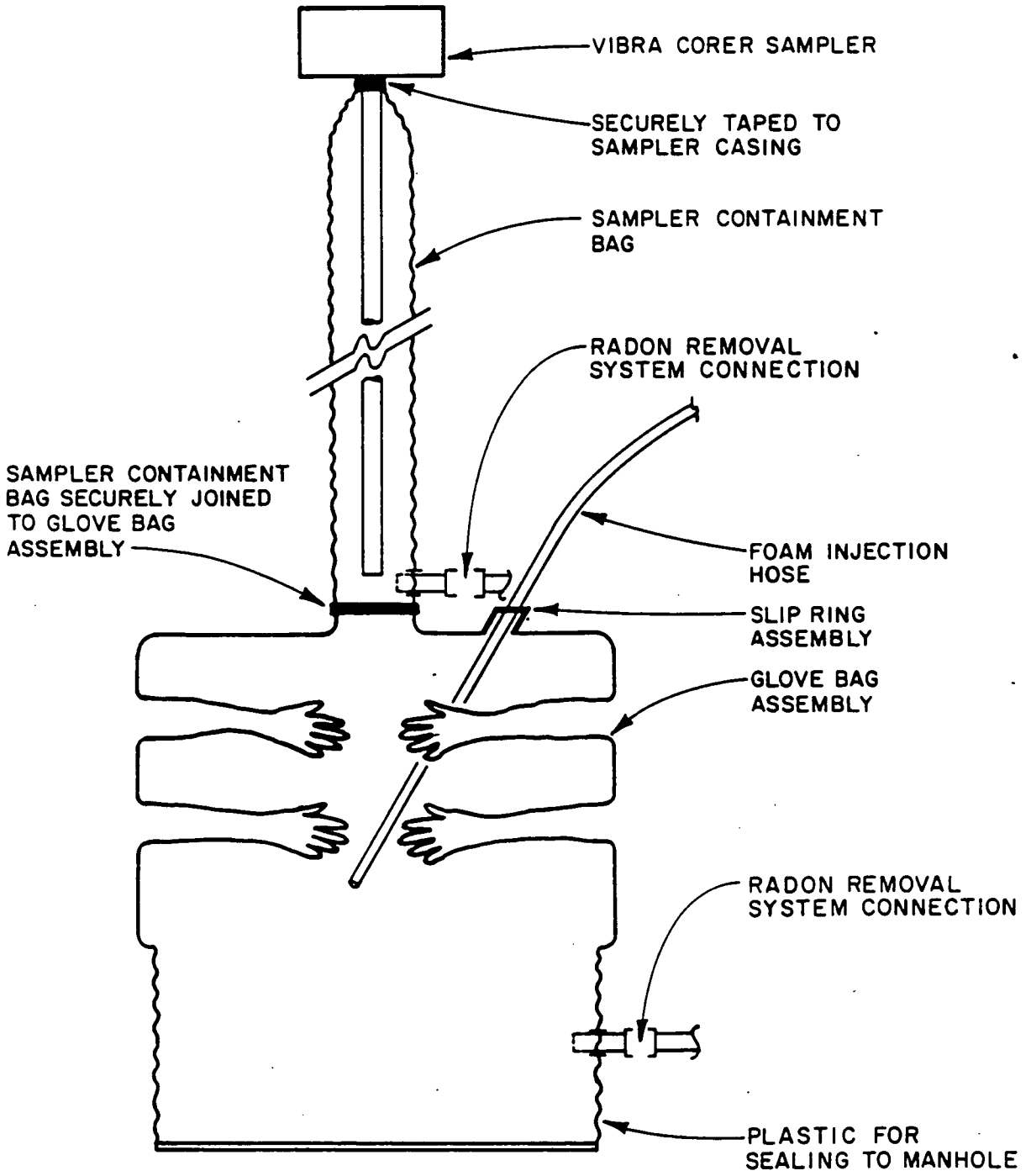


K-65 METAL OXIDE SAMPLING

NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 3-23-88	DATE LAST REV.:	INITIATOR: B. OSBURN	DRAWING NO.: 303317-A-M06
DRAWN BY: WALT McGILL	DRAWN BY:	PROJ. MGR. D. HARMER	PROJECT NO.: 303317.03



K-65 VIBRA CORER
CONTAINMENT BAG ASSEMBLY

INTERNATIONAL TECHNOLOGY CORPORATION

BRUNING 72425

TITLE: SET-UP AND POSITIONING OF THE CRANE

1.0 PURPOSE

This procedure defines the progression of steps to be followed during set-up and positioning of the crane used to support the Vibra Corer sampler during sampling of the Waste Storage Silos 1, 2, and 3. The crane must be used to eliminate undue stress and weight on the domed roofs of the silos by the sampling equipment. The crane must be relocated four times during the sampling program.

2.0 SCOPE

This procedure applies to set-up and positioning of the crane used during sampling of the FMPC Waste Storage Silos 1, 2, and 3. The mock sampling run on Silo 4 will also be performed in accordance with this procedure.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to see that this procedure is followed during the field program phase.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel that are experienced with this procedure and/or have been trained in the use of the stated equipment.

3.3 It is the responsibility of each individual working with the crane to be familiar with this procedure. Those directly involved with set-up or positioning of the crane are responsible for following this procedure and reporting any problems or unusual occurrences immediately to the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 Engineering Study of the K-65 Storage Silo Radon Mitigation and Dome Reinforcement Project at the Feed Materials Production Center; IT Corporation. August 20, 1987.

4.2 Statement of Work, K-65 Sampling; WMCO.

4.3 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3); April 1988.

4.4 Occupational Safety and Health Standards for Construction Industry; 29 CFR Part 1926.

4.5 K-65 Sampling Operation Sequence, Procedure K6501.

4.6 Mock Run Using Vibra Corer Equipment, Procedure K6506.

4.7 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Set-up, inspection, and operation of the crane must be per OSHA requirements 29 CFR Part 1926, Subpart N.

5.2 Protective clothing and dosimetry will be worn in accordance with "Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3)", dated April 1988.

5.3 Accessible areas within the swing radius of the rotating superstructure of the crane will be barricaded to prevent an employee injury.

5.4 Crane clearance from any electrical distribution or transmission lines will be maintained in accordance with the following OSHA requirements:

- Lines rated 5kV or below, minimum clearance between the lines and any part of the crane or load will be 10 feet.
- Lines rated over 5kV, minimum clearance will be 10 feet plus 0.4 inch for each kV over 50kV, or twice the length of the line insulator, but not less than 10 feet.
- In transit with no load and with the boom lowered, the equipment clearance will be a minimum of 4 feet for voltages less than 50kV; 10 feet for voltages over 50kV, up to and including 345kV; and 16 feet for voltages between 345kV and 750kV.

5.5 The crane is being used to support the weight of the sampling equipment and to minimize stresses to the domed roofs of the silos. The limited structural integrity of the silos should be considered throughout the sampling program and particularly during the operation of the crane. At no time shall the crane load rest on the surface of the dome.

5.6 Silo domes are sloped, resulting in poor footing. Appropriate footware should be worn and care taken when walking on the silos.

NOTE: At no time should personnel walk or equipment be placed on the center cap of the silos.

5.7 Review of safety and operational procedures has taken place with personnel involved.

6.0 PREREQUISITES

6.1 Safety and radiation training for all workers in accordance with procedures of WMCO and the contractor.

6.2 Skilled labor available for crane assembly and operation.

6.3 Fuel truck located for fueling crane at its five positions per Drawing No. 303317-A-C01.

6.4 Crane components for assembly and maintenance on-site.

6.5 Adequate access and travel roads around the silos.

6.6 Tool truck, small assembly crane, and other equipment required for primary crane assembly per contractor's recommendations.

6.7 Electrical transmission lines which cross the travel route of crane de-energized or moved sufficiently out of the way per OSHA requirements during crane movement.

6.8 Security fence breached at locations per Drawing No. 303317-A-C01.

7.0 PROCEDURE

7.1 Locate crane components, small assembly crane, and required general tools in the assembly area.

7.2 Barricade accessible areas within swing radius of the rotating superstructure per contractor's recommendations.

7.3 Assemble crane per manufacturer's instructions.

7.4 Fill fuel tank with fuel oil. Be sure to ground both systems properly prior to fuel transfer.

7.5 Inspect equipment, machinery, and cable prior to use. Make repairs or replacements as required before proceeding. Notify K-65 Sampling Task Team Leader of any unusual circumstances.

7.6 Locate crane sequentially beginning with position No. 1 per Drawing No. 303317-A-C01.

NOTE: Crane will be relocated four times throughout the sampling program. It should travel along the routes designated on Drawing No. 303317-A-C01. Travel route and access area should be barricaded when relocating the crane.

7.7 Set outriggers if applicable.

7.8 Position boom above corresponding sequential manhole per Drawing No. 303317-A-C01 to establish correct positioning.

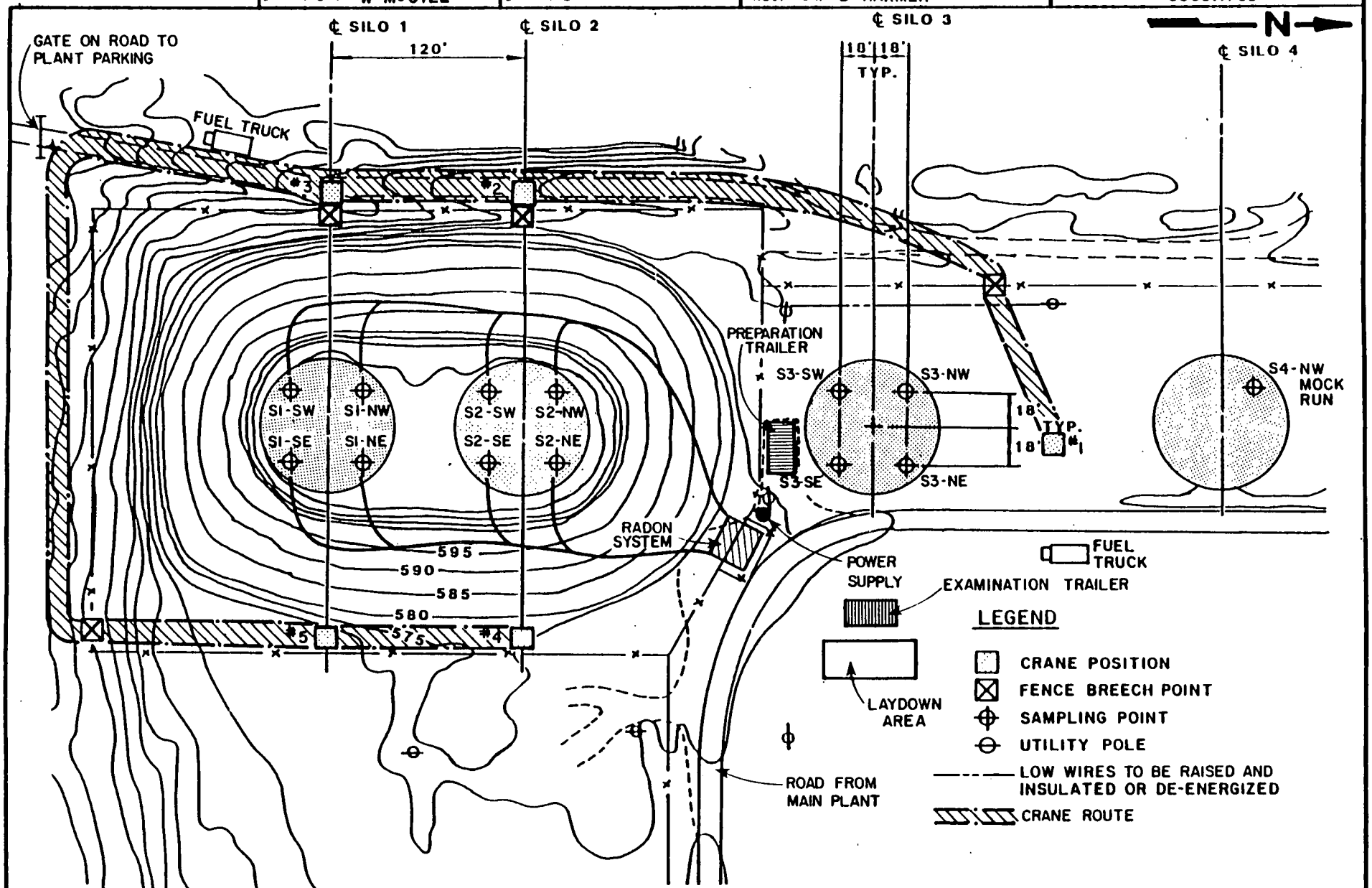
NOTE: WMCO will inspect crane position. Obtain WMCO authorization to proceed. Record authorization in the Daily Log Book.

7.9 Swing boom to a location designated in Procedure K6506 for hook-up to sampler. Secure crane. Do not proceed without confirmation from K-65 Sampling Task Team Leader.

D97X K-6504

BRUNING 72425

STARTING DATE: 3-20-88	DATE LAST REV.:	INITIATOR: K SHELL	DRAWING NO.: 303317-A-C01
DRAWN BY: W MCGILL	DRAWN BY:	PROJ. MGR. D HARMER	PROJECT NO.: 303317.03



K-65 METAL OXIDE SAMPLING

NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

TITLE: REMOVAL OF MANHOLE FLANGES

1.0 PURPOSE

This procedure provides the methodology to remove the manhole flanges prior to taking core samples from the silos.

2.0 SCOPE

This procedure applies to Storage Silos 1, 2, 3, and 4. Each of these silos is equipped with five manways (manholes). Sampling will be conducted through four manholes on Silos 1, 2, 3, and a mock run will be conducted on one manhole of Silo 4. The fifth manhole, located at the center of each domed roof, will be excluded from the sampling program. A total of thirteen manhole covers will be removed.

3.0 RESPONSIBILITY

3.1 It is the responsibility of K-65 Sampling Task Team Leader to see that this procedure is followed during the field program phase.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel that are experienced with this procedure and/or have been trained in the use of the stated equipment and removal of the flanges.

3.3 It is the responsibility of each individual performing this procedure to follow it and report any unusual occurrences to the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 K-65 Sampling Operation Sequence, Procedure K6501.

4.2 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3); April 1988

4.3 Statement of Work, K-65 Sampling; WMCO

4.4 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing and dosimetry must be worn in accordance with the "Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3)", dated April 1988.

5.2 To minimize man-rem exposure, work on the K-65 silos must be well planned and performed such that no more time than necessary is spent on the domes.

5.3 Silo domes are sloped, resulting in poor footing. Proper footwear should be worn and care exercised when maneuvering on top of the silos.

NOTE: At no time should personnel walk or equipment be placed on the center cap of the dome.

5.4 In addition to the protective clothing referenced above, disposable latex gloves should be worn during light work around the flanges. Leather gloves should be worn when handling the flange covers.

5.5 Review of safety and operational procedures has taken place with personnel involved.

6.0 PREREQUISITES

6.1 Safety and radiation training for all workers in accordance with procedures of WMCO and the contractor.

6.2 Forms

- Field Activity Daily Log (1)
- Sample Collection Log (1)
- Sample Labels (8)
- Chain-of-Custody Form (1)

6.3 Stainless Steel evacuated sample cylinders (8)

6.4 Disposable latex gloves (2 pairs)

6.5 Polyethylene bags (8)

6.6 Wrenches (2)

6.7 Crowbar

6.8 Field logbook

6.9 Bolt cutters or nut splitter

6.10 Bolt lubricant (rust penetrant and lubricant)

6.11 Protective clothing per "Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3)", dated April 1988.

6.12 Plastic squares (12) (for sitting flanges on as a holding area)

6.13 Leather gloves (2 pairs)

6.14 Two-way radios (1 set)

6.15 Backpacks (2)

7.0 PROCEDURE

7.1 RADON SAMPLE GAS COLLECTION

NOTE: Radon samples to be collected from Silo 1 and Silo 2 manholes only.

7.1.1 Collect required supplies and equipment including a working set of two-way radios from the trailers.

7.1.2 Begin field work. Routinely update the Field Activity Daily Log per Section 5.0 of the Quality Assurance Project Plan (QAPP) to indicate the location sampled, unique sample number, and other relevant information.

7.1.3 Locate the designated manhole to be sampled. The locations to be sampled are shown on Drawing No. 303317-A-C01.

7.1.4 Disposable latex gloves will be worn while collecting samples.

7.1.5 Remove the body protection plug from the sample collection nozzle located on the manhole flange as shown on Drawing No. 303317-A-M02.

WARNING: DO NOT OPEN SAMPLE VALVE ON MANHOLE (VALVE A) UNTIL CONNECTION TO SAMPLE CYLINDER IS MADE.

7.1.6 Remove the stem protection cap from the sample collection cylinder.

NOTE: DO NOT OPEN SAMPLE VALVE ON SAMPLE COLLECTION CYLINDER (VALVE B) UNTIL CONNECTION TO SAMPLE NOZZLE IS MADE.

7.1.7 Carefully connect the sample collection cylinder stem to the mating body connection located on the sample collection nozzle shown on Drawing No. 303317-A-M02. Connection is properly made when a slight "click" is heard. Double check for proper connection as no sample flow will occur if proper connection has not been made.

7.1.8 Slowly open Valve A located on the sample collection nozzle.

7.1.9 Slowly open Valve B located on the sample collection cylinder. Make sure Valves A and B are fully opened. A slight hissing sound of air filling the evacuated cylinder should be heard at this time and serves as evidence that proper connection has been made.

7.1.10 Wait 3 minutes. At the end of this time, no more hissing should be heard. After this time period, slowly close Valve B. Then slowly close Valve A.

7.1.11 Grasp the knurled sleeve located on the quick-connect body assembly and slide this spring-loaded knurled sleeve back.

7.1.12 Remove the quick-connect stem from the body assembly. Sample collection cylinder should now be disconnected from the sample collection nozzle.

7.1.13 Carefully replace the body protector plug onto the sample collection nozzle (the quick-connect body assembly).

7.1.14 Carefully replace the stem protector cap onto the end of the sample collection cylinder (the quick-connect stem assembly).

NOTE: Leave the silo dome as soon as possible to minimize man-rem exposure.

7.1.15 Complete a sample label (Section 7.0 of the QAPP) and attach it to the cylinder. The sample label should include a unique sample number which is obtained from the pre-numbered Sample Collection Log (Section 7.0 of the QAPP).

7.1.16 Place sample collection cylinder into plastic bag, then close the bag. Attach custody tape over the bag.

7.1.17 Complete a second duplicate sample label and attach it to the plastic bag.

7.1.18 Complete the Sample Collection Log. The Sample Collection Log will have been prenumbered with unique sample numbers. The Sample Collection Log will include the sample point number and silo number to ensure a proper identification of the sample location. Record field observations into the field logbook, along with pertinent information from the Sample Collection Log.

7.1.19 Complete the Chain-of-Custody Form (Section 7.0 of the QAPP).

7.1.20 The sample is to be analyzed for radon by WMCO. WMCO Health Physics authorization must be received to proceed with removal of any given flange on Silo 1 or Silo 2.

7.1.21 Complete steps 7.1.3 through 7.1.20 for the other seven sample collection points on Silo 1 and Silo 2, as indicated on Drawing No. 303317-A-C01.

7.1.22 On any given flange, do not progress to Section 7.2 until authorization from the K-65 Sampling Task Team Leader or his designee has been received.

7.2 MANHOLE FLANGE REMOVAL

7.2.1 After receiving authorization from the K-65 Sampling Task Team Leader,. collect required supplies and equipment including a working set of two-way radios from the trailers.

7.2.2 Prepare holding area for each removed flange. This should be accomplished by securing a piece of plastic to the dome on Silos 3 and 4, or to the earth berm on Silos 1 and 2, and barricading the area.

7.2.3 Sequentially, the first flange to be removed is on Silo 4 as a mock sampling run (Drawing No. 303317-A-C01). The four flanges on Silo 3 will be removed next, since radon testing and the results of sample analysis are not required prior to work on Silo 3 or Silo 4. The radon results and confirmation to proceed by WMCO is required on Silo 1 and Silo 2. Flange removal and sampling will be performed on these two silos as the radon results and WMCO approval to proceed are secured.

7.2.4 The procedure for removing any manhole flange begins with the removal of the bolts securing the flange. An attempt should first be made to remove these bolts with a wrench.

7.2.5 For rusted bolts that cannot be loosened with the wrenches, a rust penetrant and lubricant such as "Liquid Wrench" or "Kroil" may be necessary. Spray the rust penetrant and lubricant onto the rusted bolt and let it sit for 5-10 minutes before trying to loosen bolt. (Note that lubricant spraying could be done at the end of the radon sampling in preparation of flange removal.)

7.2.6 For severely rusted bolts that cannot be loosened, even after several applications of a rust penetrant, a nut splitter will be necessary to remove the bolts.

7.2.7 Once the bolts have been removed from the manhole flange, carefully pry apart the flanges using the crowbar.

WARNING: IF, UPON OPENING THE FLANGE, EVIDENCE OF ESCAPING GAS (SOUNDS, VISIBLE VAPORS) ARE NOTICED, QUICKLY RETREAT TO A SAFE DISTANCE AND IMMEDIATELY REPORT THE INCIDENT TO THE K-65 SAMPLING TASK TEAM LEADER OR HIS DESIGNEE. DO NOT PROCEED UNTIL FURTHER AUTHORIZATION IS GIVEN.

7.2.8 Carefully slide the flange over to create an edge for manually gripping and lifting the flange.

7.2.9 Using a correct lifting stance to minimize strain to the back, two people should lift the flange and relocate it to a designated holding area. The designated areas will be located on top of Silo 3 and Silo 4, but off of Silo 1 and Silo 2 as established in step 7.2.2 above.

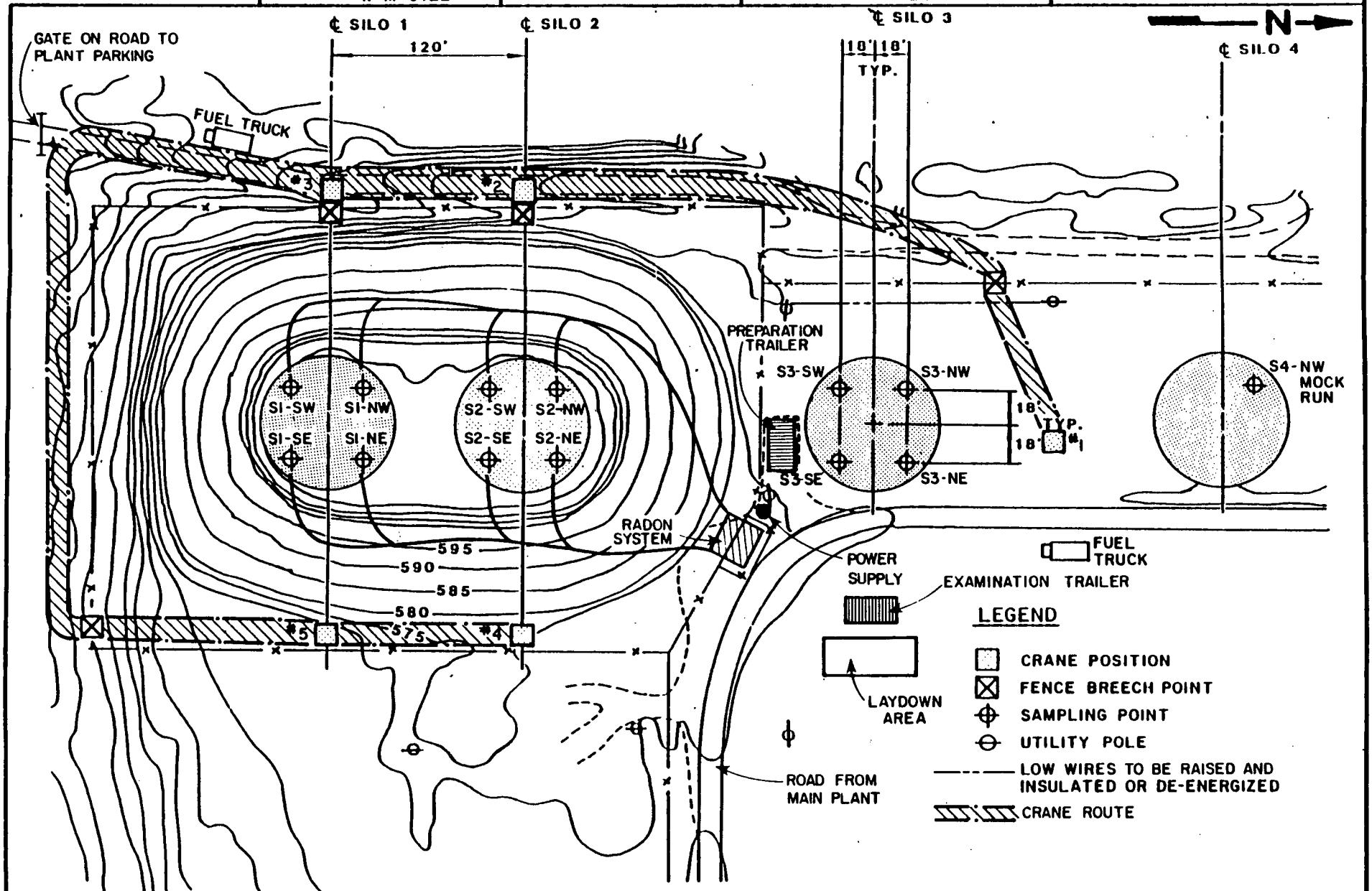
D97X K6505

This is complete set K6505 as stands, pg 8

Shows 1 7 8, 2 3 8, etc but only has 6 pages - below pages numbered wrong! dwB

BRUNING 72425

STARTING DATE: 3-20-88	DATE LAST REV.:	INITIATOR: K SHELL	DRAWING NO.: 303317-A-C01
DRAWN BY: W McGILL	DRAWN BY:	PROJ. MGR. D HARMER	PROJECT NO.: 303317.03



K-65 METAL OXIDE SAMPLING

NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

TITLE: SILO SAMPLING MOCK RUN USING VIBRA CORER EQUIPMENT

1.0 PURPOSE

This procedure is to provide all details and sequences of events for the mock sampling of Silo 4 using the Vibra Corer sampling device. This exercise is intended to reveal opportunities for improvement in carrying out the procedures developed for silo sampling, to define any additional or modified equipment needs, and to serve as a training mechanism for the sampling team.

2.0 SCOPE

This procedure details the steps required to collect a mock sample from Silo 4 at the northwest (NW) port opening after the crane has been correctly positioned. The mock run will continue to the point when the Vibra Corer sampling device has been properly loaded for transport to the sample preparation trailer.

Because this silo does not contain any material, no sample core will actually exist after the procedure is carried out. All steps required (excluding actual injection of foam) in the actual sampling of the three remaining silos will, however, be carried out in this mock run. Protective clothing designated for use in sampling the other three silos will be used in this procedure to determine if modifications are required.

3.0 RESPONSIBILITY

3.1 It will be the responsibility of the K-65 Sampling Task Team Leader to ensure that these procedures are carried out as designed. It will also be his responsibility to recognize and recommend any necessary changes to the procedures to the K-65 Sampling Task Manager prior to the sampling of Silos 1, 2, or 3. The K-65 Sampling Task Team Leader will report any unusual occurrences and evaluate the procedures established for the silo sampling using the Vibra Corer sampling apparatus.

3.2 It will be the responsibility of the K-65 Sampling Task Team Leader to designate appropriately trained or experienced personnel to the following tasks.

3.4 It will be the responsibility of each individual assigned to the following tasks to report any unusual circumstances or modification of the procedures as required to the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 Statement of Work, K-65 Sampling; WMCO.

4.2 K-65 Sampling Operation Sequence, Procedure K6501.

4.3 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

4.4 Engineering Study of the K-65 Storage Silo Radon Mitigation and Dome Reinforcement Project at the Feed Materials Production Center; IT Corporation, August 20, 1987.

4.5 Conceptual Design Report, K-65 Storage Silo Radon Mitigation and Dome Reinforcement Study; WMCO, May 1987.

5.0 SAFETY AND PRECAUTIONS

5.1 Good field safety rules will be observed at all times during the handling of the sampling equipment and the execution of the sampling exercise in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

5.2 Protective clothing and dosimetry will be worn in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

5.3 To minimize man-rem exposure, work performed near the silo domes must be well-planned and performed such that no more time than necessary is spent in close proximity to the domes.

5.4 Due to the deteriorating integrity of the dome structures, strict adherence to the health and safety requirements must be maintained.

5.5 The K-65 Sampling Task Team Leader should not descend from the silo throughout the sampling operation unless a designated, qualified person is available for standby in case of an emergency.

6.0 PREREQUISITES

6.1 All applicable training requirements of WMCO and the Contractor must be met by persons performing the following tasks.

6.2 Equipment assembly must be completed per Procedure K6503.

6.3 The Vibra Corer apparatus will have been transported to the silo and properly located for crane line attachment and detachment after sample collection.

6.4 Removal of silo flanges will have been completed per Procedure K6505.

7.0 PROCEDURE

7.1 Connect the top of the polyethylene bag with attached glovebag to the Vibra Corer head assembly right below the T-shaped head on the coupler. Slide the entire bag over the head assembly and secure the top of the bag to the head assembly with duct tape. (See Drawing No. 303317-A-M06.)

7.2 Attach the crane line to the top of the dynamometer or load cell with appropriate fittings per Procedure K6503.

7.3 Connect the Vibra Corer head assembly to the bottom of the dynamometer or load cell with the appropriate fittings collected for this purpose (see Procedure K6503).

7.4 Connect the airline or drive cable from the compressor to the Vibra Corer head assembly.

7.5 The K-65 Sampling Task Team Leader will recheck all of the crane line connections/fittings before lifting the Vibra Corer sampling device.

7.6 The K-65 Sampling Task Team Leader will take a position on top of Silo 4 using the ladder attached to the side of the silo. The NW port opening has been designated as the sample location for the mock run and will have been marked per Procedure K6502. (See Drawing No. 303317-A-C01.)

7.7 The K-65 Sampling Task Team Leader will then signal the crane operator to slowly raise the sampling apparatus off the flatbed truck.

7.8 Once the sampling device is suspended vertically in the air, the signalman or K-65 Sampling Task Team Leader will signal the crane operator to direct the device precisely over the open manhole from which the mock sample will be collected. Note the reading on the dynamometer at this time. This is the weight of the sampling apparatus.

7.9 The sampling device will be carefully positioned just inside the port opening, and the signalman or K-65 Sampling Task Team Leader will signal the crane operator to hold the position.

7.10 Slip the expansion ring around the outer casing and the polyethylene bag/glovebag. The end of the polyethylene bag needs to be curled upward toward the top of the flange.

7.11 Slide the expansion ring down the bag and casing inside the flange opening, and secure the expansion ring inside the lip of the flange by tightening the appropriate screws.

7.12 Position the foam hose that will have been attached via a slip ring assembly inside the glovebag portion of the polyethylene bag so that the hose extends into the polyethylene bag a few inches. The remaining hose is placed to the side during the remainder of the sampling procedure.

7.13 Check the placement and security of the polyethylene bag/glovebag assembly before continuing. The signalman will then signal the operator of the drive unit to start the equipment to activate the vibrating mechanism of the Vibra Corer.

7.14 If the vibrating mechanism is working properly, the signalman or the K-65 Sampling Task Team Leader will signal the operator to shut off the compressor or drive unit.

7.15 Continue to lower the Vibra Corer slowly and check to see that the polyethylene bag is folding in an accordion fashion around the flange opening. If, at any time, the bag is being carried down into the silo, tearing or pulling the expansion ring off, signal the crane operator to stop until the bag is repositioned.

7.16 Continue lowering the sample device until the 33-foot mark on the outer casing is flush with the top of the manhole opening. For the next 1 to 2 feet, the lowering of the sample device should proceed in very small (1 to 2 inch) increments.

7.17 Continue lowering the Vibra Corer Sampling apparatus until the cutting shoe just touches the bottom of the silo.

7.18 Note the exact depth on the outer casing that is flush with the top of the flange as the core barrel gently touches the bottom of the silo.

7.19 Signal the crane operator to begin slowly withdrawing the crane line. Steady the barrel of the sampling device, if needed, as it is withdrawn from the silo.

7.20 When the sampling device has cleared the top of the manhole opening by at least 3 feet, signal the crane operator to stop the withdrawal of the crane line.

7.21 Seal the polyethylene bag with the portable heat sealer at a point above the glovebag attachment and below the uppermost Radon Removal quick connect fitting. The horizontal seal must be at least 6 inches wide. Check closely to ensure that the bag is sealed completely.

7.22 Cut the seal at the approximate midpoint with a utility knife or scissors. One-half of the sealed section should now be attached to the glovebag portion and one-half to the polyethylene bag covering the sample core barrel.

a1

7.23 Connect the Radon Removal hose to the quick connect fitting on the side of the polyethylene bag on the sampling device that is now sealed.

7.24 Signal the operator of the Radon Removal System to activate the equipment.

7.25 Signal the operator of the system to deactivate the equipment when the bag is collapsed around the barrel.

7.26 Disconnect the Radon Removal hose at the fitting and lay the hose aside.

7.27 Signal the crane operator to slowly begin to raise the sampling device to clear the railing on the silo roof.

7.28 Lower the Vibra Corer to the flatbed truck located to receive the sampling apparatus.

7.29 Position the end of the core barrel up against the truck bed and inside the core trough provided.

7.30 Slowly lower the Vibra Corer and direct the sampling apparatus into the trough in a horizontal position.

7.31 Once the entire sampling device is resting completely inside the trough, signal the crane operator to hold the position.

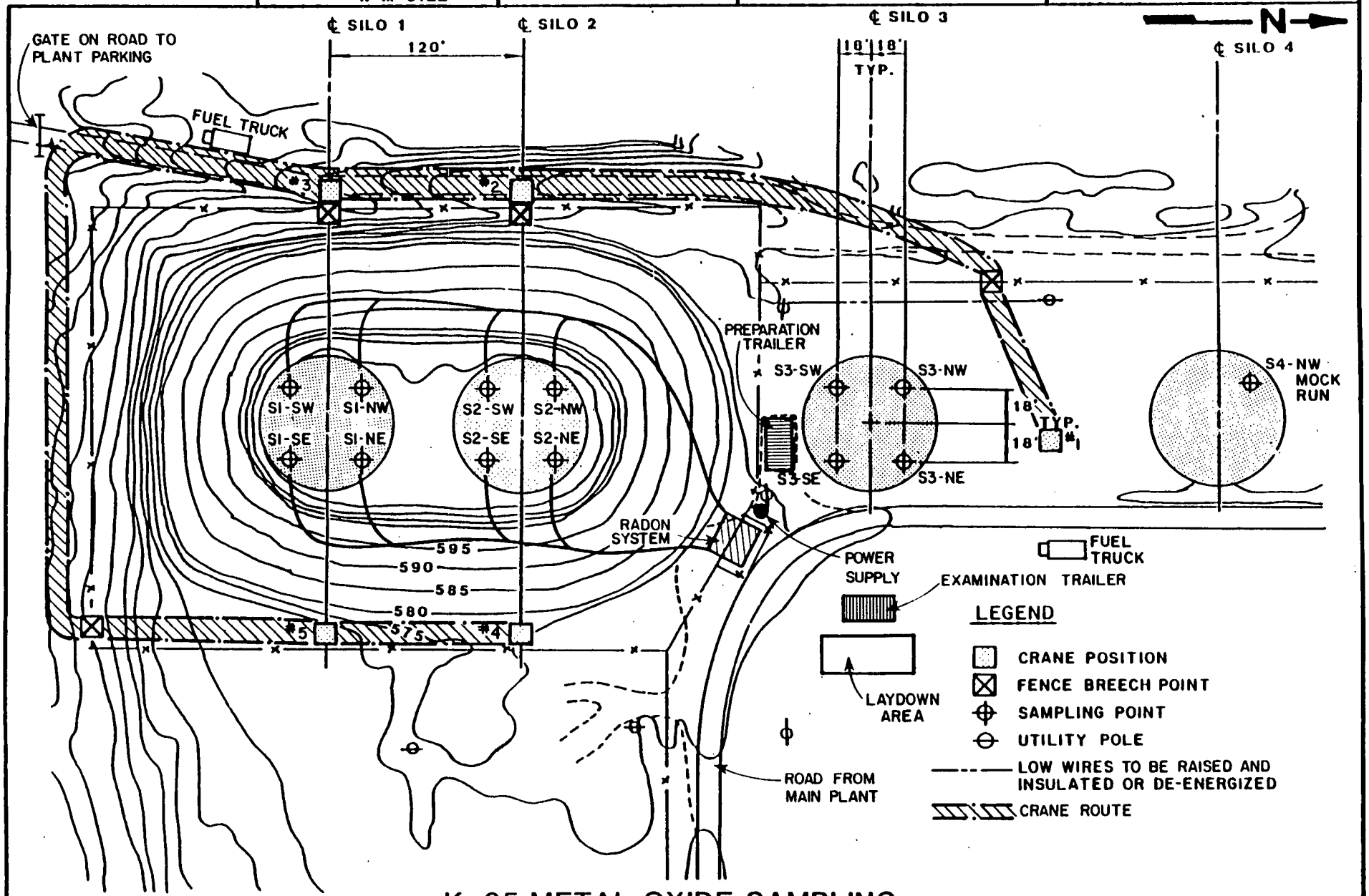
7.32 Disconnect the airline or drive cable from the head assembly.

7.33 Disconnect the dynamometer or load cell from the head assembly.

n9

BRUNING 72425

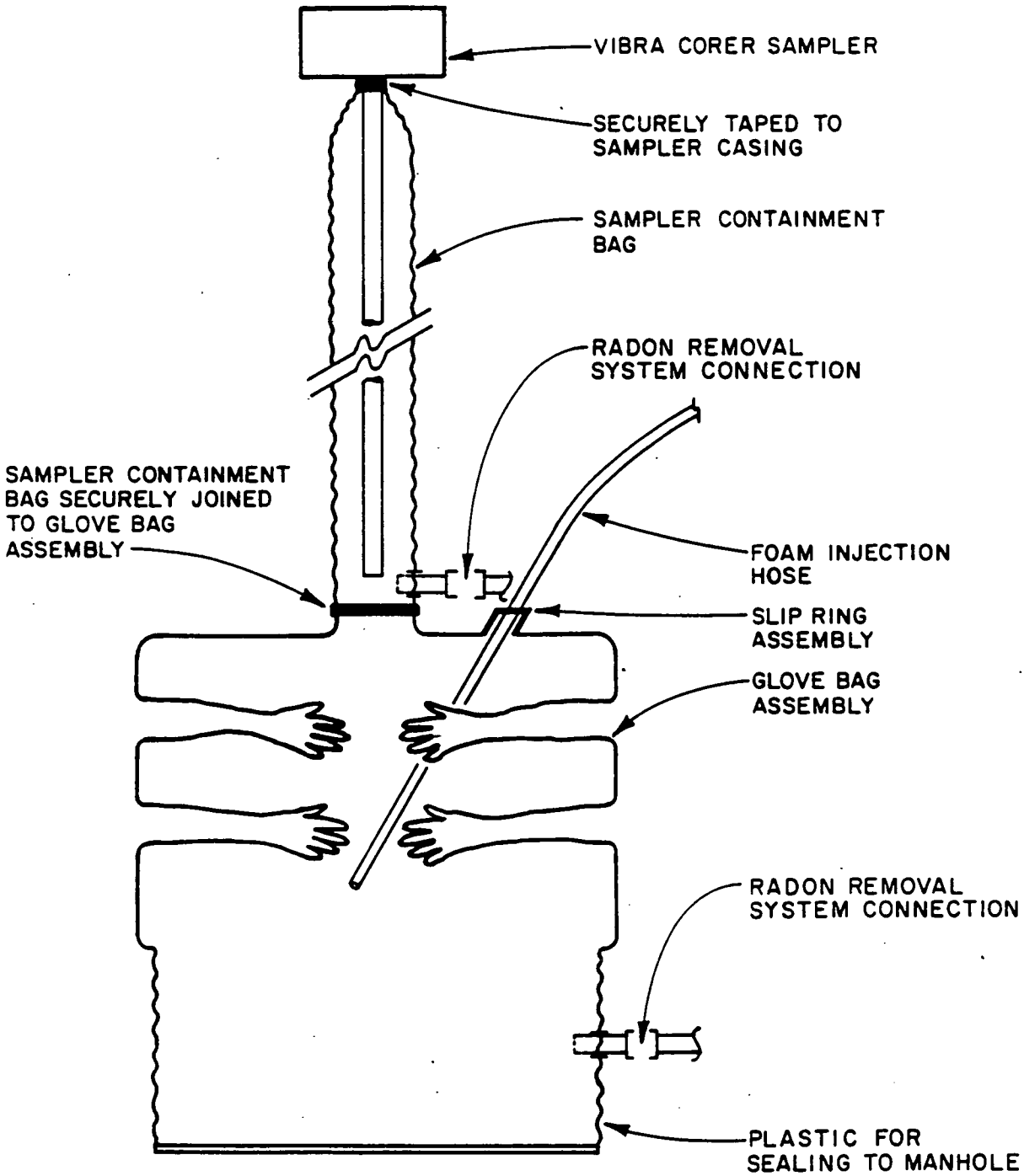
STARTING DATE: 3-20-88	DATE LAST REV.:	INITIATOR: K SHELL	DRAWING NO.: 303317-A-C01
DRAWN BY: W MCGILL	DRAWN BY:	PROJ. MGR. D HARMER	PROJECT NO.: 303317.03



K-65 METAL OXIDE SAMPLING

NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION



K-65 VIBRA CORER
CONTAINMENT BAG ASSEMBLY

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 3-23-88	DATE LAST REV.:	INITIATOR: B. OSBURN	DRAWING NO.: 303317-A-M06
DRAWN BY: WALT McGILL	DRAWN BY:	PROJ. MGR. D. HARMER	PROJECT NO.: 303317.03

BRUNING 72425

TITLE: TAKING OF SAMPLES USING VIBRA CORER EQUIPMENT

1.0 PURPOSE

The purpose of this procedure is to provide all details and sequence of events in the sampling of Silos 1, 2, and 3 using the Vibra Corer sampling device.

2.0 SCOPE

This procedure details the steps required to collect core samples from each of the three storage silos at the FMPC. The following steps become applicable at the conclusion of those described in Procedure K6505 for the removal of manhole flanges. Any procedural deficiencies, found through the performance of the mock sampling run on Silo 4 using the Vibra Corer equipment (Procedure K6506), must also be properly addressed and corrected before sampling of Silos 1, 2, and 3 proceeds.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to ensure that this procedure is carried out as designed.

3.2 It will be the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel who are experienced and/or have been trained in the use of the stated equipment and handling of the samples.

3.3 It is the responsibility of each individual assigned to the following tasks to report any unusual circumstances or procedural nonconformances to the K-65 Sampling Task Team Leader.

3.4 It is the responsibility of the K-65 Sampling Task Team Leader to inform the team members of any changes made to the procedure before implementation.

4.0 REFERENCES

4.1 Statement of Work, K-65 Sampling; WMCO.

4.2 K-65 Sampling Operation Sequence, Procedure K6501.

4.3 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

4.4 Engineering Study of the K-65 Storage Silo Radon Mitigation and Dome Reinforcement Project at the Feed Materials Production Center; IT Corporation, August 20, 1987.

4.5 Conceptual Design Report, K-65 Storage Silo Radon Mitigation and Dome Reinforcement Study; WMCO, May 1987.

91

4.6 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Field safety rules are to be observed at all times during the handling of the sampling equipment, in accordance with Addendum No. 2 to the RI/FS Health and Safety Plan (Revision 3), April 1988.

5.2 Protective clothing and dosimetry will be worn in strict accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

5.3 To minimize man-rem exposure, work performed on the silos must be well planned and performed such that no more time than necessary is spent on the domes.

5.4 All personnel involved in the following tasks must be thoroughly familiar with emergency procedures as detailed in Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

6.0 PREREQUISITES

6.1 All applicable training requirements from WMCO and the Contractor must be met by persons performing the following tasks.

6.2 Equipment preparation and set-up must be completed per Procedure K6503.

6.3 Crane assembly and positioning must be completed per Procedure K6504.

6.4 The Vibra Corer apparatus must be transported to the silo, and the flatbed truck must be properly located for crane line attachment and detachment after sample collection.

6.5 Removal of silo flanges has been completed per Procedure K6505.

7.0 PROCEDURE

7.1 Connect the top of the polyethylene bag/glovebag (see Drawing No. 303317-A-M06) to the Vibra Corer sampling device right below the T-shaped head assembly by sliding the bag over the head assembly and taping with duct tape. The bag will unfold with some assistance as the crane lifts the sampling apparatus. (See Step 7.6 below.)

7.2 Connect the crane line to the top of the dynamometer or load cell with appropriate fittings.

91

7.3 Attach the bottom of the dynamometer or load cell to the Vibra Corer head assembly with the appropriate fittings (See Procedure K6503).

7.4 Connect the air line or drive cable from the compressor to the Vibra Corer head assembly.

7.5 Recheck all crane line connections/fittings before lifting the Vibra Corer sampling device. The designated crane signalman or the K-65 Sampling Task Team Leader will then signal the crane operator to slowly raise the Vibra Corer sampling apparatus.

7.6 Pull the polyethylene bag/glovebag over the outer casing as the sampling apparatus is lifted from the truck bed into the air.

7.7 Once the sampling device is suspended vertically in the air, note the reading on the dynamometer or load cell. The designated crane signalman will signal the crane operator to direct the device precisely over the open manhole where the sample is to be collected. The signalman will walk onto the dome next to the opened port to give the signals to the crane operator.

Note: When sampling Silo 3 (which does not have an earthern mound around it), the K-65 Sampling Task Team Leader will have to position himself on top of the dome by climbing the ladder attached to the side of the silo. Appropriate safety measures such as lifelines or safety harnesses must be used.

7.8 The sampling device will be carefully positioned so that the cutting shoe of the Vibra Corer apparatus is touching the top of the foam surface in the center of the stove pipe.

Note: It has been determined that two complete sample cores are to be collected from the last manhole sampled on Silo 1. This will require that the first core sample collected from this location be positioned so that an additional sample can be obtained through the stovepipe opening. The stovepipe inserted into the foam layers will be 8 inches in diameter. Since the outer dimensions of the steel casing of the Vibra Corer sampling device is 2 3/4 inches O.D., and allowing for some compaction peripheral to the vibrating core barrel (¼- to ½-inch), a maximum of 5 inches will be available to collect the second sample. For this reason, the placement of the Vibra Corer barrel should be firmly against one side of the stovepipe. All sampling procedures described above will be applicable for both samples. The second sample cannot be collected, however, prior to the foaming of the first core opening and removal of the polyethylene glovebag and expansion ring assembly per Procedure K6508. The silo flange will not be replaced until the second sample is obtained. Specific handling of this "additional" sample is addressed in Procedure K6515.

91

7.9 Signal the crane operator to hold the position.

7.10 Slip the expansion ring around the outer casing of the Vibra Corer apparatus and the polyethylene bag/glovebag. The end of the polyethylene bag/glovebag needs to be turned upwards, toward the top of the dome to be secured with the expansion ring.

7.11 Slide the expansion ring over the polyethylene bag/glovebag and down inside the flange opening. Secure the expansion ring inside the lip of the flange by tightening the appropriate screws.

7.12 Position the foam hose (which is attached inside the glovebag portion of the polyethylene bag) so that the hose extends into the polyethylene bag/glovebag a few inches and the remainder is laid to the side of the flange opening until sampling is completed.

7.13 The K-65 Sampling Task Team Leader or his designee will check the placement and security of the polyethylene bag and the foam hose before continuing. He then will signal the operator of the compressor or drive unit to activate the vibrating mechanism of the Vibra Corer.

7.14 The K-65 Sampling Task Team Leader or his designee will signal the crane operator to begin to release line slowly to allow the sample device to penetrate the column of material to be sampled.

7.15 Once the sample device has penetrated 1 to 2 feet of material, the signalman or Team Leader should move to the edge of the dome at the top of the sloped mound. He should position himself so that eye contact with the crane operator can be maintained at all times.

7.16 As the Vibra Corer is slowly lowered into the silo, the signalman or Team Leader must ensure that the polyethylene bag is folding in an accordion fashion around the flange opening and is not being carried down inside the silo with the sampling device. Signal the crane operator to stop at any point necessary to reposition the polyethylene bag.

7.17 When the 33-foot mark on the outer casing of the Vibra Corer is flush with the top of the flange opening, signal the crane operator to stop momentarily. For the next 1 foot, coring should proceed very slowly at 1- to 2-inch increments.

7.18 When the 34-foot mark on the outer casing of the Vibra Corer is flush with the top of the manhole opening, signal the crane operator to stop the release of the line and signal the compressor or drive unit operator to deactivate the mechanism.

7.19 If refusal of the coring device is experienced at any level before the 34-foot mark, deactivate the drive unit and note in the Field Activity Daily log (see Section 5.0 of the Quality Assurance Project Plan) the exact depth of the Vibra Corer barrel that is flush with the top of the flange opening.

85

7.20 Signal the crane operator to begin withdrawing the crane line slowly. Do not pull the Vibra Corer out of the silo too quickly. Refrain from engaging the vibrating mechanism of the Vibra Corer during withdrawal of the core if possible. This reduces the likelihood of losing materials from the end of the core while being pulled from the hole. Activate the compressor only if the Vibra Corer appears lodged during withdrawal, or the reading on the dynamometer approaches the load capacity of the threaded casing supplied by the manufacturer.

7.21 As the Vibra Corer nears the top of the silo, it may be necessary to steady the barrel to prevent it from excessively swinging. Be prepared to move to the manhole opening as the last 10 feet of core is pulled from the silo to keep the barrel steady.

7.22 When the entire Vibra Corer has cleared the top of the manhole opening by at least 3 feet, signal the crane operator to stop withdrawal of the crane line.

7.23 The polyethylene bag/glovebag assembly must be sealed before the sampling apparatus is transferred to the flatbed truck. Using portable heat sealer, seal the bag horizontally above the glovebag attachment and below the Radon Removal quick connect fitting. This seal must be at least 6 inches wide. Check closely to ensure that the bag is sealed completely.

7.24 With scissors or a utility knife, cut the seal at the approximate midpoint. In other words, half of the sealed section should be connected to the bag covering the core barrel and half should be attached to the glovebag portion of the bag that will remain in the flange opening.

7.25 Connect the Radon Removal hose to the quick connect fittings provided on the polyethylene bag, which is now attached to the Vibra Corer apparatus.

7.26 Signal the operator of the Radon Removal System to activate the equipment.

7.27 Signal the operator of the Radon Removal System to deactivate the equipment when the bag is collapsed around the barrel.

7.28 Disconnect the Radon Removal hose at the fitting and lay the hose aside.

7.29 The signalman/Team Leader will signal the crane operator that the Vibra Corer is ready to be moved to the flatbed truck. The end of the core barrel will be held steady as necessary by walking alongside it as it is being moved to the truck.

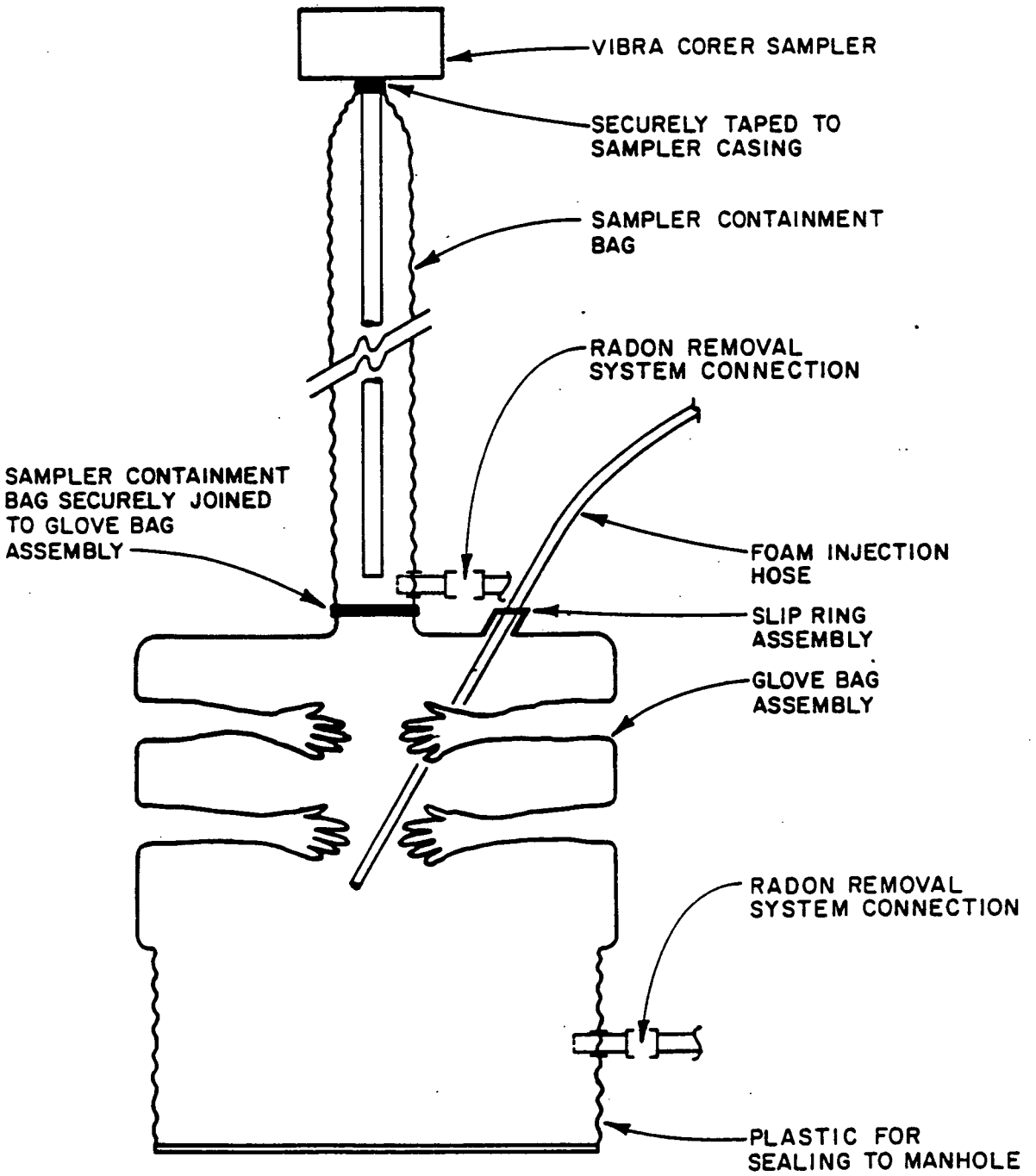
Note: When sampling Silo 3, the Team Leader will descend the silo ladder only when a qualified stand-by person is available in case of an emergency.

7.30 Once at the truck, place the end of the core barrel up against the truck bed and inside the core trough provided. Slowly lower the Vibra Corer assembly and position the core into the trough in a horizontal position.

7.31 When the entire sampling device is resting completely inside the trough, signal the crane operator to hold the position.

7.32 Disconnect both the airline or drive cable and the dynamometer from the Vibra Corer head assembly. Transport the sample to the Preparation Trailer per Procedure K6509.

STARTING DATE: 3-23-88	DATE LAST REV.:	INITIATOR: B. OSBURN	DRAWING NO.: 303317-A-M06
DRAWN BY: WALT McGILL	DRAWN BY:	PROJ. MGR. D. HARMER	PROJECT NO.: 303317.03



K-65 VIBRA CORER
CONTAINMENT BAG ASSEMBLY

INTERNATIONAL TECHNOLOGY CORPORATION

BRUNING 72425

TITLE: REPLACEMENT OF FLANGES ON SILO ACCESS PORTS

1.0 PURPOSE

The purpose of this procedure is to define the progression of steps to be followed to fill the sample holes with foam and to replace the nozzle flanges upon completion of sampling.

2.0 SCOPE

This procedure applies to sealing each sample hole with foam and replacing the nozzle flanges upon completion of the mock sampling run of Silo 4 and to the sampling at each of the four locations on Storage Silos 1, 2, and 3.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to see that this procedure is followed during the field program phase.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel that are experienced and/or have been trained in the use of the stated equipment.

3.3 It is the responsibility of each individual performing this procedure to follow it and to report any unusual occurrences to the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 K-65 Sampling Operation Sequence, Procedure K6501.

4.2 Engineering Study of the K-65 Storage Silo Radon Mitigation and Dome Reinforcement Project at the Feed Materials Production Center; IT Corporation. August 20, 1987.

4.3 Statement of Work, K-65 Sampling; WMCO

4.4 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3); April 1988

4.5 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing and dosimetry will be worn in accordance with "Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3)", dated, April 1988.

5.2 Silo domes are sloped, resulting in poor footing. Appropriate footware should be worn and care taken when walking on the silos.

NOTE: Do not permit personnel or equipment on center cap areas of silo domes.

5.3 Every attempt should be made to minimize structural stresses to the domed roofs of the silos. Appropriate care should be taken when maneuvering heavy equipment above the silos.

5.4 Minimum exposure is dependent on maintaining a seal with the glovebag attached to the inside surface of the nozzle with an expansion ring. If this seal is broken, contact the K-65 Sampling Task Team Leader immediately.

5.5 In addition to the protective clothing referenced in step 5.1, chemical goggles and chemical resistant gloves will be worn when working with foam equipment. Leather gloves should be worn when lifting flanges or working with heavy equipment.

5.6 A chemical respirator with organic vapor cartridges will be required during the foam application.

NOTE: Foam components are combustible and emit toxic fumes when burning. No smoking, matches, open flame, or known ignition source is permitted within the designated area when foaming.

5.7 A portable eyewash station with pressurized or continuous water supply will be provided in case of chemical exposure.

5.8 Material Safety Data Sheets (MSDS) for each of the chemicals to be used in the foaming process will be included as part of this procedure.

5.9 To minimize man-rem exposure, work on the K-65 silos must be well planned and performed such that no more time than necessary is spent on the dome.

5.10 Any action which results in unplanned exposure to radioactive materials or foaming chemicals will be reported immediately to the K-65 Sampling Task Team Leader.

5.11 Review of safety and operational procedures has taken place with personnel involved.

6.0 PREREQUISITES

6.1 Safety and radiation training for all workers in accordance with procedures of WMCO and the contractor.

6.2 Portable foaming equipment has been checked out and prepared for rigid foam application per manufacturer's instructions. General equipment for foam operation includes:

6.2.1 Sample collection log.

6.2.2 Field Activity Daily Log.

6.2.3 Sample bag ready and labeled for foam sample.

6.2.4 Appropriately labeled containers for containment/packaging of disposable foam lances. Containers to be supplied by WMCO.

6.2.5 Foam lances available as required.

6.2.6 Chemical resistant gloves (2 pairs).

6.2.7 Chemical goggles.

6.2.8 Chemical respirators.

6.2.9 Radon removal system operational.

6.3 General tools for replacement of flanges should be available, including:

6.3.1 Gasket material
6.3.2 Six sets of nuts and bolts per flange
6.3.3 Two wrenches
6.3.4 Two pairs of leather gloves
6.3.5 "Moly Kote" thread lubricant or approved equivalent.

6.4 A working set of two-way radios.

6.5 Procedure K6507 is complete for each specific manhole location.

7.0 PROCEDURE

7.1 Perform a foam test to ensure good quality foam. Retain a sample of foam for WMCO in labeled sample bag. Record in Sample Collection Log (Section 7.1.3 of the Quality Assurance Project Plan (QAPP).

7.2 Replace lance and dispose of used lance in appropriately labeled container.

7.3 Glovebag assembly should look similar to Drawing No. 303317-A-M04 upon completion of Procedure K6507. Foam injector was inserted prior to breaking through the foam plug with the sampler.

7.4 Slide foam injector hose down into inner pipe assembly through slip ring in glovebag.

7.5 Connect foam lance to injector hose at hose connection. Make sure connection is secure. Portable foam unit will be manually supported.

7.6 Fill void space with foam. The first three feet of rigid foam above the top of the residue is critical. To ensure integrity of this initial foam layer, slowly retract injector hose while filling the first three feet. Upon completion of the solid three-foot layer, leave hose in place and continue to inject foam to whatever height is achievable before foam sets up. (Glovebag will expand somewhat from displaced vapor.)

7.7 When foaming is complete, close the valve in the hose connection to prevent a backflow of foam and disconnect lance from injector hose.

7.8 Dispose of lance in appropriately labeled container.

7.9 Evacuate glovebag through radon removal system.

7.10 Visually inspect foam plug.

7.11 Carefully roll up injector hose and glove bag and push them into the void inside the nozzle.

WARNING: Take care not to puncture the glovebag and break the integrity of the seal!

7.12 Replace gasket material on sealing surface of flange.

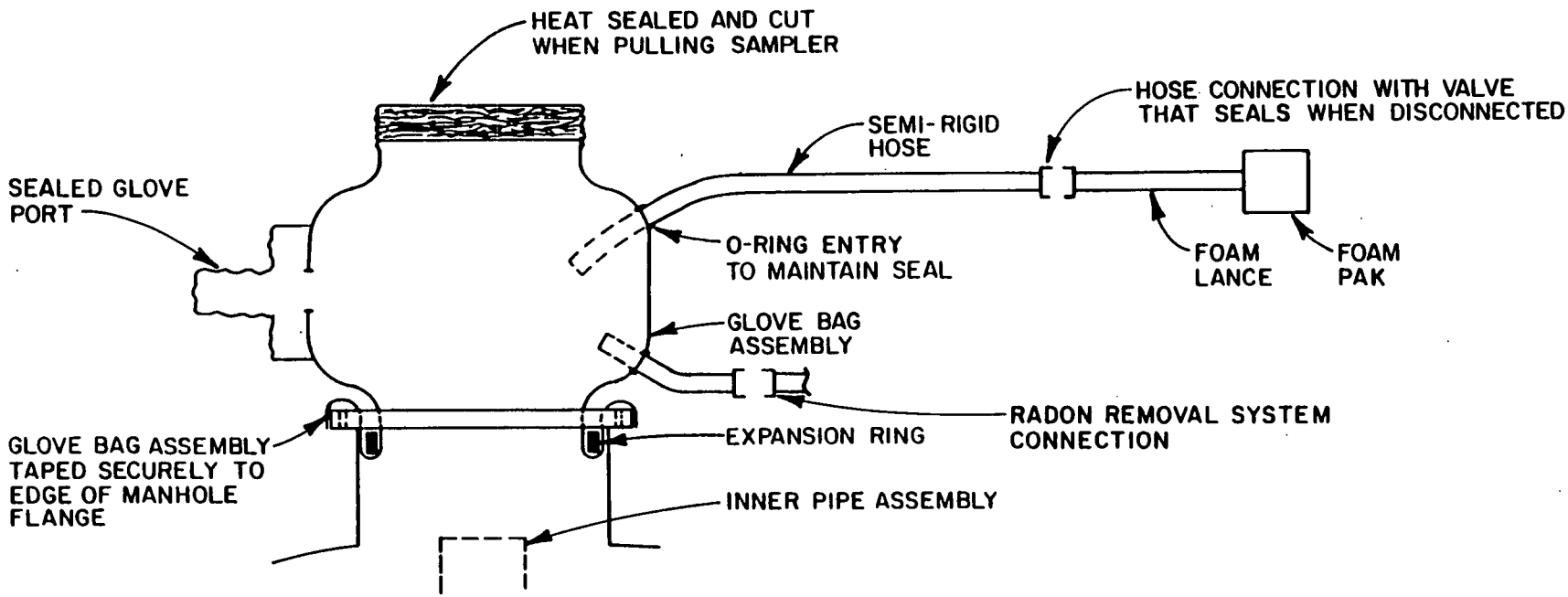
7.13 Carefully lift flange and carry from holding area to nozzle. Align bolt hole pattern and lower flange into position.

7.14 Replace nuts and bolts prepared with thread lubricant. Tighten nuts uniformly, working back and forth across the flange.

7.15 Complete the Field Activity Daily Log (Section 5.0 of the QAPP).

BRUNING 72425

STARTING DATE: 3-21-88	DATE LAST REV.:	INITIATOR: K. SHELL	DRAWING NO.: 303317-A-M04
DRAWN BY: BILL SMITH	DRAWN BY:	PROJ. MGR. D. HARMER	PROJECT NO.: 303317:03



K-65 SAMPLING - GLOVE BAG ASSEMBLY

INTERNATIONAL TECHNOLOGY CORPORATION

TITLE: TRANSPORT OF VIBRA CORER SAMPLING DEVICE

1.0 PURPOSE

The purpose of this procedure is to provide the sequence of events and equipment necessary to transport the Vibra Corer sampling device from the sampling area at each silo to the Preparation Trailer.

2.0 SCOPE

This procedure applies to the transport of the sampling device to the Preparation Trailer after sampling at each silo manhole.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to ensure that the following procedures are followed during the field program phase.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the following tasks to persons having the appropriate training or experience to perform the tasks competently.

3.3 It is the responsibility of each designated team member to notify the K-65 Sampling Task Team Leader if any unusual circumstances are noted or a nonconformance to the procedure is necessary.

4.0 REFERENCES

4.1 Statement of Work, K-65 Sampling, WMCO.

4.2 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Good field safety rules will be observed at all times during the handling of the sampling equipment, in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

5.2 Protective clothing and dosimetry must be worn in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

5.3 All personnel involved in the following tasks must be thoroughly familiar with the Emergency Procedures as detailed in the aforementioned Health and Safety Plan.

6.0 PREREQUISITES

6.1 All applicable training requirements of WMCO and the Contractor must be met by all persons performing the following tasks.

6.2 A 40-foot flatbed truck with a core trough secured to the bed of the truck per Procedure K6503.

6.3 A receiving core trough is located inside the Preparation Trailer.

6.4 A preplanned route for the flatbed truck to deliver the Vibra Corer sampling device to the Preparation Trailer will have been established prior to the sampling of each silo port.

7.0 PROCEDURE

7.1 Secure the Vibra Corer head assembly to the truck once it has been laid inside the core trough by the crane by threading rope through the closed hook or eyelet in the T-shaped head assembly. Tie the rope to the corner bar of the flatbed or other location on the truck so that the sampling device cannot slide out of the truck while in transit.

7.2 Carefully transport the sampling assembly to the Preparation Trailer via the preplanned route.

7.3 Back the flatbed truck toward the door of the Preparation Trailer, allowing at least 50 feet so that the entire sample device can be removed from the truck before entering the trailer.

7.4 Untie, or otherwise disconnect the sampling apparatus from the truck bed. Remove the Vibra Corer device from the truck bed by sliding it out of the trough. (Because of its weight and length, an adequate number of sampling team members must be available.)

7.5 Sampling team members should line up on the same side of the coring device as it is pulled from the truck bed. The side should be selected based on the location of the receiving trough in the Preparation Trailer.

7.6 Care must be taken to keep the sample core as horizontal as possible and to move it with as little agitation as possible while carrying it into the trailer.

7.7 Once the entire device is inside the trailer, gently lower the whole length of the device at the same time into the core trough provided.

7.8 Remove the Vibra Corer head assembly by unscrewing it from the coupler where the polyethylene bag is attached.

TITLE: OPERATION PROCEDURES FOR RADON REMOVAL SYSTEM

1.0 PURPOSE

This procedure defines the progression of steps to be followed during operation of the Radon Removal System in support of the K-65 sampling program.

2.0 SOPE

The radon removal system is a temporary processing unit to be connected to the Examination Trailer and the polyethylene bags on the Vibra Corer sampling device, and the glovebags at the silo flanges. The radon removal system is designed to remove and retain trace quantities of radon gas present in the air space of the trailer and the polyethylene bags and glovebags. The unit will draw the air through dehumidifiers and activated carbon beds by a fan. About 1000 cfm. will be achieved. System radon concentrations will be monitored during processing, and radon removal operations will be terminated when the processing in the trailer or the polyethylene bags and glovebags is finished.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to see that this procedure is followed during the operation of the radon removal system.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel who have had experience or training with this procedure and the use of the radon removal system equipment.

3.3 It is the responsibility of each individual performing this procedure to follow it and report unusual occurrences to the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 Statement of Work, K-65 Sampling; WMCO.

4.2 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

4.3 K-65 Sampling Operation Sequence, Procedure K6501.

4.4 Engineering Study of the K-65 Storage Silo Radon Mitigation and Dome Reinforcement Project at the Feed Materials Production Center; IT Corporation, August 20, 1987.

a1

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing and dosimetry will be worn in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

5.2 Radon is a radioactive gas that decays to form intermediate radioactive particulates. All work performed in and around the trailer and radon removal unit will be under the direction of Health Physics personnel, and all aspects of installation, testing, and operation will be carefully controlled by Radiation Work Permits.

5.3 To minimize man-rem exposure, all work on the radon removal unit must be well planned and performed so that no more time than necessary is spent completing the required tasks.

5.4 Any circumstance that could have resulted in an intake of radioactive materials by inhalation, ingestion, or absorption will be reported immediately to the K-65 Sampling Task Team Leader. The involved employees will report to the WMCO Medical Department at the end of their shift to submit a urine sample and again will report at the start of their next shift to submit another urine sample. The K-65 Sampling Task Team Leader or his designee will inform the WMCO Environmental and Radiological Monitoring Technician of the circumstance and file an Abnormal Incident Report Form before the end of the shift during which the circumstance happened.

6.0 PREREQUISITES

6.1 Radon removal system operable and connections available at the sampling areas.

6.2 Safety and radiation training for all workers in accordance with procedures of WMCO and the Contractor.

6.3 A review of safety and operational procedures has taken place with the personnel involved.

7.0 PROCEDURE

7.1 Startup of Radon Unit (Reference Drawing No. 303317-B-P05)

7.1.1 Check electrical installation to the fan and verify the rotation of the fan.

7.1.2 Check instrument installation and calibration, or perform required calibration.

7.1.3 Verify all system dampers are closed.

7.1.4 Open dampers D-01, D-03, D-04, and D-11.

7.1.5 Start fan F-001.

a9

91

7.1.6 When fan is operating, observe and record in the logbook system static pressure, fan differential pressure, and air flow. Verify that the system is operating within the design range.

7.1.7 Open dampers D-13 and D-14 radon analyzer(s).

7.1.8 Verify proper operation of the detectors.

7.2 Radon Removal Operation from Examination Trailer

7.2.1 Verify all system dampers are closed.

7.2.2 Open the following dampers:

D-01
D-05
D-06
D-11
D-13
D-14.

7.2.3 Start fan and verify air flow through system at 1000 cfm ±10 percent.

7.2.4 Continue air flow and monitor system inlet and outlet radon concentrations and dose buildup on tanks T-03 and T-04.

7.2.5 Continue air flow until operations within the Examination Trailer are completed.

Note: A third set of carbon beds is provided and can be operated if necessary to achieve desired concentrations.

7.2.6 Shut down fan F-001.

7.2.7 Close the following dampers:

D-01
D-05
D-06
D-11
D-13
D-14

7.2.8 Repeat procedure for each sample core that is taken into the Examination Trailer.

7.2.9 Entry to the radon system area should be restricted until the system sits isolated for a minimum of 30 days.

98

91

7.3 Radon Removal Operation from Sampler Containment Bag and Glovebag Assembly

7.3.1 Open the following dampers:

D-02
D-05
D-06
D-11
D-13
D-14.

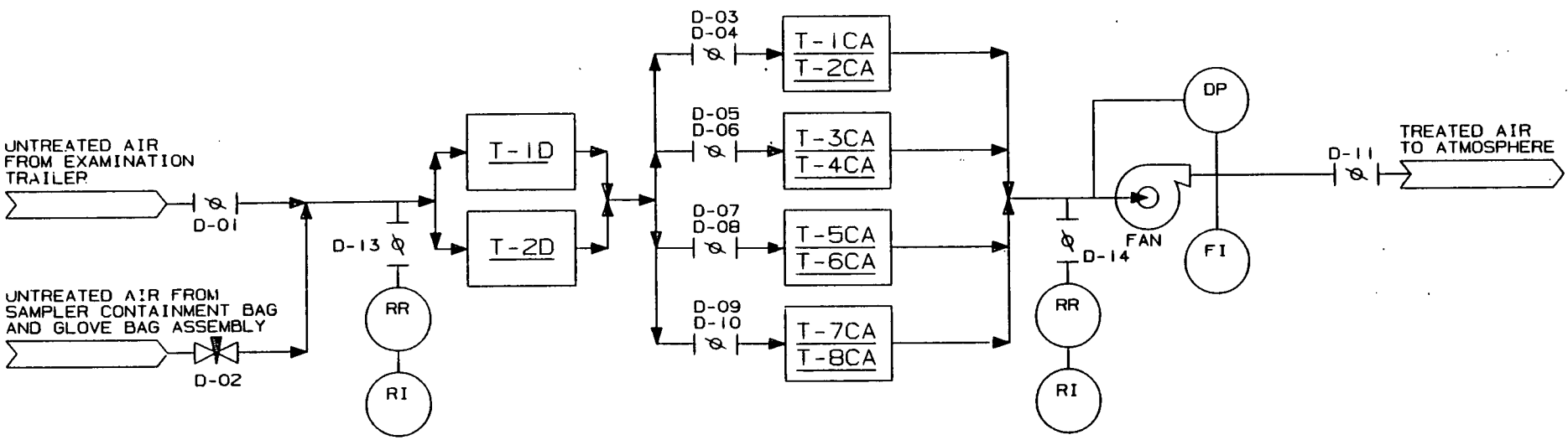
7.3.2 Start fan F-001.

7.3.3 Continue fan operation until gas is exhausted from bag, per Procedures K6507 and K6508.

7.3.4 Close the following dampers:

D-02
D-05
D-06
D-11
D-13
D-14.

99



T-1D, T-2D

CALCIUM SULFATE DEHUMIDIFIER

T-1CA THRU T-8CA

ACTIVATED CARBON ADSORBERS

INTERNATIONAL TECHNOLOGY CORPORATION

IT CORPORATION
ALL COPYRIGHTS RESERVED

STARTING DATE 3-21-88 | DATE LAST REV. | DRAFT. CHCK. BY. | INITIATOR. B. OSBURN | DRAWING NO. 303317-B-P05
DRAWN BY. BILL SMITH | DRAWN BY. | ENGR. CHCK. BY. | PROJ. MGR. D. HARMER | PROJECT NO. 303317.03

HP/MISC3/303317-B-05

100

91

TITLE: INITIAL ON-SITE CORE HANDLING AND INSPECTION

1.0 PURPOSE

The purpose of this procedure is to specify those actions that are necessary between the time when the radon has been removed from around the sample core holder and the time of the beginning of the detailed on-site data gathering. This procedure should ensure that the sample core is removed from the Vibra Corer unit, cleaned externally, and placed in position for further examination in a safe and well controlled series of steps.

2.0 SCOPE

This procedure is to be used for each K-65 sample core as soon as it has been freed of potential radon gas, but before formal examination and data-taking begin.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to see that this procedure is followed during the field operations.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel who are experienced and/or have been trained in the steps and requirements.

3.3 It is the responsibility of each individual performing this procedure to follow it and to report any unusual occurrences to the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 K-65 Sampling Operation Sequence, Procedure K6501.

4.2 Taking of Samples Using Vibra Corer Equipment, Procedure K6507.

4.3 Operation Procedures for Radon Removal System, Procedure K6510.

4.4 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

4.5 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing, respiratory protection, and dosimetry must be worn in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

5.2 Radon must have been previously removed from the sample exterior in accordance with Procedures K6510 and K6507.

5.3 Any circumstance that could have resulted in an intake of radioactive materials by inhalation, ingestion, or absorption will be reported immediately to the K-65 Sampling Task Team Leader. The involved employees will report to the Medical Department at the end of their shift to submit a urine sample and again will report at the start of their next shift to submit another urine sample. The K-65 Sampling Task Team Leader or his designee will inform the Environmental and Radiological Monitoring Technician of the circumstance and file a Minor Event Report before the end of the shift during which the circumstance happened.

5.4 Review of safety and operational procedures has taken place with personnel involved.

6.0 PREREQUISITES

6.1 Safety and radiation training for all workers in accordance with procedures of WMCO and the Contractor.

6.2 Truck with special core-transport rack available to move core between the Preparation and Examination Trailers.

6.3 Clean examination area available and prepared for receipt of the new core in the Preparation Trailer. Previously examined cores either removed or placed in a shielded condition with respect to the new core.

6.4 That portion of Procedure K6510 involving radon treatment from the polyethylene bag is completed.

7.0 PROCEDURE

7.1 Cut and remove the polyethylene sleeving material from the Vibra Corer casing.

7.2 Discard the polyethylene sleeving material in container designated for dry radioactive waste materials.

7.3 Using absorbent wiping fabric (such as "Maslon" or equivalent) and dilute cleaning detergent, moisten and wipe the exterior surface of the Vibra Corer casing until all visual evidence of soil and

91

contamination has been removed. Place the core casing on a clean work surface during the final portion of this activity, to avoid recontamination.

7.4 Remove the lower "cutting unit" of the Vibra Corer in accordance with manufacturer's instructions.

7.5 IMMEDIATELY place a prepared plug in the open end of the Lexan plastic tube.

7.6 Lift the Vibra Corer casing while tilting it slightly and carefully slide the Lexan core out of its steel casing. This step may require more than one person to perform under complete control and may require opening of the trailer doors temporarily.

7.7 Cut off the Lexan core-tube 1.5 feet above the top of the waste core sample.

7.8 Dispose of the top section in an appropriately labeled container.

7.9 Cap the ends of the Lexan core-tube as required and recheck that the tube is sealed on both ends.

7.10 Clean the Lexan core-tube per procedure in Step 7.3 above.

7.11 Affix sample numbering labels to the clean core tube and accurately mark which end of the tube was the upper one.

7.12 Slide a polyethylene sleeve over the Lexan core-tube, handling it over a clean working surface. Seal both ends.

7.13 Open trailer doors and position the core transfer truck with its core racks in place outside the open doors.

7.14 Carefully place the bagged Lexan core in the truck rack and transport it to the Examination Trailer.

7.15 Continue work, as required, on this particular core using Procedures K6512, K6513, and K6514.

7.16 Clean the remaining parts of the lower Vibra Corer unit as above before returning to service.

7.17 If no further samples are to be taken with this part of the Vibra Corer equipment, it must be set aside for decontamination in accordance with Procedure K6516.

7.18 Complete the Field Activity Daily Log (Section 5.0 of the Quality Assurance Project Plan).

91

TITLE: ON-SITE ANALYTICAL METHODS
K6512 - VISUAL INSPECTION
K6513 - VIDEO RECORDING
K6514 - RADIOLOGICAL SCREENING

1.0 PURPOSE

The purpose of these procedures is to provide the overall sequence for the performance of the on-site analysis of the core samples from the K-65 Silos and the Metal Oxide Silo at the FMPC.

2.0 SCOPE

Three procedures, K6512 - Visual Inspection, K6513 - Video Recording, and K6514 - Radiological Screening, have been combined into one procedure in order to simplify the process and minimize health and safety effects by concurrently performing all three operations.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to see that this procedure is followed during the field program phase.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel that are experienced and/or have been trained in the proper operation and use of the equipment and handling of samples required in this procedure.

3.3 It is the responsibility of each individual performing this procedure to follow it and report any unusual occurrences to the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 K-65 Sampling Procedures:
- K6501 - K-65 Sampling Operation Sequence
- K6509 - Transport and Storage of Samples On Site
- K6510 - Operation Procedures for Radon Removal System
- K6511 - Initial On-site Core Handling and Inspection
- K6515 - Sectioning and Packaging of Sample Cores

4.2 Statement of Work, K-65 Sampling; WMCO.

4.3 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

4.4 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

4.5 1986 Annual Book of ASTM Standards, Section 4.

5.0 SAFETY AND PRECAUTIONS

5.1 Good field safety rules will be observed at all times and in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

5.2 Protective clothing and dosimetry will be worn in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

5.3 To minimize man-rem exposure, the visual inspection, video recording, and radiation scanning will be conducted at the same time insofar as it is possible.

5.4 Any circumstance that could have resulted in an intake of radioactive materials by inhalation, ingestion, or absorption will be reported immediately to the K-65 Sampling Task Team Leader. The involved employees will report to the WMCO Medical Department at the end of their shift to submit a urine sample and again will report at the start of their next shift to submit another urine sample. The K-65 Sampling Task Team Leader or his designee will inform the WMCO Environmental and Radiological Monitoring Technician of the circumstance and file an Abnormal Incident Report Form before the end of the shift during which the circumstance happened.

6.0 PREREQUISITES

6.1 Safety and radiation training for all personnel in accordance with procedures of WMCO and the Contractor.

6.2 Successful completion of Procedures K6509 and K6510.

6.3 Personnel protective clothing in accordance with Addendum No. 2 to the RI/FS Health and Safety Plan (Revision 3), April 1988.

6.4 Video camera with audio capability mounted on tracks, wheels, or cart to allow movement along core sample and positional indicator (scale). A 35 mm camera will also be used in conjunction with the video camera to make color prints for archival purposes. Cameras should have a pan/tilt function, and sufficient lighting should be provided.

6.5 Spare video tapes.

6.6 Collimated Geiger counter with meter readout mounted within readable view of the video camera to allow visual indication of the counts relative to the location along the core. Shielding to be aligned such that the counter is exposed only to the sample.

6.7 Core trough with a scale mounted such that a single view of the camera will include the positional scale, core, and geiger reading.

6.8 Ice packs in plastic bags.

6.9 Radon Removal System connected to the Examination Trailer and operational per Procedure K6510.

7.0 PROCEDURE

7.1 PRELIMINARY PROCEDURES

7.1.1 Prior to receipt of the "clean" core sample from the Preparation Trailer, the video camera should be checked and loaded with a new, labeled tape. Video tapes should be labeled with the date, time, and core sample number.

7.1.2 The radiation monitor should be checked and calibrated according to the Quality Assurance Project Plan, Section 8.0. The date, time of calibration, and the instrument numbers should be recorded in the logbook.

7.1.3 The camera and audio recording system should be charged. The camera cart should be checked for free movement.

7.1.4 The core trough should be prepared for receipt of the sample and the positional scale checked for proper placement. Ice packs should be placed in the trough prior to receipt of the sample.

7.1.5 Notebooks and logbooks should be ready and labeled.

7.1.6 Proper personnel protective clothing should be donned.

7.1.7 Radon Removal System should be in operation.

7.2 ON-SITE INSPECTIONS AND ANALYSIS

7.2.1 Upon completion of the preliminary procedures, open the sample receiving doors.

7.2.2 Position the transport vehicle according to Procedure K6511.

7.2.3 Slide the core sample out of the protective shipping container onto the ice-packed core trough in the Examination Trailer. The core should still be inside the plastic (Lexan) tube. DO NOT REMOVE THE PLASTIC (LEXAN) TUBE FROM THE CORE!

7.2.4 Close the trailer doors.

7.2.5 Align the core tube with the scale at the index mark.

7.2.6 Make sure the video camera, 35 mm camera, radiation meter, and audio system are turned on and the cameras are also aligned with the index mark.

91

7.2.7 Begin verbal description of the sample. Maintain camera visual field to correspond to that section of the core being described. The "Description and Identification of Soils" ASTM D2488-84 method of description should be used. Physical handling of the sample will not be possible, so the method will have to omit that portion of the procedure.

7.2.8 Note any unusual observances in the logbook and on the Field Activity Daily Log (Section 5.0 of the Quality Assurance Project Plan) in addition to verbal descriptions on the audio/visual tapes. Note the location on the scale marker. Annotation of the physical descriptions will be logged on the attached Visual Inspection Form in a tabular form along with the radiation readings in order to correlate the radiation readings with the physical descriptions.

7.2.9 At the completion of the observations, turn the video camera system off. Remove and ensure that the tape is properly labeled. Ensure that the tabular data and the video tapes and 35 mm film are properly labeled and cross referenced to the complete core sample number per the Sampling and Analysis Plan.

7.2.10 Move the camera system aside and prepare for Procedure K6515, Sectioning and Packaging of Sample Cores.

91

FERNALD
RI/FS

PAGE____ OF ____
PAGE
CHK'D BY_____

VISUAL INSPECTION FORM

PROJECT NO.	TASK NO.
DATE	TIME
CORE SAMPLE NO.	LENGTH OF CORE FT IN
TEAM MEMBERS	
INSTRUMENT NO.	

LOCATION[1] FT	IN	RADIATION READING	PHYSICAL DESCRIPTION

[1] BOTTOM OF CORE IS LOCATION 0 FT 0 INCHES

SIGNATURE _____ DATE/TIME _____

108

91

TITLE: SECTIONING AND PACKAGING OF SAMPLE CORES

1.0 PURPOSE

The purpose of this procedure is to specify the progression of steps to be followed for sectioning and packaging the sample cores. These instructions pertain to the packaging of both archive and analytical samples.

2.0 SCOPE

This procedure is to be used for each sample core once it has been visually inspected, video taped, and radiologically screened. Sectioning for each core may vary based on these prior inspections.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to see that this procedure is followed during the field program phase.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel who are experienced and/or have been trained in the use of the stated equipment.

3.3 It is the responsibility of each individual performing this procedure to follow it and report any unusual occurrences to the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan, (Revision 3), April 1988.

4.2 K-65 Sampling Operation Sequence, Procedure K6501.

4.3 Visual Inspection Procedure K6513.

4.4 Video Recording Procedure K6514.

4.5 Radiological Scanning Procedure K6515.

4.6 Abnormal Occurrences Procedure K6525.

4.7 Statement of Work, K-65 Sampling; WMCO.

4.8 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

a1

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing, respiratory protection, and dosimetry must be worn in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

5.2 Disposable gloves will be worn at all times when handling the core samples.

5.3 With sectioning and packaging taking place in the Examination Trailer, care should be exercised at all times to prevent spread of contamination. Decontamination efforts should be thorough.

5.4 The Radon Removal System will be connected to the Examination Trailer during this procedure. Specific exhaust ducts will be supplied to the sample cutting station and the sample preparation station.

5.5 The sample preparation station will be in a hood. When sample preparation operations are being conducted, the hood will have a measured air flow face velocity of 150 feet/minute.

5.6 All temporary and permanent storage areas for cores, samples, or sample residues will be shielded to satisfy ALARA requirements for radiation exposure.

5.7 All high radiation areas will be posted and locked or guarded at all times.

5.8 Any action that results in unplanned exposure to radioactive materials must be reported immediately to the K-65 Sampling Task Team Leader (see Procedure K6525).

6.0 PREREQUISITES

6.1 Safety and radiation training for all workers in accordance with procedures of WMCO and the Contractor

6.2 Sample labels

6.3 Sample Collection Log Form

6.4 Disposable gloves

6.5 Permanent ink markers

6.6 Scaled sectioning trough

6.7 Cutting tool

6.8 Plastic caps for Lexan liner

6.9 Electrical tape (multiple rolls)

110

6.10 HEPA filtered vacuum

6.11 Trash barrel labeled "Contaminated"

6.12 Decontamination wipes

6.13 Detergent rinse and rinse bottles

6.14 Roll of plastic sleeve for encasing core sections

6.15 Heat sealers for plastic bags (2)

6.16 Paper towels

6.17 Sample bottles

6.18 Sample bottle lids

6.19 Sample custody tape

6.20 Core sample storage racks (2)

6.21 Ice chests

6.22 Writing pens

6.23 Supply of cold packs

6.24 Disposable paper (multiple rolls)

6.25 Examination Trailer ventilation system on.

7.0 PROCEDURES

7.1 SECTIONING, LABELING, AND PACKAGING OF CORE SECTIONS

7.1.1 Upon completion of K-65 Sampling Procedures K6512 (Visual Inspection), K6513 (Video Recording), and K6514 (Radiological Scanning), the Lexan-encased core will be in the cold inspection trough of the Examination Trailer.

7.1.2 Based on the results of the K-65 Sampling Procedures K6512, K6513, and K6514, the K-65 Sampling Task Team Leader or his designee should complete a Sectioning Plan Form and give copies of it to the personnel performing the sectioning and packaging of sample cores. The Sectioning Plan Form is attached.

7.1.3 Carefully transfer the Lexan-encased core to the sectioning trough in the Examination Trailer.

7.1.4 The sectioning trough is scaled off in 1-inch increments. Position the bottom of the core at the index mark on the scale.

7.1.5 Mark the top and bottom of the core sample with a permanent marker.

7.1.6 In accordance with the Sectioning Plan Form and using the trough scale, mark the sample core sections with permanent marker directly on the Lexan liner; include an arrow at each mark indicating the top of each section.

Note: Make sure to verify the association between the Sectioning Plan Form and the core to be sectioned by checking the manhole identification tag number on the core against the tag number on the form.

7.1.7 Prepare sample labels assigned to this core per the K-65 Sampling and Analysis Plan and Section 7.0 of the RI/FS Quality Assurance Project Plan. Record the unique core sample number and core manhole tag number on the sample label and complete the appropriate line on the Sample Collection Log.

7.1.8 Cut through the Lexan liner along the line marking the top of the core.

7.1.9 Recap the top end of the Lexan liner with a plastic cap and seal securely with electrical tape.

7.1.10 Cut through the Lexan liner at the next section marker working from top to bottom.

7.1.11 Securely cap and tape adjoining ends of the liner exposed by each cut.

Note: Attempt to minimize loss of sample when cutting and capping by holding entire liner securely and making a clean cut. Do not attempt to collect lost sample in any core section as cross contamination of layers could result.

4.1.12 Rotate each core section removed into an upright position.

7.1.13 Decontaminate the outside of the Lexan liner and capped ends of the core section removed with a detergent wipe.

7.1.14 Dry each removed section with paper towels and affix a sample label near the top of the core section. Protect the label with a layer of clear tape. Complete the appropriate line on the Sample Collection Log (see Section 7.0 of the Quality Assurance Project Plan).

7.1.15 Cut a section of plastic sleeve several inches longer than the core section. Heat seal at one end to form a bag.

7.1.16 Place the core section in the custom fabricated plastic bag and prepare and affix a sample label to the bag and complete the Sample Collection Log. Mark the label with an arrow indicating the top of the core section. Heat seal the sample bag as designated on the Sectioning Plan Form.

7.1.17 Store the section upright in either the temporary archive storage rack or temporary analytical sample rack. Record specific rack location of each core section on the Field Activity Daily Log (see Section 5.0 of the Quality Assurance Project Plan).

7.1.18 Repeat steps 7.1.10 to 7.1.17 for each core section.

7.2 REPACKAGING OF ANALYTICAL SAMPLES

As the other core sections are being decontaminated, labeled, and bagged, the core sections in the temporary analytical sample rack should be repackaged for laboratory analysis.

Note: A person should work with one core section at a time when repackaging!

7.2.1 Record the label numbers of the specific core section to be repackaged on the Field Activity Daily Log.

7.2.2 Place a sheet of disposable paper on the work area.

7.2.3 Obtain a sample bottle and remove the lid.

7.2.4 Remove the core section to be repackaged from the temporary analytical storage rack and place it on the disposable paper.

7.2.5 Remove the core section from the outer bag, placing the clean bag in an adjoining clean work area for reuse after sample transfer.

7.2.6 Remove the tape-sealed end cap on the top of the core section.

7.2.7 Carefully transfer the core sample into the bottle. Use a disposable spatula or spoon to break up the sample material if it will not flow. Fill the bottle completely to minimize the vapor space. Care must be taken not to spill sample material!

7.2.8 Place cap on the bottle. Seal with custody tape.

91

7.2.9 Fill out a sample label to be placed on the sample bottle duplicating the unique core sample label number. If all of the sample was not removed from the core, a new unique sample number will be assigned to the sample bottle. Record this number in the Sample Collection Log.

7.2.10 If all of the sample was not removed from the core, reseal the Lexan core section with an end cap and custody tape.

7.2.11 Decontaminate the outside of the Lexan core section with a detergent rinse. Dry with paper towels.

7.2.12 Place the Lexan-encased core section back in original bag and heat seal.

7.2.13 Place bagged core section in temporary archive storage rack. Indicate these sections by number on the Sectioning Plan Form and on the Field Activity Daily Log.

7.2.14 Decontaminate the outside of the sample bottle with a detergent rinse. Dry with paper towels.

7.2.15 Place bottle in ice chest with cold packs for storage until transported to the analytical laboratory.

7.2.16 Carefully roll up disposable paper on repackaging work area and dispose in appropriate trash container. Dispose of work gloves worn when repackaging and decontaminating.

7.2.17 Prepare shipping container(s) chests for shipment to the analytical laboratory per Procedure K6518, and transfer the temporary archive storage rack to long-term archive storage per Procedure K6517.

NOTE: A fifth sample core will be taken from Silo 1 specifically for shipment of a composite sample off site. WMCO will provide the container and paperwork for this sample. The same care written in this procedure will be taken when packaging this sample.

91

FERNALD
RI/FS

PAGE ____ OF ____
PAGE
CHK'D BY _____

SECTIONING PLAN FORM

PROJECT NO.	TASK NO.
DATE STARTED	DATE COMPLETED
TIME STARTED	TIME COMPLETED
CORE SAMPLE NO.	LENGTH OF CORE FT IN
TEAM MEMBERS	

SECTION SAMPLE NO.	BOTTOM LOCATION OF SECTION [1] FT	IN	TOP LOCATION OF SECTION FT	IN	LENGTH OF SECTION [2] FT	IN	ARCHIVE SAMPLE YES	NO	NOTES

[1] BOTTOM OF CORE IS LOCATION 0 FT 0 INCHES
[2] NOT TO EXCEED 30 INCHES (2 FT 6 INCHES)

SIGNATURE _____ DATE/TIME _____

115

91

TITLE: DECONTAMINATION OF SAMPLING EQUIPMENT

1.0 PURPOSE

The purpose of this procedure is to provide guidance for decontaminating equipment used in sampling the K-65 and Metal Oxide Silos at the Fernald Feed Materials Production Center (FMPC).

2.0 SCOPE

This procedure is applicable to the equipment used in collecting samples from the K-65 and Metal Oxide Silos.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to see that this procedure is followed throughout the sampling program.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel who are experienced and/or have been trained in the use of the stated equipment and procedures.

3.3 It is the responsibility of each individual performing this procedure to follow it and to report any necessary deviations to the K-65 Sampling Task Team Leader for approval.

4.0 REFERENCES

4.1 Procedures K6501 through K6524.

4.2 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

4.3 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

4.4 Statement of Work, K-65 Sampling, WMCO.

5.0 SAFETY AND PRECAUTIONS

5.1 All personnel operating any decontamination equipment will be adequately trained to use the equipment.

5.2 Protective clothing and dosimetry will be worn in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

91

6.0 PREREQUISITES

6.1 Safety and training for all personnel in accordance with the procedures of WMCO and the Contractor.

6.2 The radiation monitor should be checked and calibrated according to the Quality Assurance Project Plan, Section 8.0. The date, time of calibration, and the instrument numbers should be recorded in the logbook.

6.3 Controlled decontamination area established.

7.0 PROCEDURE

7.1 Before reuse of equipment:

7.1.1 Bring equipment to be cleaned to the designated decontamination area.

7.1.2 Remove plastic coverings, if present.

7.1.3 Wipe down surfaces of sample equipment with towels and a mild detergent solution.

7.1.4 Perform radiological survey of the sampling equipment. Survey for releasable surface contamination first by using a wipe test. If contaminants are present, repeat Step 7.1.3. Allow surfaces to dry completely before performing another wipe test. Once the wipe test indicates no releasable contamination, resurvey the item for detection of fixed contamination.

Note: If the survey results indicate contamination, equipment can be transported for reuse in a controlled manner if the contamination will not affect data quality.

7.2 After final use of equipment, perform Steps 7.1.1 through 7.1.4 and repeat decontamination efforts until release criteria in accordance with WMCO standard practices are met.

Note: If contamination persists, and wiping efforts obtain no further reduction in these levels, other more aggressive decontamination methods may be employed or the material may be disposed of as radioactive. The K-65 Sampling Task Team Leader will direct the disposition of equipment in conjunction with WMCO.

7.3 All vehicles and equipment leaving the K-65 Silo area will be monitored for radioactive contamination by the site Health and Safety Officer. If contamination is present, the vehicle/equipment will be directed to one of the decontamination facilities within the FMPC Production Area. After monitoring or decontamination, the

117

91

vehicle/equipment will be transferred to the main plant access gate to be monitored by a WMCO Health Physicist to obtain authorization to leave the Production Area. An exception is the final monitoring of the crane assembly, which will take place at the fenceline prior to its release through a breach in the fence. Monitoring for both releasable and fixed contamination will be per Step 7.1.4. Decontamination of the crane will be per Step 7.2.

118

91

TITLE: LONG-TERM STORAGE OF ARCHIVE SAMPLES

1.0 PURPOSE

This procedure provides the methodology to prepare core samples for long-term storage for archival purposes. This procedure will specify those actions that are necessary after the samples have been examined, sectioned, and packaged for archive storage.

2.0 SCOPE

This procedure is to be used for each K-65 or metal oxide sample core as soon as it has been examined, sectioned, and packaged.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to see that this procedure is followed during the field operations.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel who are experienced and/or have been trained in the steps and requirements.

3.3 It is the responsibility of each individual performing this procedure to follow it and report any unusual occurrences to the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 K-65 Sampling Operation Sequence, Procedure K6501.

4.2 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

4.3 Statement of Work, K-65 Sampling; WMCO.

4.4 Sectioning and Packaging of Sample Cores, Procedure K6515.

4.5 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing and dosimetry will be worn in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan, (Revision 3), April 1988.

91

5.2 Minimum exposure is dependent on maintaining a seal with the caps attached to the Lexan tube and the outer bag intact. If the caps are missing, the Lexan tube is broken, or the outer bag is torn, contact the K-65 Sampling Task Team Leader immediately.

5.3 Any action that results in unplanned exposure to radioactive materials must be reported immediately to the K-65 Sampling Task Team Leader.

6.0 PREREQUISITES

6.1 Safety and radiation training for all workers in accordance with procedures of WMCO and the Contractor.

6.2 A review of safety and operational procedures has taken place with the personnel involved.

6.3 Core storage racks consisting of 55-gallon drums and specially designed inserts are available to store core sections safely in an upright position.

6.4 Core samples have been sectioned into lengths not greater than the height of the storage rack. Core sections must be prepackaged in accordance with Procedure K6515.

6.5 Sectioning Plan Form.

6.6 Core Sample Storage Location Form (see Figure 1).

6.7 Procedure K6515 has been completed.

7.0 PROCEDURE

7.1 Upon completion of Procedure K6515, store the core sections to be archived in an upright position in the temporary archive storage rack.

7.2 Receive the temporary archive storage rack full of core samples and the Sectioning Plan Form. Inspect each core section sample. Note any tears or punctures in the outer plastic bag containing the core section sample. If there are any rips or tears in the outer plastic bag, repackage in a new bag, label appropriately, and document in the logbook or the Field Activity Daily Log (Section 5.0 of the Quality Assurance Project Plan).

7.3 Note the label number on the sectioned core sample and compare it with the number on the Sectioning Plan Form to see if it belongs in archive storage. Note also the "Up" arrow on the core sample section. Notify the K-65 Sampling Task Team Leader if these labels are missing or if the sample number does not correspond to that on the Sectioning Plan Form. Document any such occurrence in a

91

Nonconformance Report (Section 16.0 of the Quality Assurance Project Plan).

7.4 The packaged core sample sections will be stored in groups, by core, in the permanent core storage racks to facilitate possible later retrieval. Remove each core section sample from the temporary rack and place it in the permanent storage rack. Store the core sample sections in an upright position.

7.5 Note the positions of the core section samples just placed in the core storage rack. Peel off a label from the Sectioning Plan Form that corresponds to each sample stored, and place these labels in the proper positions on the Core Sample Storage Location Form. This form will act as a guide in locating individual core sample sections for possible later retrieval.

7.6 Return temporary archive storage rack to the Examination Trailer.

7.7 Label the core storage rack with the main core number and date.

7.8 Repeat steps 7.1 through 7.5 for each of the core sample sections received.

121

91

FERNALD
RI/FS

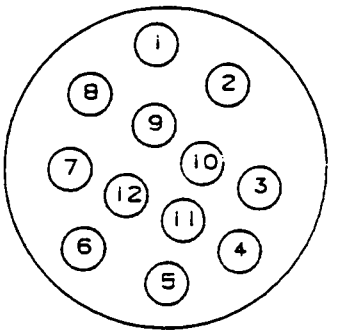
PAGE ☐☐☐☐
CHK'D BY _____

CORE SAMPLE STORAGE LOCATION FORM

PROJECT NO.	TASK NO.
DATE	TIME
TEAM MEMBERS	

CORE SAMPLE NO.[1]
DRUM IDENTIFICATION NO.

POSITION NO.	SECTION SAMPLE NO.
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	



[1] STORE ONLY SECTIONS FROM 1 CORE PER DRUM.

SIGNATURE _____ DATE/TIME _____

122

91

TITLE: SHIPMENT TO OFF-SITE LABORATORIES

1.0 PURPOSE

The purpose of this procedure is to provide guidance for shipping samples to an off-site laboratory.

2.0 SCOPE

This procedure is applicable to all samples taken from the K-65 and Metal Oxide Silos that are to be shipped from the Feed Materials Production Center (FMPC). The intent of this procedure is to ensure that all shipments are conducted properly.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Manager or the K-65 Sampling Task Team Leader to see that this procedure is followed.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader or his designee to delegate the performance of this procedure to personnel who are experienced and/or have been trained in the use of the stated equipment and handling of the samples.

3.3 It is the responsibility of each individual performing this procedure to follow it and to report any necessary deviations to the K-65 Sampling Task Team Leader or his designee. Deviations from the procedure can be approved only by the K-65 Sampling Task Team Leader, the K-65 Sampling Task Manager, or their designee.

4.0 REFERENCES

4.1 10 CFR 71, Packaging and Transportation of Radioactive Material.

4.2 49 CFR 173, U.S. Department of Transportation Rules and Regulations for Packaging and Shipment of Radioactive Materials.

4.3 Procedures K6501 through K6524.

4.4 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), April 1988.

4.5 WMCO Radioactive Material Shipping Procedures, as applicable.

4.6 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing and dosimetry will be in accordance with Addendum No. 2 to the Fernald RI/FS Health and Safety Plan (Revision 3), dated April 1988.

123

91

6.0 PREREQUISITES

6.1 The K-65 Sampling Task Team Leader will provide a list of samples to be shipped by the person conducting this procedure.

6.2 The K-65 Sampling Task Team Leader will ensure that the consignee's license authorizes receipt of the type, form, and quantity of radioactive materials to be transferred.

6.3 Type A packages will be prepared to contain the samples prepared by performing Procedure K6515 (Sectioning and Packaging of Sample Cores).

6.4 Bills of lading and other necessary transportation documents will be completed in accordance with References 4.1, 4.2, and 4.5.

7.0 PROCEDURE

When the sole use transport vehicle has arrived at the FMPC and a pre-shipment inspection of the vehicle has been completed:

7.1 Place fresh cold packs in each sample container to be shipped.

7.2 Fill void spaces of sample container(s) with vermiculite-type material (see Section 6.0 of the Quality Assurance Project Plan).

7.3 Place each sample container in its designated shipping container.

7.4 Fill void spaces of the shipping container(s) with vermiculite-type material.

7.5 Enclose completed Chain-of-Custody and Request-for-Analysis Forms (see Section 7.0 of the Quality Assurance Project Plan). Close and seal the shipping container.

7.6 Survey the shipping containers and document results on shipping papers. Ensure radiation contamination levels do not exceed limits of Reference 4.2.

7.7 Label each shipping container in accordance with Reference 4.2.

7.8 Placard transport vehicles in accordance with Reference 4.2.

7.9 Load containers in transport vehicle and brace the containers to preclude shifting of load under conditions incident to normal transport.

7.10 Survey the transport vehicle and document on shipping papers. Ensure that radiation and contamination levels do not exceed the limits specified in Reference 4.2.

7.11 Complete shipping papers.

91

7.12 Brief driver on shipment, and transfer copies of shipping papers to driver.

7.13 When shipment leaves the FMPC site, call IT's Bear Creek Laboratory personnel who are to receive samples and brief these personnel on sample content, dose rates, and scheduled arrival time.

91

TITLE: OFF-SITE PREPARATION OF SAMPLES FOR ANALYSIS

1.0 PURPOSE

The purpose of this procedure is to specify actions to be taken after arrival of samples from the K-65 sampling program for off-site analysis. These procedures ensure that subsamples of the required size are prepared under the applicable protocols for the analytical methods to be carried out at the IT Radiological Sciences and Mixed Waste Laboratories.

2.0 SCOPE

All samples from the K-65 and Metal Oxide Silos being received under this sampling program will be subject to the steps of this procedure before final analytical methods are applied.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader, and the Managers of the IT Radiological Sciences and Mixed Waste Laboratories to see that this procedure is followed during the receipt and processing of the samples from the K-65 silos.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader and the Managers of the IT Radiological Sciences and Mixed Waste Laboratories to delegate the performance of this procedure to personnel who are experienced and/or have been trained in the steps and requirements.

3.3 It is the responsibility of each individual performing this procedure to follow it and to report any unusual occurrences to the K-65 Sampling Task Team Leader and the IT Laboratory Manager involved.

4.0 REFERENCES

4.1 U.S.EPA Contract Laboratory Program (CLP), Statement of Work for Inorganics Analysis, Multi-Media and Multi-Concentration, 1987 (Revised Protocol).

4.2 U.S.EPA Contract Laboratory Program (CLP), Statement of Work for Organics Analysis, Multi-Media and Multi-Concentration, 1987 (Revised Protocol).

4.3 Toxicity Characteristic Leaching Procedure (TCLP) Final Rule, Federal Register Vol. 51, No. 216, November 7, 1986, P 40643 - 40652.

126

4.4 IT Mixed Waste Laboratory, Laboratory-Specific Attachment.

4.5 IT Radiological Sciences Laboratory, Laboratory-Specific Attachment.

4.6 IT Analytical Services, Quality Assurance Manual.

4.7 IT Radiological Sciences Laboratory, Radiation Safety Manual.

4.8 IT Bear Creek Facility, Radiation Safety Manual.

4.9 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing, respiratory protection, and dosimetry must be worn in accordance with the Radiation Safety Manuals for the IT Radiological Sciences Laboratory and Bear Creek Facility.

5.2 Operating procedures and precautions for these facilities, as stated in the above manuals, must be observed.

5.3 Work must be performed in the presence of the Health Physicist for the host facility, or his approved designee, who will approve personnel assigned to various tasks.

5.4 Chain-of-Custody Protocols must be observed at all times for these samples and subsamples.

5.5 All samples must be measured for radiation levels and approved for transfer by the IT Radiological Sciences Laboratory Health Physicist or his designee before transfer from the Bear Creek Facility to the IT Radiological Sciences Laboratory.

6.0 PREREQUISITES

6.1 Completion of Procedures K6507, K6515, and K6517.

6.2 A refrigerated or ice-packed receiving area for incoming samples.

6.3 Gamma survey instruments to determine the condition of incoming samples.

6.4 Health Physics or supervisory personnel on hand, as required by the Bear Creek Facility Radioactive License.

6.5 Personnel performing this work will be experienced in the procedures and qualified under the U.S.EPA's Contract Laboratory Program.

91

7.0 PROCEDURE

7.1 When a sample group is received at 1570 Bear Creek Road, Oak Ridge, Tennessee, the external surface of the package will be inspected and monitored with a gamma-detecting instrument. Any damage or contamination must be treated in accordance with Bear Creek Facility Procedures (see Section 6.0 of the Quality Assurance Project Plan).

7.2 Shipping and Chain-of-Custody papers will be checked for completeness.

7.3 Samples will be removed from the shipping container, examined as above, and placed in refrigerated or ice-packed storage. All data and observations will be logged.

7.4 Each sample will be opened in the laboratory hood and mixed until uniform.

7.5 A portion of the sample will also be extracted for HSL inorganics (metals and cyanides) as directed by Reference 4.1.

7.6 The procedure for TCLP extraction of metals (Reference 4.3), will be carried out on another portion of the subdivided sample.

7.7 A portion of the subdivided samples from a single core from each silo will be subjected to the extraction procedure for HSL Volatiles in accordance with the procedures of Reference 4.2.

7.8 In a likewise manner, portions of the samples will be subjected to the extraction and preparation procedures for HSL Semivolatiles, HSL Pesticides, and PCBs by the procedures of Reference 4.2.

7.9 Portions of each of the extracts and samples prepared above will be subdivided for the continuation of the analytical procedures. The size of each aliquot will be determined by the specific procedure and the sensitivity requirements of the analysis.

7.10 Each sample and extract will be screened for radioactivity. If the amount of radioactivity carried through into the aliquot is too large for receipt under the procedures of the Radiological Sciences Laboratory, the size will again be proportionately reduced or diluted. This will reduce the sensitivity of the analysis and the detection limits specified in CLP may not be obtained.

7.11 Samples and extracts so prepared will be transferred to the IT Mixed Waste Laboratory for the remaining steps in the chemical analyses, under Procedures K6520 and K6521.

7.12 A portion of selected samples will also be repackaged in the approved sample bottles and sent to the IT Radiological Sciences Laboratory for isotopic analysis. Sample size and materials for which analyses are required are controlled by Procedure K6522.

7.13 Horizontal composite samples from each silo will be prepared from the designated samples from each of the four cores from that silo. Equal weight portions of the designated samples will be mixed and shipped back to the Fernald Analytical Laboratory for the determination of physical and engineering properties.

91

TITLE: ANALYSIS OF SAMPLE EXTRACT FOR INORGANIC CONSTITUENTS

1.0 PURPOSE

The purpose of this procedure is to specify the procedure for analysis of the TCLP and leachate extracts for HSL inorganics of the K-65 and metal oxide core samples. This procedure ensures that the extracts are analyzed for the specified inorganic constituents using the appropriate analytical methods.

2.0 SCOPE

All samples received from the K-65 sampling program at the IT Mixed Waste Laboratory for inorganic assays (cyanide and metals) are covered by this procedure.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader and the Manager of the IT Mixed Waste Laboratory to see that this procedure is followed during the receipt and analysis of the sample extracts from the Bear Creek Laboratory.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader and the Manager of the IT Mixed Waste Laboratory to delegate the performance of this procedure to personnel who are experienced and/or have been trained in the steps and requirements.

3.3 It is the responsibility of each individual performing this procedure to follow it and to report any unusual occurrences to the K-65 Sampling Task Team Leader and the IT Laboratory Manager involved.

4.0 REFERENCES

4.1 U.S.EPA Contract Laboratory Program (CLP), Statement of Work for Inorganics Analysis, Multi-Media and Multi-Concentration, 1987 (Revised protocol).

4.2 Toxicity Characteristic Leaching Procedure (TCLP) Final Rule, Federal Register Vol. 51, No. 216, November 7, 1986. P 40643 - 40652.

4.3 Test Methods for Evaluating Solid Waste, USEPA, SW-846, 3rd edition, 1986 (or most current edition).

4.4 IT Mixed Waste Laboratory, Laboratory Specific Attachment.

4.5 IT Analytical Services, Quality Assurance Manual.

4.6 IT Radiological Sciences Laboratory, Radiation Safety Manual.

91

4.7 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing, respiratory protection, and dosimetry must be worn in accordance with the Radiation Safety Manual for the IT Radiological Sciences Laboratory.

5.2 Operating procedures and precautions for these facilities, as stated in the above manuals, must be observed.

5.3 Work must be performed in the presence of the Health Physicist for the host facility, or his authorized designee.

5.4 Chain-of-Custody Protocols must be observed at all times for these samples and extracts.

6.0 PREREQUISITES

6.1 Completion of Procedures K6507, K6515, K6518, and K6519.

6.2 A refrigerated or ice-packed receiving area for incoming samples.

6.3 Gamma survey instruments to determine condition of incoming samples.

6.4 Health Physics or supervisory personnel at hand, as required by the Radiological Sciences Laboratory Radioactive License.

6.5 Personnel performing this work will be experienced in the procedures and qualified under the U.S.EPA Contract Laboratory Program.

7.0 PROCEDURE

7.1 When the sample extracts from the Bear Creek Laboratory have been received, they will be inspected for damage or contamination using a gamma detecting instrument (see Section 9.2 of the Quality Assurance Project Plan).

7.2 Request-for-Analysis and Chain-of-Custody Forms will be checked against samples received and for completeness.

7.3 Samples will be held in refrigerated storage.

7.4 The extracts from the procedure for cyanides will be analyzed by the protocols specified by the CLP (Reference 4.1).

7.5 The leachate from the TCLP will be analyzed for metals by the protocols specified in SW-846 (Reference 4.3). The leachate will be analyzed for all TCLP metals.

7.6 The digestate from the acid extractions of the core samples will be analyzed for HSL metals by CLP protocols (Reference 4.1).

91

7.7 All wastes from the analysis will be disposed of in accordance with IT Mixed Waste Laboratory Procedures. Any remaining K-65 or metal oxide samples will be transferred to the Bear Creek Laboratory for return to the FMPC.

132

TITLE: ANALYSIS OF SAMPLES AND EXTRACTS FOR ORGANIC CONSTITUENTS

1.0 PURPOSE

The purpose of this procedure is to specify the methodology for analysis of the extracts from the K-65 and Metal Oxide core samples for volatile and semi-volatile HSL constituents.

2.0 SCOPE

All samples received from the K-65 sampling program at the IT Mixed Waste Laboratory for organic assays are covered by this procedure.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader and the Manager of the IT Mixed Waste Laboratory to see that this procedure is followed during the receipt and analysis of the sample extracts received from the Bear Creek facility.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader and the Manager of the IT Mixed Waste Laboratory to delegate the performance of this procedure to personnel who are experienced and/or have been trained in the steps and requirements.

3.3 It is the responsibility of each individual performing this procedure to follow it and to report any unusual occurrences to the K-65 Sampling Task Team Leader and the IT Laboratory Manager involved.

4.0 REFERENCES

4.1 U.S.EPA Contract Laboratory Program (CLP), Statement of Work for Organics Analysis, Multi-Media and Multi-Concentration, 1987 (Revised Protocol).

4.2 IT Mixed Waste Laboratory, Laboratory-Specific Attachment.

4.3 IT Analytical Services, Quality Assurance Manual.

4.4 Radiation Safety Manual, IT Radiological Sciences Laboratory.

4.5 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing, respiratory protection, and dosimetry must be worn in accordance with the Radiation Safety Manual for the IT Radiological Sciences Laboratory.

5.2 Operating procedures and precautions for these facilities, as stated in the above manual, must be observed.

5.3 Work must be performed with the approval of the Health Physicist for the host facility, or his authorized designee.

5.4 Chain-of-Custody protocols must be observed at all times for these samples and subsamples (see Section 7.0 of the Quality Assurance Project Plan).

6.0 PREREQUISITES

6.1 Completion of Procedures K6507, K6515, K6518, and K6519.

6.2 A refrigerated or ice-packed receiving area for incoming samples.

6.3 Gamma survey instruments to determine condition of incoming samples.

6.4 Health Physics or supervisory personnel on hand, as required by the Radiological Sciences Laboratory Radioactive License.

6.5 Personnel performing this work will be experienced in the procedures, and qualified under the U.S.EPA's Contract Laboratory Program.

7.0 PROCEDURES

7.1 When the sample extracts have been received from the Bear Creek Laboratory, they will be inspected for damage or contamination using a gamma detecting instrument (see Section 9.2 of the Quality Assurance Project Plan).

7.2 Request for Analysis and Chain-of-Custody forms will be checked against sample receipts and for completeness (see Section 7.2 of the Quality Assurance Project Plan).

7.3 Samples will be held in refrigerated storage.

7.4 The methanol extract from the volatiles procedure will be analyzed for HSL volatiles by the methods specified by CLP (Reference 4.1).

7.5 The extract from the HSL semi-volatiles procedures will be analyzed by the methods specified by CLP (Reference 4.1).

7.6 All wastes and residues from the analysis will be disposed of in accordance with IT Mixed Waste Laboratory Procedures. Any remaining K-65 or metal oxide sample will be transferred to the Bear Creek Laboratory for return to the FMPC.

TITLE: ISOTOPIC ASSAYS OF SAMPLES

1.0 PURPOSE

The purpose of this procedure is to specify the methodology for isotopic analysis of core samples.

2.0 SCOPE

All samples received at the IT Radiological Sciences Laboratory for isotopic analysis are covered by this procedure.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader and the Managers of the IT Mixed Waste and Radiological Sciences Laboratories to see that this procedure is followed during the receipt and analysis of the sample extracts from the Bear Creek Laboratory (1570 Bear Creek Road).

3.2 It is the responsibility of the K-65 Sampling Task Team Leader and the Managers of the involved laboratories to delegate the performance of this procedure to personnel who are experienced and/or have been trained in the steps and requirements.

3.3 It is the responsibility of each individual performing this procedure to follow it and to report any unusual occurrences to the K-65 Sampling Task Team Leader and the IT Laboratory Manager involved.

4.0 REFERENCES

4.1 IT Radiological Sciences Laboratory, Laboratory-Specific Attachment.

4.2 Sample Preparation, IT-RSL Procedure No. 201.

4.3 Gamma Spectroscopy, IT-RSL Procedure No. 112.

4.4 Determination of Selected Alpha Emitters, IT-RSL Procedure No. 304.

4.5 IT Analytical Services Quality Assurance Manual.

4.6 IT Radiological Sciences Laboratory, Radiation Safety Manual.

4.7 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing, respiratory protection, and dosimetry must be worn in accordance with the Radiation Safety Manual for the IT Radiological Sciences Laboratory.

5.2 Operating procedures and precautions for these facilities, as stated in the above manuals, must be observed.

5.3 Work must be performed with the approval of the Health Physicist for the host facility, or his authorized designee.

5.4 Chain-of-Custody protocols must be observed at all times for these samples and subsamples (see Section 7.0 of the Quality Assurance Project Plan).

6.0 PREREQUISITES

6.1 Completion of Procedures K6507, K6515, K6518, and K6519.

6.2 Gamma survey instruments to determine condition of incoming samples.

6.3 Health Physics or supervisory personnel on hand, as required by the Radiological Sciences Laboratory.

6.4 Personnel performing this work will be experienced in the procedures and qualified under the U.S.EPA's Contract Laboratory Program.

7.0 PROCEDURES

7.1 When the samples have been received from the Bear Creek Laboratory (1570 Bear Creek Road), they will be inspected for damage or contamination using a gamma detecting instrument (see Section 9.2 of the Quality Assurance Project Plan).

7.2 Request-for-Analysis and Chain-of-Custody forms will be checked against actual samples received and for completeness (see Section 7.2 of the Quality Assurance Project Plan).

7.3 The samples will be analyzed for the following isotopes:

Pb-210	Th-232
Ra-226	U-234
Ra-228	U-235
Th-228	U-238
Th-230	

7.4 Analysis will be by the RSL procedures for sample preparation, gamma spectroscopy, and alpha emitters described in References 4.2, 4.3, and 4.4 of this procedure.

7.5 All wastes and residues from the analysis will be disposed of in accordance with IT Radiological Sciences Laboratory Procedures. Any remaining K-65 or metal oxide samples will be transferred to the Bear Creek Laboratory for return to the FMPC.

91

TITLE: DETERMINATION OF ENGINEERING PROPERTIES OF SAMPLES

1.0 PURPOSE

The purpose of this procedure is to specify the methodology for determining the engineering properties of samples from the K-65 sampling program.

2.0 SCOPE

All samples from the K-65 sampling program received at the Fernald Analytical Laboratory for physical or engineering properties are covered by this procedure.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader and the Manager of the Fernald Analytical Laboratory to see that this procedure is followed during the receipt and testing of the core samples.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader and the Manager of the Fernald Analytical Laboratory to delegate the performance of this procedure to personnel who are experienced and/or have been trained in the steps and requirements of the procedure.

3.3 It is the responsibility of each individual performing this procedure to follow it and report any unusual occurrences to the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 Standard Method for Specific Gravity of Soils, ASTM D-854.

4.2 Standard Method for Particle Size Analysis of Soils, ASTM D-422.

4.3 Standard Method for Laboratory Determination of Water (Moisture) Content of Soils, ASTM D-2216.

4.4 Standard Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils, ASTM D-4318.

4.5 Environmental Health and Safety Procedures, WMCO, Fernald Site.

4.6 Quality Assurance Procedures, AL-QAP, October 1, 1987, Fernald Analytical Laboratory.

4.7 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

91

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing, respiratory protection, and dosimetry must be worn in accordance with the Environmental Health and Safety Procedures for the Fernald site.

5.2 Operating procedures and precautions as stated in the above manuals must be observed.

5.3 Work must be performed in the presence of a Health Physicist for the host facility, or his approved designee.

5.4 Chain-of-Custody Protocols must be observed at all times for these samples and subsamples (see Section 7.0 of the Quality Assurance Project Plan).

6.0 PREREQUISITES

6.1 Completion of Procedures K6507, K6515, and K6518.

6.2 Personnel performing this work will be experienced and/or trained in those procedures.

7.0 PROCEDURES

7.1 When the samples are received at the Fernald Analytical Laboratory, the Request-for-Analysis and Chain-of-Custody forms will be checked against samples received and for completeness (see Section 7.2 of the Quality Assurance Project Plan).

7.2 The following physical/engineering properties will be determined:

- Specific Gravity by ASTM D-854 (Ref. 4.1)
- Grain Size by ASTM D-422 (Ref. 4.2)
- Moisture Content by ASTM D-2216 (Ref. 4.3)
- Atterberg Limits by ASTM D-4318 (Ref. 4.4)

7.3 All wastes and residues will be disposed of per WMCO Environmental Health and Safety Procedures.

91

TITLE: RADIOACTIVE WASTE HANDLING

1.0 PURPOSE

This procedure is to provide the necessary controls and guidelines for the packaging for disposal and dispositioning of radioactive waste generated during the K-65 sampling tasks.

2.0 SCOPE

This procedure is applicable to all radioactive waste generated by sampling operations conducted on the K-65 and metal oxide silos at the Fernald Feed Materials Production Center (FMPC).

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to see that this procedure is followed during the field program phase.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel who are experienced with the performance of this procedure and/or have been trained in the use of the stated equipment.

3.3 It is the responsibility of each individual working with radioactive material to be familiar with this procedure. Those directly involved with packaging radioactive waste are responsible for following this procedure and reporting any problems immediately to the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 Statement of Work, K-65 Sampling, WMCO.

4.2 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan, (Revision 3), April 1988.

4.3 K-65 Sampling Operation Sequence, Procedure K6501.

4.4 49 CFR 178, Department of Transportation Regulations for Shipping Containers Specifications.

4.5 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing and dosimetry will be worn as specified in Reference 4.2.

91

6.0 PREREQUISITES/REQUIREMENTS

6.1 Only radioactive material will be disposed of as radioactive waste.

6.2 Radioactive waste volumes will be minimized to the extent practicable.

6.3 All packages will contain no free-standing liquid, defined as containing less than 0.5 percent of liquid by volume.

6.4 All packages will be free of materials that are explosive, have explosive off-gases, or ignite spontaneously. All combustibles will be packaged to prevent spontaneous combustion.

6.5 All personnel handling containers will be trained to utilize proper drum handling equipment and procedures.

7.0 PROCEDURES

7.1 Empty Container Inspection

Before moving a container into an area for packaging radioactive waste, visually inspect each container for adequacy.

7.1.1 Drums

- 7.1.1.1 Ensure that the drum is a new DOT specification 17H container. Each 55-gallon drum must be embossed in accordance with the specifications outlined in 49 CFR 178.
- 7.1.1.2 Ensure that the drum is assembled with all parts, gaskets, and fittings in their proper places.
- 7.1.1.3 Ensure that closures are adequate to prevent leakage of contents.

7.1.2 Boxes

- 7.1.2.1 Ensure that the box is a new box constructed for containing radioactive waste.
- 7.1.2.2 Ensure that the box is of the correct specification for the types of waste being packaged (e.g., limited quantity, LSA, Type A).
- 7.1.2.3 Ensure that the box is assembled with all parts, gaskets, and fittings in their proper places.
- 7.1.2.4 Ensure that closures are adequate to prevent leakage of contents.

7.2 Segregation

Waste will be segregated to facilitate final packaging and dispositioning. Segregation will consist of separating radioactive waste into the "Dry Active Waste" (DAW) and excess silo material from sampling handling.

7.3 Loading

7.3.1 All waste will be surveyed by a health physics technician before packaging to ensure that only radioactive waste is packaged for disposal. Documentation of surveys for release of clean material will be provided.

7.3.2 All waste will be visually inspected.

7.3.3 Baleable waste will be placed in plastic bags and then into a final waste container.

7.3.4 Rags, mopheads, etc. used for cleaning contaminated items will be allowed to dry, if possible, then packaged as baleable waste.

7.3.5 Highly contaminated items such as plastic liners for the trough will be carefully rolled up to contain the contamination and then handled as baleable waste.

7.4 Sealing Containers

7.4.1 All packages will be inspected for free-standing liquid prior to sealing. If any free-standing liquid is detected, containers will be reprocessed.

7.4.2 Containers will be sealed and inspected to ensure that the following criteria are met:

7.4.2.1 Drum lid fits properly and gasket is not damaged.

7.4.2.2 Bolt ring fits securely.

7.4.2.3 Bolt lug fits tightly.

7.4.2.4 Boxes will be sealed and inspected for containment adequacy.

7.5 Marking and Labeling

7.5.1 Assign an identification number to each container. The numbers will be visible from 10 feet and durable enough for shipment and emplacement in the burial trench.

7.5.2 Record each package identification number on Form K6524.1.

7.5.3 Other labeling of this package will be in accordance with Reference 4.4.

7.6 Curie Content and Survey

7.6.1 Estimate number of curies contained in each package and record on Form K6524.1 (attached).

7.6.2 Perform a final radiation and surface contamination survey for each package (Section 6.8 of the Quality Assurance Project Plan).

7.6.3 Enter survey data on Form K6524.1 and initial.

7.7 Records

7.7.1 Complete Form K6524.1 by listing identification, weight, curie content, radiation levels, surface contamination, description, and volume of material in each container.

7.7.2 Records will be maintained for turnover of radioactive waste to WMCO.

7.8 Storage

7.8.1 After a health physics technician clears a package from the waste packaging area, the package will be taken to a designated temporary storage area.

7.8.2 The radioactive waste storage area will meet all posting requirements for a radioactive materials storage area, and access to the area will be controlled.

7.9 Turnover

7.9.1 At the conclusion of sampling activities, or sooner, radioactive waste will be transferred to WMCO at the K-65 Sampling Task Team Manager's discretion.

7.9.1.1 Form K6524.1 will be reviewed.

7.9.1.2 A visual inspection of the waste containers will be made.

7.9.1.3 WMCO will accept custody for the waste by signing Form K6524.1.

RADIOACTIVE WASTE PACKAGE DATA FORM
FORM K6524.1

Package Number	Type of Container	Weight	Volume	Total Activity	Contract Dose Rate.	Three-foot Dose Rate	Alpha Contamination	Beta-Gamma Contamination	Initials

Reviewed: _____

Custody Accepted: _____
WMCO

PRE1250A
03/24/88 F1

91

TITLE: ABNORMAL OCCURRENCES

1.0 PURPOSE

The purpose of this procedure is to provide guidance for mitigating events that are not within the normal procedures for sampling the K-65 and Metal Oxide Silos. These procedures include potential accidents, injuries, and events not a part of the normal procedures for the sampling event.

2.0 SCOPE

This procedure covers all of the steps in the sampling, observation, handling, shipping, and analysis of the silo's contents. It serves as the master sequence for all abnormal events and a single source for procedures to mitigate such occurrences.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the K-65 Sampling Task Team Leader to see that this procedure is followed during the sampling event.

3.2 It is the responsibility of the K-65 Sampling Task Team Leader to delegate the performance of this procedure to personnel that are experienced and/or have been trained in the use of the stated equipment and handling of the sample cores.

3.3 It is the responsibility of each individual performing this procedure to follow it and to report any necessary deviations to the K-65 Sampling Task Team Leader (see Section 16.0 of the Quality Assurance Project Plan).

3.4 Deviations from the procedure shall be approved by the K-65 Sampling Task Team Leader.

4.0 REFERENCES

4.1 Procedures K6501 through K6524.

4.2 Addendum No. 2 to the Fernald RI/FS Health and Safety Plan, (Revision 3), April 1988.

4.3 WMCO Emergency Procedures, as applicable.

4.4 Fernald RI/FS Quality Assurance Project Plan (Revision 3), March 1988.

5.0 SAFETY AND PRECAUTIONS

5.1 Protective clothing and dosimetry will be in accordance with Addendum to the Fernald RI/FS Health and Safety Plan, (Revision 3), April 1988.

91

5.2 Additional health and safety requirements will be determined by the particular sampling event being performed at the time of the abnormal occurrence and the associated health risks developed as a result.

6.0 PREREQUISITES

6.1 Safety and radiation training of all involved personnel in accordance with the procedures of WMCO and the Contractor.

6.2 Appropriate Emergency Response Training and other training as required by the type of event.

6.3 Abnormal Incident Report Form.

7.0 PROCEDURES

7.1 Sampling Event Abnormal Occurrences Cross-Reference List to Sampling Procedures.

7.1.1 K6502 - Marking and Locating Sample Points
- 7.1.1.1 Personal Injury, see Section 7.2.
- 7.1.1.2 Silo Roof Failure, see Section 7.3

7.1.2 K6503 - Setup of Sampling Equipment
- 7.1.2.1 Personal Injuries, see Section 7.2

7.1.3 K6504 - Setup and Positioning of Crane
- 7.1.3.1 Personal Injuries, see Section 7.2
- 7.1.3.2 Crane Failure, see Section 7.4

7.1.4 K6505 - Mock Run
- 7.1.4.1 Personal Injury, see Section 7.2
- 7.1.4.2 Crane Failure, see Section 7.4
- 7.1.4.3 Loss of Sampling Equipment in Silo, see Section 7.5
- 7.1.4.4 Silo Damage, see Section 7.3

7.1.5 K6510 - Radon Removal System, see Section 7.10

7.1.6 K6506 - Removal of Flanges on Access Ports
- 7.1.6.1 Personal Injuries, see Section 7.2
- 7.1.6.2 Silo Roof Failure, see Section 7.3
- 7.1.6.3 Dropped Equipment into Silo, see Section 7.5
- 7.1.6.4 Radon Removal System Failure, see Section 7.10
- 7.1.6.5 Tear in Overbag after Installation, see Section 7.6

7.1.7 K6507 - Taking Samples Using Vibra Corer Equipment
- 7.1.7.1 Personal Injury, see Section 7.2
- 7.1.7.2 Vibra Corer System Failure, see Section 7.7
  - 7.1.7.2.1 Vibra Corer Break Inside Silo
  - 7.1.7.2.2 Jammed Vibra Corer
  - 7.1.7.2.3 Sample Loss, No Recovery

7.1.7.3 Crane Failure, see Section 7.4
7.1.7.3.1 Before sampling
7.1.7.3.2 During Sampling
7.1.7.3.3 After Sampling
7.1.7.4 Silo Roof Failure, see Section 7.3
7.1.7.5 Glove Bag Failure, see Section 7.6
7.1.7.6 Refoaming Failure, see Section 7.9

7.1.8 K6508 - Replacement of Flange on Silo
(See Section 7.1.6: K6505 - Removal of Flanges)

7.1.9 K6509 - Transportation and Storage at On-site Laydown Area
7.1.9.1 Dropped or Loss of Sample from Trailer or Crane, see Section 7.8
7.1.9.2 Failure of Plastic Casing/Seal Prior to Decontamination, see Section 7.8
7.1.9.3 Truck Accidents, see Section 7.11

7.1.10 K6516 - Decontamination of Sampling Equipment
7.1.10.1 Spilled or Leaking Decontamination Material, see Section 7.8

7.1.11 K6511, K5512, K6513, K6514 - On-site Examination of Sample Cores
7.1.11.1 Radon Removal System Failure, see Section 7.10
7.1.11.2 Personal Injury, see Section 7.2
7.1.11.3 Transport Accident, see Section 7.11
7.1.11.4 Trailer Fires, see Section 7.12
7.1.11.5 Failure of Examination Equipment, see Section 7.18

7.1.12 K6515 - Sectioning and Packaging of Sample Cores
7.1.12.1 Personal Injuries, see Section 7.2
7.1.12.2 Failure of Radon Removal System, see Section 7.10

7.1.13 K6516 - Long-Term Storage of Samples
7.1.13.1 Site Integrity
7.1.13.1.1 Security Breeches, see Section 7.16
7.1.13.1.2 Fire, see Section 7.12
7.1.13.1.3 Flood, see Section 7.15
7.1.13.1.4 Windstorm, see Section 7.13
7.1.13.1.5 Seismic, see Section 7.14
7.1.13.2 Sample Integrity
7.1.13.2.1 Plastic or Lexan Tube Failure, see Section 7.8
7.1.13.2.2 Cap or Ends Fall Off, Sample Leaks, see Section 7.8
7.1.13.2.3 Improper Documentation, Mislabeled, etc. see Section 7.19

7.1.14 K6524 - Handling Wastes from Sampling Operation
7.1.14.1 Spillage and Leaks, see Section 7.8
7.1.14.2 Personal Injury, see Section 7.2
7.1.14.3 Accidents During Transport to Disposal Area, see Section 7.11

7.1.15 K6518 - Shipping of Wastes to Off-site Laboratories
7.1.15.1 Transportation Accidents, see Section 7.11
7.1.15.2 Leaks or Sample Container Failure During Transport (not a result of an accident), see Section 7.8
7.1.15.3 Documentation Errors, see Section 7.19

7.2 Personal Injuries

The following procedures are intended to provide guidance and state minimum requirements in the event of injury or illness to personnel. WMCO Safety Policies and Procedures provided to contractor will be followed. Actions outlined in the Addendum No. 2 to the Fernald RI/FS Health and Safety Plan, (Revision 3), April 1988, will also be followed.

7.2.1 Any injury, no matter how minor, is to be reported to K-65 Sampling Task Team Leader, K-65 Sampling Task Team Manager, or their designee as soon as possible after occurrence.

7.2.2 The K-65 Sampling Task Team Leader, K-65 Sampling Task Team Manager, or their designee is responsible to report to Health and Safety personnel all injuries and accidents occurring during his or her shift.

7.2.3 Summon help if required using other uninjured personnel, alarm, radio, or voice. Phone numbers for emergency personnel will be posted prominently at site telephone locations.

7.2.4 Site personnel qualified to render first aid and/or cardiopulmonary resuscitation shall provide aid to the victim as appropriate to the limit of their abilities without compromising safety.

7.2.5 Person rendering aid must decide, based on severity of injury and potential or impending damages whether to treat victims in place or move them. As a general rule, do not move victim in any way if the person cannot perform this movement under his or her own control.

7.2.6 When trained emergency personnel arrive, if summoned, transfer victim to their care and provide as much information as possible.

7.2.7 If any injury/illness is the result of a chemical exposure a supervisor shall promptly initiate the steps necessary to identify the chemical(s) being used.

7.2.8 Any injury/illness not limited to a first aid case will require that site management immediately notify the Health and Safety representative. This will allow the coordination of internal resources to assist the treating physician in rendering appropriate care.

91

7.3 Damage or Failure of the Silo or Silo Roof

This procedure is designed to provide guidance to emergency and operating personnel in the event of a silo or silo roof failure.

7.3.1 Upon failure of the silo or roof, immediately cease all operations and evacuate the immediate work area.

7.3.2 Notify the K-65 Sampling Task Manager, K-65 Sampling Task Team Leader, or their designee of the event and its estimated magnitude.

7.3.3 If any personnel are injured, refer to Section 7.2, Personal Injuries.

7.3.4 The K-65 Sampling Task Manager, K-65 Sampling Task Team Leader, or their designee should notify the appropriate WMCO personnel of the event so that their plant wide emergency response system can be activated, if needed.

7.3.5 WMCO emergency evacuation procedures may be instituted if the magnitude of the event is sufficient. In that event, follow instructions or training given by WMCO personnel.

7.3.6 If sampling cannot continue on the failed/damaged silo, remove equipment as soon as possible after safety and radiological clearances are given by WMCO health physics or appropriate personnel. DO NOT ENTER AREA WITHOUT CLEARANCE. Otherwise, the equipment may have to be left in place. Mitigation of the event will be determined at the time.

7.3.7 If the safety evaluation determines that sampling can continue, proceed with due caution. If the event damaged any sampling equipment, refer to the appropriate abnormal procedure.

7.3.8 The event must be recorded on the Abnormal Incident Report Form and the Field Activity Daily Log.

7.4 Crane Failures

The following is a series of steps to be followed upon failure of the crane during sampling operations:

7.4.1 Tipping

Tipping can be minor, moderate, or major (overturning) depending on the causes and circumstances. The causes for this mode of failure are as follows:

91

7.4.1.1 Improper bearing conditions are the most common causes of a crane tipping. Improper calculations on the soil bearing capacity and improper outrigging on the crane allows the crane's counterbalance system, the outriggers, to sink into soft ground thus changing the crane's center of gravity. During this occurrence the crane will lift off the ground a few inches. This can be rectified by changing the center of gravity of the crane by moving the boom. Once the crane has settled back down, inspect the outriggers and place pads or mats under the outriggers, or mechanically lock the outriggers into place if they are unlocked.

7.4.1.2 Miscalculation of payload weight is another factor to induce crane tipping. This factor will be minor in this application as a dynamometer will be used to monitor abnormal forces during the crane operation.

7.4.1.3 Excessive forces during extraction of the sample can also cause the crane to tip. Again, this factor will be minor because of monitoring abnormal extractive forces using the dynamometer during sample retrieval.

7.4.1.4 Excessive wind loads can also cause a crane to tip. A good practice is to park the crane with the boom lowered after daily operations have ceased. Do not operate the crane during high winds, thunderstorms, or lightning conditions.

7.4.1.5 Tipping can be sensed by an experienced crane operator and tipping is generally lifting the back end of the crane a few inches off the ground. This can be compensated by backing off on hoisting the load or shifting the boom and changing the center of gravity of the crane. If Steps 7.4.1.1 through 7.4.1.3 are followed, tipping should never occur. In the event the crane tips over, another crane must be used to upright the overturned crane.

NOTE: **During an abnormal occurrence such as this, immediately attempt to rectify the situation to prevent damage then stop and report the incident to the K-65 Sampling Task Team Leader. Do not proceed any further with any procedure until direction from the Task Team Leader has been given an authorization to proceed has been received.**

7.4.2 Mechanical Failures

7.4.2.1 The crane uses a series of winches, cables, and other mechanical components that must be properly lubricated for efficient operation. Two winches are

149

91

used for the boom lift, and one winch is used for the hoist (load) lift. An internal combustion engine drives the winches and must be properly maintained. Should the crane experience a mechanical failure during sampling, stop operations and report the situation to the K-65 Sampling Task Team Leader.

7.4.2.2 The winches use a mechanical friction brake that must be properly maintained. If the brake gets wet due to precipitation, the load will start to slip. This will be felt by an experienced operator. In this instance, an operator would dry the brake drum by carefully lowering the load while applying the brake, similar to tapping the brake pedal in an automobile after running through a deep puddle.

7.4.2.3 Cable failure during operation is remote if proper maintenance and inspection prior to operation is performed. Should a failure occur, stop current procedure and immediately report incident to the K-65 Sampling Task Team Leader. If damage to the silo occurs, refer to Section 7.3. If loss of equipment in the silo occurs, refer to Section 7.5.

7.4.2.4 Should cable failure occur and result in loss of load, replace damaged cable and attempt to recover lost load after authorization from WMCO has been given. Once load has been recovered and inspection reveals no damage to the sampler, resume sampling. The K-65 Sampling Task Team Leader will then note the incident on the Abnormal Incident Report Form and on the Field Activity Daily Log.

7.4.2.5 Should cable failure occur with no loss of load due to a cable jam in the boom head pulley (due to improper operation), stop current procedure and immediately report incident to the K-65 Sampling Task Team Leader. If sampler is in manhole and sampling operations have begun, it may be necessary to use another crane to complete the procedure if the cable cannot be freed while the sampler is still attached. If sampling operations have not been started or have been completed, it may be possible to lower the load by lowering the boom. Set the load on the plastic sheeting as designated by the K-65 Sampling Task Team Leader.

7.5 Loss of Equipment into Silo

The following is a series of steps to be followed upon loss of equipment into a silo:

91

7.5.1 Upon loss of equipment (Vibra Corer, tools, etc.) into the silo through the open manhole, stop current activity, and immediately report incident to the K-65 Sampling Task Team Leader. Describe the item dropped into the silo and obtain the decision from the K-65 Sampling Task Team Leader on whether to leave the object in the silo or to recover it.

NOTE: Do not proceed any further with any procedure until direction from the K-65 Sampling Task Team Leader has been given and an authorization to proceed has been received.

7.5.2 If authorized to leave the object in the silo, continue with the current procedure. The K-65 Sampling Task Team Leader will then note the incident on the Abnormal Incident Report Form and on the Field Activity Daily Log.

7.5.3 If directed to recover object in the silo and the object can be safely and easily recovered by manually picking it out or by otherwise removing it out without physically entering the silo, then recover object.

7.5.4 If directed to recover object in the silo and object cannot be easily recovered, stop and report recovery attempts to the K-65 Sampling Task Team Leader. A different recovery plan must be formulated to recover the lost object.

7.5.5 Once object has been recovered and/or authorization to proceed has been given, continue with current procedure. The K-65 Sampling Task Team Leader will then note the incident in the Abnormal Incident Report Form and on the Field Activity Daily Log.

7.6 Failure of Glovebag Assembly

The following is a series of steps to be followed in the event of a failure of the glovebag assembly:

7.6.1 Upon failure of the glovebag assembly prior to puncturing the foam seal with the Vibra Corer Sampler, stop the current procedure and immediately report the incident to the K-65 Sampling Task Team Leader. Describe the type of failure (rip, tear, loss of seal) and obtain the decision from the K-65 Sampling Task Team Leader on whether to reseal, repair, or replace the glove bag assembly.

NOTE: Do not proceed any further with any procedure until direction from the K-65 Sampling Task Team Leader has been given and an authorization to proceed has been received.

91

7.6.2 Upon failure of the glovebag assembly after puncturing the foam seal in the silo, stop sampling operations immediately and retreat from the area. Report incident immediately to the K-65 Sampling Task Team Leader and obtain the decision from him on how to proceed. Do not extract the sampler from the silo if at all possible.

NOTE: Do not proceed any further with any procedure until direction from the K-65 Sampling Task Team Leader has been given and an authorization to proceed has been received.

7.6.3 Once the area has been checked by the Health and Safety personnel and proper protective clothing has been donned, visually inspect the area around the failure. If possible, seal the puncture tear or seal loss with duct tape.

7.6.4 Once the defect has been sealed, and it has been determined by the K-65 Sampling Task Team Leader that the puncture, tear, or seal loss was minor and authorization has been given to proceed, carefully continue sampling operations per Procedure K6507. The K-65 Sampling Task Team Leader will then note the incident on the Abnormal Incident Report Form and on the Field Activity Daily Log.

7.6.5 Once the defect has been temporarily sealed and it has been determined by the K-65 Sampling Task Team Leader that the puncture, tear, or seal loss was major, then carefully retract the Vibra Corer Sampler and immediately foam in accordance with the steps outlined in Procedure K6508.

7.6.6 The sampler containment bag must then be heat sealed in two places and the bag cut between the seals in accordance with Procedure K6507. The sampler containment bag may then be evacuated by attaching the connection to the Radon Removal System and opening the valve once the system is running. Carefully remove the sampler from the silo using the crane. Transport the sampler to the Preparation Trailer in accordance with Procedure K6509. Remove and save any sample collected according to Procedure K6511. Remove the head in accordance with the steps outlined in Procedure K6509 and decontaminate unit conforming with Procedure K6516.

7.6.7 Prior to resampling, the polyethylene glovebag assembly must be replaced. Evacuate the old glovebag assembly per Procedure K6508 and install a new glovebag assembly per Procedure K6507.

NOTE: Visually ensure that the foam has hardened before removing the old glovebag assembly.

7.6.8 Carefully reattach crane hook to the sampler and hoist above manhole. Carefully attach the sampler containment bag to the Vibra Corer Sampler per Procedure K6507. Resample per Procedure K6507.

7.6.9 The K-65 Sampling Task Team Leader will then note the incident on the Abnormal Incident Report Form and on the Field Activity Daily Log.

7.7 Vibra Corer Failure

The following is a series of steps to be followed upon failure of the Vibra Corer and ancillary equipment:

7.7.1 Upon failure of Vibra Corer equipment, stop current procedure and immediately report incident to the K-65 Sampling Task Team Leader. Describe current operations prior to failure of equipment to aid in determining cause of failure.

NOTE: Do not proceed any further with any procedure until direction from the K-65 Sampling Task Team Leader has been given and an authorization to proceed has been received.

7.7.2 Determine if the compressed air supply from the compressor is of sufficient capacity and pressure. If insufficient, repair or replace compressor.

7.7.3 If compressed air supply is of sufficient capacity and pressure at compressor, the problem may be in the hose. Visually check the hose for kinks, holes, loose fittings, or other problems.

7.7.4 If the hose appears to be in satisfactory condition, then the problem may be in the Vibra Corer head or at the fittings. The Vibra Corer must be carefully retracted using the crane. The Sampler Containment Bag must then be heat sealed in two places and the bag cut between the seals in accordance with Procedure K6507. The puncture made by the Vibra Corer through the foam must be resealed by foaming per the steps outlined in Procedure K6508.

7.7.5 Carefully set the Vibra Corer on the plastic sheeting as designated by the K-65 Sampling Task Team Leader. Carefully disconnect the crane hook from the sampler head assembly. Check the fittings where they connect to the Vibra Corer head to determine if they are loose or improperly connected. A leak detectant such as "Snoop" can be used to determine if there are any leaks in the fittings.

91

7.7.6 Carefully disconnect the air compressor hose from the sampler head. Inspect the fittings to make sure air is flowing through the hose. If no air is flowing through the hose and Step 7.7.2 has confirmed that the compressor is producing air at sufficient capacity and pressure, the problem is in the hose. Replace or repair hose and check for any obstructions in the hose. Verify air is flowing through the new or repaired hose.

7.7.7 If air is flowing through the hose, then the problem may be in the Vibra Corer sampler head. Check the sampler head lubricator to ensure that it is filled with proper lubricant at the proper level. Refill reservoir with proper lubricant to the proper level as described in the manufacturer's operating manual.

7.7.8 If the lubricant reservoir is filled at the proper level, reconnect fitting to the sampler head and reopen air supply valve. If Vibra Corer head does not operate, then the sampler head may be defective. Check the manufacturer's operating manual for additional directions.

7.7.9 If the procedures and suggestions in the manufacturer's operating manual have been followed and the unit still fails to operate, the head is defective and must be repaired or replaced. Transport the entire Vibra Corer to the Preparation Trailer in accordance with Procedure K6509. Remove and save any sample collected and label according to Procedure K6511. Remove the defective head in accordance with the steps outlined in Procedure K6509 and decontaminate sampler head and casing conforming with Procedure K6516. Replace the head with an operating unit.

7.7.10 Connect the air compressor hose to the replaced sampler head and verify that the head operates properly. Reassemble Vibra Corer and replace with a new sample tube and an uncontaminated casing. Transport assembly to the silo.

7.7.11 Prior to resampling, the polyethylene glovebag assembly must be replaced. Replace old glovebag assembly per Procedure K6508, and install a new glovebag assembly per Procedure K6507.

NOTE: Visually ensure that the reinjected foam has hardened before removing the old glovebag assembly.

7.7.12 Carefully reattach crane hook to the sampler head and hoist above manhole. Carefully attach the Sampler Containment bag to the Vibra Corer sampler casing per Procedure K6507. Resample per Procedure K6507.

7.7.13 The K-65 Sampling Task Team Leader will then note the incident on the Abnormal Incident Report Form and on the Field Activity Daily Log.

91

7.8 Spills

7.8.1 Isolate and contain the spill; do not allow the spill to migrate. If the spill is on a hard surface, such as concrete or tile, and relatively small, wipe it up or pick up the spilled material and place it in an approved waste container.

7.8.2 Notify the K-65 Sampling Task Team Leader or his designee of the spill and warn nearby personnel of the possible danger.

7.8.3 If the spill is on open ground, contain the spill. Because the material to be handled from the silo is a solid or thick sludge, the material may be scooped up with a shovel and placed in waste containers. Some soil may have to be picked up.

7.8.4 Health and Safety personnel will be required to monitor the area to determine exposure levels and subsequent decontamination procedures.

7.8.5 If the spill occurs inside a building or trailer, follow the above procedures. In addition, initiate ventilation and, if possible, turn on the Radon Removal System. Do not allow the spill to spread outside the building or trailers; close the doors.

7.8.6 Disallow unnecessary entry of personnel into the area and minimize personal exposure by leaving the area after the initial containment is complete.

7.8.7 If personnel are contaminated, follow procedures outlined in the Health and Safety Plan for personnel decontamination.

7.8.8 If the spill is major (e.g., if the silo has a major rupture) attend to any injured, evacuate the area, and immediately notify the K-65 Sampling Task Team Manager or the K-65 Sampling Task Team Leader.

7.8.9 Do not reenter any spill zone without approval of the K-65 Sampling Task Team Leader.

7.8.10 Record the spill on an Abnormal Incident Report Form and on the Field Activity Daily Log.

7.9 Refoaming Failure

7.9.1 Upon failure of the foaming operation, stop current procedure and immediately report incident to the K-65 Sampling Task Team Leader. Describe current operations prior to failure to aid in determining cause of failure.

91

NOTE: Do not proceed any further with any procedure until direction from the K-65 Sampling Task Team Leader has been given and an authorization to proceed has been received.

7.9.2 Determine cause of failure and carefully attempt to rectify the situation. If the foam supply chamber is empty replace in accordance with Procedure K6508.

7.9.3 If the foam supply chamber is filled and further refoaming attempts fail, the foam injection hose may be obstructed or the quick connect valve assembly may be defective. The quick connect assembly at the end of the foam lance should be checked by connecting a mating connector and refoaming in a pail as designated by the K-65 Sampling Task Team Leader. If refoaming attempts fail, replace the defective connector. If refoaming occurs successfully, the connector on the foam injection hose must be replaced using a bag-in bag-out procedure.

7.9.4 Once the defective connector(s) have been replaced, reattempt the foaming operation. Should refoaming occur successfully, continue refoaming operations per Procedure K6508. The K-65 Sampling Task Team Leader will then note the incident on the Abnormal Incident Report Form and on the Field Activity Daily Log.

7.9.5 If refoaming attempts are unsuccessful, the hose may be obstructed and must be replaced. Replace defective hose assembly using a bag-in bag-out procedure.

7.9.6 Once the defective hose assembly has been replaced, reattempt the foaming operations. If refoaming is successful, continue refoaming operations per Procedure K6508. The K-65 Sampling Task Team Leader will then note the incident on the Abnormal Incident Report Form and on the Field Activity Daily Log.

7.9.7 If refoaming attempts are unsuccessful, stop procedure and report to the K-65 Sampling Task Team Leader. A new procedure must be formulated at that time.

7.10 Radon Removal System Failure

7.10.1 Shut down all work that relies on the operation of the Radon Removal System

7.10.2 Ductwork Failure

7.10.2.1 Shut down Radon Removal System fan.

7.10.2.2 Close dampers D-01, D-02, D-11, D-13, D-14 and all carbon bed inlet dampers that are open.

7.10.2.3 After system is repaired refer to Procedure K6510 for startup.

156

91

7.10.3 Power or Instrument Failure

7.10.3.1 Isolate the unit by closing the open dampers.

7.10.3.2 Determine the cause of the failure and correct.

7.10.3.3 Refer to Procedure K6510 for startup.

7.11 Transportation Accidents

7.11.1 On-site transportation accidents would include

7.11.1.1 Accidents that involve personal injury, see Section 7.2.

7.11.1.2 Accidents which result in a spill of core material, see Section 7.8

7.11.1.3 Accidents which involve a fire, see Section 7.12

7.11.1.4 For accidents in which none of the above apply, actions required will be determined by the nature of the problem. The K-65 Sampling Task Team Leader must be notified and an appropriate response determined. If the truck cannot be moved and the trailer is not damaged, then another truck could be used to move the trailer to its destination. If the trailer is damaged and cannot be easily moved, then the core will have to be transferred to another trailer for transport to its final destination.

7.11.1.5 After the core has been secured, appropriate measures to repair the damaged equipment can be instigated. These measures will have to be developed at the site and approved by team management.

7.11.1.6 The Abnormal Incident Report Form and the Field Activity Daily Log should be completed.

7.11.2 Off-site Accidents

7.11.2.1 For off-site accidents, the primary concern should be personal safety and health and safety of the public. Local authorities and the K-65 Sampling Task Team Leader should be notified immediately. The nature of the incident and integrity of the cargo should be determined.

7.11.2.2 If the core sample is damaged and is exposed, notification and isolation of the area are essential. If possible, the material should be contained.

7.11.2.3 An appropriate emergency response person must be made available to assist the local authorities in the mitigation of the incident.

91

7.11.2.4 If the core sample is not damaged, the accident investigation will follow standard contractor and local procedures.

7.11.2.5 The Abnormal Incident Report Form and Field Activity Daily Log should be completed along with any other necessary forms.

7.12 Fires

7.12.1 The primary concerns in the event of a fire are personal injuries, contamination, and extinguishing or controlling the fire.

7.12.2 If anyone is injured, refer to Section 7.2 for instruction.

7.12.3 Notify the Fire Brigade, then notify the K-65 Sampling Task Team Manager, K-65 Sampling Task Team Leader, or their designee.

7.12.4 If the fire is small enough and does not present a radiological contamination problem, fire extinguishers may be used to suppress the fire until the Fire Brigade arrives.

7.12.5 If the fire is severe enough that fire extinguishers are insufficient, remove any injured personnel, secure any equipment in danger, evacuate to a safe distance, and wait for the Fire Brigade.

7.12.6 Should a radiological hazard exist, evacuate according to WMCO procedures and await clearance from WMCO and the K-65 Sampling Task Team Leader for reentry.

7.12.7 After the fire, cleanup and decontamination should follow WMCO- and contractor-developed procedures prior to resumption of sampling or repair of storage structures.

7.12.8 The K-65 Sampling Task Team Leader or his designee should note the event on an Abnormal Incident Report Form and on the Field Activity Daily Log.

7.13 Windstorm, Lightning, Tornado

7.13.1 Sampling operations should cease during severe weather conditions, especially operations with the crane and on top of the silos in high winds and lightning. Under no circumstances should anyone be on top of the silo or in the crane during a lightning storm. Personnel should go to a safe location inside a designated building or trailer until the storm has passed.

91

7.13.2 Personnel will institute a general housekeeping practice that all loose material is kept to a minimum and/or safely tied down. Severe thunderstorms, lightning, and tornados do occur during the spring and summer in Ohio.

7.13.3 The trailers should be secured so that the expected wind conditions will not adversely affect their safety or integrity.

7.13.4 Sampling should continue only after the danger of severe weather conditions is past and any damage is cleaned up according to the procedure appropriate for that equipment or event.

7.13.5 An Abnormal Incident Report Form and Field Activity Daily Log should be completed by the K-65 Sampling Task Team Leader.

7.14 Seismic Event

7.14.1 If a seismic event occurs during the sampling process, all work should cease and an assessment of damage be taken.

7.14.2 If any injuries occur, refer to Section 7.2 for instructions.

7.14.3 If there is neither significant damage nor any consequential impact, resume sampling after concurrence with the K-65 Sampling Task Team Leader.

7.14.4 If significant damage does occur, refer to the appropriate procedure for that equipment or event and proceed with mitigation. Do not resume sampling until clearance is given by the K-65 Sampling Task Team Leader.

7.14.5 Check the sample storage building for damage. If the samples have been damaged, refer to Section 7.8 for cleanup procedures

7.14.6 The event should be recorded on the Abnormal Incident Report Form and the Field Activity Daily Log by the Sampling Task Team Leader.

7.15 Flood

7.15.1 Flooding of the area during the sampling event by rising backwater is not likely. Flash flooding from a heavy rainstorm could occur, however.

7.15.2 Work should not be in progress during a rainstorm heavy enough to cause flash flooding as per Section 7.13.

91

7.15.3 Safe areas on high ould be provided and personnel should assemble th railers and storage and archive building should be a not subject to flash flooding.

7.15.4 If the buildings c laced on high ground and a flash flood occurs, do n he area until the water subsides. Examine ings and their supports for stability and make repairs. If the crane has been undermined, refer t 7.4 for instructions.

7.15.5 Samples should be s that they cannot be washed away. If they are ay, every attempt should be made to safely retrieve

7.15.6 The K-65 Sampling T Leader should be notified of the event and an Abnorm t Report Form and Field Activity Daily Log completed.

7.16 Intruder

7.16.1 The sampling and st s will be inside the security fence at the FMPC. is continuously patrolled and an intruder is unlik ver, if an intruder is spotted, immediately notify ng Task Team Leader who should then notify WMCO se sonnel.

7.16.2 Report to the K-65 ask Team Leader any unusual occurrences that ma intrusion into the area when operating and sampl nel were away.

7.16.3 Complete an Abnorma Report Form and note on the Field Activity Dail each case or perceived case of intrusion.

7.17 Failure of On-site Examinat ent

7.17.1 Failure of the Rado System will require shutdown of this portion of the l the system can be repaired.

7.17.2 Failure of the Audi corder, 35 mm camera, or Geiger counter would not c a serious personnel hazard. Delay the completio n-site examination process until the equipment paired. Consult manufacturer's information to trou any failures of the equipment.

7.17.3 Extra tapes, batter film, etc. should be kept on site.

7.17.4 Equipment malfunct i be documented on the Abnormal Incident Report For the Field Activity Daily Log.

160

91

7.18 Documentation Errors

7.18.1 Every effort should be made to ensure that all samples are properly and securely labeled, referenced, and accompanied by the completed chain-of-custody forms.

7.18.2 Should a sample be discovered with missing sample identification or duplicate sample identification the team management should be notified immediately.

7.18.3 An investigation into the sample history should include personnel handling the sample, sample number sequences, and missing sample numbers. The sample identification should be evident by finding a "missing" sample sequence number. If the number is a duplicate, the sample may have to be discarded.

7.18.4 If the investigation does not reveal the identity of the sample, it cannot be utilized in the program.

7.18.5 Missing or incorrectly documented chain-of-custody forms should be reported to the team management.

7.18.6 Documentation discrepancies shall be reported on the Abnormal Incident Report Form and on the Field Activity Daily Report. In addition, the the Quality Assurance Project Plan addresses this problem and may require additional actions (see Sections 6.0, 7.0, and 9.0).

141

ABNORMAL INCIDENT REPORT FORM

Date of Incident: _____
Supervisor: _____

PROCEDURE INVOLVED
Procedure Number: _____
Procedure Name: _____

DESCRIPTION OF INCIDENT _____

INJURIES (Yes No)
Nature of Injury: _____
Name of Injured: _____
Address: _____

Phone Number: _____

DAMAGE TO EQUIPMENT
Nature of Damage: _____

Equipment Involved: _____

SPILL OR RELEASE (Yes No)
Nature of Spill: _____

Materials Involved: _____

CORRECTIVE ACTION TAKEN _____

ADDENDUM NO. 2 TO FERNALD RI/FS HEALTH AND SAFETY PLAN, REVISION 3

HEALTH AND SAFETY PLAN
FOR SAMPLING OF THE K-65 AND METAL OXIDE SILOS
AT FMPC, FERNALD, OHIO

April 1988

91

CONTENTS

		Page
1.0	PURPOSE	1-1
2.0	SITE BACKGROUND	2-1
	2.1 Site Description and History	2-1
	2.2 K-65 Silo History and Description	2-1
	2.3 K-65 Silo Waste Characteristics	2-1
	2.3.1 Chemical Characteristics	2-2
	2.3.2 Radiological Characteristics	2-2
	2.4 Metal Oxide Silo History and Description	2-2
3.0	ORGANIZATION AND RESPONSIBILITIES	3-1
4.0	MEDICAL PROGRAM	4-1
5.0	PERMISSIBLE EXPOSURE LIMITS/GUIDELINES	5-1
	5.1 Chemical Exposure Guidelines	5-1
	5.2 Radiological Exposure Limits	5-1
6.0	EMPLOYEE TRAINING	6-1
7.0	ENGINEERING CONTROLS	7-1
8.0	REGULATED ZONES/AREAS	8-1
9.0	PERSONNEL PROTECTIVE EQUIPMENT	9-1
10.0	MONITORING EQUIPMENT	10-1
11.0	ALARA CONSIDERATIONS	11-1
12.0	RADIATION WORK PERMIT	12-1
13.0	MEDICAL/SITE EMERGENCY	13-1
14.0	GENERAL SAFETY REQUIREMENTS	14-1
15.0	HEAT STRESS	15-1
REFERENCES		

164

91

TABLES

Number		Page
2-1	Elemental Characterization of the FMPC K-65 Wastes	2-3
2-2	Elemental Characterization of the FMPC Metal Oxide Wastes	2-6
3-1	Key Personnel and Emergency Numbers	3-2
5-1	Occupational Radiation Exposure Standards	5-2
5-2	Exposure of Individuals and Population Groups in Uncontrolled Areas	5-3

FIGURES

8-1	Site Control Zones	8-2

91

HEALTH AND SAFETY PLAN

1.0 PURPOSE

This Health and Safety Plan presents the specific guidelines to be followed during the sampling of the K-65 and metal oxide silos by the Sampling Task Team at the Department of Energy's Fernald Plant Site. The plan is to ensure the health and safety of the workers and general public, to comply with all federal, state, local, and Westinghouse regulations and guidelines, and to maintain exposure of workers to levels as low as reasonably achievable (ALARA).

This plan includes an evaluation of the possible hazards that may be encountered by the sampling personnel, training requirements, protective equipment requirements, monitoring and engineering controls that will be used to reduce workers' exposures to ALARA, and the measures to control the release of hazardous and radioactive materials to the environment. The requirements of the procedures may change as work progresses due to changing conditions, but no reduction in requirements will be made without prior approval by the Project Health and Safety Manager, or his designee. A complete discussion of the health and safety program requirements for the Fernald RI/FS can be found in the Fernald RI/FS Health and Safety Plan (Revision 3).

91

2.0 SITE BACKGROUND

2.1 SITE DESCRIPTION AND HISTORY

The FMPC was constructed and began operations at the Fernald site in the early 1950s. The United States Atomic Energy Commission, predecessor to the DOE, established this integrated production complex for processing uranium and its compounds from natural uranium ore concentrates for U.S. Government needs. Initially, uranium ore concentrates, and presently, recycled materials, are converted to either uranium oxides or uranium ingots and billets. They are machined or extruded into tubular form for production reactor fuel cores and target fuel element fabrication.

From 1953 through 1955, the FMPC refinery processed pitchblende ore from the Belgian Congo. No chemical separation or purification was performed on the ore before it arrived at the FMPC. Beginning in 1956 the refinery feed consisted of uranium concentrates (yellowcake) from Canada and the United States.

No uranium ore is currently being received at the FMPC. The basic process performed now is the conversion of uranium-containing residues, uranium hexafluoride, and uranium tetrafluoride to uranium metal.

2.2 K-65 SILOS HISTORY AND DESCRIPTION

The two K-65 silos, located on the west side of the FMPC, were constructed in 1951 and 1952. The silos are used for storage of radium bearing residues, a by-product of the uranium ore processing. The silos are structurally solid with the exception of a 20-foot-diameter center section of the dome. At present, two interim stabilization projects are underway to provide radon release control and provide some structural reinforcement to the degrading condition of the dome center section. Phase I, the external foam application results are reported in WMCO: TD: 88-056 letter and attached report. Phase II, the internal foam application is scheduled for spring 1988.

2.3 K-65 SILO WASTE CHARACTERISTICS

The current volume of K-65 residues contained in the silos is estimated to be 211,115 cubic feet (8800 M.T.). The chemical and radiological characteristics

of the K-65 residues are summarized in Paragraphs 2.3.1 and 2.3.2 below. The total void volume currently existing is estimated to be 87,500 cubic feet (No. 1 of 38,000 cubic feet and No. 2 of 48,000 cubic feet), which will be filled with foam before the K-65 silos are sampled. The foam application will reduce radon emissions and provide additional structural reinforcement for the silo domes.

2.3.1 Chemical Characteristics

Inorganic constituent analyses for nonradiological elements in the K-65 residue at the FMPC are summarized in Table 2-1. Approximately 40 percent of the K-65 waste is composed of silicates (SiO_2). The other constituents comprising 1 percent or more of the residue include calcium, iron, magnesium, and lead. No data for organic constituents of the K-65 residues are available.

2.3.2 Radiological Characteristics

The radiological constituents of the K-65 residue have been estimated to include 11,200 kg of uranium (0.71 percent U-235) and 1,652 Ci of radium (Ra-226). The radium concentration is 2.0 X 105 pCi/g. Radon flux measurements made in October 1984 at 24 locations on each silo ranged from 123 $pCi/m^2/sec$ to more than 3×10^7 $pCi/m^2/sec$. The highest flux values were obtained on surfaces that contained obvious cracks.

At present, the radiation exposure rate on the surface of the K-65 silo domes is approximately 145 and 185 mrem/hour, and the radon emission levels monitoring results are 45 Pci/liter and 20 Pci/liter, respectfully. With Phase II completed, the radiation levels on the surface of the domes are estimated to be approximately 55 to 60 mrem/hour, and radon emission levels are estimeate to be near zero.

2.4 METAL OXIDE SILO HISTORY AND DESCRIPTION

Metal Oxide Silo 3 contains waste raffinate slurries that had been dewatered in an evaporator and spray calciner to produce a dry, powder-like waste. This calcined waste was pneumatically conveyed to the silo. The silo inventory

contains an estimated 5100 cubic yards of metallic oxide, 18,000 kg uranium, 130 kg uranium 235, and an estimated total of 23 curies uranium 235. The elemental constituents are listed in Table 2-2.

Table 2-1. Elemental Characterization of the FMPC K-65 Wastes[a] September 1970

Constituent	Percentage	Weight (metric tons)
Metals		
Ag	<0.002	0.176
Al	0.875	77
As	<0.03	<2.64
Au	<0.005	0.44
B	0.015	1.32
Ba	0.07	6.16
Be	ND[b]	--
Bi	ND	--
Ca	3.89	342
Cd	ND	--
Cl	No data	--
Co	0.175	15.4
Cr	0.012	1.06
Cu	0.05	4.4
F	No data	--
Fe	1.2	105.6
Hg	ND	--
La	0.089	7.83
Mg	1.25	110
Mn	0.02	1.76
Mo	0.02	1.76
Na	0.7	61.6
Ni	0.225	19.8
Pb	5.1	448.8
PO_4	ND	--
Sb	ND	--
Se	No data	--
SiO_2	40.76	3587
Sn	0.008	0.7
SO_4	No data	--
Ti	0.07	6.16
V	0.021	1.85
Zn	ND	--
Zr	0.02	1.76

Table 2-1. (Continued)

Constituent	Percentage	Weight (Metric Tons)
Rare Earths		
Dy	0.003	0.26
Er	ND	--
Eu	ND	--
Gd	0.004	0.35
Ho	<0.0015	0.13
Lu	ND	--
Sm	0.0048	0.42
Tb	ND	--
Tm	<0.0008	0.07
Y	0.004	0.35
Yb	0.0006	0.05

[a]Percentage and weight are based on sample analysis and do not account for total reported amount (8800 m.t.) of K-65 residues.
[b]ND = not detected.

Ref: FSAR for K-65 storage silos radon mitigation and dome reinforcement project.

91

Table 2-2. Elemental Characterization of the FMPC Metal Oxide Wastes

Constituent	Silo 3[a] (%)	MT
Ag	<0.002	<0.07
Al	280	98.67
As	b	
Au	<0.004	<0.14
B	0.02	0.70
Ba	0.02	0.70
Be	b	b
Bi	b	b
Ca	4.10	144.48
Cd	<0.28	
Cl	6.70	
Co	0.25	8.81
Cr	0.05	1.76
Cu	0.25	8.81
F	11.63	
Fe	6.40	225.52
Hg	b	b
La	b	b
Mg	8.50	229.52
Mn	0.49	17.27
Mo	0.06	2.11
Na	3.80	133.90
Ni	0.65	22.90
Pb	0.25	8.81
PO_4	19.40	683.62
Sb	<0.015	<0.53
Se		b
SiO_2	13.10	461.62
Sn	0.04	1.41
SO_4	19.64	692.08
Ti	0.06	2.11
V	0.10	3.52
Zn	<2.11	
Zr	0.03	1.06
Rare Earths		
Dy	<0.003	<0.11
Er	<0.21	
Eu	<0.04	
Gd	<0.006	<0.21
Ho	<0.003	<0.11
Lu	<0.07	
Sm	<0.006	<0.21
Tb	b	b
Tm	<0.002	<0.07
Y	0.008	0.28
Yb	0.004	0.14

[a]NLO analyses of Silo 3 Metal Oxides.
[b]No data.

m2

3.0 ORGANIZATION AND RESPONSIBILITIES

The silo sampling project will take place under Task 3.7 of the Fernald RI/FS. The RI/FS organization structure with the responsibilities is outlined in Section 7A of the RI/FS Health and Safety Program Plan (Revision 3). Table 3-1 is a listing of key personnel and emergency numbers for notification if required at the site.

Table 3-1. Key Personnel and Emergency Numbers

WMCO EMERGENCY	513-738-6511
HAMILTON COUNTY EMERGENCY	513-825-2260
BUTLER COUNTY EMERGENCY	513-867-5700
Project Health & Safety Officer Rick Greene, IT	615-482-9707
Site Health & Safety Officers Dale Anderson, IT Art Farmer, ASI	513-738-3100
Project Director Dick Wilde, ASI	513-738-3100
Site Manager Bob Lenyk, ASI	513-738-3100
On-Site Technical Manager Bob Galbraith	513-738-3100
Project Coordinator Jerry Krieger, WMCO	513-738-6854
WMCO Manager of Health Physics Bob Rogers	513-738-6837
Contractor Health & Safety Coordinator Larry Hubschmann, WMCO	513-738-6897

4.0 MEDICAL PROGRAM

Requirements are contained in the Fernald RI/FS Health and Safety Plan (Revision 3).

5.0 PERMISSIBLE EXPOSURE LIMITS/GUIDELINES

5.1 CHEMICAL EXPOSURE GUIDELINES

The prescribed standards for chemical exposures at DOE facilities are the current threshold limit values (TLVs) adopted by the American Conference of Governmental Industrial Hygienists (ACGIH). The current TLVs are found in the 1987-1988 ACGIH TLV Handbook. The most limiting chemical constituents by hazard and abundance are listed below with their TLVs:

	Concentration in Air
Lead	50 $\mu g/m^3$
Silicates	0.1/mg/m^3

5.2 RADIOLOGICAL EXPOSURE LIMITS

Radiation exposures will be maintained as low as reasonably achievable within the standards prescribed in DOE Order 5480.1, Chapter XI, Requirements for Radiation Protection. The concentration guides given in Attachment 1, Table 1, Column 1 of the order will be used in evaluating the adequacy of health protection measures against airborne radioactivity in regulated areas.

Radiation protection standards for occupationally exposed persons and for members of the public are given in Tables 5-1 and 5-2, respectively.

Exposure to ionizing radiation and chemical hazards shall be controlled by the proper use of a Radiation Work Permit as outlined in Section 13.0 and WMCO-FMPC-ESH-P-30-002 Procedure.

91

Table 5-1. Occupational Radiation Exposure Standards[a]

Type of Exposure	Exposure Period	Dose Equivalent (Dose or Dose Commitment[b] in rem)
Whole body, head and trunk, gonads, lens of the eye[c], red bone marrow, active blood-forming organs	Year	5
	Calendar quarter	3
Unlimited areas of the skin (except hands and forearms); other organs, tissues, and organ systems (except bone)	Year	15
	Calendar quarter	5
Bone	Year	30
	Calendar quarter	10
Forearms	Year	30
	Calendar quarter	10
Hands	Year	75
	Calendar quarter	25

[a]From DOE Order 5480.1A.

[b]To meet the above dose commitment standards, operations must be conducted in such a manner that it would be unlikely that an individual would assimilate in a critical organ by inhalation, ingestion, or absorption, a quantity or radionuclide or mixture of radionuclides that would commit the individual to an organ dose that exceeds the limits specified in the above table. Dose commitment is defined as the dose equivalent (rem) received by specific organs during a period of one calendar year, that was the result of radionuclide uptakes by a person occupationally exposed.

[c]A beta exposure below a maximum energy of 700 KeV will not penetrate to the lens of the eye; therefore, the applicable limit for these energies would be that for the skin (15 rem/yr).

177

Table 5-2. Exposure of Individuals and Population Groups in Uncontrolled Areas[a]

Type of Exposure	Annual Dose Equivalent or Dose Commitment[b]	
	Based on Dose to Individuals at Point of Maximum Probable Exposure (rem)	Based on Average Dose to a Suitable Sample of the Exposed Population (rem)
Whole body, gonads, or bone marrow	0.5	0.17
Other organs	1.5	0.5

[a]From DOE Order 5480.1A.
[b]In keeping with DOE policy on lowest practicable exposures, exposure to the public shall be limited to as small a fraction of the respective annual dose limits as is reasonably achievable. Dose commitment is defined as the dose equivalent (rem) received by specific organs during a period of one calendar year, that was the result of radionuclide uptakes by a person.

6.0 EMPLOYEE TRAINING

Requirements for employee training are contained in the RI/FS Health and Safety Plan (Revision 3).

Mock-run training will be conducted on Silo 4 to familiarize personnel with the procedures to be used on Silos 1, 2, and 3.

91

7.0 ENGINEERING CONTROLS

One of the primary means of reducing personnel exposure to radiation is to use good, sound engineering practices in designing, shielding, containments, and material handling practices for the material to be removed from the silos during the sampling project. Containments may be used to control the spread of contamination or release of contaminants to the environment or a combination of these factors. Shielding against exposure to ionizing radiation can be a very effective tool for the ALARA concept without hindering the workers ability to conduct their tasks in an expeditious manner. Sound engineering can reduce the requirements of personnel protective clothing to a minimum and thus increase the productivity of the work force.

Methods considered for reducing radiation exposure are:

- Shielding during the core sectioning;
- Use of a bandsaw for Lexan tube cuts;
- Shielding for sample/core storage;
- Minimize workers' time at the source;
- Maximize the workers' distance from source; and
- Radon Removal System.

8.0 REGULATED ZONES/AREAS

A site control program has been developed to control worker exposure to radioactive and hazardous materials and to prevent the spread of contamination. The FMPC site has been divided into three general work zones as shown in Figure 8-1. These work zones have been established based on worker exposure potential, established site control zones, and contamination control considerations.

Zone 1 is the FMPC Process Area. This area includes both the Production Area and the Waste Storage Area. Personnel access to the Process Area will be through the change rooms in the Service Building. Personnel entering the Process Area are required to change into WMCO issued undergarments, coveralls, and boots. Showers, clothing changes, and contamination monitoring are required when leaving the Process Area. Vehicle access to the Process Area will be through the South Gate. Vehicles leaving this zone will be monitored for contamination. Eating, drinking, and smoking are permitted only in designated areas within this zone.

Within Zone 1, an exclusion zone shall be established around the three silos. This exclusion area shall have its own control point for contamination control and to limit the number of personnel in the area.

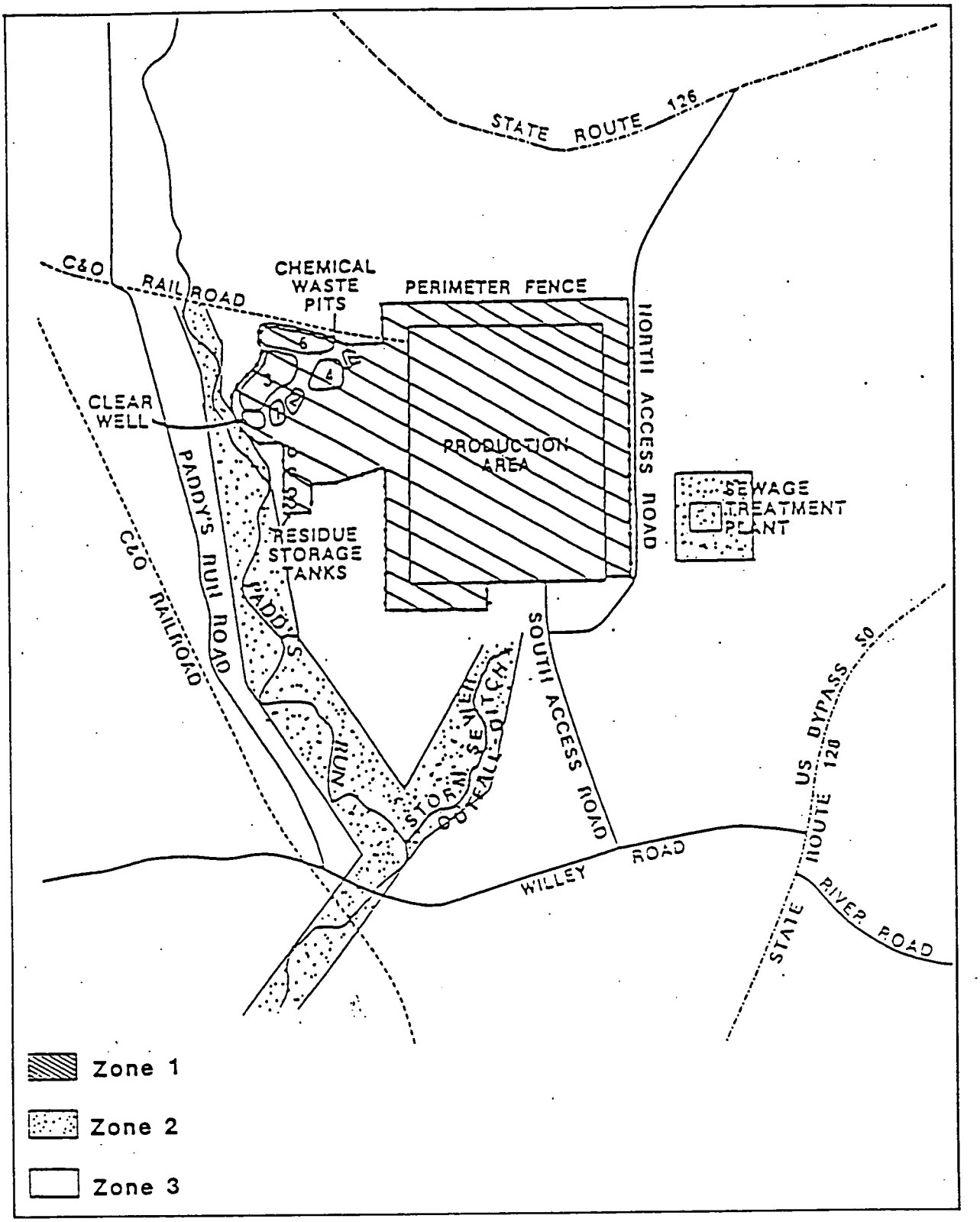


Figure 8-1. Site Control Zones

91

9.0 PERSONNEL PROTECTIVE EQUIPMENT

Based on current information, the following personnel protective equipment (PPE) is prescribed for the sampling of the silos:

Enter Zone 1:

- Safety glasses;
- Safety shoes (supplied by WMCO); and
- Overalls (supplied by WMCO).

Enter Exclusion Area at Silo Sampling Work Site:

- Glove liners (cotton);
- Shoe covers (PVC);
- Tyvek coveralls (hooded);
- Glove (outer) rubber/leather;
- Shoe covers (outer) disposable (latex);
- Full-face respirator with organic filter and HEPA filter No. GMA-H; and
- Hard hats.

A complete list of PPE requirements shall be stated in the WMCO Radiation Work Permit (Section 12.0).

91

10.0 MONITORING EQUIPMENT

The components of the Health Physics and Industrial Hygiene monitoring program are contained in the Fernald RI/FS Health and Safety Program Plan (Revision 3).

The specific procedure to be followed for monitoring and controlling the health and safety of this project will be as follows.

Personnel monitoring required are as a minimum:

- One Radon dosimeter;
- One Pocket dosimeter (self-reading);
- One Thermoluminescence detector (TLD); and
- Bioassay program for sampling personnel.

91

11.0 ALARA CONSIDERATIONS

Protection of workers in the United States is controlled by Federal regulations which establish exposure limits. However, regardless of quantitative limits incorporated into standards, pertinent regulations require that no radiation dose be permitted that can practically and reasonably be avoided. This principle, called the ALARA concept, is the keystone of contemporary radiation exposure reduction efforts.

ALARA involves both a philosophical approach to radiation protection and a defined set of technologies that will minimize exposure at an acceptable cost. ALARA is a moving target because the emergence of improved methods or the development of radiation protection practices may reduce radiation exposures further.

It is Contractor's policy to maintain exposures to radiation at levels that are as low as reasonably achievable. ALARA is achieved through proper training of employees, adequate work procedures, good housekeeping practices, and, when required, use of protective equipment. Each individual working in radiologically controlled areas is required to strictly adhere to established radiation protection and ALARA rules, regulations, and concepts. For example:

- Minimizing radiation exposures where practical by the use of time, distance, shielding, and administrative controls (the methods are included in Section 8.0 of this plan);
- Engineering the exposure to ionizing radiation out of the work to be accomplished (ALARA review document addresses the use of shielding for exposure to radiation control); and
- Mock-run training of selected work crew.

91

12.0 RADIATION WORK PERMIT

It is the policy of WMCO that Radiation Work Permits shall be issued for the performance of any task that involves radioactive material or for which there is no approved work procedure. Radiation Work Permits are also issued for tasks performed under approved work procedures if these tasks involve work in high radiation fields or in areas where radiation fields are variable or unknown. WMCO shall maintain personnel radiation dose ALARA at FMPC. Radiation Work Permits shall be obtained as outlined in WMCO-FMPC ESH-P-30-002 Procedure.

The primary purpose of the Radiation Work Permit is to control non-routine or periodic-routine tasks that involve the potential for significant radiation exposures. The Radiation Work Permit identifies the work activity, the associated radiological conditions, and the protective measures required to accomplish the work.

186

91

13.0 MEDICAL/SITE EMERGENCY

Reporting procedures are contained in the RI/FS Health and Safety Plan (Revision 3).

In case of accident or injury, the supervisor must fill out a "Supervisor's Employee Injury Report" and give it to the Site Health and Safety Officer.

91

14.0 GENERAL SAFETY REQUIREMENTS

The following general safety requirements will be followed in order to minimize the occurrence and potential adverse affects of unsafe or hazardous conditions at the site:

- Contaminated protective equipment, such as respirators, hoses, boots, etc., shall not be removed from the regulated area unless they are properly packaged and labeled. Waste shall be handled per Procedure K6524 for this task.
- Legible and understandable precautionary labels shall be affixed prominently to containers of contaminated scrap, waste, debris, and clothing.
- Contaminated materials shall be stored in tightly closed containers in well ventilated areas.

91

15.0 HEAT STRESS

Guidelines have been developed by the National Institute for Occupational Safety and Health (NIOSH) for monitoring heat stress and other physiological factors and are published in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1986). These guidelines are presented in the Fernald RI/FS Health and Safety Program Plan (Revision 3). Specific methods to be used on this task for personnel safety are:

- Team members must observe each other for signs of toxic exposure. Indications of adverse effects include, but are not limited to:
  - Changes in complexion and skin discoloration;
  - Changes in coordination;
  - Changes in demeanor (behavior);
  - Excessive salivation and pupillary response; and
  - Changes in speech pattern.
- Team members should inform each other of nonvisual effects of toxic exposure such as:
  - Headaches;
  - Dizziness;
  - Nausea;
  - Blurred vision;
  - Cramps; and
  - Irritation of eyes, skin, or respiratory tract.

91

REFERENCES

Health and Safety Program Plan for the Remedial Investigation of the Feed Materials Production Center, Fernald, Ohio, Revision 3.

American Conference of Governmental Industrial Hygienists Handbook, 1986-1987.

DOE Order 5480.1A, Chapter XI, Requirements for Radiation Protection.

OSHA 29 CFR 1910.132, Personal Protective Equipment.

ANSI N13.12, Surface Radioactivity Guide.

OSHA Manual for Hazardous Waste Site Activities (1986).

10 CFR 20, Standards for Protection Against Radiation.

Fernald RI/FS Environmental, Health, and Safety Plan, Addendum (September 29, 1987).

Final Safety Analysis Report for K-65 Storage Silos (October 1987).

NavSea 0989-015-9000 (Rev. 4, October 1975), Chapter 4, Paragraph 4.3.4, Radiological Fundamentals.

WMCO-FMPC ESH-P-30-002, Procedure for Filling Out Radiation Survey and Work Permit Form.

91

ALARA REVIEW OF
SAMPLING PLAN OF K-65
AND METAL OXIDE SILO
AT FERNALD, OHIO

PRE1258COV
03/31/88 F3

191

91

ALARA REVIEW SUMMARY

An ALARA Review of the K-65 and Metal Oxide Silo Sampling Plan was conducted per the Statement of Work, using the Guidelines of DOE/EV/1830-TS Publication, Radiation Work Practices Handbook and Good Engineering Practices.

The estimated radiation exposure for the K-65 and Metal Oxide Silo sampling project is a total of 4.268 Rem. Supporting calculations are included as attachments. Major contributions to the estimated dose are the (1) Sampling Phase of Silos 1 and 2, (2) on-site survey/sectioning of cores from Silo 3, (3) on-site survey/sectioning of cores from Silos 1 and 2, and (4) foaming operations of the cored holes. Using the time, distance, and shielding components of ALARA, the component that has the most input to dose reduction in this project is shielding. This component will be usable on Items 2 and 3 (above). For Items 1 and 4, due to the requirement that no additional weight be loaded on the domes because of their structural condition, the components of time and distance shall be used (i.e., restrict the number of personnel on or near the dome and establish stay times for work in higher dose rate areas). Required handling of samples and guiding the Vibra Corer into the store pipe of each manhole are essential for collection of representative samples. Shielding with either lead blankets or a shield wall along the core during sectioning is recommended for operator dose reduction. The use of a bandsaw for the cutting of core samples is also recommended.

Shielding Design for Sectioning Cores, Inspection of Cores, Foaming the Core Holes, Etc.

Foaming Operation

1. No additional weight shall be applied to the domes. This makes the use of shielding on the domes not applicable for this task.

2. Time requirements to foam a core hole are conservative until a mock up test can be performed for a true feeling of the time requirement. An estimated value of 1 hour/core using a two-man crew

192

on the dome and one man in the Background Radiation Area (i.e., 50 mRem and 5 mRem/hr respectively) was used in the ALARA review calculations.

3. Distance may be a variable that would reduce the total exposure for the two men on the dome; by using only one man in the dome, dose could be reduced by ½ or 600 mRem/12 coreholes.

Sectioning Cores

1. Distance from source is limited due to the need of the worker to be near the core for operation of Lexan tube cutting device.

2. Time of actual contact with core is dependent on the required number of cuts (samples) determined from results of inspection and surveys. Extremities dose may be lowered by the use of remote handling devices such as mechanical fingering. Whole body dose, which was used in the estimation, is at 3 feet; the only means of dose reduction is by shielding.

3. Shielding may be the only means available for whole body exposure reduction. With the use of lead for shielding, 2 inches of lead would reduce the dose rate by a factor of 10 (i.e., 190 mRem lowered to 19 mRem, and 6 mRem lowered to 0.6 rRem). This shielding may be a requirement for use of the survey instruments to reduce background radiation to an acceptable level. This reduction factor would require an engineering evaluation for load consideration and worker accessibility to the core.

Temporary shielding such as lead blankets or bricks may be considered as dose reduction methods.

ATTACHMENT A
ALARA REVIEW SUMMARY

1. Set-up phase

A. Crane positioning/setup	62.0 MREM
B. Trailer positioning/setup	3.0 MREM
C. Laydown area	1.0 MREM
D. Silo 4 mock up training	5.0 MREM
Total	71.0 MREM or 0.071 REM

2. Sampling phase

A. Silo 3 (metal oxide) with 2.5 factor	
(1) Whole body	64.5 MREM
Total	64.5 MREM or 0.065 REM
B. Silos 1 and 2 (K-65) with 2.5 factor	
(1) Whole body	1005.0 MREM
Total	1005.0 MREM or 1.005 REM

3. Site survey/sectioning/decontamination

A. Silo 3 core	
(1) Survey	17.0 MREM
(2) Sectioning	51.0 MREM
(3) Decon/handling	41.0 MREM
(4) Packaging/archiving	50.0 MREM
Total	159.0 MREM X 2.5 = 397.5 MEM or 0.398 REM
B. Silos 1 and 2 core	
(1) Survey	270.0 MREM
(2) Sectioning	575.0 MREM
(3) Decon/Handling	450.0 MREM
(4) Packaging/Archiving	150.0 MREM
Total	1445.0 MREM or 1.445 REM

4A. Site cleanup

A. Crane removal	0.4 MREM
B. Trailer removal	1.6 MREM
C. Tool removal	2.0 MREM
D. Waste cleanup	20.0 MREM
Total	24.0 MREM or 0.024 REM

4B. Foaming Operations

$$12 \text{ cores} \times \frac{1 \text{ hr}}{\text{core}} \times 2 \text{ men} \times \frac{50 \text{ MREM}}{\text{hr}} = 1200 \text{ MREM}$$

$$12 \text{ cores} \times \frac{1 \text{ hr}}{\text{core}} \times 1 \text{ man} \times \frac{5 \text{ MREM}}{\text{hr}} = 60 \text{ MREM}$$

5. Analytical phase

A. Sample receipt
B. Sample prep/reduction
C. Laboratory analysis

Summary of Exposure

Phase 1	0.71 REM
Phase 2	1.07 REM
Phase 3	1.843 REM
Phase 4A	0.024 REM
Phase 4B	1.26 REM
Phase 5	---
Total	4.268 REM (estimate with multiplier)

Actual Budget Exposure 1.707 REM X 2.5 = 4.268 REM

ATTACHMENT B
ALARA REVIEW

1. Setup phase - This phase includes time for:

   A. Crane position and setup
   B. Position of three trailers
   C. Laydown area for tools
   D. Mock up training on Silo 4

2. Estimates of Exposure and Time for items in "A" above

   A. 3 hours/location

      a. Silo 4 = 0.11 MREM/hr X 3 hr = 0.33 = 0.33
      b. Silo 3 = 0.2 MREM/hr X 3 hr = 0.60 X 2 = 1.20
      c. Silo 2 = 5.0 MREM/hr X 3 hr = 15.0 X 2 = 30.00
      d. Silo 1 = 5.0 MREM/hr X 3 hr = 15.0 X 2 = 30.00

         Total MREM 61.53

   B. Trailer Position and Setup

      a. General area of 0.05 MREM/hr
         Position and utilities = 8 hr X 0.05 = 0.4 MREM
      b. General area of 0.23 MREM/hr
         Position and utilities = 8 hr X 0.23 = 1.84 MREM

         Total MREM 2.24

   C. Laydown Area for Tools

      a. General area of 0.1 MREM/hr X 2 hr = 0.2 MREM

   D. Mock up Training of Silo 4

      a. General area of 0.1 MREM/hr
      b. Crew of six for 8 hr = 4.8 MREM

3. Total for setup phase

   1. 61.53 MREM
   2. 2.24 MREM
   3. 0.2 MREM
   4. 4.8 MREM

      68.77 MREM = 0.07 REM

91

ATTACHMENT C

1. Assumptions for Sampling Silo 3 (Metal Oxide)
   A. Silo contains approximately 2750 metric tons of waste
   B. Total of 23 curies of uranimum
   C. Dose rates are:
      1. General area = 0.2 MREM/hr
      2. Work area on dome = 0.2 MREM/hr
      3. Core = 3.8 MREM/hr at contact
      4. Core = 0.12 MREM/hr at 1 meter (3 feet)
      5. General area of truck with core = <.2
   D. Sampling time of 30 minutes (dome work time)
   E. Survey, uncase core, load time of 30 minutes
   F. Work force equal to six men
      1. Truck driver
      2. Crane operator
      3. Health physics technician
      4. Worker (dome)
      5. Worker (standby)
      6. Supervisor

2. Estimate of Exposure per Sampling Phase

   A. Whole body

1. 60 minutes at 0.2 MREM/hr	= 0.2
2. 60 minutes at 0.2 MREM/hr	= 0.2
3. 30 minutes at 0.2 MREM/hr + 30 minutes at 3.8	= 1.95
4. 30 minutes at 0.2 MREM/hr + 30 minutes at 3.8	= 1.95
5. 30 minutes at 0.2 MREM/hr + 30 minutes at 3.8	= 1.95
6. 60 minutes at 0.2 MREM/hr	= 0.2
Total	6.45 MREM

   B. Extremities per Core

4. 18 minutes at 3.8 MREM/hr	= 1.14
5. 18 minutes at 3.8 MREM/hr	= 1.14
Total	2.28 MREM
4 Cores X 2.28 MREM	4.56 MREM

3. Summary

   Exposure estimates for the sampling of metal oxide silo, excluding exposure for setup and removal of crane service. This estimate is covered under a separate heading for total estimated exposure.

   Total whole body exposure = 25.8 MREM

   Total 25.8 MREM for 4 Cores

4. This estimate is for ideal conditions; if the normal problems are encountered, a safety factor of 2.5 will be used in the final total job exposure estimate.

   25.8 X 2.5 = 64.5 MREM (metal oxide silo)

INTERNATIONAL TECHNOLOGY CORPORATION

By R. Meyer Date 3-24-88 Subject K-65 & Metal Oxide Silo Alara Review Sheet No. 1 of 4

Chkd. By VAM Date 3-24-88 Proj. No. 602 T 3.7

0.5cm. X 0.5cm.

Approved:

Ref: Report from B. Frederick
Silo Contains ≈ 2750 metric Tons of Waste
Uranium Curie Content of 23

$$\frac{2750\ mT}{.9\ \frac{mT}{Ton}} \times 2000\ \frac{lbs}{Ton} = 6{,}113{,}889\ lbs$$

$$\text{Estimated Volume} = 5100\ cu.yd \times 27\ \frac{ft^3}{cu\ yd} = 137{,}700\ ft^3$$

$$\text{Estimated Waste Weight} = \frac{6{,}113{,}889\ lbs}{137{,}700\ ft^3} = 44.4\ \frac{lbs}{ft^3}$$

$$\text{Estimated Curie Content} = \frac{23\ ci}{6{,}113{,}889\ lbs} = 3.76E^{-6}\ \frac{ci}{lb} = 3.8E^{-6}\ \frac{ci}{lb}$$

$$\frac{23\ ci}{137{,}700\ ft^3} = 1.67E^{-4}\ \frac{ci}{ft^3}$$

$$3.76E^{-6}\ \frac{ci}{lb} \times 44.4\ \frac{lbs}{ft^3} = 1.669E^{-4}\ \frac{ci}{ft^3}$$

Sample Volume of 2.5" Diameter x 240" long Core

$$\frac{\pi D^2 l}{4} = \frac{(3.1416)(2.5")^2(240")}{4} = \frac{1178\ inch^3}{1728\ \frac{inch^3}{ft^3}} = .6817\ \frac{ft^3}{Core} = 0.69\ \frac{ft^3}{Core}$$

$$0.69\ \frac{ft^3}{Core} \times 44.4\ \frac{lbs}{ft^3} = 30.6\ \frac{lbs}{Core}$$

$$30.6\ \frac{lbs}{Core} \times 3.8E^{-6}\ \frac{ci}{lb} = 1.2E^{-4}\ \frac{ci}{Core}$$

Attachment D

INTERNATIONAL TECHNOLOGY CORPORATION

By R. Meyer Date 3-24-88 Subject K-65 & Metal Oxide Silo Hazard Review Sheet No. 2 of 4

Chkd. By LAM Date 3-24-88 Proj. No. 602 T 3.7

0.5cm. X 0.5cm.

Estimated Dose From 20' Core at 1 meter

1 ci = 1 Rem @ 1 meter

< $\frac{L}{2}$ = Line Source Rule

$$1.2E^{-4}\ \frac{ci}{Core} = 1.2E^{-4}\ \frac{Rem}{Core}\ @\ 1\ meter \times 10^{3}\ \frac{mrem}{Rem} = .12\ \frac{mrem}{hr}$$

Contact Dose = 3.175 cm

$$D_1R_1 = D_2R_2$$

$$(D_1)(3.175) = \left(.12\ \frac{mrem}{hr}\right)(100\ cm)$$

$$D_1 = 3.8\ \frac{mrem}{hr}$$

OR

$$3.8E^{-6}\ \frac{ci}{lb} \times \frac{lb}{454\ Grams} = 8.4E^{-9}\ \frac{ci}{Gram} = 8.4\ \frac{nci}{Gram}$$

$$30.6\ \frac{lbs}{Core} \times 454\ \frac{Grams}{lb} = 13{,}892\ Grams$$

$$13892\ \frac{Grams}{Core} \times 8.4E^{-9}\ \frac{ci}{Gram} = 1.2E^{-4}\ \frac{ci}{Core}$$

Both calculations produce the same curie content/core

∴

Dose Rate on contact and at one meter Calculations Result in the Same Exposure.

3.3.3 Waste Storage Silos

The waste storage silos are located south of the waste pits area as shown on Figure 3.5.

The four 80-foot silos were constructed with floors of 4-inch concrete over an 8-inch layer of gravel containing an underdrain system of 2-inch slotted pipe draining to a collection tank (NLO, 1985c). Below the gravel is a 2-inch layer of asphaltic concrete underlain by 18 inches of compacted clay. The walls are 18 inches thick pre- and post-stressed concrete with a 0.75-inch gunite coating on the exterior. The domed roofs are 4-inch thick reinforced concrete (Table 3.1).

Waste raffinate slurries were pumped into the K-65 silos where the solids would settle. The clarified liquid was then decanted to a treatment facility through valves placed along the 26-foot height of the silo wall. As the depth of solids reached the level of a valve, it was sealed and the next higher valve was used to decant liquids. Settling and decanting were continued in this way until the silos were filled to approximately 4 feet below the top of the vertical wall (NLO, 1985c).

[redacted] excess conveying air was filtered through a bag house dust collector (NLO, 1985c). Metal oxide tank 4 remains empty.

From 1952 through 1959 more than 7,200 cy of residues resulting from the processing of pitchblende ores were disposed in the K-65 silos (Tables 3.1 and 3.2) (H&R, 1986). This residue contains 11,200 kg of uranium, as well as radium and trace amounts of precious and heavy metals (Table 3.4).

In 1964, the walls of the silos were covered with an earthen embankment to provide protection and support, and to minimize gamma emissions. In 1979, all tank openings were sealed to provide total enclosure of the waste residues. The earthen embankment was further enlarged in 1983 to alleviate observed soil erosion on the slopes. Following identification of cracks in the center portion of the domes of the silos, protective

TABLE 3.2

APPROXIMATE WASTE STORAGE INVENTORY

Facility	Contents [a, b, c]	Estimated Volume (cy)	Uranium (kg)	Uranium-235 (kg)	Thorium (kg)	Total curies[b] (Ci)
Pit 1	neutralized waste filter cakes, graphite brick scrap, sump liquor & cakes, depleted slag	40,000[a]	52,000[a,c]	370[a,c]	unk	108
Pit 2	neutralized waste filter cakes, graphite, brick scrap, sump liquor & cakes, depleted slag	13,000[a]	1,206,000[a,c]	2,550[a,c]	400[a,c]	35
Pit 3	lime neutralized raffinate concentrate, slag leach residues, filter cakes, fly ash, lime sludge	227,000[b]	129,000[a,c,]	1,771[a] 1,010[c]	400[a,c]	553
Pit 4	process residues, trailer cakes, slurries, raffinates, depleted graphite, non-burnable trash, asbestos, barium chloride salt	50,000[a,b]	3,000,371[a] 3,048,087[c]	5,400[a] 5,529[c]	61,700[a] 61,800[c]	233
Pit 5	solids from neutralized raffinate, slag leach slurry, sump slurry, lime sludge	102,500[a,b]	50,261[a] 50,309[c]	420[a,c]	17,000[a,c]	327
Pit 6	depleted slag, scrap green salt, process residues, filter cake	9,000[a,b]	427,857[a] 843,142[c]	813[a] 1,740[c]	unk	178
[redacted]						
[redacted]						
Burn Pit	pyrophoric and reactive chemicals, oils, combustible wastes	unk[a,b,c]	unk	unk	unk	unk
Clear well	clear process effluents, surface runoff	unk	unk	unk	unk	unk
Fly Ash Area 1	fly ash, oils	50,000[c]	1,000[c]	unk	unk	unk
Fly Ash Area 2	fly ash	33,000[c]	unk	unk	unk	unk

[a] NLO, 1985c
[b] Dames and Moore, n.d.
[c] H&R, 1986
unk= unknown

91

ATTACHMENT E
ALARA REVIEW

1. Assumptions for Silos 1 and 2 (K-65) Sampling Phase
   A. Silos are foamed IAW FSAR
   B. Dose rates are:
      1. General area = 5 MREM/hr
      2. Work area of dome = 50 MREM/hr
      3. Core = 190 MREM/hr at contact
      4. Core on truck = 6 MREM/hr at 1 meter (3 feet)
      5. General area of truck = 2 MREM/hr at 3.04 meter (10 feet)
   C. Sampling time of 30 minutes (dome work time)
   D. Survey, uncase core, load time of 30 minutes
   E. Work force equal to six men
      1. Truck driver
      2. Crane operator
      3. Health physics technician
      4. Worker (dome)
      5. Worker (standby)
      6. Supervisor

2. Estimate of Exposure per Sampling Phase
   A. Whole Body

1. 15 minutes at 5 MR/hr	= 1.25	=	1.25
2. 60 minutes at 5 MR/hr	= 5.00	=	5.00
3. 30 minutes at 5 MR/hr + 30 minutes at 6 MR/hr	= 2.5 + 3	=	5.50
4. 30 minutes at 50 MR/hr + 30 minutes at 6 MR/hr	= 25.0 + 3	=	28.00
5. 30 minutes at 5 MR/hr + 30 minutes at 6 MR/hr	= 2.5 + 3	=	5.50
6. 60 minutes at 5 MR/hr	= 5.00	=	5.00
Total MREM		=	50.25
	X 8/job MREM	=	402.00

   B Extermities Per Core

4. 18 minutes at 190 MREM/hr	=	95 MREM
5. 18 minutes at 190 MREM/hr	=	95 MREM
Total per Core		190 MREM
	=	0.19 REM
Total for 8 Cores	=	1520 MREM
	=	1.52 REM

3. Summary

   Exposure estimates for the sampling phase, excluding exposure for setup and removal of crane and areas are within the guidelines set forth by DOE Order 5480.1A and this Health and Safety Plan (i.e., total whole body dose to crew = 50.25 MREM/core or 402 MREM/job).

202

ALARA concept the shielding of $2000/REM during the sampling phase is not cost effective. During the sectioning of the 20-foot core would be considered necessary for ALARA principle. This phase would call for much more time for handling the 190 MREM/hr core.

4. Ideal conditions for exposure should use a multiplier for safety and unforseen problems. Using a multiplier of 2.5 will raise the exposure level to:

W/B per core = 50.25 MREM X 2.5 = 125.63 MREM/core

or

Total exposure of 125.63 X 8 = 1005.04 MREM = 1.005 REM

INTERNATIONAL TECHNOLOGY CORPORATION

By K. Meyer Date 3-24-88 Subject K-65 & Metal Oxide NARA Review Sheet No. 1 of 3

Chkd. By LAM Date 3-24-88 Proj. No. 602 T 3.7

0.5cm. X 0.5cm.

Approved:

Ref: Reports used for the FSAR on Foam Application to the interior of Silo 2 & 1

K-65 Silo's contain ≈ 8800 metric tons of Sludge
≈ 87,400 ft³ Total Void Space
= Sludge weight of 100 lbs/ft³

Verification Calculations

1. Sludge = $\frac{\pi D^2 h}{4} = \frac{(3.1416)(77)^2(19.54')}{4} = 90990.47\ ft^3 \times 100\ \frac{lbs}{ft^3} = 9099047\ lbs$

$\frac{9099047\ lbs}{2000\ \frac{lbs}{Ton}} = 4549.52\ Tons \times .9 = 4095$ metric tons

$= \frac{\pi D^2 h}{4} = \frac{(3.1416)(77')^2(21.7')}{4} = 101049\ ft^3 \times 100\ \frac{lbs}{ft^3} = 10104900\ lbs$

$\frac{10104900\ lbs}{2000\ \frac{lbs}{Ton}} = 5052.44\ Tons \times .9\ \frac{m.T.}{Ton} = 4547$ metric tons

4095 + 4547 = 8642 metric tons

2. Void Space =

Total Volume − Sludge Volume = Void Space

Total Volume = $\frac{\pi D^2 h}{4} = \frac{(3.1416)(77')^2(30')}{4} = 139698.77\ ft^3$

∴

Void Volume = 139,698.77 ft³ − 90,990 ft³

= 48709 ft³

Void Volume = 139698.77 ft³ − 101049 ft³

= 38,650 ft³

Total Void Volume = 48709 ft³ + 38,650 ft³ = 87,359 ft³

Attachment F

INTERNATIONAL TECHNOLOGY CORPORATION

By R. Meyer Date 3-24-88 Subject K-65 & Metal Oxide Silo Video Review Sheet No. 2 of 3

Chkd. By LAM Date 3-24-88 Proj. No. 602 T 3.7

0.5cm. X 0.5cm.

Dose Calculation for 2.5" Diameter x 240" long Core Sample

$$\text{Volume} = \frac{\pi D^2 L}{4} = (3.1416)(2.5'')^2(240'') = \frac{1178 \text{ inch}^3}{1728 \frac{\text{inch}^3}{\text{ft}^3}} = 0.68 \text{ ft}^3$$

$$\text{Weight} = 0.68 \text{ ft}^3 \times 100 \frac{\text{lbs}}{\text{ft}^3} = 68 \text{ lbs}$$

$$68 \text{ lbs} \times 454 \frac{\text{Grams}}{\text{lb}} = 30872 \text{ Grams}$$

Activity

$$188 \frac{\text{nci}}{\text{gram}} \times 30872 \frac{\text{Grams}}{\text{Core}} = 5.8E^{6} \frac{\text{nci}}{\text{Core}}$$

$$5.8E^{6} \text{ nci} \times 10^{-9} \frac{\text{ci}}{\text{nci}} = 5.8E^{-3} \text{ ci}$$

$\therefore$

$$5.8E^{6} \text{ nci} \times 37 \frac{\text{DPS}}{\text{nci}} = 2.15E^{8} \text{ DPS}$$

$$\frac{2.15E^{8} \text{ DPS}}{3.7E^{10} \frac{\text{DPS}}{\text{ci}}} = .58E^{-2} \text{ ci} = 5.8 \text{ mci} = 5.8 \frac{\text{mrem}}{\text{hr}} \text{ at meter}$$

Dose Rate

1 meter = 5.8 mrem/hr or 6 $\frac{\text{mrem}}{\text{hr}}$

Contact or 3.175 cm
< $\frac{L}{2}$ = Line Source

$$D_1 R_1 = D_2 R_2$$

$$D_1 = \frac{D_2 R_2}{R_1}$$

$$= \frac{(6)(100 \text{ cm})}{3.175 \text{ cm}}$$

$$= 188.97 \frac{\text{mrem}}{\text{hr}} \text{ or } 189 \text{ mrem/hr. (Contact}$$

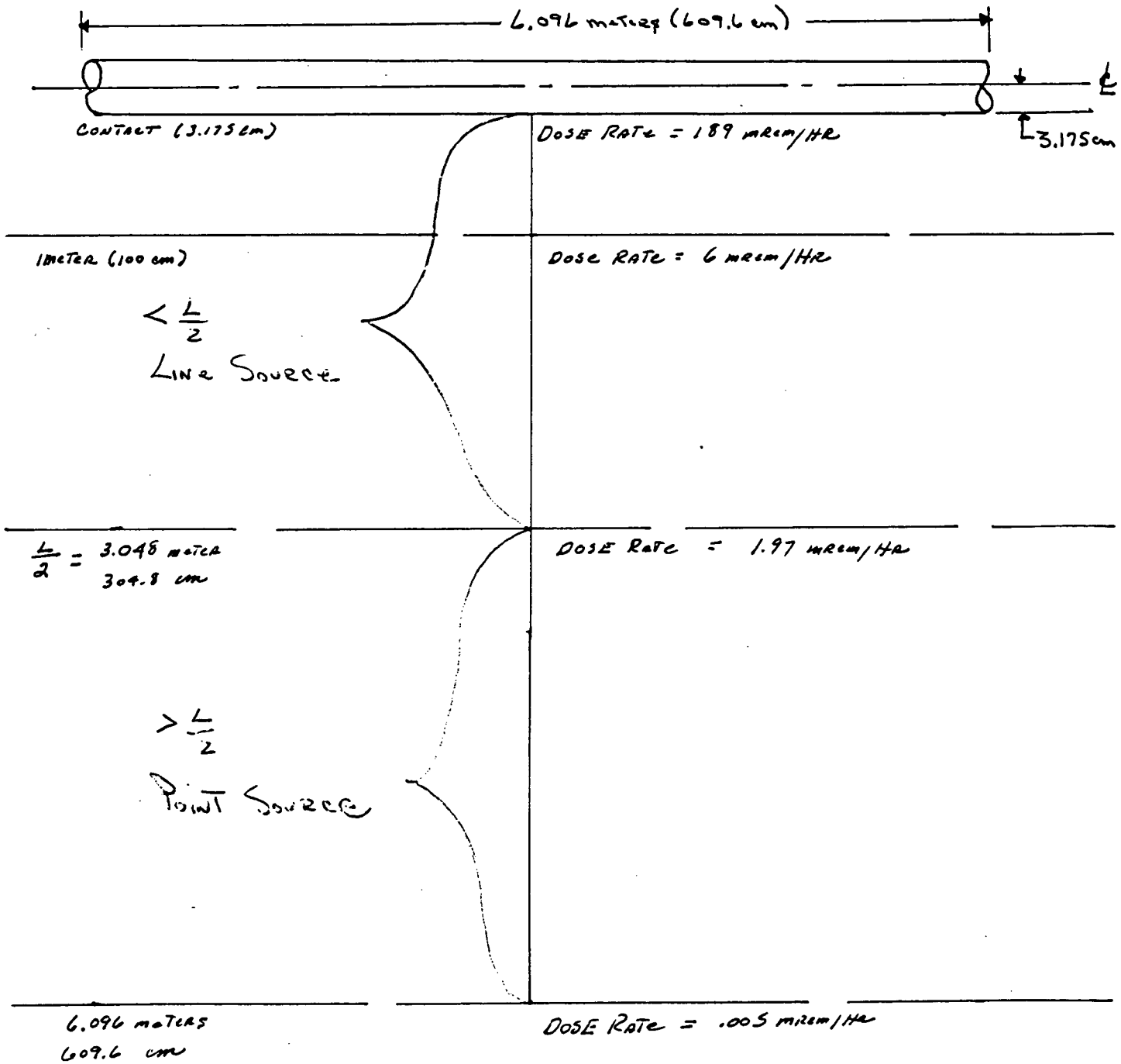
Attachment F

INTERNATIONAL TECHNOLOGY CORPORATION

By R. Meyer Date 3-24-88 Subject K-65 & Metal Oxide Silo Alpha Review Sheet No. 3 of 3

Chkd. By LAM Date 3-24-88 Proj. No. 602 T 3.7

0.5cm. X 0.5cm.



INTERNATIONAL TECHNOLOGY CORPORATION

By R. Meyer Date 3-24-88 Subject K-65 & Metal Oxide Silo Alpha Review Sheet No. 1 of 2

Chkd. By LAM Date 3-24-88 Proj. No. 602 T 3.7

0.5cm. X 0.5cm.

Approved: [signature]

Dose Calculations For 2.5" Diameter x 240" long Core Divided into Liter Samples

$$\frac{30872 \text{ Grams}}{\text{core}} \times \frac{1 \text{ Liter}}{1543.6 \text{ Grams}} = 20 \text{ Liters}$$

$$\frac{1543.6 \text{ Grams}}{\text{Liter}} \times 188 \frac{\text{nci}}{\text{gram}} = 290196.8 \frac{\text{nci}}{\text{Liter}}$$

$$2.9E^{5} \frac{\text{nci}}{\text{Liter}} \times 37 \frac{\text{DPS}}{\text{nci}} = 1E^{7} \frac{\text{DPS}}{\text{Liter}}$$

$$\frac{1E^{7} \text{ DPS}}{3.7E^{10} \frac{\text{DPS}}{\text{ci}}} = .27E^{-3} \frac{\text{ci}}{\text{Liter}} = .27 \frac{\text{mci}}{\text{Liter}} = .27 \frac{\text{mrem}}{\text{hr}} @ 1 \text{ meter}$$

Liter Sample Container ≈ 20 cm high x 7.5 cm Diameter

$$\text{Dose at } \frac{L}{2} = D_1R_1^2 = D_2R_2^2$$

$$= \frac{\left(.3 \frac{\text{mrem}}{\text{hr}}\right)(100 \text{ cm})^2}{(10 \text{ cm})^2}$$

$$D_1 = 30 \frac{\text{mrem}}{\text{hr}}$$

$$\text{Dose on contact (3.75 cm)} = D_1R_1 = D_2R_2$$

$$= \frac{D_2R_2}{R_1}$$

$$= \frac{(30)(6.25)}{3.75}$$

$$= 50 \frac{\text{mrem}}{\text{hr}}$$

Attachment G

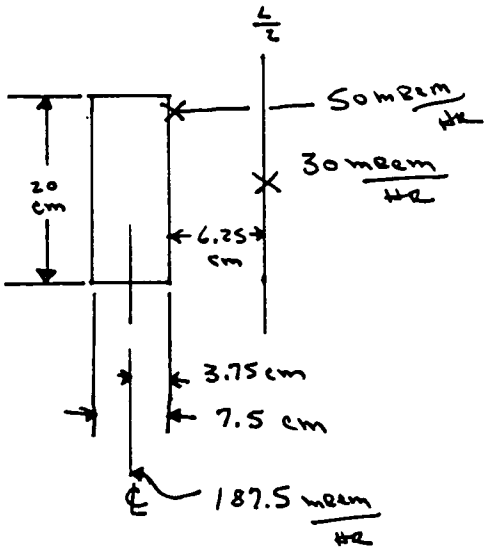
INTERNATIONAL TECHNOLOGY CORPORATION

By R. Meyer Date 3-24-88 Subject K-65 & Metal Oxide Silo ALARA Review Sheet No. 2 of 2

Chkd. By LAM Date 3-24-88 Proj. No. 602 T 3.7

0.5cm. X 0.5cm.

Sample Container



X 100cm

.3 mrem/hr

ATTACHMENT H

C. Survey/Handling/Sectioning/Packaging/Decon - Silo 3

1. On-site analytical methods (surveys)
   a. Visual inspection No. 3 0.25 hr X 4 cores X 4 MREM/hr = 4.0
   b. Video recording No. 3 0.25 hr X 4 cores X 0.2 MREM/hr = 0.25
   c. Radiological scanning No. 3 0.25 hr X 4 cores X 4 MREM/hr = 4.0
   8.25 MREM
   2 X 8.25 = 17.0 MREM

2. Handling
   a. Transport to and storage of samples at on-site laydown area = 4 MREM
   b. Waste from sampling operations = 5 MREM
   c. Decon 1 hr X 4 cores X 4 MREM/hr X 2 men = 32 MREM
   41 MREM

3 Sectioning
   a. Cut into 30-inch lengths = 8 cuts/core X 4 cores = 32 cuts
   b. Cut for sample = 8 cuts/4 samples X 4 cores = 32 cuts
   64 cuts

64 cuts X 0.1 hr X 2 men X 4 MREM/hr = 51.2 man MREM

Total 109.2 MREM = 110 MREM

110 MREM X 2.5 (factor) = 275 MREM or 0.275 REM

1. Survey Silos 1 and 2

A. Visual inspection $\frac{0.25\text{ hr}}{\text{core}}$ X 12 cores X $\frac{6\text{ MREM}}{\text{hr}}$ = $\frac{72\text{ MREM}}{\text{man}}$ X 2 = 36 MREM

B. Video $\frac{0.25\text{ hr}}{\text{core}}$ X 12 cores X $\frac{6\text{ MREM}}{\text{hr}}$ = $\frac{72\text{ MREM}}{\text{man}}$ X 2 = 36 MREM

C. Radiological $\frac{0.25\text{ hr}}{\text{core}}$ X 12 cores X $\frac{6\text{ MREM}}{\text{hr}}$ = 72 X 2 = 36 MREM

Total 108 MREM

108 MREM X 2.5 = 270 MREM = .27 REM

2. Sectioning

A. Cut into 30-inch lengths $\frac{8\text{ cuts}}{\text{core}}$ X 12 cores = 96

B. Cuts for sample $\frac{8\text{ cuts}}{4\text{ samples}}$ X 12 cores = 96

Total 192 cuts

C. 192 cuts X 0.1 hr/cut X 6 MREM/hr X 2 men = 230 MREM

230 x 2.5 = 575 MREM or 0.575 REM

3. Decontamination/Handling

A. Decontamination $\frac{1\ hr}{core}$ X 12 cores X 2 men X $\frac{6\ MREM}{hr}$ = 144 MREM

B. Handling of core $\frac{1\ hr}{core}$ X 12 cores x 2 men X $\frac{6\ MREM}{hr}$ = 15 MREM

C. Waste handling = 20 MREM

Total 179 MREM

179 MREM x 2.5 (factor) = 447.5 MEM or 0.45 REM

ATTACHMENT I

4a. Crane removal	2 hrs X $\frac{0.2 \text{ MREM}}{\text{hr}}$	=	0.4 MREM
4b. Trailer removal	8 hrs X $\frac{0.2 \text{ MREM}}{\text{hr}}$	=	1.6 MREM
4c. Tool removal	4 hrs X $\frac{0.5 \text{ MREM}}{\text{hr}}$	=	2.0 MREM
Total			4.0 MREM
4d. Waste cleanup			20.0 MREM
Total			24.0 MREM

INTERNATIONAL TECHNOLOGY CORPORATION

By P. Keegan Date 3-24-88 Subject Assumptions for Alora Review Sheet No. 1 of 1

Chkd. By LAM Date 3-24-88 Approved: D. E. Hunter Proj. No. 303317

① Radium activity in core will be 200 Nanocuries/gram

② Radon is in secular equilibrium with radium in the core.

③ 50% of available Radon will be released when transferring core material to sample container

④ Affected breathing zone with no ventilation is 8 ft^3

⑤ Ventilation flow rate from trailor will be 1000 cfm

⑥ Maximum core volume transferred per operation will be 1000 cc

⑦ Density of core material is 1.6 grams/cc

⑧ 25% of core material will be transferred in one day

$$(1000\ cc)\left(1.6\ g/cc\right)\left(200\ \frac{\text{Nanocuries}}{\text{gram}}\right)\left(50\%\ \text{Release}\right) \Rightarrow \text{source term}$$

$\Rightarrow 1.6 \times 10^5$ NANOCURIES OR 1.6×10^{-2} microcuries

a) Immediate breathing zone - no ventilation

$$\frac{1.6 \times 10^{-2}\ \text{Microcuries}}{(8\ ft^3)(28{,}316\ cc/ft^3)} \Rightarrow \boxed{7.1 \times 10^{-4}\ \mu Ci/cc}$$

b) Total Radon Discharged

$$(12\ \text{Cores})\left(.68\ \frac{ft^3}{\text{core}}\right)\left(45{,}400\ \frac{\text{grams}}{ft^3}\right)\left(200\ \frac{\text{Nanocuries}}{\text{gram}}\right)\left(50\%\ \text{Release}\right)\left(25\%\ \text{material}\right)$$

$\Rightarrow$ 9,261,600 Nanocuries discharged or $\boxed{9{,}261\ \text{Microcuries}}$

c) Rate of Radon discharge

$$\frac{9261\ \text{Microcuries}}{(1000\ \text{cfm})(480\ \text{minutes})(28{,}316\ cc/ft^3)} \Rightarrow \boxed{6.8 \times 10^{-7}\ \text{microcuries}/cc}$$

* Instantaneous discharge rates may exceed this value by two orders of magnitude.

5.0 NEPA CHECKLIST

STRUCTURAL INTEGRITY OF SILO DOMES DURING K-65 SAMPLING OPERATIONS

91

STRUCTURAL INTEGRITY OF SILO DOMES DURING K-65 SAMPLING OPERATIONS

Due to environmental elements, the K-65 silo domes have deteriorated and are considered the weakest structural component of the silo system. The recent placement of dome covers over the structurally deficient 20-foot center portion of the domes was considered only as a temporary remedial solution (1 to 2 years). Since final remediation plans for the K-65 silos will take at least 3 years to develop and implement, additional remedial actions to provide for continued safe containment of the K-65 residues are being considered.

The continuing concern regarding the structural integrity of the silo domes was instrumental in the development of the operational procedures for the K-65 sampling program. The use of cranes located away from the silos was dictated by the constraint on placing heavy equipment on the domes. The specified size of the crane was based on the need to maintain a factor of safety in relation to the moment arm created by the weight of the sampling unit and the resistance forces during sample withdrawal. This will minimize the risk of the crane overturning or failure of the cantilevered beam. A repositioning of the crane for each pair of samples will keep the length of the moment arm at a minimum.

The probability of cable failure (resulting in a possible impact force on the dome by the falling sampler apparatus) is low considering the high tensile strength of the cable. The use of the dynamometer will further reduce such a risk by monitoring the tension force created by sample resistance during withdrawal. Any significant resistance will be overridden by the start up of the vibratory action of the Vibra Corer.

Any loads that are on the domes during sampling will be kept at an acceptable level. Due to ALARA considerations, the maximum number of sampling personnel on the dome at any given time will be limited to three to four individuals. Recent operations at the silos (e.g. the exterior foaming project) have shown that such loads can be supported. As an additional safeguard, no personnel or other loading will be allowed within the 20-foot central portion of the dome occupied by the plywood and steel cap. This portion is considered the most

215

susceptible to structural failure due to the reduced thickness of the concrete in this area. It is also noteworthy that the snow load assumed under the worst-case structural analysis will not be of concern during the sampling program, thereby providing an additional factor of safety in the allowable loadings.