5904 R-023-204 .9

URANYL NITRATE HEXAHYDRATE NEUTRALIZATION PROJECT REMOVAL ACTION WORK PLAN REMOVAL ACTION NO. 20 REVISION 1, AUGUST 1994

08/01/94

DOE-FN EPA
404
WORKPLAN

5904

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

URANYL NITRATE HEXAHYDRATE NEUTRALIZATION PROJECT

REMOVAL ACTION WORK PLAN
REMOVAL ACTION NO. 20

REVISION 1, AUGUST 1994

Submitted by:

U. S. Department of Energy
Fernald Area Office
P. O. Box 538705
Cincinnati, Ohio 45253-8705

000001

5904

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

URANYL NITRATE HEXAHYDRATE NEUTRALIZATION PROJECT

REMOVAL ACTION WORK PLAN
REMOVAL ACTION NO. 20

REVISION 1, AUGUST 1994

Submitted by:

U. S. Department of Energy
Fernald Area Office
P. O. Box 538705
Cincinnati, Ohio 45253-8705

000002

UNH NEUTRALIZATION PROJECT
Removal Action Work Plan
TABLE OF CONTENTS

1.0 PURPOSE/SCOPE 1
1.1 General Process Description 1

FIGURE 1 2

FIGURE 2 3

TABLE 1 4
1.2 UNH Processing History 5
1.2.1 Plant 2/3 and Refinery Sump Areas 5

TABLE 2 6
1.2.2 Plant 8 Waste Water Operations 7
1.3 UNH Neutralization Background 7

2.0 UNH NEUTRALIZATION SCOPE OF WORK 8
2.1 Processing Plan 8
2.1.1 UNH Processing Order 10
2.1.2 UNH Dilution 10
2.1.3 UNH Neutralization 11
2.1.4 UNH Slurry Filtration 11
2.2 New Equipment 12
2.2.1 UNH Piping Transfer System 12
2.2.2 UNH Flexible Hose Connection 13
2.2.3 Progressive Cavity Pumps 13
2.2.4 UNH Solution Transfer Pumps 13
2.2.5 UNH Slurry Transfer Pumps 13
2.2.6 Magnesium Hydroxide Transfer Pump 14
2.3 Instrumentation 14
2.3.1 Dilution/Neutralization Tanks (F1-25 and F1-26) 14
2.3.2 UNH Storage Tanks 15
2.3.3 Plant 8 Filter Operation 15
2.4 Utilization of Existing Facilities 15

3.0 PRE-OPERATION BENCH SCALE TESTING 15
3.1 OPERATIONS SAMPLING 16
3.1.1 Operations/Process Sampling 16
3.1.2 In-Process Sampling 16
3.1.3 Analytical Laboratory Sampling 16

UNH NEUTRALIZATION PROJECT
Removal Action Work Plan
TABLE OF CONTENTS (Continued)

4.0 PRE-OPERATION CERTIFICATION OF EQUIPMENT, PROCEDURE AND PERSONNEL 17
4.1 Personnel Training 17

5.0 ENVIRONMENTAL COMPLIANCE AND SPILL RESPONSE 18
5.1 PERMIT INFORMATION SUMMARY 18
TABLE 3 19
5.1.1 Air Emissions 24
5.1.2 Hazardous Waste Treatment 24
5.2 LEAKS AND SPILLS/SECONDARY CONTAINMENT 24

TABLE 4 25
5.3 CHARACTERIZATION AND STORAGE/DISPOSAL OF FILTER CAKE 26
5.4 WASTE WATER 26
5.5 SAMPLING PLAN APPROACH 26

LIST OF ATTACHMENTS

ATTACHMENT 1 - NPDES PERMIT
ATTACHMENT 2 - TEST DATA REPORT
ATTACHMENT 3 - PROJECT-SPECIFIC HEALTH AND SAFETY PLAN FOR THE NEUTRALIZATION AND STABILIZATION OF UNH SOLUTIONS AT PLANT 2/3 AND 8 (CONSTRUCTION) DATED MARCH 1994
ATTACHMENT 4 - PROJECT-SPECIFIC SAMPLING AND ANALYSIS PLAN #94-795

UNH NEUTRALIZATION PROJECT

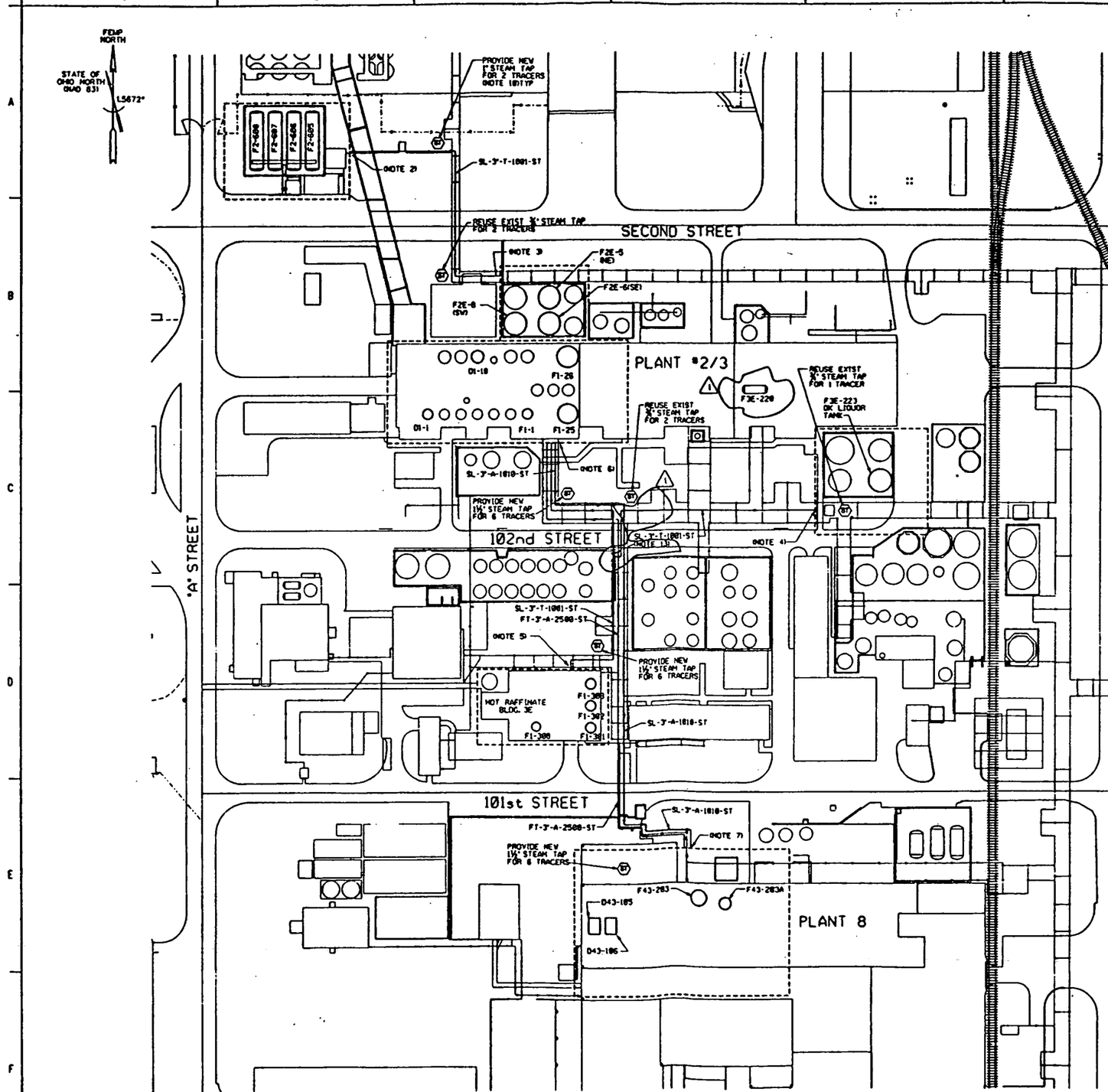
1.0 PURPOSE/SCOPE

The purpose of the Uranyl Nitrate Hexahydrate (UNH) Neutralization Project (UNH Project) is to safely neutralize and dispose of approximately 200,000 gallons of uranium dissolved in nitric acid (UNH). The UNH was "Material in Process" until June 1991 when DOE reclassified it as a waste material. This reclassification caused the material to be characterized as a mixed hazardous waste under the Resource Conservation and Recovery Act (RCRA) due to its corrosive properties and hazardous constituents. These UNH solutions are presently stored in nineteen tanks at the Fernald Environmental Management Project (FEMP). A list of the nineteen tanks and their locations is provided in Figure 1 and Table 1. The solutions will be diluted, neutralized and filtered. The solid filter cake is expected to be non-RCRA hazardous and meet acceptance criteria for shipment to the Nevada Test Site (NTS) for burial as low-level radioactive waste. The liquid filtrate will be tested to confirm its acceptability for discharge under the present National Pollutant Discharge Elimination System (NPDES) permit.

1.1 General Process Description

To achieve the project's objectives, it is planned to neutralize the existing inventory of UNH solution with magnesium hydroxide. This will cause the uranium and other heavy metals in solution to precipitate out of solution. The precipitate will be separated from the resulting slurry using a vacuum filter. The filtrate will be processed into an effluent suitable for release under the existing site NPDES permit. Attachment 1 provides a copy of the limits contained in the site NPDES.

The FEMP has approximately 200,000 gallons of UNH that is stored in 19 tanks. The UNH will be pumped in batches to a dilution/neutralization tank in Plant 2A where it will be mixed with warm water to make a solution containing less than 1 N free acid and less than 100 grams per liter of uranium. Each dilute batch will then be neutralized in the same tank with magnesium hydroxide slurry. The excess nitric acid will be neutralized to form soluble magnesium nitrate and the UNH will react to form a magnesium diuranate precipitate. Other metal contaminants such as chromium and barium also will be precipitated in the process. The neutralized UNH slurry will be transferred to existing filter feed tanks, and filtered on existing rotary drum vacuum filters (east and west Eimco filters) in Plant 8. The filter cake will be collected in drums, sampled and staged for shipment to NTS. The high-nitrate filtrate will be either discharged for treatment in the Biodenitrification (BDN) facility or returned to Plant 2/3 for dilution or rinse water. Figure 2 shows a process-flow diagram of the UNH Neutralization Project.



NOTES

1. FOR DRAWING INDEX SEE DRAWING 92X-5900-X-00071.
2. FOR PIPING IN THIS AREA SEE DRAWING 92X-5900-P-00259.
3. FOR PIPING IN THIS AREA SEE DRAWING 92X-5900-P-00058.
4. FOR PIPING IN THIS AREA SEE DRAWING 92X-5900-P-00061.
5. FOR PIPING IN THIS AREA SEE DRAWING 92X-5900-P-00062.
6. FOR PIPING IN THIS AREA SEE DRAWING 92X-5900-P-00063.
7. FOR PIPING IN THIS AREA SEE DRAWING 92X-5900-P-00065.
8. PIPING SHALL BE FIELD ROUTED AND FIELD SUPPORTED. GENERAL PIPE ROUTING IS SHOWN. DO NOT POCKET SLURRY LINES. ACTUAL FIELD CONDITIONS SHALL BE VERIFIED PRIOR TO FABRICATION AND INSTALLATION.
9. SUGGESTED PIPE SUPPORTS ARE SHOWN ON DRAWING 92X-5900-P-00066.
10. LOCATIONS FOR NEW AND EXISTING STEAM TRACING TAPS ARE SHOWN AS (ST). STEAM TRACING DETAILS ARE SHOWN ON DRAWING 92X-5900-P-00067.
11. FOR MECHANICAL PROCESS SYMBOLS AND LEGEND SHEET SEE DRAWING 92X-5900-M-00073.
12. FOR PIPING AND INSTRUMENTATION DIAGRAMS SEE DRAWINGS 92X-5900-M-00074, 92X-5900-M-00075, AND 92X-5900-M-00076.
13. LOCATE SPOOL TEE AND FLANGES FOR OK LIQUOR TANK SLURRY AND HOT RAFFINATE TANK SLURRY TRANSITION OVER EXISTING TANK CONTAINMENT (DIKED AREA).

REF DWG NO.	DRAWING TITLE
92X-5900-X-00071	DRAWING INDEX
92X-5900-P-00259	PIPING PLAN AND SECTION - NFS TANKS
92X-5900-P-00060	PIPING PLAN AND SECTION - CD BLEND TANKS
92X-5900-P-00061	PIPING PLAN AND SECTION - OK LIQUOR TANK
92X-5900-P-00062	PIPING PLAN AND SECTION - HOT RAFFINATE TANKS
92X-5900-P-00063	PIPING PLAN AND SECTIONS DILUTION - NEUTRALIZATION
92X-5900-P-00065	PIPING PLAN AND SECTIONS - DEWATERING SYSTEM
92X-5900-P-00066	PIPING SUPPORT DETAILS
92X-5900-P-00067	STEAM TRACING DETAILS
92X-5900-M-00073	MECHANICAL PROCESS - P&ID SYMBOLS AND LEGEND SHEET
92X-5900-M-00074	MECHANICAL PROCESS - P&ID TRANSFER SYSTEM
92X-5900-M-00075	MECHANICAL PROCESS - P&ID DILUTION AND NEUTRALIZATION SYSTEM
92X-5900-M-00076	MECHANICAL PROCESS - P&ID FILTRATION SYSTEM

REV NO.	BRIEF DESCRIPTION OF REVISION PURPOSE	APPROVALS AND DATE
1	MOVED SPOOL PIECE; ADDED TANK F3E-220	
0	CERTIFIED FOR CONSTRUCTION	MB 3-25-94 / JT 3-30-94

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

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

PROJECT NAME
URANYL NITRATE NEUTRALIZATION PROJECT

DRAWING TITLE
PIPING/PLANT DESIGN
PIPING PLAN
URANYL NITRATE PROCESSING SYSTEM

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
G. ROSENE	1-18-94	JIM TABB	3-25-94	R. H. SWARTZ, JR	3-01-94

SCALE: 1"=30'-0"

SUBMITTED FOR APPROVAL: MIKE BOLAND 3-25-94
ISSUED ON APPROVAL: JIM TISARANNE 3-30-94
CERTIFIED FOR CONSTRUCTION

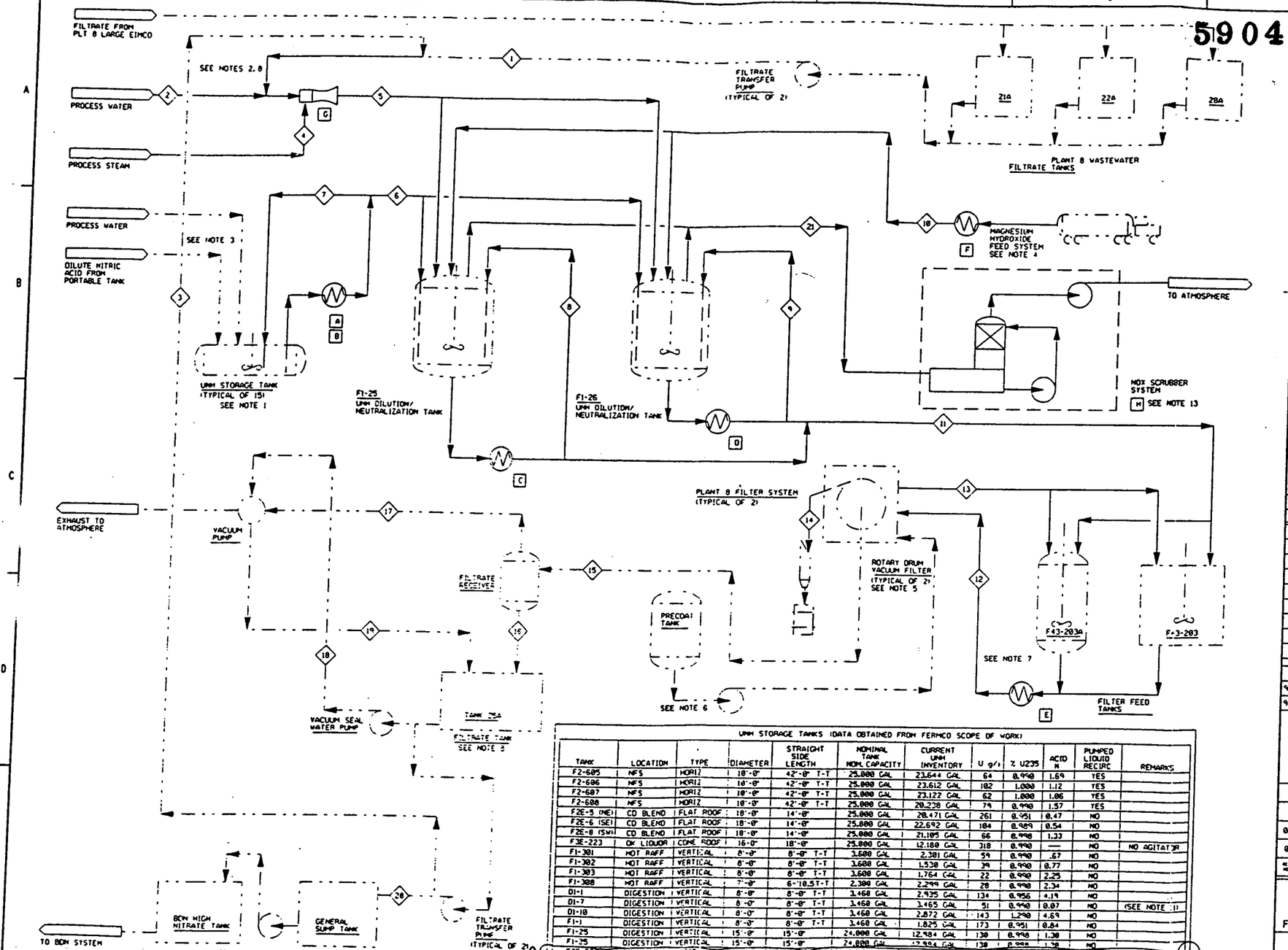
PROJECT ORDER NUMBER: CRU2/P0110
FEMP PROJECT NO.: VBS L3 00-90701
DRAWING PROJECT CODE NO.: 92X-5900-P-00058 P0001
REV NO. 1

000006

Figure 1

92000069.m(6307.ws426) po110@ws426, Tue May 31 16:18:27 EDT 1994

5904



NOTES

1. THERE ARE 17 TYPICAL UNH STORAGE TANKS REQUIRING NEUTRALIZATION. INITIALLY, THE CONTENTS OF TANK F1-26 WILL BE NEUTRALIZED AND TRANSFERRED TO TANK F1-25. F1-26, NOW EMPTY, WILL BE CONVERTED TO A DILUTION/NEUTRALIZATION TANK TO PROCESS THE CONTENTS OF F1-25. WHEN F1-25 IS EMPTY, IT WILL ALSO BE CONVERTED TO A DILUTION/ NEUTRALIZATION TANK. BOTH F1-25 AND F1-26 WILL THEN BE USED TO PROCESS THE CONTENTS OF THE REMAINING 15 UNH STORAGE TANKS.
2. FILTRATE FROM THE PLANT 8 WASTEWATER FILTER WILL BE USED AS THE PRIMARY SOURCE OF UNH DILUTION WATER. PROCESS WATER WILL BE USED AS A BACK-UP SOURCE.
3. WHEN EMPTY, EACH UNH TANK WILL BE RINSED WITH DILUTE NITRIC ACID (1 NORMAL) FOLLOWED BY PROCESS WATER. THESE SOLUTIONS WILL BE USED TO DISSOLVE ANY CRYSTALS REMAINING IN THE TANKS. A HOSE CAN BE USED TO ADD THE DILUTE NITRIC ACID BELOW THE LIQUID LEVEL IN THE TANK.
4. MAGNESIUM HYDROXIDE WILL BE ADDED TO EACH DILUTION/NEUTRALIZATION TANK (F1-25 OR F1-26) TO REACH A FINAL pH OF 7. EACH DILUTION/NEUTRALIZATION TANK (F1-25 OR F1-26) WILL BE USED SEPARATELY FOR BATCH NEUTRALIZATION.
5. FLOWS SHOWN ARE TOTAL DESIGN RATES FOR BOTH THE EAST AND WEST EIMCO FILTERS OPERATING SIMUTANEOUSLY. FERMCO PROCEDURE "SOP 88-C-685 EIMCO FILTER OPERATION" WILL BE USED DURING FILTRATION.
6. FERMCO PROCEDURE SOP 8-C-184 MAKEUP OF PRECOAT SLURRY AND PRECOATING ROTARY VACUUM FILTERS" WILL BE USED FOR PRECOATING THE FILTERS.
7. ONE FILTER FEED TANK WILL FEED THE FILTER(S) WHILE THE OTHER TANK IS BEING FILLED FROM THE NEUTRALIZATION PROCESS. VALVES ON BOTH TANKS WILL BE CONTROLLED SO THAT THE INTERMITTENT SLURRY OVERFLOW FROM THE FILTER(S) CAN ONLY RETURN TO THE TANK THAT IS FEEDING THE FILTER(S).
8. ANY OUT-OF-SPECIFICATION FILTRATE COLLECTED IN TANK 29A FROM THE UNH PROCESS WILL BE TRANSFERRED BACK TO THE DILUTION/NEUTRALIZATION TANK (F1-25 OR F1-26) FOR REPROCESSING.
9. ONE PUMP WILL BE USED TO TRANSFER SLURRY. THE SAME PUMP CAN BE USED TO RECIRCULATE THE UNH WHEN NOT TRANSFERRING. THE SECOND PUMP WILL BE INSTALLED AT THE NEXT UNH STORAGE TANK TO BE PROCESSED. IT WILL BE USED TO RECIRCULATE THE UNH PRIOR TO TRANSFER.
10. TOTAL QUANTITIES FOR STREAM 5 AND STREAM 6 WILL BE DETERMINED SPECIFICALLY FOR EACH UNH STORAGE TANK TO BE PROCESSED.
11. THE CONTENTS OF TANK D1-7 WILL NOT BE PROCESSED UNDER THE SCOPE OF WORK OF THIS PROJECT.
12. DILUTION WATER, UNH, AND MAGNESIUM HYDROXIDE WILL BE ADDED TO ONE DILUTION/NEUTRALIZATION TANK AT A TIME.
13. SCRUBBER SYSTEM TO BE PROCURED AS A SKID MOUNTED UNIT. INSTALLATION AND ALL INTERCONNECTIONS SHALL BE PROVIDED BY FERMCO.

MAJOR EQUIPMENT LIST

MARK	QTY	EQUIPMENT NAME
A	1	UNH TRANSFER PUMP
B	1	UNH TRANSFER PUMP (SPARE)
C	1	NEUTRALIZED UNH TRANSFER PUMP
D	1	NEUTRALIZED UNH TRANSFER PUMP
E	1	FILTER FEED PUMP
F	2	MAGNESIUM HYDROXIDE FEED PUMP
		(ONE UNINSTALLED SPARE)
G	1	DILUTION WATER STEAM HEATER
H	1	NOX SCRUBBER SYSTEM

REF DWG NO.	DRAWING TITLE
92X-5900-X-00071	DRAWING INDEX
92X-5900-N-00073	SYMBOLS AND LEGEND SHEET

UNH STORAGE TANKS (DATA OBTAINED FROM FERMCO SCOPE OF WORK)

TANK	LOCATION	TYPE	DIAMETER	STRAIGHT SIDE LENGTH	NOMINAL TANK NOM. CAPACITY	CURRENT UNH INVENTORY	U g/l	% U235	ACID N	PUMPED LIQUID RECIRC	REMARKS
F2-605	NFS	HORIZ	10'-0"	42'-0" T-T	25,000 GAL	23,644 GAL	64	0.990	1.69	YES	
F2-606	NFS	HORIZ	10'-0"	42'-0" T-T	25,000 GAL	23,612 GAL	102	1.000	1.12	YES	
F2-607	NFS	HORIZ	10'-0"	42'-0" T-T	25,000 GAL	23,122 GAL	62	1.000	1.06	YES	
F2-608	NFS	HORIZ	10'-0"	42'-0" T-T	25,000 GAL	20,238 GAL	74	0.990	1.57	YES	
F2E-5 (NE)	CD BLEND	FLAT ROOF	18'-0"	14'-0"	25,000 GAL	28,471 GAL	261	0.951	0.47	NO	
F2E-6 (SE)	CD BLEND	FLAT ROOF	18'-0"	14'-0"	25,000 GAL	22,692 GAL	184	0.989	0.54	NO	
F2E-8 (SW)	CD BLEND	FLAT ROOF	18'-0"	14'-0"	25,000 GAL	21,105 GAL	66	0.998	1.33	NO	
F3E-223	OK LIQUOR	CONE ROOF	16'-0"	18'-0"	25,000 GAL	12,180 GAL	318	0.990	—	NO	NO AGITATOR
F1-301	HOT RAFF	VERTICAL	8'-0"	8'-0" T-T	3,600 GAL	2,301 GAL	54	0.990	.67	NO	
F1-302	HOT RAFF	VERTICAL	8'-0"	8'-0" T-T	3,600 GAL	1,538 GAL	39	0.990	0.77	NO	
F1-303	HOT RAFF	VERTICAL	8'-0"	8'-0" T-T	3,600 GAL	1,764 GAL	22	0.990	2.25	NO	
F1-308	HOT RAFF	VERTICAL	7'-0"	6'-10.5 T-T	2,300 GAL	2,299 GAL	28	0.990	2.34	NO	
D1-1	DIGESTION	VERTICAL	8'-0"	8'-0" T-T	3,460 GAL	2,935 GAL	134	0.956	4.19	NO	
D1-7	DIGESTION	VERTICAL	8'-0"	8'-0" T-T	3,460 GAL	3,465 GAL	31	0.990	0.07	NO	(SEE NOTE 11)
D1-10	DIGESTION	VERTICAL	8'-0"	8'-0" T-T	3,460 GAL	2,872 GAL	143	1.290	4.69	NO	
F1-1	DIGESTION	VERTICAL	8'-0"	8'-0" T-T	3,460 GAL	1,825 GAL	173	0.951	0.84	NO	
F1-25	DIGESTION	VERTICAL	15'-0"	15'-0"	24,000 GAL	12,984 GAL	130	0.998	1.30	NO	
F1-25	DIGESTION	VERTICAL	15'-0"	15'-0"	24,000 GAL	17,994 GAL	138	0.998	1.38	NO	
F3E-220	DENITRIF	HORIZ	5'-0"	16'-0"	3,500 GAL	2,036 GAL	28	0.995	3.54	NO	

STREAM NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
COMPONENT	PLANT 8 WSTWATER FILTRATE	PROCESS WATER	OFF-SPEC FILTRATE RECYCLE	PROCESS STEAM	HEATED DILUTION WATER	UNH TO DILUTION TANK	UNH RECIRC	DILUTE UNH RECIRC	DILUTE UNH RECIRC	MgOHD TO NEUTRALIZ	NEUTRAL UNH TO PLANT 8	NEUTRAL UNH TO FILTERS	FILTER RECYCLE	FILTER CAKE	FILTRATE TO RECEIVER	FILTRATE TO STORAGE	SUCTION TO VAC PUMP	SEAL WATER SUPPLY	SEAL WATER RETURN	FILTRATE TO BDN	FUMES TO SCRUBBER
OPERATING MODE	INTERMIT	INTERMIT	INTERMIT	INTERMIT	INTERMIT	INTERMIT	INTERMIT	INTERMIT	INTERMIT	INTERMIT	INTERMIT	CONTIN	INTERMIT	CONTIN	CONTIN	CONTIN	CONTIN	CONTIN	CONTIN	INTERMIT	CONTIN
OPERATING hr/day												24		24	24	24	24	24	24		24
LIQUID (lb/hr)	50040	50040	-	3703	53747																
SOLIDS (lb/hr)	0	0	0	0	0						48975	14693	-	1685	13008	13008		-	-		
URANIUM (g/l)	0	0	0	0	0	22-318	22-318	-50	-50	0	13184	3931	-	3931	0	0		0	0		
FREE NITRIC ACID (N)	0	0	0	0	0	0-4.69	0-4.69	0-1.6	0-1.6	-	0	0	0	0	0	0		0	0		
SPECIFIC GRAVITY (slurry)	-	-	-	-	-	1.1-1.5	1.1-1.5	- 1.2	- 1.2	1.5	1.24	1.24	1.24	0	-	-		-	-	1.0	
SPECIFIC GRAVITY (liquid)	1.0	1.0	- 1.1	-	1.0	-	-				- 1.1	- 1.1	- 1.1		- 1.1	- 1.1		- 1.1	- 1.1		
% SOLIDS	0	0	0	-	0	UP TO 30	UP TO 30	UP TO 10	UP TO 10	50	20	20	20	70	0	0		0	0		
FLOW RATE (gpm)	100	100	100	-	104	100	100	100	100	50 max	100	30	0	-	24	24		10	10	100	
TEMPERATURE °F	AMBIENT	60	50	324	140	AMBIENT	AMBIENT	120	120	AMBIENT	120	80		AMBIENT	AMBIENT	AMBIENT		AMBIENT	AMBIENT	AMBIENT	
FLOW RATE (ACFM)																					100
NOTES			9		10, 12	9, 10, 12	9			9		9, 12	9, 12	9							13

Figure 2

000007

0A	ADDED TANK F3E-220		
0	CERTIFIED FOR CONSTUCTION	APP JT 3-25-94	3-30-94
REV NO.	REVISION PURPOSE - DESCRIPTION	APP	TITLE DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

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

PROJECT NAME
URANYL NITRATE NEUTRALIZATION PROJECT

DRAWING TITLE
PROCESS
PROCESS FLOW DIAGRAM
UNH HANDLING SYSTEM

DRAWN BY	DATE	LEAD ENGINEER	DATE	REVIEWED BY	DATE
JIM LAWSON	10-10-94	RALPH CAVANTOUS	3-25-94	R. STRADFORD	02-01-94

PLANT/BLDG NO. | FLOOR | SCALE NONE

SUBMITTED FOR APPROVAL	TITLE/ON APPROVAL
G. P. PYRZ 3-25-94	J. TISARANNI 3-30-94

DOE PROJECT NO. | TEAM PROJECT NO. WBS 1.3 00-90701 | DRAWING INDEX CODE NO. 92X-5900-F-00069 | SHEET NO. F0001 | REV NO. 0A

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU2/P0110

TABLE 1			
HWMU Number	**Tank Numbers**	**Location**	**Tank Construction**
HWMU #10 (NAR System)	F3E-220	Southwest corner of Denitration Area	Aboveground, cylindrical, horizontal, stainless steel (SS304L)
HWMU # 48	F3E-223	Southeast of Plant 2/3 (Outdoors)	Aboveground, vertical, cylindrical, stainless steel (SS304L) tanks
HWMU # 47	SE F2E-5	North of Plant 2/3 (Outdoors)	Aboveground, vertical, cylindrical, stainless steel (304L) tanks
	NE F2E-6		
	SW F2E-8		
HWMU # 46	F2-605	NFS Storage Area (Outdoors)	Aboveground, cylindrical, horizontally-mounted, insulated, stainless steel (304L) tanks
	F2-606		
	F2-607		
	F2-608		
HWMU # 50	F1-301	Raffinate Building - 2 Locations Inside	Aboveground, vertical, cylindrical, stainless steel (304L) tanks Tank F1-308 is made of SS 347.
	F1-302		
	F1-303		
	F1-308		
HWMU # 49	D1-1	Digestion Area - 2 Locations Inside	Aboveground, vertical, cylindrical, stainless steel (304L) tanks
	D1-7		
	D1-10		
	F1-1		
	F1-25		
	F1-26		

1.2 UNH Processing History

Production at the FEMP was ceased in 1989. Among the materials left on-site following the cessation of production are approximately 200,000 gallons of uranyl nitrate hexahydrate (UNH-uranium compounds in nitric acid) solution stored in nineteen stainless steel storage tanks. The FEMP's mission has been re-focused on waste management and environmental restoration. Three of the primary areas that have been involved with processing UNH solutions are Plant 2/3 (the Refinery), the Refinery Sump area, and Plant 8 (the Scrap Recovery Plant).

1.2.1 Plant 2/3 and Refinery Sump Areas

The principal function of Plant 2/3 was to convert uranium-bearing materials into uranium trioxide UO_3 (orange oxide). This began with the dissolving of uranium ore concentrates, residues, and recycle materials in nitric acid to produce uranyl nitrate feed solution. Liquid-liquid countercurrent solvent extractors were then used to purify the uranyl nitrate solution.

Low-grade uranium slurries required filtration and concentration prior to feeding to the extraction system. After the extraction process, the solution was further concentrated and thermally denitrated to UO_3. The Nitric Acid Recovery (NAR) facility was operated to recover nitric acid from the nitric acid fumes generated by the Digestion and Denitration operations.

The presence of carbonate used in the solvent recovery system required that water collected and transferred from containment area floor sumps (known as sump water) be processed separately from the other water collection systems. This treatment and filtration was performed in the Refinery Sump Area. Uranium was recovered from the sump water through the Refinery Sump by heating the water, adding magnesium hydroxide slurry and precipitating the uranium in a settling tank. The effluent flowed to a polishing filter before discharging to the General Sump. The uranium was precipitated from the slop water and the precipitate was pumped from the bottom of the settling tank and transferred back to Plant 2/3 to be used as feed for digestion.

The uranium content of the nineteen UNH storage tanks ranges from 13 to 341 grams of Uranium per liter. One tank, D1-7, containing a uranium/organic/water mixture, will require additional treatment prior to neutralization. The total quantity of uranium amounts to a nominal 100 metric tons of uranium (MTU). The uranium in six tanks has an enrichment of 1% or greater of U-235. The solutions have a free acid content of up to 4.7 N. Table 2 provides a summary of the UNH inventory.

The material stored in the nineteen tanks is classified as a RCRA hazardous waste under 40 CFR 261.22 due to its corrosivity characteristic and under 40 CFR 261.24 due to toxicity characteristic resulting from the presence of two heavy metals (chromium and barium). The extended storage of this material as a liquid is not a desirable arrangement due to the possibility of leakage from aging tank valves, flanges, and other fittings.

UNH PROCESSING SYSTEM TANKS
TABLE 2

Date: June 1, 1994

TANK ID NUMBER	TANK LOCATION	TANK CONTENTS	Capacity (gallons)	Volume (gal.)	U (g/l)	Norm.	U-235 (%)	Ba (ppm)	Cr (ppm)	Pb (ppm)	Hg (ppm)
D1-1	Digestion	Zernlo UNH	3,507	3,150	135	4.02	0.955	79.0	465.5	17.67	1.00
D1-7	Digestion	Organic/Water	3,625	3,218	*	*	0.790	*	*	*	*
D1-10	Digestion	UNH	3,625	2,648	154	4.65	1.290	99.3	1003.0	24.07	5.52
F1-1	Digestion	UNH Crystals	3,421	1,825	173	0.84	0.962	412.5	344.3	84.59	2.86
F1-25	Digestion	UNH	23,543	12,875	133	1.38	0.994	139.7	139.7	30.00	2.04
F1-26	Digestion	Zernlo UNH	23,008	1,454	85	2.42	0.950	51.8	280.7	18.66	0.51
F1-301	Hot Raffinate	UNH/Solids	3,066	1,990	60	0.59	0.872	140.3	83.5	19.45	2.22
F1-302	Hot Raffinate	UNH/Solids	3,066	2,309	13	0.20	0.960	28.4	26.4	4.71	0.34
F1-303	Hot Raffinate	UNH/Solids	3,066	2,104	19	1.57	0.801	41.5	93.9	8.25	3.14
F1-308	Hot Raffinate	UNH	2,107	1,894	30	2.27	1.000	81.6	248.9	11.38	1.98
F2E-5 (SE)	CD Blend (Outside)	Evap. UNH	25,232	23,645	122	0.42	1.018	****	****	****	****
F2E-6 (NE)	CD Blend (Outside)	WMD UNH	25,232	21,423	202	0.53	0.952	11.6	2.6	3.48	0.00
F2E-8 (SW)	CD Blend (Outside)	Evap. UNH	25,232	21,740	57	1.50	0.997	7.8	1.8	1.07	0.43
F2-605	NFS Storage (Outside)	Evap. UNH	25,458	23,463	59	1.60	0.989	94.6	59.4	17.21	0.72
F2-606	NFS Storage (Outside)	Evap. UNH	25,470	23,427	55	1.04	1.010	96.8	49.4	15.70	0.71
F2-607	NFS Storage (Outside)	Evap. UNH	25,450	22,726	36	0.94	1.090	181.9	69.4	18.36	1.13
F2-608	NFS Storage (Outside)	Evap. UNH	25,458	19,996	68	1.48	1.000	151.5	147.5	18.19	1.01
F3E-220	Denitration **	Scrubber UNH	3,500	2,036	20	3.54	0.995	<2.0	10.6	3.47	0.24
F3E-223	OK Liquor (Outside)	Pure UNH	28,759	9,231	341	0.19	0.993	<2.0	0.8	0.30	0.22
F43-203	Plant 8	Neutral. UNH	10.080	5,432	20	0.0***	0.99	****	****	****	****
F43-203A	Plant 8	Sump Water	5,278	4,232	.01	0.0***	0.99	****	****	****	****

* Tank D1-7 is layered Organic/Water with varying Uranium Concentration
** Tank F3E-220 was not part of the original project
*** Content Ph is > 7.0. (Neutralized UNH from previous process)
**** Results not available

1.2.2 Plant 8 Waste Water Operations

The present operations in Plant 8 involve the collection, treatment, and filtration of waste water from site operations and storm water to remove uranium and Clean Water Act (CWA) regulated heavy metals. Bulk materials which are used in the water treatment process which may be stored in the vicinity of the project area are hydrated lime (calcium hydroxide), sodium hydroxide, and calcined diatomaceous earth (Dicalite).

1.3 UNH Neutralization Background

Neutralization of uranyl nitrate solutions and precipitation of the uranium from the solution was previously accomplished using magnesium hydroxide. This procedure is well established and has been used intermittently at the Refinery Sump. Previous testing showed that the resulting filter cake is not a hazardous waste per the Toxicity Characteristic Leaching Procedure (TCLP) test and that the filtrate is suitable for processing through the existing biodenitrification process and subsequent discharge. Attachment 2 provides a copy of the Test Data Report.

In 1992, approximately 20,000 gallons of UNH solution were processed during a plant test. During the plant test, UNH solution from three storage tanks was blended together to reduce the overall isotopic concentration of U-235 in the resulting blend below 1.00% and improve the homogeneity and filterability of the solution. The blended solution was then diluted with process water to reduce the uranium concentration below 50 grams U per liter. The dilute solution was then heated to between 110 and 130 degrees F, and neutralized with magnesium hydroxide. Upon neutralization, uranium, barium, and chromium precipitated from the solution. The precipitated solids were filtered from the solution and drummed, and the filtrate quarantined pending certification for discharge. Subsequent laboratory analysis demonstrated that the filter cake passed the TCLP. Results from the plant test are provided in Attachment 2.

The inadvertent transfer of approximately 20,000 gallons of dilute UNH solution to Plant 8 and the resulting release of an estimated 30 gallons of UNH solution to the environment resulted in a Type B investigation of the circumstances leading to the release. The conclusions of the Type B investigation required further study of the operations and assurances of system integrity and configuration control before any processing could restart. Operations were suspended pending conversion of the plant test procedure into a more formal operating procedure.

Lessons learned from the investigation and from a February 1993 report which documented the results of the 1992 plant test ("Proof of Process Plant Test Report for the Disposition of Uranyl Nitrate Solutions"), have influenced the selection of the processing methodology, operating procedures and management discipline, and equipment to be utilized in the present UNH Neutralization Project.

Attachment 3 provides a copy of the task-specific Construction Health and Safety Plan. This task-specific Health and Safety Plan supplements the existing FEMP site-wide Health and Safety Plan, providing additional information involving the processing of UNH solutions.

2.0 UNH NEUTRALIZATION SCOPE OF WORK

Processing of the UNH solutions will be accomplished using a combination of new and existing equipment. In general, existing tanks, agitators, filters and secondary containment will be used, while the interconnecting piping and transfer pumps will be new construction. New instrumentation and engineered controls will be installed to improve process safety and control.

2.1 Processing Plan

To expedite removal and neutralization of the UNH solutions from the storage tanks, it is planned to process the material in a manner similar to the plant test procedure. The UNH solutions will be diluted with water, neutralized with magnesium hydroxide to induce metals precipitation, and the precipitated metals removed from the neutralized liquid via filtration.

A principal difference between the new processing plan and the previous plant test procedure involves the batchwise dilution and neutralization of the UNH in Tanks F1-25 and F1-26. The earlier Plant Test utilized the Refinery Sump Tank F1-608 for dilution, and Tanks F1-609 and F1-610 for neutralization. A key advantage to batchwise rather than continuous treatment of the UNH is the increased assurance that the filtrate and filter cake will meet disposal specifications prior to discharge from Plant 2/3.

The following additional problems were noted during the review of the previous plant test:

- The neutralization and dilution tanks are located outside the buildings; thus they are subject to possible adverse weather conditions.

- Tank F1-608, which was used for the UNH dilution step, is equipped with a steam sparge agitator, therefore, temperature control and agitation was poor. This increased the potential for generating NOx fumes.

- The diked area surrounding Tanks F1-608, F1-609, and F1-610 provides inadequate secondary containment volume and should be modified to increase its capacity consistent with Best Management Practices if the tanks are to be used to contain hazardous chemicals.

- Tank F1-608 is flat-bottomed, increasing the tendency for solids to accumulate in the tank and are more difficult to remove than from a round-bottomed tank.

- The Refinery Sump, containing Tanks F1-608, F1-609, and F1-610, is located at the southeast corner of Plant 2/3, while the NFS tanks which contain a substantial fraction of the UNH to be processed are located at the Northwest corner of Plant 2/3. Therefore, the principal processing area was not centrally located and required long transfer piping runs.

- Process control is more difficult with a continuous type process. Excess magnesium hydroxide was used because of the short time allowed for reaction with the UNH. Also, filterability was not assured prior to transfer to the filters at Plant 8.

In contrast, the use of Tanks F1-25 and F1-26 offers the following advantages:

- The tanks are located inside the Digestion Area of Plant 2/3 and are less sensitive to variations in weather conditions.

- The tanks are equipped with mechanical agitators. Also, external heaters will be provided to heat the dilution water, so that there will be no direct heating of the UNH solution. This reduces the potential for generation of NOx fumes.

- The location of the tanks inside the building provides improved containment in the event of a tank failure.

- Tanks F1-25 and F1-26 are round-bottomed tanks, reducing the tendency for solids to accumulate.

- The tanks are centrally located with respect to the locations of the UNH storage tanks and the Plant 8 filter facilities, thus, reducing the length of the individual pipe runs needed for the UNH transfers.

Another significant change in the processing plan is that the UNH will be removed from the top of the storage tanks using new progressive cavity pumps instead of the existing discharge piping and pumps on the bottom of the tanks. After a tank has been pumped to a low-level, it will be rinsed. The rinse water will be pumped to the dilution/neutralization tanks for processing in the same manner as the UNH solution. Following the emptying and rinsing of a given UNH storage tank, the pump skid will be disconnected from that tank, moved, and re-connected to another tank in the same group of tanks. After all tanks in a group are pumped to a low level, the pump skid will be connected to the bottom discharge in order to completely empty the UNH tanks.

Prior to processing any individual tank's contents, the UNH Processing Team will conduct laboratory tests to confirm that the individual solutions can be neutralized with magnesium hydroxide, the metals precipitated, and the resulting slurry filtered. The UNH Processing Team also will be responsible for ensuring the disposability of the resulting filter cake and filtrate.

2.1.1 UNH Processing Order

The UNH Project Plan calls for the emptying of Tank F1-26 prior to starting the UNH Neutralization Process. The contents of Tank F1-26, approximately 1,450 gallons of UNH, must be removed so the tank can be prepared for use as a Dilution/Neutralization tank. After Tank F1-26 has been emptied and prepared for use in dilution and neutralization of UNH, it will be utilized in a simulation, using water in place of UNH solution. This simulation will certify the system, procedures and training of personnel from the beginning to the end of the neutralization process.

An empty tank, F1-2, located next to Tank F1-26 will be prepared to receive the UNH solution from Tank F1-26. Tank F1-2 will be isolated, cleaned, inspected and repaired. A LEAK TEST of F1-2 will be conducted. A portable diaphragm pump equipped with chemical hoses and transfer lines will be used to transfer the UNH solution from the bottom of Tank F1-26 through the top of Tank F1-2. Next, Tank F1-26 will be flushed, cleaned, inspected, repaired, and isolated. A LEAK TEST of Tank F1-26 will be conducted. Tank F1-26 then will be instrumented and its progressive cavity pump connected to a new discharge line from the tank.

The first tank to be filtered in Plant 8 will be the current inventory of neutralized solution produced from the previous plant test, Tank F43-203 in Plant 8.

The first tank to be neutralized in Plant 2/3 will be Tank F1-25. Tank F1-25 is the second dilution/neutralization tank and will be required to be emptied prior to construction completing the installation of the new piping and instrumentation. AFTER COMPLETION OF CONSTRUCTION ACTIVITIES, TANK F1-25 WILL BE LEAK TESTED.

Emptying and rinsing of the remaining UNH tanks will be conducted sequentially, one tank at a time.

2.1.2 UNH Dilution

Existing Tanks F1-25 and F1-26 will be used to dilute the UNH solutions with water to an acid normality of less than 1 and a uranium concentration of less than 100 grams per liter. The dilution water will be put into the tank prior to the addition of UNH. The water to be used for dilution will come from one of the following sources:

1) Clear water left in the tank after a neutralized batch of UNH is transferred to Plant 8
2) Filtrate water from the filtering of UNH in Plant 8
3) Filtrate water from the filtering of Waste Water in Plant 8, or
4) Process water.

Options one through three have been added to the project to minimize the amount of water generated during the UNH project. If options two through four are used, the water may be heated using a new direct steam injection heater.

2.1.3 UNH Neutralization

After the UNH solution has been diluted, magnesium hydroxide will be added to neutralize the free acid and precipitate the metals present. Magnesium hydroxide will be provided to the project either by direct transfer from a vendor's tanker truck or by mixing MgO and water in Tank 3A, which is located near Tanks F1-25 and F1-26. THE VENDOR SUPPLIED MAGNESIUM HYDROXIDE SLURRY WILL BE A SATURATED SOLUTION OF MAGNESIUM HYDROXIDE $Mg(OH)_2$ CONTAINING A SUSPENSION OF UNDISSOLVED MAGNESIUM OXIDE MgO, DESCRIBED AS A 58% MgO SLURRY CONTAINING 5 POUNDS MgO PER GALLON. The magnesium hydroxide will be added via a new progressive cavity pump hooked up to a supply tanker truck or Tank 3A. Magnesium hydroxide flow will be controlled by means of a batch controller incorporated into the transfer pump skid. The quantity of magnesium hydroxide to be added to each batch of UNH will be determined based on analytical laboratory data previously obtained. The pH in the neutralization tank will be monitored during magnesium hydroxide addition to assure that satisfactory neutralization and metals removal are achieved. AN END POINT OF pH 7 OR GREATER WILL BE ACHIEVED WITH EACH BATCH TO ASSURE A SATISFACTORY REMOVAL OF URANIUM AND ANY OTHER DISSOLVED METAL ION WHICH HAS BEEN IDENTIFIED IN EACH BATCH QUANTITY OF THE SEVERAL TANKS OF URANIUM SOLUTION. THE FORMS OF THE PRECIPITATED URANIUM WILL BE EITHER AS URANIUM HYDROXIDE $UO_2(OH)_2$, MAGNESIUM DIURANATE, MgU_2O_7, OR AS AN EQUILIBRIUM OF THE TWO, PROBABLY CONTROLLED BY THE SPECIFIC pH OF THE RESULTING SOLUTION. OTHER IONS IDENTIFIED IN THE VARIOUS TANKS OF UN SOLUTION AND WHICH WILL LIKEWISE BE PRECIPITATED AS HYDROXIDES INCLUDE: COPPER, IRON, CHROMIUM, AND BARIUM. The liquid temperature will be monitored during neutralization so that the temperature of the dilute UNH liquid will be controlled to less than 140 degrees F to minimize formation and emissions of NOx.

2.1.4 UNH Slurry Filtration

After neutralization, the UNH will be transferred to Plant 8 for filtering. Filtration of the UNH will be completed using the same tanks and filters as the previous plant test. The UNH slurry will be received in Tanks F43-203 and F43-203A. Using a new progressive cavity pump, the UNH slurry will be transferred to the East and/or West EIMCO Filters. Procedures for routine processing of process waste water prescribe the following criteria for discharge to the BDN Facility. THE CRITERIA FOR DISCHARGE TO THE BDN IS A FILTRATE pH OF 7.0 OR GREATER AND A LIMIT FOR SOLUBLE URANIUM (U^{+6}) OF LESS THAN OR EQUAL TO 48.0 mg/l U (ppm). Waste water exceeding these levels is sent to Plant 8 for processing prior to discharge.

Filtrate from UNH neutralization will be sampled and, if it exceeds these same criteria, will be returned for reprocessing. Filtrate meeting the Plant 8 discharge criteria will either be recycled to Plant 2/3 for use as dilution water or pumped to the BDN High Nitrate Tank for storage prior to discharge to the BDN Facility.

2.2 New Equipment

2.2.1 UNH Piping Transfer System

To improve process control, a new dedicated transfer system, constructed of 3" diameter 304L Stainless Steel piping, will be installed to transfer UNH solutions from the individual storage tanks to the dilution/neutralization tanks F1-25 and F1-26. The piping to transfer the neutralized UNH slurry to Plant 8 will be 3" diameter carbon steel piping. The valves to be installed will be full-port ball valves. All piping, valves and pumps will be arranged so that all flanged connections are located within secondary containment areas, either permanent or temporary. The new piping system is designed for slurry transfer and will ensure configuration control and positive control of tank transfers as it will connect to only one storage tank at a time. Construction of the new piping network will remove the possibility of sending UNH to an unintended destination.

The new transfer piping system will be routed as follows:

- NFS Storage Tanks (4 tanks)
  This header will run from the NFS Tanks through the CD Blend Tank Storage Area into the north Digestion side of Plant 2/3.

- CD Blend Storage Tanks (3 Tanks)
  The same header used by the NFS Tanks will be used after isolating the piping to the NFS Storage Tanks.

- OK Liquor Storage Tank (1 Tank)
  This header will be installed from the OK Liquor Tank Area through the east-west rack along 102nd Street to its intersection with the north-south rack to the south Digestion side of Plant 2/3.

- Hot Raffinate Storage Tanks (4 Tanks)
  This header will be installed in the existing rack from the Hot Raffinate Building to the intersection with the east-west rack along 102nd Street.

- Digestion and Denitration Storage Tanks (7 Tanks)
  A header will be installed down the middle of the Digestion Area to the dilution/neutralization tanks.

All piping will be installed above ground and will be inspected for leaks on a daily basis during the period when piping is being used for UNH transfer operations. Drain valves will be installed on either side of each block valve. These drain valves also may be used for flushing should the header become plugged. The new piping will be compatible with the material to be transferred. The piping system consists of new butt-welded stainless steel schedule 40 pipe.

2.2.2 UNH Flexible Hose Connection

The connection between the new progressive cavity pump to the new UNH Piping and the UNH Storage Tanks will be made utilizing braided stainless steel flex hoses for final fit-ups. The pump discharge will be connected to the main transfer header at each of the valved points in turn through temporarily installed hard piping using braided stainless steel flex hoses for final fit-ups. A recirculation line from the pump back to the source tank will be used to allow for greater tank agitation than that provided by the existing tank agitators.

2.2.3 Progressive Cavity Pumps

Progressive cavity pumps will be used to transfer UNH solutions, UNH slurries, and magnesium hydroxide slurries. All pumps are equipped with a flow totalizer and reversing capability.

2.2.4 UNH Solution Transfer Pumps

A new progressive cavity pump will be used to pump the UNH solutions from the individual storage tanks to the dilution/neutralization Tanks F1-25 and F1-26. This pump will be skid mounted for portability and will be connected in turn to each tank for processing. Two pump skids will be purchased to allow for optimum hook-up. One pump will be hooked up to a tank and operating while the second pump will be in the process of being hooked up to the next tank. This will allow for a "leap-frog" type of arrangement that should reduce the overall processing time.

The pump skids will be located within or overflow to the existing secondary containment area of each tank or group of tanks. To allow for this the pump skids will have a 12-inch tall stainless steel pan built around the skid. This pan will have a 2-inch drain that will drain any leakage into the secondary containment area of each group of tanks.

2.2.5 UNH Slurry Transfer Pumps

Two new progressive cavity type pumps will be installed to transfer the neutralized UNH slurry from Tanks F1-25 or F1-26 to Plant 8 Filter Feed Tanks, F43-203 and F43-203A, via new carbon steel piping. A recirculation line will be installed from the pump discharge back to

Tanks F1-25 or F1-26 for extracting a sample and to promote better tank agitation. A third new progressive cavity pump will be installed to transfer the neutralized slurry from Tanks 203 and 203A to the East and West EIMCO Filter.

2.2.6 Magnesium Hydroxide Transfer Pump

One new progressive cavity pump will be installed to transfer magnesium hydroxide slurry to the dilution/neutralization Tanks F1-25 or F1-26. Magnesium hydroxide will be supplied either from a vendor tanker truck or from mixing MgO with water in Tank 3A. A flexible chemical hose will be used to connect the tanker truck or Tank 3A to the new pump.

2.3 Instrumentation

2.3.1 Dilution/Neutralization Tanks (F1-25 and F1-26)

New instrumentation for Tanks F1-25 and F1-26 includes level indicator/alarm/recorder and temperature indicator/alarm/recorder. Both tanks have a high level and high-high level alarms and switches which shut off the UNH and water inlet lines to prevent overfilling of the dilution/neutralization tanks. IN ACCORDANCE WITH STANDARD OPERATING PROCEDURES, OPERATORS WILL MONITOR A PRESSURE GAUGE LOCATED ON THE TRANSFER PUMP AND WILL SHUT OFF THE PUMP IF NECESSARY. THESE SHUT-OFF CONTROLS AND PROCEDURES ARE IN PLACE TO PROVIDE ADEQUATE SAFEGUARDS AGAINST INLET LINES LEFT PUMPING AGAINST A CLOSED VALVE IN THE EVENT THAT AN AUTOMATIC SHUT-OFF SWITCH CLOSES THE VALVE. ALSO, THE TRANSFER PUMPS ARE EQUIPPED WITH A HIGH-PRESSURE SWITCH TO SHUT OFF THE PUMP. The tank temperature indicator will indicate the temperature of the liquid at three levels (top, middle, and bottom) in the tank. All new instrumentation will use existing tank nozzles. A flow meter will be installed to measure the quantity of dilution water transferred into the tank. Temperature instrumentation will be installed on the dilution water line to indicate water temperature prior to entering the tanks. Flow out of the tanks will be controlled by adjusting the pump speed, and both instantaneous and total flow readouts will be provided. All instrumentation will be mounted on a new local panel located near the dilution/neutralization tanks.

The dilution/neutralization tanks also will be equipped with a pH probe that will be used to monitor the addition of magnesium hydroxide and to assure that the UNH is neutralized prior to transfer to Plant 8. The pH probe is also equipped with a low pH alarm.

The flow of neutralized UNH solution from the dilution/neutralization tanks will be positively controlled by an interlock system. This system requires that the UNH inlet valves on the dilution/neutralization tank be closed prior to activating the discharge pump. This will prevent the entry of additional liquids into the tanks while pumping a completed batch.

2.3.2 UNH Storage Tanks

Instrumentation for control of the pump skid for the UNH Storage Tanks will be installed at each storage tank. A level transmitter will be used to measure the level in the storage tank. Also, a thermowell will be installed to measure the temperature at three (3) levels (top, middle, and bottom) within the tank. Installation of these instruments will utilize existing nozzles on the tanks. The instrumentation will be moved from tank to tank with the pump, and readouts from the instrumentation will be installed on the pump skid panel.

2.3.3 Plant 8 Filter Operation

Within Plant 8, most new installations center around the existing filter feed tanks, F43-203 and F43-203A. These tanks will be provided with new level indicators and alarms. The existing filters will be provided with a new overflow line back to the filter feed tanks and high level switches to shut off the feed pump in case of plugging of the overflow line. Also, there will be an interlock between the inlet and outlet valves of both tanks, so that only one tank can be pumped at any time, with overflow returning to the same tank. Flow measurement will be calculated from the pump speed; both instantaneous and total flow readouts will be provided. All new instrumentation will be mounted on a new local panel by the Filter Feed Tanks in Plant 8.

2.4 Utilization of Existing Facilities

Several existing systems in Plant 2/3 are planned for use. In addition to the existing storage and processing tanks, constructed of 304L Stainless Steel in the early 1950s, the following will be used: 1) Process water system for tank rinsing and dilution; 2) Tank agitators; 3) Secondary containment systems, and 4) Steam system.

The major system planned for re-use within Plant 8 is the existing East-West Eimco filter system. This includes the filters themselves, along with the filter feed tanks, vacuum-producing system, filter cake drumming system, filter precoat system, and the filtrate collection and transfer system. Also associated with Plant 8, the existing General Sump and Biodenitrification Facility will be utilized.

3.0 PRE-OPERATION BENCH SCALE TESTING

A pre-operational bench scale testing program is being conducted to provide information for the development of the procedures needed to safely and efficiently dilute, neutralize and filter the UNH. This program involves sampling of the contents of each UNH tank after agitation, and chemical analysis of each sample to determine its uranium, free acid and heavy metal concentrations. The test program also includes laboratory dilution, neutralization and filtering of the UNH samples to determine the optimum amount of neutralizing agent required, evaluate the filterability of the resulting slurry, and identify the kinds and concentrations of contaminants remaining in the filtrate.

3.1 OPERATIONS SAMPLING

Three types of samples will be taken during processing: operation/process, in-process, and analytical laboratory samples.

3.1.1 Operations/Process Sampling

pH probes are to be installed in the dilution/neutralization tanks, F1-25 and F1-26 to provide operators with a continuous recorded reading on the liquid pH during the neutralization of the UNH. The pH indications also will be used to control the rate and quantity of Magnesium Hydroxide addition to the process.

3.1.2 In-Process Sampling

In-Process samples will be taken and field analyzed using portable equipment to monitor for the presence of Uranium and measure for pH.

The pH sample will be analyzed using a portable Ph analyzer that has been calibrated using a buffer solution.
The presence of Uranium will be determined by using a dimple plate, potassium ferrocynide and glacial acetic acid. If Uranium is present in a drop of the sample, the dimple will turn color. This type of analysis is visual and not quantitative.

These in-process samples will be used in the following applications:

Source	Liquid Sampled	Description
Neutralization/ Dilution Tank	Neutralized UNH Slurry	After settling, the clear liquid phase will be checked for Uranium and pH. This will provide a filterability indication prior to transfer to Plant 8.
Rinsed UNH Tank	UNH Tank Heel	The UNH Tank will be rinsed until the pH is greater than 2.0. This will need to be achieved prior to bottom discharge.
Filter Effluent	Filtrate	Periodic checking of filtrate as produced from filter to check filter performance.

3.1.3 Analytical Laboratory Sampling

Samples will be periodically extracted from in-process fluid, filter cake and filtrate and transported to the Analytical Laboratory for chemical analysis. Sampling will routinely be performed on the diluted UNH for uranium inventory accountability, on the filtrate prior to its

discharge to the General Sump (see section 5.4 Waste Water) and on the filter cake to confirm its suitability for shipment to the Nevada Test Site (see section 5.3 Characterization and Storage/Disposal of Filter Cake).

4.0 PRE-OPERATION CERTIFICATION OF EQUIPMENT, PROCEDURE AND PERSONNEL

Certification of the UNH process equipment and procedure will be obtained by an operability or simulation test. The simulation procedure will involve a series of hydro tests followed by a demonstration of system operability using water as the process fluid. The following list of the equipment to be utilized during UNH processing will be included in this test.

"UNH" Tank -	A tanker truck filled with water will be positioned near each of the five different UNH tank locations.
Dilution/ Neutralization Tank -	Tank F1-26 will be used to received the water from the tanker truck. While the water is in tank F1-26, some quantity of Magnesium Hydroxide will be transferred to simulate neutralization.
Magnesium Hydroxide Supply Tank -	Tank 3A, located by Tank F1-26, will be used to make-up a quantity of Magnesium Hydroxide by mixing MgO to water.
Filter Feed Tank -	Tank 203A will be used to receive the water from Tank F1-26. This tank will also be used to provide water to the East or West EIMCO Filter to simulate filtering of the UNH.
East and West EIMCO Filter -	Each filter will be operated separately during the simulation procedure.
Filtrate Receiving Tank -	Tank 25A will be used to receive filtrate water from the East and West EIMCO Filter

The transferring of water from each processing vessel will be performed using the new pumps and piping systems.

4.1 Personnel Training

A training and qualification programs incorporating past lessons learned and hazardous analysis results will be in place to ensure that personnel have the ability to operate and understand the process. These programs will be enhanced by the simulation operation. Performance of this simulation operation will allow a detailed review of the procedures and provide on-the-job type qualification prior to the actual processing of UNH.

5.0 ENVIRONMENTAL COMPLIANCE AND SPILL RESPONSE

The UNH Removal Action will be implemented under 40 CFR Part 300.415, CERCLA Sections 104(a)(2) and 105(a). In accordance with 40 CFR 300.400(e) and the September 1991 Consent Agreement, as Amended, under CERCLA Sections 120 and 106(a), permits for this removal action will not be required, however, substantive requirements, standards, criteria, and limitations of each permit otherwise required will be met. All applicable portions of the Consent Decree with OEPA, including the appropriate and relevant portions of closure/post closure, are considered herein.

Congress provided a statutory basis for ARARs in the Superfund Amendments and Reauthorization Act (SARA) of 1986, which added Sec. 121, "Cleanup Standards" to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. According to Sec. 121(d), which mandates the degree of cleanup that must be achieved on CERCLA sites, response actions conducted under Sections 104, "Response Authorities", and 106, "Reimbursement", of the statute must at least attain (or the decision document should justify the waiver(s) of) all applicable or relevant and appropriate requirements (ARARs) of other Federal environmental laws, more stringent State environmental laws, and State facility-siting laws.

5.1 PERMIT INFORMATION SUMMARY

Although the UNH Neutralization Removal Action is exempted from the procedural requirements to obtain Federal, State or local permits, Section XIII.B of the Amended Consent Agreement requires DOE to provide specific information regarding the permits that would be required in the absence of the CERCLA permit exemption for on-site response actions. This permit information is required to include:

- Identification of each permit that would otherwise be required;
- Identification of the standards, requirements, criteria or limitations that would have had to have been met to obtain each permit; and,
- Explanation of how the response action will meet the standards, requirements, criteria, or limitations identified in the above Item.

This Permit Information Summary was prepared to fulfill the requirements of Section XIII.B of the Amended Consent Agreement. This summary provides a description of how this removal action will comply with the standards, requirements, criteria, or limitations that would be imposed by permits required absent the CERCLA permit exemption for on-site response actions. Table 3 summarizes this permit information, as well as other ARARs for the project.

TABLE 3 (UNH Neutralization Project)		
APPLICABLE OR RELEVANT AND APPROPRIATE (ARARs) REQUIREMENTS		
Permit That Would Be Required	**Permit Requirements (ARARs)**	**Compliance Plan**
Hazardous Waste Facility Board Permit	Nature and volume of waste to be treated.	Waste to be neutralized on one-time basis has the characteristic of corrositivity and contains elevated levels of chromium and barium. Metals to be removed during this process. Approximately 200,000 gallons of UNH are contained in 19 tanks on-site.
	Facility comply with the hazardous waste stds. adopted pursuant to Section 3734.12 of the Revised Code	The FEMP has submitted a Part A and Part B Permit Application to OEPA.
	Facility must represent the minimum adverse environmental impact, considering the state of available technology and nature and economics of various alternatives, and other considerations.	Other alternatives were explored including shipment off-site. It was determined that the risk could be reduced by treating the UNH using the existing treatment system.
	Facility must represent the minimum risk for the following:	
	Contamination of ground and surface waters	Health & Safety Plan is in effect in addition to the SPCC Plan. These plans serve to minimize the risks of spills. The UNH Tank System has secondary containment and inspections are conducted daily of the piping.
	Fires or explosions from treatment, storage or disposal methods	Health & Safety Plan is in effect and a Spill Prevention Control and Countermeasure Plan. UNH tanks have secondary containment. NPDES parameters will be monitored prior to discharge.
	Transportation safety	All transportation of waste will conform to site-procedures as well as DOT packing and shipping requirements.
	Impact on public health and safety	The on-site removal action is isolated from any population centers such as schools, jails, residences. The removal site is not in a wetland or located within a flood plain. Limits on waste water discharges will be enforced. Removal plan procedures/contingency plans etc. will be followed, thus, no negative impact on the public health or environment will result.
	Air Pollution	See "Air Pollution Control" under the first column.
	Soil Contamination	No soil contamination is expected. The removal plan and site emergency and contingency plans address any spills, releases, etc.

TABLE 3 (UNH Neutralization Project)		
APPLICABLE OR RELEVANT AND APPROPRIATE (ARARs) REQUIREMENTS		
Permit That Would Be Required	**Permit Requirements (ARARs)**	**Compliance Plan**
40 CFR PART 61 - National Emission Standard for Hazardous Air Pollutants - (NESHAPS)	SUBPART H - SECTION 61.92: Emissions of radionuclides (except $radon^{222}$ and $radon^{220}$) to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr. Pursuant to 40 CFR 61.07 and 61.96(b), an application for approval does not have to be filed for radionuclide sources if the effective dose equivalent caused by all emissions from the new construction or modification is less than 0.1 mrem per year. Continuous emission monitoring is required under 40 CFR 61.93 (b) for stacks and vents which have the potential, under normal operating conditions, without benefit any emission control devices, to release radionuclides in sufficient quantity to cause an effective dose equivalent of 0.1 mrem/year or greater to any member of the public.	The dose resulting from the FEMP is reported to US EPA on an annual basis. Emissions from this removal action will not result in the annual standard being exceeded. Radionuclide emissions from the UNH project are not expected to cause an EDE 0.1 mrem/year or above to any member of the public.
NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT - OEPA NPDES PERMIT NO. 1IO00004*DD	FEMP wastewater discharges must not cause a violation of effluent limits or loading rate at NPDES permitted outfalls. Discharges must also be conducted in accordance with the terms and conditions of the permit. This includes notification requirements under 40 CFR 122.42 for Clean Water Act (CWA) Section 307 toxic pollutants and State water quality standards established under OAC 3745-1.	The project will meet limits as imposed by the current NPDES permit. The filtrate will be sampled and analyzed prior to waste water discharge to ensure all NPDES effluent limitations are met. See Attachment 1 for a copy of the NPDES limits. Wastewater associated with the proposed project will be treated at Plant 8 and the BDN Facility to ensure compliance with effluent limits and loading rates at NPDES permitted outfalls *4605 (BDN-ETS) and *4001 (MH-175) and applicable water quality standards. Processing filtrate through the Plant 8 filtration system and the BDN-ETS (*4605) satisfies the BAT requirements on which the permit effluent limitations are based. (BAT Requirements on which the current permit is based are found at 40 CFR 421.323 and 40 CFR 471.72).

TABLE 3 (UNH Neutralization Project)		
APPLICABLE OR RELEVANT AND APPROPRIATE (ARARs) REQUIREMENTS		
Permit That Would Be Required	**Permit Requirements (ARARs)**	**Compliance Plan**
Atomic Energy Act	Radiation doses, levels, and concentrations in restricted and unrestricted areas	
Air Pollution Control (OAC 3745)	PERMITS TO INSTALL - OAC 3745-31-05 (A): Installation of the proposed pilot plant facility must not prevent or interfere with the attainment or maintenance of applicable ambient air quality standards; and must not result in a violation of any applicable laws; and must employ the best available technology to control emissions. PERMITS TO OPERATE - OAC 3745-35-02 (C) - The proposed pilot plant facility must be operated in compliance with applicable air pollution control law; must be constructed, located or installed in compliance with the Terms and Conditions of a Permit To Install; and must not violate National Emission Standards for Hazardous Air Pollutants adopted by the Administrator of the EPA.	Air Permits are in place or being renewed for the existing process. See Table 4 for a list of the air permits. The tanks will not interfere with the attainment or maintenance of any applicable air quality standards or cause a violation of any applicable laws. Best available technology (BAT) will be implemented to control emissions. The tanks will be operated in compliance with applicable air pollution control laws and will not violate National Emissions Standards for Hazardous Air Pollutants.
Safe Drinking Water Act (42 USC 300G; PL 93-523)	National Primary Drinking Water Regulations (40 CFR 141),	Compliance will be demonstrated by sitewide environmental monitoring (including air, soil, and groundwater). Reports summarizing the sitewide monitoring results will be submitted to the EPA. Promulgated standards are relevant and appropriate to remedial actions because these activities may cause contaminants to migrate or leach into the underlying aquifer. While not relevant and appropriate, proposed standards may be considered if water impacted by the site would be used directly as a drinking water supply. Engineering controls and best management practices will be utilized to mitigate the potential discharge of contaminated wastewater to the underlying aquifer. The FEMP will ensure groundwater is not adversely impacted through continued monitoring under its existing Groundwater Monitoring Program.
	National Revised Primary Drinking Water Regulations (40 CFR 141.60 through .63);	
	Ohio Drinking Water Regulations,	
	Public Water System Primary Contaminant Control, OAC 3745-81	

TABLE 3 (UNH Neutralization Project)		
APPLICABLE OR RELEVANT AND APPROPRIATE (ARARs) REQUIREMENTS		
Permit That Would Be Required	**Permit Requirements (ARARs)**	**Compliance Plan**
Exposure to the Public	Radiation Dose Limit	The UNH project will be designed and operated to minimize the releases of radionuclides. Compliance will be demonstrated by sitewide environmental monitoring (including air, soil, and groundwater). Reports summarizing the sitewide monitoring results will be submitted to the EPA.
	Radiation Dose Limit (Drinking Water Pathway)	
	USEPA Health Effects Assessment Guidance	
Resource Conservation and Recovery Act	Hazardous Waste Determinations	The UNH project will operate in accordance with all RCRA management regulations. Daily inspections will be conducted of the aboveground piping and secondary containment is provided for the tank systems. The filtrate and filter cake will be sampled and analyzed prior to discharge and shipment off-site.
	Generators who Treat, Store, or Dispose of Hazardous Waste on-site	
	Generators who Transport Hazardous Waste for Off-site Treatment, Storage, or Disposal	
	Waste Accumulation on-site by Generator	
	Generator Recordkeeping and Reporting	Current FEMP procedures for preparing and maintaining records will be followed.
	Treatment, Storage, or Disposal Facility Standards:	The existing RCRA Part B Permit Contingency Plan and Emergency Procedures will be followed for any hazardous waste release associated with the project.
	Treatment, Storage, or Disposal - Facility contingency plan and emergency procedures and Facility preparedness and prevention	
	Closure with no Post-Closure Care	Provisions for facility closure will be identified as part of the final remediation program for OU-3.
	Container Storage and Management	Containers will be periodically inspected and records of these inspections will be kept.
	Tanks - treatment in a Unit	All treatment will comply with the RCRA regulations.
	Land Disposal Restrictions	All materials removed from the FEMP will be managed in compliance with applicable provisions of RCRA and other Federal and State requirements, including the US EPA's Off-Site Rule as became effective on October 22, 1993.

TABLE 3 (UNH Neutralization Project)		
APPLICABLE OR RELEVANT AND APPROPRIATE (ARARs) REQUIREMENTS		
Permit That Would Be Required	**Permit Requirements (ARARs)**	**Compliance Plan**
Operational - Worker Protection & Training	All facility personnel shall be trained. Employers shall develop and implement a written safety and health program for employees involved in hazardous waste operations.	This removal action will be conducted in accordance with the provisions of the Project Health and Safety Plan and the FEMP site Health and Safety Plan.
National Environmental Policy Act (NEPA)	Ensure that all federal agencies (including DOE) consider environmental impacts in the planning and decision-making phases of their projects.	NEPA compliance is addressed with the Categorical Exclusion (CX) No. 358 as was approved on January 15, 1992, by DOE-HQ. CX #358 addressed the entire scope of the Plant 2/3 UNH Removal Action. Modifications to the neutralization re-start project were submitted in a letter dated March 2, 1994, for DOE-FN concurrence that the existing CX would be adequate and still cover all aspects of the project.
DOE Orders	To Be Considered	All project design activities shall be implemented according to the DOE procedures.

5.1.1 Air Emissions

The UNH tanks, as well as the EIMCO filters and associated feed and filtrate tanks, will be operated within the limits of their existing Permits to Operate (PTOs). Table 4 provides a list of the tanks with their permit numbers and emission limitations. The UNH Neutralization Project will not exceed these emission limitations. The neutralization process will be controlled to maintain the solution temperature below 140 degrees F to minimize any NOx generation. Dispersion modelling demonstrates that any NOx emissions that may occur will be well below the level permitted by OEPA's air toxics policy. Even though not required, a NOx scrubber will be installed to prevent release of NOx to the environment and provide additional protection to workers in the plant. The NOx scrubber is a caustic type scrubber. Caustic will be pumped from a tank to the top of a packed tower. The vapors from Tanks F1-25 and F1-26 will enter the packed tower at the bottom and flow upward, contacting and being neutralized by the down flowing caustic. The air will then be vented to the atmosphere.

5.1.2 Hazardous Waste Treatment

Under CERCLA Section 121(e), a response action conducted entirely on-site is exempt from having to obtain a Federal, State or local permit. This permit exemption allows the removal action to proceed free from delays caused by approval of administrative requirements; however, all RCRA substantive requirements must be met for treatment of the UNH. The requirements include meeting the design and operating standards for the type of unit in which the hazardous waste will be treated. RCRA tank regulations are found at 40 CFR 264.190, 40 CFR 265.190, and OAC 3745-55.

The operations plan for the removal details how the neutralization project will progress. The treatment standards for the removal action will be below regulatory levels for TC constituents from 40 CFR 261.24 and OAC 3745-51-24. A pH of 6.5 to 9.0 from 40 CFR 261.22 and limits found in the FEMP NPDES permit will be met. Also, radiological limits per site documents for waste water sent to Plant 8 will be imposed.

5.2 LEAKS AND SPILLS/SECONDARY CONTAINMENT

The nineteen (19) UNH storage tanks associated with the UNH Neutralization Project are provided with secondary containment that meets the requirements of 40 CFR 265.193 and OAC 3745-66-90. Leak detection inspections are conducted by visually inspecting containment areas on a daily basis in accordance with the FEMP Hazardous Waste Management Unit Inspection criteria and 40 CFR 265 requirements. Spills will be contained in accordance with existing spill containment and response procedures. The spill response procedures are consistent with OAC 3745-55-96.

AIR PERMIT SUMMARY
TABLE 4

TANK ID	PTO #	EXPIRATION DATE	TANK CONTENTS	EMISSIONS
D1-1	P113	3/25/96	Nitric Acids/ Uranium Oxides/ Slag Leach	39.24 tpy NOx
D1-7	P119	3/25/96	Refinery Thickening Slurry\Nitric Acid	0.14 tpy NOx
West Eimco	P240	12/31/95	Neutralized Acid Raffinate & Slag Leach Filter Cake	7.29E-1 lb U/year 12.71 lb PM/hr
East Eimco	P248	12/31/95	Neutralized Acid Raffinate & Slag Leach Filter Cake	7.29E-1 lb U/year 12.71 lb PM/hr
F-203	P281	03/26/96	Raffinate Slurry	4.21E-7 lb U/year
F-203A	P282	03/26/96	Raffinate Slurry	8.28E-7 lb U/year
D1-10	T021	12/13/96	Uranyl Nitrate	5.95E-7 lb U/year
F1-1	T023	12/13/96	Uranyl Nitrate	6.07E-7 lb U/year
F1-2	T024	12/13/93*	Uranyl Nitrate	6.07E-7 lb U/year
F1-25	T025	12/13/93*	Uranyl Nitrate	1.82E-6 lb U/year
F1-26	T026	12/13/93*	Uranyl Nitrate	1.82E-6 lb U/year
F2E-6	T029	12/13/93*	Uranyl Nitrate	1.37E-6 lb U/year
F2E-5	T031	12/13/93*	Uranyl Nitrate	1.37E-6 lb U/year
F2E-8	T032	12/13/93*	Uranyl Nitrate	1.82E-6 lb U/year
F2-608	T039	03/18/95	Uranyl Nitrate	5.43E-6 lb U/year
F2-607	T040	03/18/95	Uranyl Nitrate	5.43E-6 lb U/year
F2-606	T041	03/18/95	Uranyl Nitrate	5.43E-6 lb U/year
F2-605	T042	03/18/95	Uranyl Nitrate	5.43E-6 lb U/year
F1-301	T047	03/18/95	Slag Leach/ Magnesium Fluoride	5.20E-7 lb U/year
F1-302	T048	03/18/95	Slag Leach/ Magnesium Fluoride	5.20E-7 lb U/year
F1-303	T049	03/18/95	Slag Leach/ Magnesium Fluoride	5.20E-7 lb U/year
F3E-223	T070	12/13/93*	Uranyl Nitrate	4.60E-6 lb U/year
F1-308	T073	03/18/95	Filtrate from Slag Leach	1.77E-6 lb U/year
25A	T098	12/20/93*	Filtrate from Vacuum Filters	6.51E-6 lb U/year
F3E-220	SEE NOTE #1	——	Nitric Acid	——————

* - Renewal applications have been submitted for these tanks. They are currently being operated under their existing Permits To Operate.

NOTE #1 - Tank F3E-220 is a component of the Nitric Acid Recovery (NAR) emission control system. Since it was considered an item of control equipment, it was not permitted as an emission source. However, several permits list the NAR system as control equipment (e.g. P113, P116, etc.).

All aboveground piping not located within the secondary containment areas will be inspected on a daily basis in accordance with 40 CFR 265.193(f) and OAC 3745-66-93(F). The skid-mounted pumps will be placed within the secondary containment areas where feasible; otherwise, temporary secondary containment will be provided.

5.3 CHARACTERIZATION AND STORAGE/DISPOSAL OF FILTER CAKE

Once the neutralization of each batch of UNH is complete as verified by reaching a final pH of 7 or greater, the contents of the neutralization tank will be transferred using the progressive cavity pump to the filter feed tanks (F43-203 and/or F43-203A) in Plant 8. The neutralized slurry will be filtered on one or both existing rotary drum vacuum filters (East and West Eimco Filters) located in Plant 8. The slurry will be pumped from either of the two feed tanks. Filter cake from the filters will be drummed directly as it is produced at the filters. The filter cake will be drummed in 55-gallon drums. The 55-gallon drums will be sampled and analyzed in accordance with Section C, Waste Characteristics, of the FEMP RCRA Part B Permit Application to confirm that no hazardous waste is present. The drums will be staged and shipped off-site.

5.4 WASTE WATER

Neutralized UNH filtrate will be collected in Tank 25A. Some of the filtrate may be recycled to Tanks F1-25 and F1-26 for use in the dilution step of the neutralization process or used as rinse water to clean the UNH Storage Tanks. Filtrate which is not recycled, after being sampled and approved for discharge, will be transferred to the Biodenitrification facility via the General Sump. If contaminants are detected in the filtrate above the discharge limit, the filtrate will be discharged to the High Nitrate Tank for further processing through the Biodenitrification Facility.

5.5 SAMPLING PLAN APPROACH

The batch processing of UNH solution will generate two distinct waste streams: 1) aqueous filtrate, and 2) filter cake. In 1993 approximately 20,000 gallons of UNH solution were processed generating 26,000 gallons (501 drums) of filter cake. Each drum of the filter cake was sampled to form 60-drum composite samples which were then analyzed for TCLP metals. All TCLP results were 60 times lower than the respective regulatory limits. This initial processing validated the bench-scale work that had been completed earlier in the project which showed that the process effectively neutralized the wastewaters and precipitated the RCRA metals in a form not capable of leaching from the waste matrix of the filter cake.

Characterization of the filter cake to be generated from the remaining UNH solution will draw heavily on the successful work completed to date. It is anticipated that the processing will require 30 to 50 individual batches to treat the 200,000 gallons of UNH solution. The filter cake generated from each batch processed will be sampled and analyzed to verify that the process continues to perform as expected and to establish a correlation between the feed materials, processing conditions, and the final waste product. Because each batch is extremely well mixed, only two samples will be required from each batch processed (taking two samples allows basic statistics such as mean, variance and confidence interval to be calculated).

If after the first seven batches a strong correlation can be drawn between the feed materials, process conditions, and the analytical results for the final filter cake product, then the sampling of the final filter cake may be cut back to minimize the generation of secondary waste streams from sampling and analysis (including mixed waste streams such as acid digestates) and to minimize project costs. In cases where either the physical or chemical attributes of the feed materials fall outside the bounds for the established correlation (i.e., batches with high chromium or barium feed concentrations), sampling of the resultant filter cake will be resumed to verify that the filter cake remains non-hazardous.

All sampling and analysis will be completed in accordance with the FEMP Sitewide CERCLA Quality Assurance Project Plan (SCQ). Sampling will be conducted following the Prototype Sampling and Analysis Plan (SAP) for containerized waste. As required by the Prototype SAP, a Project-Specific Sampling and Analysis Plan (PSAP) has been generated for this sampling effort specifying the detailed information required for each sampling event (e.g., drum numbers, number of samples required, parameters for analysis). Attachment 5 provides a copy of the Project-Specific Sampling and Analysis Plan #94-795. The physical sampling will be conducted following FERMCO procedure 20-C-805 "Sampling of Drummed Material for Hazard Identification". Analytical results will be summarized and included in the characterization file for this waste stream (Material Evaluation Form (MEF) Number 1186). Chapter 9 of EPA's SW-846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" recommends that with an initial estimate of the mean and variance Equation 8 be used to determine the appropriate number of samples to collect under a simple random sampling scheme to adequately characterize the waste. Given the low mean and small variance obtained from the sampling of filter cake from the UNH processed last year, Equation 8 returns an extremely low number of samples required to characterize the remainder of the waste stream (less than 1). The approach outlined above utilizes a judgmental sampling scheme appropriately tailored to the batch-wise processing of the UNH solution and results in the collection of more samples than would be dictated by the application of Equation 8.

The characterization and sampling and analysis approach outlined above is consistent with the Section C, Waste Characteristics included as part of the FEMP RCRA Part B Permit Application.

Attachment I

NPDES PERMIT

5904

Part I, A. - FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from the following outfall: 1IO000004001. See Part II, OTHER REQUIREMENTS, for location of effluent sampling.

EFFLUENT CHARACTERISTIC			DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
			Concentration Specified Units		Loading* kg/day			
Reporting Code	Units	Parameter	30 Day	Daily	30 Day	Daily	Meas. Frequency	Sample Type
00300	mg/l	Dissolved Oxygen	-	(5.0 Min)	-	-	1/Week	Grab
00530	mg/l	Residue, Total Nonfilterable	30	45	99	149	1/Week	24 Hr. Composite
00550	mg/l	Oil and Grease, Total	15	15	50	50	1/Week	Grab
00610	mg/l	Nitrogen, Ammonia (NH_3)	-	-	-	-	1/Week	24 Hr. Composite
00620	mg/l	Nitrogen, Nitrate (NO_3)	-	-	-	-	1/Week	24 Hr. Composite
00720	DELETED							
00951	mg/l	Fluoride, Total (F)	-	-	-	-	1/Week	24 Hr. Composite
01034	µg/l	Chromium, Total (Cr)	-	-	-	-	1/Week	24 Hr. Composite
01042	µg/l	Copper, Total (Cu)	23	94	0.077	0.310	1/Week	24 Hr. Composite
01051	DELETED							
01067	µg/l	Nickel, Total (Ni)	-	-	-	-	1/Week	24 Hr. Composite
01077	DELETED							
01220	µg/l	Chromium, Dissolved Hexavalent	-	-	-	-	1/Week	Grab
50050	MGD	Flow Rate	-	-	-	-	Daily	24 Hr. Total
80082	mg/l	$CBOD_5$	20	30	66	99	1/Week	24 Hr. Composite

* Loadings are based on 0.872 MGD.

2. The pH (Reporting Codes 00402 (minimum) and 00401 (maximum)) shall not be less than 6.5 S.U. nor greater than 9.0 S.U. and shall be monitored continuously and the critical values reported. See Part II, Item E.

3. Samples taken in compliance with monitoring requirements specified above shall be taken at sampling stations described in Part II, OTHER REQUIREMENTS.

5904

Part I, A. - FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from the following outfall: 1IO000004605. See Part II, OTHER REQUIREMENTS, for location of effluent sampling.

EFFLUENT CHARACTERISTIC			DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
			Concentration Specified Units		Loading* kg/day			
Reporting Code	Units	Parameter	30 Day	Daily	30 Day	Daily	Meas. Frequency	Sample Type
00310	mg/l	Biochemical Oxygen Demand, 5 Day	30	45	26	38	1/Week	24 Hr. Composite
00530	mg/l	Residue, Total Nonfilterable	30	45	26	38	1/Week	24 Hr. Composite
00610	mg/l	Nitrogen, Ammonia (NH_3)	-	-	-	-	1/Week	24 Hr. Composite
00620	mg/l	Nitrogen, Nitrate (NO_3)	72.7	145	62	124	1/Week	24 Hr. Composite
00951	DELETED							
01034	µg/l	Chromium, Total (Cr)	12	27	0.0101	0.0226	1/Week	24 Hr. Composite
01042	µg/l	Copper, Total (Cu)	45	90	0.0387	0.0770	1/Week	24 Hr. Composite
01067	µg/l	Nickel, Total (Ni)	29	42	0.0251	0.0361	1/Week	24 Hr. Composite
01220	µg/l	Chromium, Dissolved Hexavalent	-	-	-	-	1/Week	Grab
50050	MGD	Flow Rate		-	-	-	Daily	24 Hr. Total

* Loadings are based on 0.2252 MGD.

2. The pH (Reporting Code 00400) shall be monitored daily by grab sample.

3. Samples taken in compliance with monitoring requirements specified above shall be taken at sampling stations described in Part II, OTHER REQUIREMENTS.

Attachment 2

TEST DATA REPORT

FERMCO
Management Corporation P.O. Box 398704 Cincinnati, Ohio 45239-8704 (513) 738-6200

5904

January 29, 1993

U. S. Department of Energy
Fernald Environmental Management Project
Letter No. C:OP:93-156

Mr. James J. Fiore, Acting Manager
DOE Field Office, Fernald
P. O. Box 398705
Cincinnati, Ohio 45239-8705

Dear Mr. Fiore:

CONTRACT DE-AC05-020R21972, TEST DATA REPORT (PTA 90-2/3-003, REV. 1) DISPOSITION OF REFINERY URANYL NITRATE SOLUTIONS.

Attached is the Test Data Report for PTA 90-2/3-003, Rev. 1, Disposition of Refinery Uranyl Nitrate Solutions, for DOE-Operational Readiness Evaluation (ORE) team review.

This is the Final Test Data report for the first 20,000 gallons of UNH that was processed under Removal Action #20. The primary recommendation of the Test Data Report is to complete all further batches of UNH under a Standard Operating Procedure (SOP). All other recommendations will be implemented before seeking authorization to proceed.

FERMCO will complete a Readiness Review (RR) for the next phase of the UNH processing under the SOP and will submit the results to DOE for review by the DOE-ORE team. The new Standard Operating Procedures will be forwarded as soon as they are completed.

Very truly yours,

N. C. Kaufman
President

NCK:DJD:tln
Attachments

cc: P. Campbell
J. King
J. Long
D. Paine
File Record Storage Copy 102
J. Simak, DOE/FN
J. Thiesing, w/o attachment
R. Warner, DOE/FN

Test Report Issue Date: February 1, 1993

TEST DATA REPORT

Test Procedure Number: PTA 90-2/3-003, Rev.1

Test Title: DISPOSITION OF REFINERY URANYL NITRATE SOLUTIONS

Date(s) of Test: 30 June, 1992 - 20 November, 1992

Test Sections Covered by this Report: First batch in F1-26

Test Report Prepared By: Bruce Y. Ledbetter
Startup Engineer

Approved: 1-28-93
Manager - Operations Readiness and Startup

Approved:
Manager - CRU3

Approved: 1/29/93
Manager - RSO Operations

Approved: for Don Paine 1/28/93
Vice President - Environmental Health & Safety

.0 INTRODUCTION 3

.0 SUMMARY OF RECOMMENDATIONS 3

.0 TEST RESULTS 4

3.1 SUMMARY OF TEST RESULTS 4

3.2 SUMMARY OF TEST 4

3.3 COMPARISON OF TEST RESULTS WITH TEST REQUIREMENTS 10

.0 SUMMARY OF PROCEDURE CHANGES 16

.0 SUMMARY OF TEST EXCEPTIONS 18

UMMARY OF RADIOLOGICAL SURVEY DATA 18

.0 SUMMARY OF INDUSTRIAL HYGIENE SURVEY DATA 18

.0 RECOMMENDATIONS 19

TABLES
1. UNH FILTERING OPERATIONS
2. ANALYSIS SUMMARY - TCLP
3. ANALYSIS SUMMARY - MC&A
4. ANALYSIS SUMMARY - TANK 25A(FILTRATE)

ATTACHMENTS
1. SUMMARY OF UNH RADIOLOGICAL SURVEY DATA
WEMCO:IRS&T(RA&I):92-315

2. SUMMARY OF INDUSTRIAL HYGIENE SURVEY DATA
M:ESH:92-010

3. MEF-1186 UNH SUMP CAKE

1.0 INTRODUCTION

Approximately twenty tanks in the Refinery area contain uranyl nitrate solutions in various concentrations. The total quantity amounts to approximately 226,000 gallons of solution which contains a nominal 100 metric tons of uranium (MTU). The extended storage of this previously designated work in process (WIP) material as a liquid is not a desirable arrangement. The possibility of leakage from valves, flanges, and other fittings could generate adverse publicity, be a potential threat to the environment, and create additional emergency operations. These tanks of solution were prepared as the initial step of purification, but the Refinery will not function again to process uranium as in the past. Therefore, it is desirable to convert the currently dissolved uranium into a solid form which would be much more amenable to extended storage, shipping, etc.

The Refinery has not been in service since September, 1988 and none of the equipment was maintained. All piping was pressure tested in a System Integrity Test prior to commencing the PTA. The equipment is to be tested in the PTA.

2.0 SUMMARY OF RECOMMENDATIONS

The contents of tank F1-26 were processed per this procedure as an initial test to provide assurance that the product could be precipitated, pumped, filtered, drummed, and sampled. The Health and Safety plan was assessed for the proper requirements.

The processing was judged to be successful in that all of these objectives were met.

The PTA was written to process all of the UNH and the first blend was to be used to smooth out the process. After the first blend was complete, a partial test report was to be issued. This Test Report is being issued as a final, because it is our recommendation to complete the process under a SOP rather than continuing on with the PTA.

The existing Health and Safety plan developed for this PTA and changed due to problems encountered under this PTA should be kept in effect as a reference document under the SOP.

The following corrective actions implemented by Unusual Occurrence Report ORO-WEMCO-FMPC-1992-0075 should be incorporated into the SOP and and any further training:

1) All personnel given Conduct of Operation training stressing verbatim compliance to procedures.

2) Personal NO_2 monitors to be worn by personnel.

3) Personnel trained to the Health and Safety Plan and lessons learned due to the incident.

4) None of the tanks, except the holding tanks in the refinery sump, will be heated.

5) Lexan covers installed on the manholes of the blend tanks with a small sliding door for level measurement.

6) All blends will take place in blend tank F1-25. F1-25 has an installed vent fan, F1-26 does not.

7) At least one roof exhaust fan in digestion shall be running during any blending operation.

8) Allow leeway on the precipitation temperature and pH and the blend volumes.

9) All changes affecting operating parameters should be reviewed and approved by DOE/FN.

The RCRA sampling plan should be changed to require only 10% sampling.

This process should be used for any UNH produced during cleanup for safe shutdown and/or CERCLA/RCRA closure.

3.0 TEST RESULTS

3.1 Summary of Test Results

A. The UNH blend when diluted to approximately 50 g-U/l can be precipitated, pumped, and filtered using existing equipment.

B. It is not necessary to use lime in tank F1-610 to increase the pH of the slurry to above 7.0.

C. It is not necessary to dilute the $Mg(OH)_2$ slurry prior to use.

D. Analytical results show both the filter cake and filtrate to be non-RCRA.

3.2 Summary of Test

The Test Log was started on 6/30/92 after receiving permission from DOE to commence testing. Test Exception's 1 through 20 were written before testing began to cover open work orders on the system. Test

Change Notice(TCN) #1 was written to add a DOE required hold point after the first batch was processed.

The initial valve lineups commenced on 7/6/92 and continued through 7/10/92.

The original first blend recipe was to consist of the following:

F1-26	16,114 gallons
F1-25	3,000 gallons
F2-607	3,000 gallons
D1-2	1,000 gallons

Since the agitator on tank F2-607 had not yet been repaired, 3000 gallons from tank F2-608 were substituted. The substitution did not affect the isotopic level of the blend since all four NFS tanks are isotopically identical.

After tank F2-608 was heated for several hours, no temperature change was seen on the installed thermometer. The thermometer read 110°F, but a small amount of orange fumes were seen at the vent stack. A portable thermometer was inserted through the manhole and read 147°F. The NFS tanks contain material with a high solids content and it is suspected that solids have accumulated at the bottom of the tank and insulated the installed temperature probe.

Approximately 3000 gallons of UNH were pumped from tank F2-608 to blend tank F1-26 at a temperature of 147°F. The decision to pump at a temperature outside the specified temperature range of 120°-130°F was discussed with all present and based on:

a) While pumping out of tank F2-608, outside air would be entering the vent line and fumes would not be escaping.

b) The temperature range of 120-130° F was an arbitrary selected range for heatup of the material in the tanks to ensure that the temperature would not exceed 150° F during the precipitation step. Tank F2-608 was not being heated up for the precipitation step but being heated up to dissolve any UNH not in solution.

The blend was completed by the addition of approximately 2100 gallons from tank D1-4. The blend recipe was revised to allow tank D1-4 to be pumped to below a flange that was leaking. Tank D1-2 will be used in future blends. During heating of tank D1-4 the temperature reached 135°F which was outside the procedure specified range of 120°-130°F. Several

factors contributed to this:

a) An operator was not left in the area to continuously monitor the heatup. Industrial Hygiene limited the operator stay times because of the heat. Once a heatup rate was established an operator went in periodically to take temperatures.

b) The operator was not instructed to turn off the steam at any particular temperature.

c) Once the temperature was in the range, it took longer than expected to dress the pumping team in PPE and reenter the area to close the steam inlet valve.

UNH was pumped from D1-4 until the level was below the leaking flange. Approximately 2100 gallons were transferred out of tank D1-4 into tank F1-26. At the end of the transfer the IH technician reported a high NO_2 reading on his Draeger tube. A few minutes later an alarm sounded in digestion. One of the operators was potentially exposed to high levels of NO_2 while investigating the alarm and not wearing his airline.

The test was put on hold until an investigation could occur and corrective actions could be implemented (Unusual Occurrence Report ORO-WEMCO-FMPC-1992-0075).

Permission to restart was given on 3 September, 1992. The following are corrective actions implemented prior to restart:

1) All personnel were given Conduct of Operation training stressing verbatim compliance to procedures.

2) The Health and Safety Plan was changed to include new personnel NO_2 monitors to be worn by personnel.

3) All personnel were trained to the changes in the Health and Safety Plan and lessons learned due to the incident.

4) The procedure was changed. None of the tanks, except the holding tanks in the refinery sump, will be heated.

5) Lexan covers were installed on the manholes of the blend tanks with a small sliding door for level

measurement.

6) All further blends will take place in blend tank F1-25. F1-25 has an installed vent fan, F1-26 does not.

7) At least one roof exhaust fan in digestion shall be running during any blending operation.

8) The procedure was changed to allow leeway on the precipitation temperature and pH and the blend volumes.

9) All Test Change Notices(TCN) affecting operating parameters would be reviewed and approved by DOE/FN.

Isotopic sample analysis of the first batch was .977% U^{235}.

Refinery Sump hold tank F1-608 was filled with 5000 gallons of water. 4973 gallons of UNH were transferred from F1-26 using the level gauge on tank F1-608. When an inspection of the level readings on F1-26 was done, it was found that only 3700 gallons were transferred out of F1-26. An investigation showed that the gauge at F1-608 had been calibrated for water and was reading approximately 20% high for UNH. A metal tape was then attached alongside the sightglass of tank F1-608 for reading all future levels.

Precipitation began on 10 September, after the pH probe on tank F1-609 was replaced. The initial filling and precipitation in tanks F1-609 and F1-610 took two days. The process was placed on standby with the agitators running for the weekend. On Monday morning, 14 September, it was discovered that the steam valves for heating up tank F1-608 had leaked over the weekend. The temperature in tank F1-608 was 160° F. Approximately 700 gallons of water from tank F2E-601 were added to tank F1-608 to lower the temperature. The high temperature in tank F1-608 did not produce any visible fuming out of the stack nor did the MDA single point NO_2 monitors alarm. A different set of block valves will now be used to control the steam to tank F1-608.

After again replacing the pH probe for tank F1-609, precipitation of the contents of tank F1-608 was completed on 15 September. A new type of pH probe was ordered with input from the Instrument Mechanics. 7460 gallons of slurry were pumped to Plant 8. 5600 gallons were left in tank F1-609, and enough slurry was left in tank F1-610 to cover the pH probe.

On 16 September, the first product was filtered on the East Eimco filter. The filter cake produced initially was very dry and dusty. Some of the dust was not caught by the packaging station dust collector. Per the Health and Safety Plan, the drumming station operators were wearing respirators and no airborne contamination was detected. Maintenance built an extension to the chute and the filter operators adjusted the cut on the filter to produce a wetter cake.

Tank F1-608 was filled with approximately 10,000 gallons of filtrate water from Plant 8 and 8030 gallons of UNH from tank F1-26. After filling, a small leak was discovered at a flange on tank F1-608. The leak was contained in a diked area near the area sump. The flange was tightened and the leakage was washed to the sump. The AEDO declared this a loggable event(92-09375).

On 17 September, during third shift, a Plant 8 operator attempted to pump water from tank F2E-601 to Plant 8. The valve in the line from the Refinery Sump to Plant 8 had been closed the previous day after UNH was pumped to Plant 8. The valve in the line to Plant 8 is within several feet of a valve in the Refinery Thickener Slurry(RTS) line and both are chain operated valves. In the dark the operator pulled the wrong chain and opened the valve in the RTS line which was an unused and untested line. A flange on the line leaked and spilled a couple of gallons of low level contaminated water on the ground. The AEDO declared this a loggable event(92-09376). The filled line was drained to a sump and sent to Plant 8 as UNH.

While performing the valve lineup prior to resuming precipitation, it was observed that the diaphragm on the $Mg(OH)_2$ pump had ruptured. The diaphragm was replaced, but the head refused to seal. The pump was replaced.

A leak was also discovered on the bottom sightglass of tank F1-608. The AEDO declared this a loggable event(92-09377) since none of the leakage was outside of the diked area. The sightglass was tightened to stop the leak.

On 18 September, tank F2E-601, which was being used for sump water, was discovered to be contaminated with UNH. This either resulted from the previous day's filling of the unused line or because the transfer line from F1-26 to F1-608 was not flushed adequately. Flushing of all lines will be now done until clear water appears at the destination tank. The contaminated water in tank F2E-

601 was treated as UNH.

A blanked flange near the bottom of tank F1-608 started leaking about a pint every 5 minutes. The AEDO declared this a loggable event(92-09378). The contents of tank F1-608 were transferred to tank F2E-601. The blank was discovered to be Monel and therefore incompatible with nitric acid. No stainless steel blanks of the required size were available, so a Monel blank was installed with a full faced teflon gasket. The monel will not come into contact with the UNH in the tank.

WEMCO management directed that all flanges within the UNH systems be evaluated for the correct material. After a full inspection of all the systems, no other monel flanges were found.

TCN-25 was written on 5 October, to allow the contents of tank 13 in the General Sump to be sent to the High Nitrate Tank prior to receiving sample results. This was necessary because of the time required to receive Ba & Cr results.

On 20 October, the process water line that supplies seal water to the Eimco filter vacuum pumps ruptured. Vacuum was lost to both filters. UNH processing was on hold for three days for repairs to the process water line and placing the filters back on line.

On 5 November, a bomb threat was called into the FEMP. While searching the digestion area, the supervisor noticed that a leak on tank D1-2 had increased from the last time he had seen it. This was a previously known leak that was being collected in a bucket and was being monitored daily by a HWMU inspector.

It was decided by WEMCO management and concurred with by DOE to empty tank D1-2. While performing the valve lineups, it was discovered that approximately 2 ft. of piping was missing from the discharge side of the D1-2 pump. The pump had been replaced, but the piping hadn't been replaced yet. Maintenance replaced the piping and the contents of D1-2(3068 gallons) were transferred to blend tank F1-25, which contained 20,000 gallons This will make up the blend for the second batch. Tank D1-2 was flushed with water to tank F1-25.

On 6 November, the last precipitate from the first batch was sent to Plant 8 and the precipitation tanks were flushed out with water.

On 14 November, the filter from an air sampler above tank 203A in Plant 8 was discovered to be coated with a yellow material. A further investigation of the area

showed equipment in the area of tank 203A to also be coated with a yellow material, the same color as the UNH slurry. This event was given the number ORO-WMCO-FMPC-1992-0127. The dust was caused by blowing down the sump water transfer line into tank 203A. Tank 203A was half full of UNH slurry and there was a coating of dried slurry on the inside of the tank. The Plant 8 procedure will be changed to blow down the transfer line to one of the digester tanks. The open flanges on top of tank 203A have been covered.

On 20 November, the last of the UNH slurry was filtered.

3.3 Comparison of Test Results with Test Requirements

Under Purpose/Scope in the PTA, Section 1.1

All uranium solutions now stored in the various tanks located in the Refinery area will be converted to a solid form and packaged for storage. The contents of the tanks will be blended to reduce each composite blend to an isotopic level less than 1.00% U^{235}. The solutions will also be blended to achieve a nominal uniform concentration of < 100 g U/liter prior to precipitation and filtration. The product filter cake will be packaged into drums.

Test Result:

A. The contents of tank F1-26 plus 3069 gallons out of tank F2-608 and 2103 gallons out of tank D1-4 were blended to a isotopic level of .977% U^{235} and a concentration of 107.1 g U/liter.

B. The Blend was diluted at least 1:1 in the refinery sump hold tank F1-608.

C. The filter cake was double drummed in 48/55 overpacks.

Under Purpose/Scope in the PTA, Section 1.2

Twenty tanks in the Refinery area contain uranyl nitrate solutions in various concentrations. The total quantity amounts to approximately 226,000 gallons of solution, with a nominal 100 Metric Tons of Uranium (MTU). The criterion for this PTA is to develop the optimum parameters and methods for converting various solutions of Uranyl Nitrate into a stable filter cake that can be stored in drums. The PTA outlines parameters for blending, pH adjustment, precipitation methods, and filtering techniques that will be used.

Specific parameters will be determined for various concentrations as they are blended and precipitated. This will be done by first, blending the solutions to a uniform mix, adding water to create the optimum concentration for neutralization, then precipitating the uranium from solution by magnesium hydroxide and lime addition, filtering the slurry, and loading into drums. The filtrate will be analyzed to verify full recovery of uranium from filtration and acceptable levels of other contaminants. The drums of filter cake product will be sampled and analyzed for final inventory control and material classification.

Test Result:

A. The first batch was blended to obtain the following results:

F1-26	16,114 gallons	128 g/l	.991% U^{235}
F2-608	3,000 gallons	79 g/l	1.000% U^{235}
D1-4	2,000 gallons	138 g/l	.955% U^{235}

F1-26) 16,114 gallons * 3.785 l/gal =
60,991.49 l * 128 g-U/l =
7,806,910.72 g-U * .991% U^{235} =
77,366.49 g-U^{235}

F2-608) 3,000 gallons * 3.785 l/gal =
11,355.00 l * 79 g-U/l =
897,045.00 g-U * 1.00% U^{235} =
8,970.45 g-U^{235}

D1-4) 2,000 gallons * 3.785 l/gal =
7,570.00 l * 138 g-U/l =
1,044,660.00 g-U * .955% U^{235} =
9,976.5 g-U^{235}

Total U = 9,748,615.72 g
Total U^{235} = 96,313.44 g
% U^{235} = .99

Total liters = 79,916.49
Total g-U/l = 121.99

B. The analytical results are as follows:

107.1 g-U/l
.977% U^{235}

C. The first batch was successfully blended to < 1% U^{235}.

D. The final dilution in the refinery sump hold tank to approximately 50 g-U/l was

satisfactory. The thickness of the slurry was acceptable at this concentration and no problems were encountered with pumping to Plant 8.

E. Hydrated Lime Slurry $Ca(OH)_2$ was used initially in tank 610, but it was found that continued lime addition was not necessary to raise the pH. While maintaining a pH of approximately 5.5 in tank 609, it was found that the residence time produced by the cascading effect into tank 610 allowed the $Mg(OH)_2$ sufficient time to bring the pH up to approximately 7.5. The automatic flow control valve for $Mg(OH)_2$ addition was found to be of insufficient capacity. The automatic flow control valve was bypassed and with the bypass fully open, pH control was easily maintained at 5.5 with the UNH inlet valve.

F. The initial, too dry cuts on the Eimco filter were corrected by taking a deeper cut. In addition an extension chute was installed on the drumming station to minimize any further releases. During the filtering run it was noticed that filtering efficiency was very erratic from shift to shift. This is due to several reasons:

a) Different experience levels between the operators on each shift.

b) Shutting the filter down for lunch breaks and shift turnover.

Another problem was encountered with the filtering operation. There was excessive in leakage on both vacuum pumps seals for the Eimco filters. Leakage is designed into the seals to maintain the vacuum and to cool the pumps but this seal leakage amounted to approximately 3000 gallons per day which went to tank 25A. Seal water was provided by process water. This was an unnecessary 3000 gallons a day of process water that was being sent to the high nitrate tank. Maintenance installed a new pump and repiped the seal water lines to allow seal water to be provided from either process water or recycling the contents of tank 25A to the seals.

G. 487 drums were produced accounting for 8 lots

of 60 drums. The first two lots were analyzed for isotopic concentration and TCLP metals. The rest of the lots were analyzed only for TCLP metals. A summary of the results is attached as Table #2.

H. MC&A samples were also taken on the same lot schedule and a summary of the results is attached as Table #3.

Under Purpose/Scope in the PTA, Section 1.3

The conversion to solid form will be conducted in a series of ten or more "batches", each of which will be designed to mix solutions from two or more tanks that will satisfy the enrichment criteria of <1.00% U^{235} and concentration standards of < 100 g U/l. Before each solution is transferred from its storage tank to the blending tank, it will be heated to approximately 125°F and mixed to dissolve all settled material. The heating will be performed by steam jackets or steam jet spargers as determined by the Test Coordinator (TC). The TC will determine the sequence of the batches and will make adjustments to the specific recipes when required to maintain acceptable results.

Test Result:

A. The analytical results of the first batch are as follows:

107.1 g-U/l
.977% U^{235}

B. The source tanks will no longer be heated prior to blending. The source tanks will be agitated and all settled material will be dissolved with nitric acid and flushed when the tank is empty.

C. The Test Coordinator with concurrence from the area supervisor adjusted the recipe of batch #1 for operational concerns to maintain acceptable results. All further batches will be adjusted as necessary.

Under Purpose/Scope in the PTA, Section 1.4

Blending of solutions will be done in blend tanks F1-25 & F1-26, located in the refinery digestion area. The contents of the blend tanks will be thoroughly mixed. Transfers from the various storage tanks will be made in accordance with the designated piping routes and the

blend recipes. Transfers are predetermined by the TC and shown in Section 1 of the "Batch Information and Record Sheet," (Attachment 1) to achieve the desired concentration and isotopic result. All tanks of uranyl nitrate solution will be heated and agitated prior to transfer. As each storage tank is emptied, it will be rinsed/flushed with nitric acid and/or water to assure removal of all uranium-containing solution and bottom sediment. Nitric Acid is stored in tanks F1-23, F1-24, and F3E-220. Each batch will be held in the blend tank until authorization is received from the Test Coordinator to proceed (based on analysis results).

Test Result:

A. The first blend batch was done in tank F1-26. All further blends will take place in tank F1-25, which has an installed vent fan.

B. When tank D1-2 was emptied, it was flushed with water. There was no sediment in the bottom of D1-2 that needed nitric acid to dissolve.

Under Purpose/Scope in the PTA, Section 1.5

Each blend batch will be transferred through the designated pipe route to receiving tank F2E-601 or F1-608 in the refinery sump. All health and safety requirements in SOP 2-C-601 will be followed during processing in addition to the Task Specific Health and Safety Plan requirements. The precipitation will be brought about by the addition of magnesium hydroxide slurry purchased in bulk tanker truck quantities. If required, Hydrated Lime Slurry $Ca(OH)_2$ will also be added to optimize full precipitation. Tank 12 in the General Sump will receive each tanker truck load of $Mg(OH)_2$. The as-received slurry will be diluted with water as needed for use. The magnesium hydroxide (MgOH) slurry will be periodically transferred to the MgOH makeup tank (F1-617). The precipitate slurry will be transferred to Plant 8 receiving tanks F1-203/F1-203A. The optimum concentration will be determined by the TC based on results of prior laboratory test results and prior filtration under this PTA.

Test Result:

A. Hydrated Lime Slurry $Ca(OH)_2$ was used initially in tank 610, but after the initial addition it was discovered that the lag time of the slurry going through 610 was sufficient to allow the pH to increase to approximately 7.5.

B. It was not necessary to dilute the $Mg(OH)_2$ slurry prior to use.

C. The final dilution in the refinery sump hold tank to approximately 50 g-U/l was satisfactory. The thickness of the slurry was acceptable at this concentration and no problems were encountered with pumping to Plant 8.

Under Purpose/Scope in the PTA, Section 1.6

The slurry from the refinery sump will be received in Plant 8 and filtered on the East and/or West Eimco filter, according to SOP 8-C-116 "Filtering Refinery Thickener Underflow". All health and safety requirements in the SOP will be followed in addition to the Site Specific Health and Safety Plan specific requirements. The wet filter cake will be collected into drums and packaged according to the FEMP Lot Marking and Color Coding System. Sampling will be performed according to Sampling Plan #0001 dated January 17, 1992 (Attachment D). After sampling in Plant 8, the drums will be stored on the Plant 1 pad until the analysis of the filter cake is complete. If determined to have RCRA constituents, the drums will be subject to all applicable hazardous waste rules and regulations. If determined non-RCRA, the drums will be transferred to a non-RCRA storage area.

Test Result:

A. The filter cake has been determined to be non-RCRA(Attachment # 3). A summary of the analysis results is attached as Table #2. The drums are being stored on the Plant 8 East pad.

Under Purpose/Scope in the PTA, Section 1.7

An organizational chart is included in Attachment C designating the lines of authority for this project. The operation is to be controlled by the Manager of Facilities & Warehousing. Systems Engineering, Project Management, and IRS&T personnel will be matrixed to the Area Supervisor who will direct the operations. The Test Coordinator (TC) will be the Project Engineer.

Test Result: N/A

Under Requirements/Acceptance Criteria in the PTA, Section 2.1

All UNH batches have been blended to <1.00% U^{235} as verified by analysis.

Test Result:

A. The analytical results for the first batch are as follows:

107.1 g-U/l
.977% U^{235}

Under Requirements/Acceptance Criteria in the PTA, Section 2.2

The following tanks have been emptied of UNH solutions and washed with nitric acid and/or water:

Test Result:

A. Tank D1-2 was emptied and flushed with water.

4.0 Summary of Procedure Changes

TCN - 001, Impact Level 2

Added DOE requested hold point after first batch.

TCN - 002, Impact Level 4

Changed initial valve lineup to conform to prints.

TCN - 003, Impact Level 4

Deleted an inaccessible valve from checklist.

TCN - 004, Impact Level 4

Added sump water valves to checklists.

TCN - 005, Impact Level 4

Added sump water valves to checklists.

TCN - 006, Impact Level 4

Deleted stuck open, but isolated valve from checklist.

TCN - 007, Impact Level 4

Deleted valve from checklist. Valve removed and blank flange installed.

TCN - 008, Impact Level 4

Added sump water valves to checklists.

TCN - 009, Impact Level 4

Added sump water valves to checklists.

TCN - 010, Impact Level 4

Added sump water valves to checklists.

TCN - 011, Impact Level 4

Reduced tank heating limits and deleted heating tank D1-10.

TCN - 012, Impact Level 4

Deleted tank heating for blend tanks.

TCN - 013, Impact Level 4

Added minimum requirements for pre-shift briefings.

TCN - 014, Impact Level 3

Added requirement for running at least one roof exhaust fan in digestion.

TCN - 015, Impact Level 3

Added operation of tank F1-25 vent fan to checklists.

TCN - 016, Impact Level 3

Added requirement for blending to be done only in tank F1-25.

TCN - 017, Impact Level 2

Broadened temperature range for $Mg(OH)_2$ addition.

TCN - 018, Impact Level 2

Broadened pH range for $Mg(OH)_2$ addition.

TCN - 019, Impact Level 3

Deleted source tank heating.

TCN - 020, Impact Level 2

Broadened volume transfer allowance.

TCN - 021, Impact Level 4

Corrected typo on checklist.

TCN - 022, Impact Level 4

Deleted sump water valves on checklist.

TCN - 023, Impact Level 4

Deleted agitation of tanks F2E-601 and F1-608.

TCN - 024, Impact Level 3

Deleted automatic flow control to tank F1-609.

TCN - 025, Impact Level 2

Allow Plant 8 to send filtrate to General Sump after receiving U, pH, and Cu results but before receiving Cr and Ba results.

5.0 Summary of Test Exceptions

TE #1 through #20 - Track open work orders to specific checklists.

TE #21 - Track open sump water valves to checklists 36 & 37.

6.0 Summary of Radiological Survey Data

Both Plant 2/3 and Plant 8 are "Contamination Areas" requiring full anti-contamination clothing for entry. There have been a total of 3 personal contamination events as a result of UNH operations. PCM's have been installed at both the Refinery Sump and Plant 8 control points. See Attachment #1 for more details.

7.0 Summary of Industrial Hygiene Survey Data

Personal NO_2 monitors with data logging capabilities were purchased after the NO_2 overexposure event of 13 July. After extensive data taking at the Refinery Sump area the personnel respiratory protection requirements were reduced. See Attachment # 2 for more details.

9.0 Recommendations

The original plan was to perform this PTA until all the UNH had been processed. It is our recommendation now that this PTA be turned into a SOP. The process and equipment have been tested enough for a SOP to be sufficient to process the rest of the UNH. The following recommendations should be incorporated into the SOP's:

Plant 2/3

1. The source tanks should not be heated. During the investigation into the NO_2 over exposure it was found that most of the source tanks contain up to 4N nitric acid.

2. The blends should only be made in tank F1-25. F1-25 is the only blend tank with an installed vent fan.

3. During any blending operation in the digestion area, at least one roof exhaust fan should be running. This will help dilute any NO_2 fumes that may escape during outage measurements.

4. UNH blends should be diluted to approximately 50 g-U/l prior to precipitation.

5. The Plant 2/3 procedure should be changed to require lining up the transfer line to a digestor when air blowing the line.

6. Emptied tanks should only be flushed with cold water.

Plant 8

6. The Plant 8 filtering SOP should be changed to proceduralize the use of recycled filtrate from tank 25A.

7. The second and third shift filter operators should be retrained by the first shift operator. This will help to increase the efficiency of filter operations on the back shifts.

8. The filters should not be shut down for shift changes. Greater filter efficiency will be realized if the operators relieve on station.

9. Complete the installation of the new Eimco filter and filter UNH on both old Eimco filters.

UNH FILTERING OPERATIONS ON THE EAST EIMCO FILTER

DATE	GALLONS	DRUMS	POUNDS	HOURS
16-Sep-92	700	2	626	8.0
17-Sep-92	4,700	10	7,146	12.3
18-Sep-92	0	0	0	0.0
21-Sep-92	27,000	5	1,550	24.0
22-Sep-92	33,000	3	853	23.0
23-Sep-92	32,500	3	511	24.0
24-Sep-92	29,800	1	295	24.0
25-Sep-92	5,000	0	0	4.0
28-Sep-92	25,000	3	816	20.0
29-Sep-92	23,100	12	4,614	22.0
30-Sep-92	7,800	23	10,555	20.0
01-Oct-92	2,500	8	3,792	6.0
02-Oct-92	0	0	0	0.0
05-Oct-92	0	0	0	0.0
06-Oct-92	2,600	9	4,196	8.0
07-Oct-92	4,330	21	9,134	14.0
08-Oct-92	3,000	12	5,578	8.0
09-Oct-92	3,300	5	1,732	6.0
12-Oct-92	10,500	13	5,766	16.0
13-Oct-92	6,200	25	11,711	17.0
14-Oct-92	4,300	6	2,757	12.0
15-Oct-92	0	0	0	0.0
16-Oct-92	10,000	12	4,275	12.0
19-Oct-92	8,920	19	8,462	18.0

DATE	GALLONS	DRUMS	POUNDS	HOURS
20-Oct-92	0	0	0	0.0
21-Oct-92	0	0	0	0.0
22-Oct-92	1,500	12	5,090	14.0
23-Oct-92	2,000	6	2,959	8.0
26-Oct-92	9,037	24	9,277	24.0
27-Oct-92	5,230	18	7,076	15.0
28-Oct-92	5,953	28	14,003	22.0
29-Oct-92	1,850	10	4,248	6.0
30-Oct-92	8,800	25	9,657	16.0
02-Nov-92	390	1	495	2.0
03-Nov-92	6,500	13	5,281	16.0
04-Nov-92	5,796	29	13,243	24.0
05-Nov-92	2,270	15	7,803	10.0
06-Nov-92	342	2	788	4.0
09-Nov-92	10,130	28	10,548	24.0
10-Nov-92	12,200	8	2,358	13.0
11-Nov-92	0	0	0	0.0
12-Nov-92	4,400	21	9,092	16.0
13-Nov-92	2,650	5	2,038	7.0
16-Nov-92	18,700	12	3,720	13.0
17-Nov-92	17,193	22	9,257	19.0
18-Nov-92	17,000	7	1,889	15.0
19-Nov-92	4,500	5	1,504	4.0
20-Nov-92	5,000	4	1,000	8.0
TOTALS	385,691	487	205,695	578

TABLE #1

000056

5904

ANALYSIS SUMMARY - TCLP

METAL	As	Pb	Se	Ag	Ba	Cd	Cr	U-235
UNITS	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	Wt % U
LIMIT	5	5	1	5	100	1	5	1
LOT #								
1	<0.01	<0.003	<0.005	0.036	0.369	<0.005	0.017	0.987
2	<0.01	<0.003	<0.005	<0.01	<0.2	<0.005	<0.01	0.986
3	<0.01	<0.003	<0.005	<0.01	0.4597	<0.005	<0.01	
4	<0.01	<0.003	<0.005	<0.01	0.3596	<0.005	<0.01	
5	<0.01	<0.003	<0.005	<0.01	<0.2	<0.005	<0.01	
6	<0.01	<0.003	<0.005	<0.01	0.3423	<0.005	<0.01	
7	<0.01	<0.003	<0.005	<0.01	0.3291	<0.005	<0.01	
8								

Blanks indicate sample results not back yet.

TABLE #2

ANALYSIS SUMMARY - MC&A

	ANALYSIS		WEIGHT		
	URANIUM	MOISTURE	TOTAL	U	U
UNITS	%	%	lbs	lbs	Kg
LOT #					
1	9.78	60.5	24466	2392.77	1086.32
2	8.89	40.5	27291	2426.17	1101.48
3	9.52	38.5	25509	2428.46	1102.52
4	10.5	41.6	25599	2687.90	1220.30
5	10.4	43.1	26155	2720.12	1234.93
6	11.1	42.5	24579	2728.27	1238.63
7			23971		
8			23289		
		TOTAL =	200859	15383.69	6984.193

• = Sample results not back yet.

TABLE #3

ANALYSIS SUMMARY - Tank 25A(Filtrate)

ANALYSIS	U	pH	Cu	NO3	Ba	Cr	Pu-239	Th-230	Np-23
UNITS	lbs/gal		mg/L	mg/L	ug/L	ug/L	pCi/mL	pCi/mL	pCi/m
AnaLIS ID #									
920917-024	0.000210	7.9	0.06						
920918-011					<200	51.4	<0.093		
920921-134	0.000110	8.2	0.02	670					
920922-071	0.000050	8.7	<0.01	168.4					
920923-157	0.000010	8.1	<0.01						
920929-017	0.000005	10.9	0.01						
921001-004	0.000030	8.4	0.07	11048	500	<10	<0.093	<0.059	
921005-031	0.000009	7.8	0.04	3557	790.3	<10	<0.019	0.036	
921008-015	0.000110	7.8	0.06	9338	249.2	<10	<0.0086		
921010-004	0.000020	7.8	0.10	10491	228.8	<10	<0.0086	<0.46	
921012-117	0.000280	8.2	0.03	1177	308.3	23.2	<0.0086	0.031	
921014-004	0.000090	8.0	0.09	4937	313.6	<10	<0.019	0.046	
921017-011	0.000070	8.4	<0.01	1405	42.1	35	0.018	<0.051	
921020-033				10413	1502	14.6	<0.0099		
921023-165	0.000060	7.8	0.07	6286	368.5	30	<0.0086		
21026-153	0.000030	8.0	0.04	5018	265.7	<10			
21028-069	0.000100	8.1	0.09	10952	301.5	16.3			
21030-001	0.000040	7.8	0.14	10724	534.5	23			
21 049	0.000190	8.1	<0.01	3379	291.7	<10			
21 050	0.000017	8.0	<0.01	1307	<200	<10			
21104-053	0.000080	7.9	0.05	9411	337.2	12.3			
21106-001	0.000070	8.0	0.03	8959	454.7	<10			
21109-017	0.000006	7.8	<0.01	736	35.8	25.5			
21110-001	0.000250	8.1	0.04	6457	<200	67.5			
21111-029	0.000900	8.6	0.02	1581	<200	115.6			
21111-030	0.000790	8.4	0.02						
21112-007	0.000560								
21113-011	0.000140	8.0	0.10	7732	<200	179.5			
21116-086	0.000100	8.6	0.02	1027	<200	95.3			
21118-003	0.000090	8.0	0.16	9136	410.3	139.3			
21119-065	0.000100	8.5	0.07	500	<200	85.8			
1120-075	0.000100	8.2	0.04	228	<200	<10			

TABLE #4

= Out of spec on U

= Resample of 92111-029

' = Resample of 92111-030(U still out of spec - Refiltered water)

nks indicate either sample not requested or sample results not back yet.

Attachment 3

PROJECT-SPECIFIC HEALTH AND SAFETY PLAN FOR THE NEUTRALIZATION AND STABILIZATION FOR UNH SOLUTIONS AT PLANTS 2/3 AND 8

(CONSTRUCTION)

DATED MARCH 1994

5904 2

FERNALD ENVIRONMENTAL

RESTORATION MANAGEMENT CORPORATION

PROJECT SPECIFIC HEALTH & SAFETY PLAN FOR THE NEUTRALIZATION AND STABILIZATION OF UNH SOLUTIONS AT PLANTS 2/3 AND 8 (CONSTRUCTION)

MARCH 1994

EMERGENCY PHONE NUMBER ON-SITE 738-6511
RADIO: "CONTROL"

APPROVALS:

Jim Tisaranni, Project Manager — 3/30/94 Date

Daryl Mills, OS&H Compliance Manager — 3/30/94 Date

Richard E. Maurer, RSO Health & Safety Officer — 3/29/94 Date

REV. 0 RSO: March 29, 1994

TABLE OF CONTENTS

INTRODUCTION 1

1.0 DESCRIPTION AND HISTORY 1
1.1 FEMP SITE HISTORY 1
1.2 CHARACTERIZATION 2
1.3 SCOPE OF WORK 3

2.0 WORK AREA AND MANAGEMENT 5
2.1 WORK AREAS 6
2.2 MANAGEMENT CHAIN OF COMMAND 8

3.0 GENERAL SAFETY REQUIREMENTS 8
3.1 PERMITS AND POSTINGS 8
3.2 SAFETY EQUIPMENT LIST 10
3.3 HEAT STRESS 12
3.4 COLD STRESS 12
3.5 MATERIAL SAFETY DATA SHEETS (MSDSs) 13
3.6 ILLUMINATION 13
3.7 SANITATION AT TEMPORARY WORKSITES 14
3.8 STANDARD OPERATING PROCEDURE 14
3.9 REQUIRED SAFETY MEETINGS 15

4.0 SITE CONTROL 15
4.1 FEMP REQUIREMENTS 15
4.2 WORK SITE REQUIREMENTS FOR ENTRY 16
4.3 HOW WORK SITES WILL BE DEFINED 16
4.4 EXCLUSION ZONES 18
4.5 LEAD REGULATED AREA 18

5.0 TRAINING 19
5.1 REQUIRED TRAINING FOR SITE ENTRY 19
5.2 REQUIRED TRAINING TO PERFORM WORK IN THE DEFINED WORK ZONES 20
5.3 OPERATIONAL TRAINING FOR SPECIAL TYPES OF EQUIPMENT 21
5.4 RECORDS OF TRAINING 21
5.5 VISITORS 21
5.6 COMPETENT PERSON 22

6.0 MEDICAL MONITORING AND SURVEILLANCE 22
6.1 REQUIRED MEDICAL MONITORING 22
6.2 REQUIRED MEDICAL RECORDS 23

7.0 HAZARD CONTROL 24
7.1 ENGINEERING CONTROLS 24
7.2 ADMINISTRATIVE CONTROLS 24
7.3 PERSONAL PROTECTIVE EQUIPMENT 25

8.0 REQUIRED MONITORING AND ACTION LEVELS 33
8.1 AIR MONITORING 34
8.2 RADIOLOGICAL MONITORING 43
8.3 INSTRUMENTATION 46

9.0 HANDLING DRUMS AND CONTAINERS 52
9.1 INSPECTION 52
9.2 STORAGE 52
9.3 TRANSPORTATION 52
9.4 MONITORING 53
9.5 LABELING 53

10.0 DECONTAMINATION 53
10.1 SITE DECONTAMINATION REQUIREMENTS 53

11.0 HAZARD ASSESSMENT 55
11.1 INDUSTRIAL HYGIENE ISSUES 58
11.2 RADIOLOGICAL SAFETY ISSUES 60
11.3 INDUSTRIAL SAFETY ISSUES 61
11.4 FIRE PROTECTION ISSUES 65
11.5 NUCLEAR SAFETY ISSUES 67
11.6 NATURAL OCCURRENCE ISSUES [WEATHER] 67

12.0 EMERGENCY / CONTINGENCY PLANS 67
12.1 REPORTING 68
12.2 EVACUATION ROUTES / ACCOUNTABILITY 69
12.3 AVAILABLE EMERGENCY EQUIPMENT 70
12.4 EMERGENCY RESPONSE 70

13.0 CHANGES / AMENDMENTS TO HEALTH AND SAFETY PLAN 72
13.1 CONTROL OF HEALTH & SAFETY PLAN 73

TABLE OF CONTENTS

Appendix A	Safety Procedure Requirements (SPRs) Referenced in the PSHSP
Appendix B	FEMP Rally Points
Appendix C	Location of FEMP Medical Facility
Appendix D	Work Area Maps
Attachment A	Acknowledgement Form
Attachment B	OSHA / DOE Employees Rights poster
Attachment C	FEMP Minutes of Safety Meeting
Attachment D	Project Specific Health & Safety Requirements Matrix

INTRODUCTION

Safety is an attitude and a belief that all injuries and occupational illnesses can be prevented. All levels of management and supervision at the FEMP have adopted this attitude toward safety and are committed to provide training and resources for a safe environment. The most important person to be committed to safety is the site worker. He/she must also assume responsibility for working safely.

This Project Specific Health and Safety Plan (PSHSP) is a tool to convey management's safety commitment to employees and to inform the workers of the known hazards they may encounter while conducting activities in the project area.

This PSHSP covers the following topics:

- The chemical, physical, radiological, and biological hazards that are common to project activities.
- The methods that will be used to control the known hazards.
- Emergency response procedures
- Site training requirements
- Medical requirements

The requirements, designated protocols and procedures defined or referenced in this plan shall be followed by all personnel. This document is applicable to all FEMP employees, visitors, vendors, contractors and subcontractors.

1.0 DESCRIPTION AND HISTORY

1.1 FEMP SITE HISTORY

The Fernald Environmental Management Project (FEMP) is located in southwestern Ohio, approximately eighteen miles northwest of downtown Cincinnati, near the communities of Miamitown and Ross, Ohio. The site covers a total area of 1050 acres of which 850 acres are in Crosby Township of Hamilton County and 200 acres are in Ross and Morgan Townships of Butler County, Ohio. The FEMP is owned by the U. S. Department of Energy (DOE) and operated by Fernald Environmental Restoration Management Corporation (FERMCO).

The FEMP was built between 1951 and 1952 and full operation started in 1952. The purpose of the facility was to establish an in-house integrated production complex for processing uranium and its compounds from natural uranium ore concentrates for use in government defense programs. A wide variety of chemical and metallurgical process steps were utilized to support the production of uranium metal products. Production stopped in 1989. Since mid-1991, the site mission has focused on environmental restoration.

1.2 CHARACTERIZATION

Plant 2/3 and Refinery Sump Areas:

Since the cessation of production operations, approximately 200,000 gallons of uranyl nitrate hexahydrate (UNH) solution have been stored in eighteen stainless steel storage tanks. UNH is composed of digested uranium metal in nitric acid solution. The uranium concentration in these tanks ranges from 22 to 318 grams U/liter. Three tanks have a U-235 content of 1% or more. This UNH material is currently classified as a hazardous waste under 40 CFR 261.22 for its corrosivity and under 40 CFR 261.24 for its chromium and barium content.

The total quantity of uranium amounts to a nominal 100 metric tons of uranium (MTU). The continued long term storage of this previously designated work in process (WIP) material (as a liquid) is not a desirable arrangement due to the possibility of leakage from valves, flanges, and other fittings which pose potential threats to workers and the environment. Therefore, it is desirable to convert the currently dissolved uranium into a solid form which would be much more amenable to interim storage, shipment, and ultimately disposal of the materials.

The tanks holding the uranyl nitrate solutions are fabricated of stainless steel, as are also all of the pipes, pumps, valves and fittings through which the solutions will be transferred. Most of the tanks are located outdoors, near the Refinery. Four of these outside tanks are large circular (~20 ft. dia. & ht.) and four are large horizontal (~10 ft. dia.) tanks with ladders and elevated walkways installed to facilitate work on the tanks and adjacent equipment. The two remaining large tanks (blend) and the five smaller tanks are located indoors. Work at these tanks will be less influenced by inclement weather. Some of the tanks hold solutions having a free acid content greater than 4 normal. This strong acid, as well as the dissolved uranium present, would be of concern in the event of a spill or other loss.

Plant 8:

Plant 8 (the Recovery Plant) was constructed in the southwest quadrant of the FEMP site in 1952 to reclaim uranium from process wastes and by-products for recycle. Plant 8 is approximately 240 feet by 280 feet, consisting of ground floor and a partial second level. The building exterior is constructed of asbestos containing transite siding.

A variety of milling, drying, oxidation, precipitation, dissolution, and filtration processes were used to recover uranium (or thorium) from by-product. Operations in Plant 8 were originally sized to recover 30 tons of uranium per month, but by 1954 the plant was recovering more than 37 tons of uranium per month from residue materials. The recovery plant was expanded in 1955 to handle the high volume of residue generated from on site processes. Most uranium recovery operations in Plant 8 were discontinued in 1989.

The present operations in Plant 8 involve the processing and treatment of waste water from site operations and storm water to remove uranium, regulated metals, and volatile organics. Bulk materials which are used in the water treatment process which may be stored in the vicinity of the project area are hydrated lime (calcium hydroxide), sodium hydroxide, and calcined diatomaceous earth (dicalite).

1.3 SCOPE OF WORK

Construction will be performed in Plants 2/3 and 8 to support the restart of UNH neutralization and stabilization activities. All new piping has been planned for all UNH transfer lines. Planned construction activities are outlined below.

1.3.1 A new dedicated header (3", 304L SS) will be installed to transfer UN solutions from the NFS tanks to both tanks F1-25 and 26. This header will be routed in existing racks and will run from the NFS tanks to the Digestion side of Bldg. 2/3.

1.3.2 New hard piping will be installed from Tanks F1-25 and F1-26 using existing nozzles to a location inside the Digestion Area accessible by a tanker. The hard line will terminate with a quick disconnect coupling for connection to the tanker. A new metering pump will be installed in the line to transfer the MgOH to Tanks F1-25 and F1-26. A pH monitoring and recording system that will control the caustic unloading pump. This system optimizes the amount of material required for neutralization and precipitation. Level sensors, to be installed in the two tanks, will shut off all input pumps on high level.

1.3.3 Tanks F1-25 and F1-26 will each have a new progressive cavity pump installed to transfer neutralized UN slurry to Plant 8. A new recirculation line will be installed from each pump discharge back to its corresponding tank to promote better tank mixing and temperature control. The recirculation line will be installed so that the solution is returned to the tank below liquid level.

1.3.4 Full-port plug valves will be installed at key locations along the header: 1) CD Blend Tank Area; 2) inside the Digestion Tank Area; 3) in the east-west rack along 102nd Street at the intersection with the north-south rack from the Hot Raffinate Building; and 4) in the east-west rack along 102nd street (at the intersection with the north-south rack to the Refinery Sump Area) to the OK Liquor tanks. All piping will be arranged so that all valves and flanged connections are located within secondary containment areas, either permanent or temporary. Drain valves will be installed on either side of each block valve. These drain valves may also be used for flushing should the header become plugged.

1.3.5 Further hard piping (3", 304L SS) will be installed in the existing rack from the Hot Raffinate Building to the intersection with the east-west rack along 102nd Street. A short length of hard pipe (3",304L SS) will be installed from the OK Liquor Tank Area through the east-west rack along 102nd Street to its intersection with the north-south rack (which runs to the Refinery Sump Area). These headers will be tied in turn into the main transfer header for processing of the Hot Raffinate Tanks and the OK Liquor Tank.

1.3.6 Skid mounted pumps will be used for portability, and will be connected in turn to each tank for processing. Two pump skids will be purchased to allow for optimum hook-up and for sparing. The pump will be connected to each tank with temporarily installed hard piping (3", 304L SS), utilizing braided stainless steel flex hoses for final fit-ups. The pump discharge will be connected to the main transfer header at each of the valved points in turn through temporarily installed hard piping, again using braided stainless steel flex hoses for final fit-ups. A recirculation line from the pump back to the source tank may be used in some cases to allow for greater tank agitation than that provided by the existing tank agitators.

1.3.7 Instrumentation for control of the pump skid will be installed on a local panel mounted on the skid. This instrumentation will include a pump speed controller for controlling flow, an instantaneous flow readout, a flow totalizer, a pump speed readout, pump start and stop switches, and pump run lights. Additional instrumentation will be installed at each storage tank. A level transmitter will be used to measure the level in the storage tank, and a thermowell probe will be installed to measure the temperature at three different levels within the tank.

1.3 SCOPE OF WORK (Continued)

1.3.8 Installation of these instruments will utilize existing nozzles on the tanks. This instrumentation may be moved from tank to tank with the pump, and readouts from the instrumentation will be installed on the pump skid panel.

1.3.9 New instrumentation will be installed at tanks F1-25/26 which will include level indication/alarm and temperature indication at three different levels within the tank. All new instrumentation will utilize existing tank nozzles. Meters will be installed to measure and totalize the flow used for dilution and heating. Temperature indication of the warm process water will be provided. Flow out of F1-25/26 will be controlled by adjusting the pump speed, and both instantaneous and total flow readouts will be provided. All instrumentation will be mounted on a new local panel.

1.3.10 Existing tanks F1-25/26 will be used for neutralization and precipitation of the dilute UN solutions. A new header (3", 304L SS) will be installed to transfer the slurry to Plant 8 through the newly installed progressive cavity pump.

1.3.11 New installations in Plant 8 center around the existing filter feed tanks, F43-203 and F43-203A. These tanks will be provided with new level indication and alarm, and a new progressive cavity type pump will be installed to transfer neutralized UN slurry to the existing East - West Eimco filters. New piping (3", 304L SS) will be installed from the tanks to the filters. The existing filters will be provided with new level instrumentation. A new level controller will control the flow of slurry to the filter by adjusting the speed of the transfer pump.

1.3.12 Eimco filters: The filters have an overflow line in the filter basin that directs flow back to the Filter Feed Tanks F43-203 and F43-203A. A new level sensor will be installed at a level just above the overflow pipe to disable the pump if the overflow line develops a plug.

2.0 WORK AREA AND MANAGEMENT

The Refinery tankage holding the solutions are interconnected, by piping, and also connected to other equipment. Equipment not being used will be isolated by tagged/locked valves, blind flanges, pipe removal, etc. to prevent transfer of material outside the intended work area.

Radiological Control and Industrial Hygiene Departments are to be notified of any changing condition (ie. newly found leaks, spills of any magnitude - indoors or outdoors, or changes in work scope) to assess degree of chemical and radiological hazard, and assure proper personal protective equipment is in use for the leak containment and control.

ES&H-1-1000, Comprehensive Environmental Occupational Safety & Health Program Manual, provides the posting and access control requirements to radiological, chemical, and hazardous work areas. Task specific FERMCO Work Permits will identify the personal protection and job/area specific requirements for chemical, radiological, and industrial hazards, and will be posted at the radiological access control points to the project area. FERMCO Work Permits are to be initiated by RSO project supervision for the integration of Radiological Control, Industrial Hygiene, and Safety personal protection and contamination control requirements. Attached to each FERMCO Work Permit will be a Radiological Work Permit, issued by the Radiological Control Department, and a Chemical/Hazardous Material Permit, issued by Industrial Hygiene. These permits serve as addendums to the FERMCO Work Permit to document radiological and chemical conditions and hazards associated with each task and work area

Project area maps are included as Appendix D.

2.1 WORK AREAS

All the specific work areas listed below will have access restrictions and health and safety requirements for entry. These will be identified on a FERMCO Work Permit, which will be posted at the affected control point for entry/egress to the respective areas.

2.1.1 NFS Tank Storage Area

The NFS Tank Storage area is located outdoors and is posted as a Contamination Area, within the present radiological Controlled Area.

2.1.2 Plant 2/3 Digestion Area

The Digestion Area is within a posted Contamination Area. One central control point for personnel entry and exit into Plant 2/3 (and surrounding outdoor tank/sump areas) is located at the south door of Extraction. "Emergency Exit Only" exits have been identified and are posted as such. This area has also been identified as an exclusion area due to potential asbestos contamination, resulting from deteriorating transite panels.

2.1.3 CD Blend Tanks

These tanks are located outdoors within an open secondary containment, on the north side of Digestion, and are within a posted Contamination Area. Access to these tanks will be controlled through the Extraction area central control point.

2.1.4 OK Liquor Storage Area

The OK Liquor Storage tanks are located outdoors at the SE corner of Plant 2/3, within an open secondary containment, which is within a posted Contamination Area. Access to these tanks will be controlled through the Extraction area central control point.

2.1.5 General Sump/Refinery Sump

This area is located outdoors within a posted Contamination Area. A control point is located in a trailer, just south of the General Sump Building for controlling access and egress from this area. There is only a limited need for entering this area during construction activities.

2.1.6 Raffinate Area

Access and egress to the outside Combined Raffinate tank area and the Hot Raffinate Building will be controlled through a control point located in the NAR Building. This area has also been identified as an exclusion area due to potential asbestos contamination, resulting from deteriorating transite panels and damaged pipe insulation.

2.1.7 Plant 8

Plant 8 is within a posted Contamination Area. The areas of concern inside Plant 8, as they relate to the UNH process, are the neutralized UNH feed slurry tanks 203 and 203A, the Eimco filters, the final product drumming stations located just below the Eimco Filters on the first floor, the Filtrate receiving/hold Tank 25, and associated piping/valve lineup locations. Product filter cake will be precipitated from one or both of the two Eimco filters. The two filters are on the second floor (west end), and are within close proximity to one another, separated by a distance of 3 to 5 feet, and run parallel to each other. Wastewater will be processed on the large Eimco filter during the construction period.

2.1 WORK AREA (Continued)

Exterior surfaces of the filled drums will be wiped down and surveyed by a Radiological Safety Technician and will be limited to 1000 dpm/100 cm^2 prior to release from the dumping/drumming station area.

2.2 MANAGEMENT CHAIN OF COMMAND

Project Manager	Jim Tisaranni
Construction Manager	Richard L. Maurer
Operations Manager	Tim Huey
Maintenance Manager	Mike Townsend
SAR Manager	Bill Rainey
Regulatory Manager	Milt Galper
Plant 8 Manager	Tim France

3.0 GENERAL SAFETY REQUIREMENTS

Safety is everyone's responsibility. Workers are responsible for conducting work in a safe manner. Taking chances or risks concerning safety is not acceptable. Workers shall report unsafe conditions to their supervisor immediately for correction.

Supervisors are responsible for the safety and health of subordinate personnel. Supervision must ensure that all applicable safety, health, and environmental practices and policies have been considered when planning work and enforce all safety rules and regulations at all times.

3.1 PERMITS AND POSTINGS

3.1.1 FERMCO Work Permits

A FERMCO Work Permit is required for any of the following:

- Entry into a confined space
- Electrical work not covered by a FERMCO Safety Performance Requirement (SPR)
- Elevated work not covered by a FERMCO SPR
- First line breaks
- Trenching, excavations or any floor penetration
- Welding or any work requiring an open flame
- Working with hazardous chemicals or materials which are not addressed by a FERMCO Standard Operating Procedure (SOP)
- Work involving asbestos containing materials

- Work with radioactive materials
- Work in a Controlled Area
- Work that requires an outage (for example, road closure, or interruption of sewer, water, telephone, fire protection system, or alarm systems)
- Collection of media samples for laboratory analysis

The following table lists the work hazards regulated under the FERMCO Work Permit system. The responsible FERMCO department is to be contacted for an evaluation of task specific hazards, and will document permitting requirements on the appropriate form(s). The originals are to be posted at the area specific work site or control point.

HAZARD	FERMCO DEPARTMENT	ES&H MANUAL #
Asbestos Work	Industrial Hygiene	SPR 5-2
Chemical/ Hazardous Materials	Industrial Hygiene	SPR 5-16
Confined Space Evaluation	Industrial Hygiene	SPR 5-13
Construction Excavation	Construction	SPR 3-9
Facility Outage	Utility Engineers	
Hazardous Work	Safety	SPR 2-57
Open Flame and Welding	Safety	SPR 2-57
Radiological Work	Radiological Control	RPR 3-1

3.1.2 Postings

The following areas shall be clearly defined and posted according to FERMCO procedures:

Posted Area	Posted By	
	FERMCO	ORGANIZATION PREFORMING TASK
Asbestos abatement area		X
Confined Spaces	X	
Construction area		X
Hazardous noise areas	X	X
Radiological	X	

At the entrance to specified construction work zones the following shall be posted:

- NFS tank storage posted as a contamination area within a radiological controlled area
- 2/3 Digestion Area, General Sump, and Plant 8 is posted as a contamination area
- The work area posted as a construction zone
- Sign stating "STOP" (You Must Read And Sign The PSHSP Before Entering This Project) PSHSP & Requirements Matrix will be maintained at the Plant 2/3 office for review

3.2 SAFETY EQUIPMENT LIST

3.2.1 The following is a minimum list of safety equipment which shall be available at the work areas controlled by a PSHSP. Quantities and types will be based on anticipated needs.

- Personal protective equipment (PPE) as specified in Sections 7.0 in approved cabinets.

3.2 SAFETY EQUIPMENT LIST (Continued)

- Barricade barrier tape and/or plastic safety fence, safety signs, and radiological rope and signs (provided by FERMCO) where necessary for controlling radiological work.

- Fire extinguisher (appropriate for situation and materials); a minimum 10lb. A-B-C fire extinguisher is required for each work area and for all work requiring a Flame and Welding Permit

3.2.2 Emergency Safety Equipment

Emergency safety equipment shall be located in the immediate work area. The Construction Supervisor shall be responsible for ensuring the emergency equipment is accessible and maintained in proper working condition. The emergency equipment shall be tested in accordance with the manufacturers requirements and FERMCO policies. The locations of the emergency safety equipment shall be known to all employees at the work site and posted whenever possible.

ANSI approved eyewash / safety showers shall be within 100 feet or within 10 seconds of travel time from any operation that requires an eye wash to be available.

Fire extinguishers shall be located near any point of hazardous (fire) operations.

- A means to communicate any emergency condition must be available at all times during any work activity. This may be any of the following:

  On-site work:
  - Site telephone or Cellular phone
  - 2 - way radio on FEMP channel
  - Site fire alarm station

Refer to section 12.0 for additional information.

3.3 HEAT STRESS

Heat stress may affect personnel performing activities with or without protective clothing when wo-king in high ambient temperatures. Plenty of water, rest breaks and careful attention by the employee and his supervisor shall be used as control measures. Personnel shall become aware of symptoms of heat stress and be able to recognize these symptoms in oneself and in other workers. Heat stress recognition and prevention shall be reviewed at regularly scheduled safety meetings. Measures shall be taken to assess and prevent heat stress in accordance with *ESH-1-1000*, SPR 5-5 (Working in Extreme Temperature Hot and Cold).

When ambient temperatures exceed 80°F, Industrial Hygiene shall be contacted to review and/or add control measures to minimize heat stress.

When project tasks/activities involve the use of anti-contamination protective clothing worn over top of FERMCO issued work clothing, control measures shall be taken to minimize heat stress. Examples of control measures used are use of ice vests, air cooled vests, shaded rest area, potable water supply, special scheduling of work hours, and/or work-rest regimens.

The shaded rest area and potable water supply shall be established in a location approved by Radiological Control.

3.4 COLD STRESS

Tasks may be conducted when temperatures could present a potential cold stress hazard. Personnel shall become aware of symptoms of cold stress and be able to recognize these symptoms in oneself and in other workers. Cold stress recognition and prevention shall be reviewed at regularly scheduled safety meetings.

During cold weather, special care should be taken to dress appropriately for anticipated weather conditions. Specific attention will be given to the hands and feet and other exposed body parts to prevent frostbite. When equivalent chill temperature drops below 0^0 F, Industrial Hygiene shall be contacted to review and/or add control measures to minimize cold stress.

When a worker desires to wear a coat (or other type of cold weather gear), and anti-contamination clothing is required, the cold weather gear must be worn <u>under</u> anti-contamination clothing.

3.5 MATERIAL SAFETY DATA SHEETS (MSDSs)

MSDSs for all products or chemicals to be used on the job shall be provided to FERMCO (Industrial Hygiene) for review prior to the product or chemical arriving on site. Since products or chemicals may be disapproved for use by FERMCO, or may require special work practices or PPE requirements, early (at least one week in advance of planned use) submittal of MSDSs is recommended.

During the initial usage of a product, all restrictions / precautions specified on the MSDS, or specified by FERMCO, shall be followed. FERMCO Industrial Hygiene and Radiological Engineering departments have the authority to upgrade or downgrade the required PPE, if monitoring determines that a change is required. These changes will be documented on a FEMP work permit.

MSDSs for all chemicals used at the site, shall be located on FEMP property. The location of the MSDSs shall be posted at the work site along with this Project Specific Health and Safety Plan.

If an MSDS is not available for a chemical to be used, that chemical shall not be used until an MSDS is available.

All workers who will be working with, or in the vicinity of, a hazardous chemical shall be trained as required by the Training Section (section 5.0) of this plan.

Refer to SPR 5-6 (Hazard Communication) in the FERMCO Comprehensive Environmental Occupational Safety and Health Program Manual (ESH-1-1000) for additional information.

Quantities of hazardous materials / chemicals shall be kept to a minimum. Chemicals required to perform the task shall be brought on-site only in quantities required to perform the work at hand. Planning shall include using all such materials or arranging for removal from the FEMP.

MSDSs for FEMP Site Materials determined to present a hazard for work covered by this PSHSP will be included in Appendix E. While not expected to present a hazard on this project, various materials are stored in Plants 2/3 and 8. A list of these materials are included in Appendix E.

3.6 ILLUMINATION

Areas accessible to employees shall be lighted to not less than the minimum illumination intensities listed in the following table while any work is in progress.

TABLE 1 REQUIRED ILLUMINATION	
FOOT CANDLES per ft^2	AREA of OPERATION
5	General site areas
3	Excavation and waste areas, accessways, active storage areas, loading platforms, refueling, and field maintenance areas.
5	Indoors: Warehouses, corridors, hallways, and exitways
10	General shops (e.g., mechanical and electrical equipment rooms, active storerooms, locker or dressing areas, and indoor toilets and workrooms)

FERMCO Industrial Hygiene (IH) may be contacted to evaluate work areas for the required illumination.

3.7 SANITATION AT TEMPORARY WORKSITES

An adequate supply of potable water shall be provided near the work site. The containers used to dispense drinking water shall be capable of being tightly closed, and equipped with a tap. Any container used to distribute drinking water shall be clearly marked as to the nature of its contents and not used for any other purpose.

All drinking water locations in a radiological controlled area shall be approved by Radiological Control (RC) prior to use. For work covered by this PSHSP, drinking water is available in the NAR Control Building.

Hand washing facilities will be identified for personnel working on this project.

3.8 STANDARD OPERATING PROCEDURES

All work conducted shall comply with all applicable OSHA regulations (29 CFR 1910 and 1926) and FERMCO safety and health procedures. The FERMCO safety and health procedures can be found in the FERMCO Comprehensive Environmental Safety and Health Program Manual (ESH-1-1000) volumes I and II.

Compliance with any project specific work plans or operational procedures is required.

3.9 REQUIRED SAFETY MEETINGS

All personnel involved in this project shall be given a PSHSP safety briefing prior to receiving authorization to work within the defined work zones. This PSHSP safety briefing shall review this Health and Safety Plan describing all of its requirements, noted hazards and required actions by the workers. A prework/kick off safety meeting will be conducted by the subcontractor construction contracts manager, subcontractor site supervisor, subcontractor Health and Safety Officer, or designee and will satisfy the requirement for this PSHSP safety briefing.

As a minimum, safety meetings shall be held weekly and more often as needed. The safety meetings will be conducted by the site supervisor, subcontractor Health and Safety Officer, or designee. Documentation on the briefings shall be recorded on the FEMP Minutes of Safety Meeting (Attachment C). Safety meeting attendance sheets will be maintained as part of the project. Copies of the safety meetings shall be forwarded to the RSO HSO after each meeting by the individual conducting the meeting.

The safety meetings shall address any new operations, tasks or procedures that are to be conducted or changes in work practice that will be implemented due to new information. Briefings shall also be given to facilitate compliance with prescribed safety and health practices when performance deficiencies are identified during daily operations or as a result of safety audits.

4.0 SITE CONTROL

4.1 FEMP REQUIREMENTS

Before entering the work are defined in section 2.0, all personnel shall be oriented to the PSHS Requirements Matrix. Sign the acknowledgement log (attachment A) and initial employee training on the hazard communication form.

Construction zones will be established based on the hazards identified and the location of the work activities and construction zones will be established by the RSO Health and Safety Officer with assistance from the FERMCO ES&H Department.

4.2 WORK SITE REQUIREMENTS FOR ENTRY

All personnel performing work covered by this Project Specific Health and Safety Plan shall be orientated to the hazards of the site and the control measures through:

- Attending a safety briefing where the PSHSP is reviewed by the site supervisor, HSO or designee
- Signing the acknowledgment form (Attachment C) stating they have been informed of the conditions of the plan and will comply with the applicable requirements of the plan and have attended a safety meeting that discussed the plan.
- Attendance at all training required in section 5.0.

For the duration of the job the acknowledgment form will be maintained and available for review at the work site. Upon completion of the project, the form will be transferred to the project manager where it will be maintained on file as a permanent record of the personnel who worked on the project.

4.3 HOW WORK SITES WILL BE DEFINED

4.3.1 Safety Posting Zones

Construction / Work Area - a construction/work area is a site physically separated from the general public due to the hazards associated with the activity occurring at the site. The site may or may not have radiological or hazardous waste concerns. Access is restricted to workers that are properly trained per section 5.0 of the PSHSP. Any construction area shall be posted with signs stating "Construction Area". The signs shall be located around the perimeter of the defined area and at all entry locations. Signs shall be placed approximately every 50 feet around the defined work area.

4.3.2 Radiological Areas

Entrances to, and perimeters of, radiological areas are defined by yellow and magenta rope or, where practical, are defined by physical structures, such as fences or buildings. All radiological areas can be identified by signs having the standard radiation symbol, the trifoil, on a yellow background. Signs state the type of area and general entry requirements.

Anyone entering a Controlled Area of the FEMP shall wear a Thermoluminescent Dosimeter (TLD) as directed by Radiological Control.

Radiological area boundaries may change at any time based on changing work activities and posting requirements.

At the FEMP, posting of radiological areas is based primarily on contamination and airborne limits for natural uranium. However, limited amounts of more restrictive radionuclides, most notably thorium, are present at the FEMP. Table 2-2 of DOE/EH-0256T, Radiological Control Manual, contains posting limits for the various radionuclides.

PCM whole-body Personnel Contamination Monitors are installed at all Contamination Area control points associated with UNH project activities, with the exception of the NFS tank area. Whole-body monitoring with a portable hand-held frisker will be used at the control point for this location.

Step-off-pads, used for the purpose of contamination control will be in place at each entry location to the UNH project areas. PPE donning/doffing areas are established and will be maintained with the proper amounts and types of PPE or anti-contamination garments.

The following paragraphs list the types and definitions of radiological areas encountered at the FEMP.

Controlled Area - a controlled area is any area, room, or enclosure to which access is controlled to protect individuals from exposure to radiation or radioactive materials, or where radioactive materials may be present. Surface contamination, radiation, and airborne contaminants are less than applicable limits for further posting. Personnel exposure is not expected to exceed 100 mrem in one year while working in a Controlled Area. The following radiological areas are found within Controlled Areas. Limits mentioned are from Table 2-2 of DOE/EH-0256T.

Radioactive Material Area - any area, room, or enclosure where radioactive material is used, handled, or stored.

Fixed Contamination Area - any area, room, or enclosure where fixed contamination exists greater than limits, but removable contamination is less than the limits. These areas may be outside of a Controlled Area.

Contamination Area - any area, room, or enclosure where removable contamination levels exceeds applicable limits, but are less than 100 times these values.

4.3 HOW WORK SITES WILL BE DEFINED (Continued)

High Contamination Area - any area, room, or enclosure where removable surface contamination exceeds 100 times the limit.

Airborne Radioactivity Area - any area, room, or enclosure where airborne radioactivity exceeds 10% of the applicable Derived Air Concentration (DAC) averaged over 8 hours or a peak concentration of 1 DAC.

Radiation Area - any area, room, or enclosure where radiation exposure rates are greater than 5 mrem/hour, but are less than or equal to 100 mrem/hr.

High Radiation Area - any area, room, or enclosure where radiation exposure rates are greater than 100 mrem/hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates. These areas require supplemental dosimetry and stay-time controls by Radiological Control.

All personnel entering any radiological area shall meet the training requirements of Section 5.0.

4.4 EXCLUSION ZONES

An exclusion zone is a high hazard site that contains hazardous waste and is governed by 29 CFR 1910.120. Entry is restricted to authorized personnel that are properly trained per the requirements of Section 5.0 of this PSHSP. These zones shall be designated by the use of yellow caution tape. The area shall have a sign posted to specify the hazard(s) in the exclusion zone. When an exclusion zone contains radiological contamination, the zone will be controlled as a radiological "controlled" area.

The restricted locations may be expanded at any time.

Entrance to an exclusion zone(s) shall be controlled by the supervisor in charge at the work site.

4.5 LEAD REGULATED AREA

An area which is established to demarcate areas where airborne concentrations of lead exceed or can reasonably be expected to exceed the permissible exposure for lead. Lead regulated areas shall be posted with warning signs to denote the lead hazard.

All personnel entering any lead regulated area shall meet all of the training requirements of Section 5.0.

5.0 TRAINING

There are four categories of training on site. The type of work to be conducted and the location of the work will determine the category of training the employee requires. Most training requires an annual refresher course.

5.1 REQUIRED TRAINING FOR SITE ENTRY

5.1.1 General Employee Training

This level of training will allow the employee to conduct work in non radiological controlled areas and non exclusion (OSHA 1910.120) zones. The employee must receive the following training:

- Four (4) - Hour General Employee Training (GET)

In addition, the following training may be required:

- FEMP Respirator Training and Quantitative Fit Test

5.1.2 Radiologically Controlled Areas (Occasional Site Worker) 24-Hour Training. OSHA 1910.120

This training is required for work conducted in radiologically controlled areas. The Occasional Site Worker shall not work in areas where exposure to hazards could exceed established exposure limits. The Occasional Site Worker shall not wear a respirator or anti-c clothing.

The Occasional Site Worker shall receive the following training:

- Four (4) - Hour General Employee Training (GET)
- Twelve (12) - Hour Site worker training
- Eight (8) - Hour Radiation Worker I
- One (1) day supervised field experience

5.1.3 Radiological Contamination Areas (General Site Worker) 40-Hour Training. OSHA 1910.120

Training required to conduct work in radiological contaminated areas and exclusion (1910.120) zones.

5.1 REQUIRED TRAINING FOR SITE ENTRY (Continued)

The General Site Worker shall receive the following training:

- Four (4) - Hour General Employee Training (GET)
- Twelve (12) - Hour Site worker training
- Twenty four (24) - Hour Radiation Worker II
- Three (3) days supervised field experience

5.1.4 Supervisor In Radiologically Controlled Areas

Training required to supervise work conducted in radiologically controlled areas and exclusion (1910.120) zones.

The supervisor shall receive the following training:

- Four (4) - Hour General Employee Training (GET)
- Twelve (12) - Hour Site worker training
- Twenty four (24) - Hour Radiation Worker II
- Three (3) days supervised field experience
- Eight (8) - Hour Site Supervisor Training

5.2 REQUIRED TRAINING TO PERFORM WORK IN THE DEFINED WORK ZONES

5.2.1 Work Zone Specific Training

Personnel assigned to specific tasks may/shall have been trained in specific subjects as necessary to perform the defined work. Examples of additional training: asbestos, confined space, energy control, and hands-on fire extinguisher (fire watch) training.

Personnel required to enter permit-required confined spaces, act as attendant personnel, and act as entry supervisors shall attend Permit Required Confined Space: Entrant/Attendant Training (FERMCO Course number 1408 or equivalent), as required by OSHA 1910.146.

Personnel required to perform work with lead (ie. mechanical removal of lead based paint, torch cutting, or welding on lead painted surfaces) which results in exposure above the OSHA action level shall attend FERMCO Lead Worker Training (FERMCO course number 1438) or equivalent as required by OSHA 1926.62.

5.2 REQUIRED TRAINING TO PERFORM WORK IN THE DEFINED WORK ZONES (Continued)

Personnel required to perform work with asbestos containing materials and personnel supervising asbestos work shall be trained in accordance with the asbestos training requirements of the Ohio Department of Health.

5.3 OPERATIONAL TRAINING FOR SPECIAL TYPES OF EQUIPMENT

Employees operating construction or heavy equipment or any equipment (i.e., sampling equipment) that requires training (noted in manufacturers manual or other requirements), shall have been trained in the operation of that equipment. The employee will have for review required certificates or certification cards.

The Subcontractor Health & Safety Officer shall evaluate the training of all personnel that are operating heavy/specialized equipment and forward a letter to the FERMCO Construction Manager and RSO HSO, stating who has been verified to be competent for that identified equipment. Documentation of the employee successfully completing the training shall be placed on file locally.

5.4 RECORDS OF TRAINING

Documentation of training classes attended from sources other than FEMP shall be submitted to RSO Health and Safety Officer (to review and approve) for FERMCO personnel involved with this project.

Documentation of training classes attended from sources other than FEMP shall be submitted to FERMCO Construction Management for subcontract personnel.

5.5 VISITORS

A visitor to the work site covered by this PSHSP will be defined as anyone coming to the work site with the sole purpose of observation or viewing the activity in progress (hands-off inspections). Visitors can not operate any equipment or supervise / oversee any work activity.

5.5.1 Visitors who have been trained per section 5.1 shall be orientated to the hazards of the site and the control measures through:

- Briefing on this PSHSP (see section 3.9)
- Shall contact the site supervisor for briefing on the current site activities and the associated hazards.

5.5 VISITORS (Continued)

5.5.2 Visitors entering construction / work areas, radiologically controlled areas and fixed contamination areas, but not entering any contamination area or exclusion zones shall obtain the following prior to entry into the work area:

- Briefing on this PSHSP (see section 3.9)
- Escort by a person who has all the required training for the area to be toured
- Shall watch the general site orientation video
- Shall read and sign the visitor brochure
- Shall wear a Dosimeter badge as required
- Visitors who need to enter the contamination area (or Radiation or Airborne Radioactivity Areas) must receive authorization from the Manager of Radiological Control.
- Visitors who need to enter the exclusion zone must receive authorization from the RSO Health and Safety Officer.
- Visitors who need to enter asbestos or lead regulated areas must receive authorization from the Manager of Industrial Hygiene.

5.6 COMPETENT PERSON

Subcontractors shall provide to the FERMCO Project Manager and the RSO Health & Safety Manager, the names and documentation of all competent persons for work requiring the competent person designation under OSHA 29CFR 1910, 1926 and ESH-1-1000 SPR 2-2 (Competent Person Designation).

6.0 MEDICAL MONITORING AND SURVEILLANCE

6.1 REQUIRED MEDICAL MONITORING

In accordance with 29 CFR 1910.120, all personnel assigned to a FEMP project and performing tasks are required to participate in the FEMP medical monitoring program. If examinations conducted by medical personnel other than FEMP personnel are planned, the subcontractor must receive prior authorization from FEMP Medical Services concerning the necessary protocols and providers.

6.1 REQUIRED MEDICAL MONITORING (Continued)

Medical surveillance exams will be conducted based upon the following frequency or as determined appropriate by FEMP Medical Services:

- Pre-assignment (baseline)
- Annual (within one year of previous physical)
- After incidents, potential exposures, or physician recommendation
- Exit (termination)

All personnel who enter contamination or airborne radioactivity areas must participate in the bioassay program. The radiation surveillance must be conducted according to the following frequency:

- Baseline (site work)
- Periodic, Once per month (Class D soluble uranium) - Bioassay Yearly - In Vivo
- Following an incident
- Upon an individual's request
- Exit (end of project or termination)

All individuals required to wear respiratory protection must be medically approved, trained and fit tested. FERMCO will conduct the medical review, the training, the respirator fit test and issue a respirator fit test card. FERMCO will accept authorization to use respiratory protection from other organizations provided that documentation that meets FERMCO requirements is provided to the respirator program administrator in advance.

Personnel required to perform asbestos work shall participate in a medical surveillance program as required by OSHA 29 CFR 1926.58. Documentation of this asbestos medical surveillance shall be provided to FERMCO Medical Services prior to the start of asbestos removal activities.

Personnel required to perform work with lead containing materials shall participate in a medical surveillance program as required by OSHA 29 CFR 1926.62. Documentation of this lead medical surveillance shall be provided to FERMCO Medical Services prior to the start of work.

6.2 REQUIRED MEDICAL RECORDS

The Medical Department shall maintain all medical records as required by FERMCO policy.

7.0 HAZARD CONTROL

7.1 ENGINEERING CONTROLS

When feasible, engineering controls will be used to control physical, chemical, and radiological hazards. Engineering controls isolate the worker from the hazard or remove the hazard from the work area. These controls are to be designed into the project.

Engineering controls which will be used during the work covered by this PSHSP include:

- Containment of radiologically contaminated equipment
- HEPA filtered vacuum cleaners to remove loose contamination from building surfaces and work clothing
- HEPA filtered vacuum cleaners to remove airborne particulates from point of dust generation
- Removal of paint/contamination from surfaces prior to flame/mechanical cutting of metal

7.2 ADMINISTRATIVE CONTROLS

The following administrative controls shall be used to control physical, chemical, radiological hazards as appropriate:

- This Project Specific Health and Safety Plan
- FERMCO ESH-1-1000 - FERMCO Comprehensive Environmental Occupational Safety and Health Manual
- FERMCO Work Permits
- Standard Operating Procedures
- Lead Abatement Written Compliance Program

7.3 PERSONAL PROTECTIVE EQUIPMENT

The level of protective equipment (PPE) to be worn by field personnel involved with task activities will be defined on an activity basis and will be posted in the work area on a FERMCO Work Permit Form. The selection of PPE shall be based on the potential hazards posed by each individual while performing routine long-term tasks or groups of short-term tasks, and will be area specific. All workers within the UNH project area shall ensure that PPE is worn correctly and maintained properly as per this PSHSP. "Anti-contamination" or "anti-C" clothing is considered a form of PPE and the term is explicit in its intent for preventing personal contamination events from direct body contact with UNH (or other radioactive and/or hazardous materials). For all practical purposes, these terms should be considered interchangeable.

The RSO Health and Safety Officer and Technical Field Support Personnel shall perform work area inspections to determine if the PPE is being worn correctly and being properly maintained. Should PPE be found to be incorrectly worn, or improperly maintained, the worker will be informed, the problem corrected and RSO Management informed of the deficiency. The deficiency will be discussed with all employees at regularly scheduled safety meetings. Should the situation or condition continue, then disciplinary actions will be utilized.

FERMCO ES&H field personnel (technicians) are given the authority to upgrade PPE at the job by either amending or issuing a new FERMCO Work Permit (with new Radiological Work Permit attached). The ES&H field personnel do not have the authority to downgrade PPE requirements without the permission of the HSO, Radiological Engineering and Industrial Hygiene. The FERMCO Work Permit will be used to document all changes in PPE requirements that do not agree with the preliminary requirements set forth in this PSHSP. The preliminary requirements given here are based on health and safety assessments of proposed work areas and on the anticipated work activities that will be performed in each of those areas.

All persons engaged in burning/welding/flame activities or persons assisting those doing the work shall wear clothing with fire retardant characteristics as the outer layer of protection. When only one layer of protection is required, this outer layer is all that is required, with exceptions being protection to hands and feet.

If Industrial Hygiene and Radiological Control requirements differ, the more restrictive will apply.

7.3 PERSONAL PROTECTIVE EQUIPMENT (Continued)

7.3.1 PPE Required For:

- Site Mobilization Work - Outdoor Areas of Plants 2/3 & 8 Only
- Disassembly/Dismantling of Previously Existing, Outdoor, Flushed and Rinsed, Process Piping and/or Associated Systems.

ITEM	REQUIRED	JUSTIFICATION
Hard Hat	Yes	Minimum Requirement
Process coveralls underwear, socks	Yes	Minimum Requirement (furnished by FERMCO)
Safety Glasses w/rigid side shields complying with ANSI Z-87.1	Yes	Minimum Requirement
Steel Toed Safety Shoes	Yes	Minimum Requirement (furnished by FERMCO)
Latex rubber shoe covers	Yes	Minimum Requirement (furnished by FERMCO)
Laboratory Coat	Yes	Minimum Requirement for entering Contamination Areas.
Cotton glove liners (optional)	No (Yes)	Minimum Requirement for entering Contamination Areas.
Vinyl or latex surgical gloves	Yes	Minimum Requirement for entering Contamination Areas.
Tyvek, Mar Mac, or cloth Anti-C coveralls, Hood, Boot Covers	Yes	Job Specific Requirement - only when dry working conditions are anticipated
Water resistant Anti-contamination Coveralls, Hood, Boot Covers	No (Yes)	Required for wet or damp conditions while working in a contamination area

7.3 PERSONAL PROTECTIVE EQUIPMENT (Continued)

Chemical Resistant Anti-Contamination Coveralls, Hood, Boot Covers	No(Yes)	Required when FERMCO Work Permit requires chemical protective clothing
Full-Face APR w/magenta Cartridges	No(Yes)	Task specific, as specified by FERMCO ES&H
Hearing Protection	No(Yes)	Required when 85 DBA 8-hr TWA may be exceeded
Leather Palm Gloves	No(Yes)	Required when handling sharp-edged objects for physical hand protection
Cool (Ice) vest	No(Yes)	Required when heat stress control measures are necessary
Chemical Resistant Outer Gloves	No(yes)	Glove type will be determined based on MSDS requirements
Safety goggles	No(Yes)	As needed to prevent contact with splash or flying particles - when full face APR not used

7.3.2 PPE Required For:

- Flame Cutting Of Steel And Structural Steel Demolition (Indoor and Outdoor Locations where UNH is present or stored)
- Work which involves disassembly of existing pumps, transfer lines, valve assemblies, or flanged joints which has the potential to contain UN solutions.
- Work which involves disassembly of existing pumps, transfer lines, valve assemblies, or flanged joints which has the potential to contain unknown materials or unknown concentrations of materials
- Decontamination activities

7.3 PERSONAL PROTECIVE EQUIPMENT (Continued)

- Tank rinsing, cleaning, sampling, or any other activity where there is a high potential for splashing. These activities will require a Radiological Control evaluation (case-by-case) to specify additional PPE requirements, as is necessary.

ITEM	REQUIRED	JUSTIFICATION
Hard Hat	Yes	Minimum Requirement
Process coveralls underwear, socks	Yes	Minimum Requirement (furnished by FERMCO)
Safety Glasses w/rigid shields complying with ANSI Z-87.1	Yes	Minimum Requirement
Steel Toed Safety Shoes	Yes	Minimum Requirement (furnished by FERMCO)
Latex rubber shoe covers	Yes	Minimum Requirement (furnished by FERMCO)
Cotton inner gloves and latex or vinyl surgical gloves	Yes	Minimum Requirement
Flame Retardant Coveralls (worn as outer layer of protection)	No(Yes)	Required for persons engaged in burning/welding/flame activities or persons assisting those doing the work (furnished by FERMCO). If wet conditions are not anticipated, this outer layer of coverall is all that is required.
Chemical Resistant (Saranex) Anti-Contamination Coveralls, Hood,	Yes	Required for wet or damp conditions while working in a Contamination Area or when FERMCO Work Permit requires chemical protective clothing

NOTE: Duo-Flo Full-Face Airline (equipped with air purifying filter) are to be used in Digestion, Extraction, and Hot Raffinate areas. When asbestos and potential airborne radioactivity are the only hazards present, the Duo-Flow can be used in negative pressure mode. This allows freedom of motion and decreases industrial safety hazards to the wearer. FERMCO Work Permits and this PSHSP (above) will specify the requirements for going on air - in the areas mentioned above.

Supplied Air Respirator	No(Yes)	Required when flame cutting painted surfaces

Note: For welding or burning on confirmed or suspected lead painted surfaces, OSHA lead in construction standard requirements apply. These require either removal of a 6 inch strip of paint prior to welding/burning and using air-purifying respirators, or else using pressure demand air-supplied respirators.

Hearing Protection	No(Yes)	Required when 85 DBA 8-hr TWA may be exceeded
Cool (Ice) vest	No(Yes)	Required when heat stress control measures are necessary

7.3.3 PPE Required For:

- Waste container loading
- Installation of new piping and associated heat trace, insulation, and cladding (indoor areas of Plants 2/3 and 8).
- Concrete Demolition Work - indoor areas

ITEM	REQUIRED	JUSTIFICATION
Hard Hat	Yes	Minimum Requirement
Process coveralls underwear, socks	Yes	Minimum Requirement (furnished by FERMCO)
Safety Glasses w/rigid shields complying w/ANSI Z-87.1	Yes	Minimum Requirement, not required when full face APR worn

Steel Toed Safety Shoes	Yes	Minimum Requirement (furnished by FERMCO)
Latex rubber shoe covers	Yes	Minimum Requirement (furnished by FERMCO)
Cotton inner gloves and latex or vinyl surgical gloves	Yes	Minimum Requirement
Anti-Contamination Coveralls Hood, Boot Covers (cloth or disposable type)	Yes	Minimum Requirement - dry conditions only
Water resistant Anti-Contamination Coveralls, Hood, Boot Covers	No(Yes)	Required for wet or damp conditions
Anti-contamination Coveralls, Chemical resistant	No(Yes)	Required or when specified on FERMCO Work Permit
Full-Face APR with magenta cartridges	Yes	Minimum Requirement Refer to FERMCO Work Permit
Supplied Air Respirator	No(Yes)	For work around tops of tanks which are open to the work environment, that currently in use for UNH or nitric acid storage. This is for protection against NO_2 and HNO_3 which have no approved cartridges.

NOTE: Duo-Flo Full-Face Airline (equipped with air purifying filter) are to be used in Digestion, Extraction, and Hot Raffinate areas. When asbestos and potential airborne radioactivity are the only hazards present, the Duo-Flow can be used in negative pressure mode. This allows freedom of motion and decreases industrial safety hazards to the wearer. FERMCO Work Permits and this PSHSP (above) will specify the requirements for going on air - in the areas mentioned above.

Hearing Protection	No(Yes)	Required during concrete cutting/breaking or whenever 85 DBA 8-hr TWA may be exceeded
Leather Palm Gloves	No(Yes)	Required when handling sharp-edged objects for physical hand protection
Cool (Ice) vest	No(Yes)	Required when heat stress control measures are necessary

7.3.4 PPE Required For:

- Installation of new piping and associated heat trace, insulation, and cladding (outdoor areas of Plants 2/3 and 8).
- Concrete Demolition Work (outdoor areas of Plants 2/3 and 8)

ITEM	REQUIRED	JUSTIFICATION
Hard Hat	Yes	Minimum Requirement
Process coveralls underwear, socks	Yes	Minimum Requirement (furnished by FERMCO)
Safety Glasses w/rigid side shields complying w/ANSI Z-87.1	Yes	Minimum Requirement, not required when full face APR worn
Steel Toed Safety Shoes	Yes	Minimum Requirement (furnished by FERMCO)
Latex rubber shoe covers	Yes	Minimum Requirement (furnished by FERMCO)
Cotton inner gloves and latex or vinyl surgical gloves	Yes	Minimum Requirement

Anti-Contamination Coveralls Hood, Boot Covers (cloth, or disposable type, ie. Mar-Mac or Tyvek)	Yes	Minimum Requirement - dry conditions only
Water resistant Anti-Contamination Coveralls, Hood, Boot Covers	No(Yes)	Required for wet or damp conditions
Anti-contamination Coveralls, Chemical resistant Saranex	No(Yes)	Required when specified on FERMCO Work Permit
Full-Face APR with magenta cartridges	Yes	Minimum Requirement Refer to FERMCO Work Permit
Hearing Protection	No(Yes)	Required during concrete cutting/breaking or whenever 85 DBA 8-hr TWA may be exceeded
Leather Palm Gloves	No(Yes)	Required when handling sharp-edged objects for physical hand protection
Cool (Ice) vest	No(Yes)	Required when heat stress control measures are necessary
Safety goggles	No(Yes)	As needed to prevent contact with splash or flying particles when full face APR not used.

8.0 REQUIRED MONITORING AND ACTION LEVELS

FEMP policy is to maintain exposures to radiation and chemical vapors and gases **As Low As Reasonably Achievable** (ALARA). To comply with this policy, air and surface sampling shall be conducted. The type of monitoring, monitoring equipment, and frequency of monitoring is specified in this PSHSP, by FERMCO ES&H and by the RSO Health and Safety Officer.

8.0 REQUIRED MONITORING AND ACTION LEVELS (Continued)

Measurements of radioactive contamination and airborne radioactivity levels will be performed to assign the proper protective equipment. Pre-evaluation of the process activities and tasks involved, and the required levels of PPE for these activities is provided in the section on PPE. Dose-rates will be measured to assign RWP stay-times. Radiological coverage, and resulting measurements will be performed by Radiological Safety Technicians, and will be evaluated by Radiological Engineering to ensure proper level of area and personal protection requirements are maintained.

8.1 AIR MONITORING

General:

Air monitoring will be conducted as appropriate to determine level of protection required for tasks in the work area and to ensure compliance with the regulatory limits and FERMCO action levels.

Air sampling determines the amount of contaminant in the air. When the concentration of a contaminant reaches a predetermined level (Action level) workers shall leave the area and changes in PPE or operations will be implemented. Action levels will be established based on the chemical and radiological concentration of the materials worked with and the activities being conducted. All action levels shall be in accordance with regulatory standards. FERMCO Industrial Hygiene and Radiological Control Technicians will provide monitoring support for all activities as required by this PSHSP.

The type and frequency of sampling will be based on the location of the work zone, the task being conducted, and the materials being worked with.

During the performance of the tasks, personal air sampling may be conducted. Workers will occasionally be required to wear personal air samplers to monitor their exposure to airborne contaminants. This is done to verify proper selection of PPE and compliance with current regulatory standards.

Perimeter air monitoring equipment will be set up outside of work zones to monitor ambient concentration of contaminants in the air. The type and frequency of sampling will be based on the location of the work zone, the task being conducted and the materials being worked with.

Table 2 lists project tasks / operations and general air monitoring requirements.

8.1 AIR MONITORING (Continued)

8.1.1 Asbestos Monitoring:

Asbestos breathing zone and general area monitoring will be conducted by Industrial Hygiene within the Exclusion Zone of the Refinery during the period of blending and solution transfer being done in this area for this project.

Where process work is to be done in other areas having asbestos-containing siding panels, fixtures, etc.; where such materials are discovered to be damaged or broken in the work area, monitoring for airborne asbestos fibers will be conducted.

Where maintenance work is done on transite or asbestos insulated pipelines, Industrial Hygiene will perform breathing zone asbestos sampling, which is part of issuing the Asbestos Work Permit.

8.1.2 Dicalite Monitoring:

Airborne Dicalite dust will be monitored by Industrial Hygiene using a MIE RAM-1 forward light scattering dust photometer where this hazard could be encountered during construction activities.

8.1.3 Calcium Hydroxide Monitoring:

Airborne Calcium Hydroxide dust will be monitored by Industrial Hygiene during bag dumping operations using a MIE RAM-1 forward light scattering dust photometer, where this hazard could be encountered during construction activities.

8.1.4 Nitric Acid Monitoring:

Nitric acid will be monitored by Industrial Hygiene in indoor areas where nitric acid/UN solutions will be heated to 100°F-120°F. Monitoring will be performed using short-term Draeger tubes to ensure the level of respiratory protection is sufficient for the concentration of nitric acid measured. Additional 8-hour TWA samples may be collected using silica gel tubes.

The nitric acid/UN solution will not be heated during the construction activity.

8.1.5 Nitrogen Dioxide Monitoring:

Nitrogen dioxide will be monitored by Industrial Hygiene at indoor areas where nitric acid/UN solutions will be heated to 100°F-150°F. Monitoring will be performed using short-term Draeger tubes, Draeger or Metrosonics instruments, or alarming MDA Single Point Monitors with dataloggers. Additional 8-hour TWA samples may be collected using silica gel tubes. The nitric acid/UN solution will not be heated during the construction activities.

Nitrogen dioxide will continuously be monitored by Industrial Hygiene during any activity where workers may come into contact with UNH solutions. Several methods are available to perform real-time monitoring for nitrogen dioxide:

- Draeger colorimetric detector tubes may be used to give a color change which indicates the presence of nitrogen dioxide. Drager tubes may be used for personnel and general area air monitoring.

- The MDA single point monitor is an automated sampling device which uses a color change on an indicating tape to measure the concentration of nitrogen dioxide present. The MDA may be used for general area air monitoring and has as alarm which can be set at 0.5 ppm to indicate when supplied air respiratory protection is necessary.

- Metrosonics or Drager real-time personal monitors will be worn by workers when UNH work is in progress. The alarm on these personal monitors will be set at 15 ppm to indicate when concentrations of nitrogen dioxide begin to approach one-half of IDLH levels and a pressure-demand respirator equipped with an emergency escape bottle will be necessary.

8.1.6 Soluble Uranium Monitoring:

Soluble uranium will be monitored by Industrial Hygiene at specific tasks as noted in the Task Analysis table (Section 4.4). Breathing zone PVC filter samples will be analyzed by OSHA Method 170 or equivalent. Likewise, the bioassay requirements listed above apply for soluble uranium will be used to assess potential internal radiation dose to each individual.

8.1.7 Airborne Radioactivity Monitoring

Personal Air Sampling for airborne radioactivity will be emphasized for monitoring personnel per the guidelines listed below. Personal air sampling shall be conducted whenever the FERMCO Work Permit specifies personal respiratory protection be worn, or when personnel are expected to perform any of the following activities:

- the opening or breaching of a closed system containing radioactive materials
- drum sampling, filling, dumping, or crushing
- miscellaneous waste material compaction, crushing, or shredding
- decontamination and/or demolition activities
- burning, welding, or weld cutting on contaminated surfaces which contain levels greater than either of the values (removable or total) specified in Table 2-2 of DOE Radiological Control Manual.

Twenty-five percent of the individuals present in those areas where the above work activities are being performed will be equipped with a PAS sampling device.

General Area (GA) and high volume "grab" samples will be collected at select locations along the UNH project area to supplement the collected PAS air data and monitor ambient and work area airborne concentrations.

TABLE 2
I. H. AMBIENT AIR MONITORING REQUIREMENTS

TASK / OPERATION	CONTAMINANT (1)	FREQUENCY AND TYPE OF MONITORING	PERMISSIBLE EXPOSURE LIMIT	ACTION LEVEL	ACTION (3)
Work with insulated pipe, transite siding or other asbestos containing material	Asbestos	As required Personal and ambient monitoring.	0.2 f/cc	0.1 f/cc	Air-Purifying Respirator (Magenta Cartridges)
Work with Hazardous Materials (painting new equipment, piping, etc.)	Other chemical based on MSDSs	As required	Dependant on the chemical being used	One-half of the established regulatory limit	Contact FERMCO Industrial Hygiene
Entry into confined space	Carbon monoxide	Continuous	25 ppm	15 ppm	Withdraw and contact FERMCO IH
	Explosive atmosphere	Continuous	N/A	Greater than 10% of the LEL	Withdraw and contact FERMCO Fire and Safety Inspector and IH
	Oxygen content	Continuous	Less than 19.5% Greater than 23.5%	Less than 20.5% Greater than 21.5%	Withdraw and contact FERMCO IH

TABLE 2
I. H. AMBIENT AIR MONITORING REQUIREMENTS

TASK / OPERATION	CONTAMINANT (1)	FREQUENCY AND TYPE OF MONITORING	PERMISSIBLE EXPOSURE LIMIT	ACTION LEVEL	ACTION (3)
	Hydrogen sulfide	Continuous	10 ppm TWA 15 ppm STEL	5 ppm	Withdraw and contact FERMCO IH
Welding/flame cutting or mechanical removal of lead bearing metal or painted surfaces	Inorganic Lead	As required by IH: Personal and area monitoring	0.05 mg/m^3	0.03 mg/m^3	FF APR with magenta cartridges for mechanical removal of paint, or Supplied Air Respirator or remove paint from area to be cut/welded (may also require ventilation)

000102

TABLE 2
I. H. AMBIENT AIR MONITORING REQUIREMENTS

TASK / OPERATION	CONTAMINANT (1)	FREQUENCY AND TYPE OF MONITORING	PERMISSIBLE EXPOSURE LIMIT	ACTION LEVEL	ACTION (3)
Excavation, drilling, jack hammering, concrete sawing and any activity that would suspend solids (eg., dust generating, handling dicalite, etc.)	Nuisance dust	As required Total Dust Monitoring	10 mg/m^3 (total dust)	5mg/m^3 (total dust)	Wet material, Air-Purifying Respirator (Magenta Cartridges)
	Respirable Dust (< 1% silica)	As Required Personal monitoring	5 mg/m^3	2.5 mg/m^3	Wet Material, Air-Purifying Respirator (Magenta Cartridges)
	Silica (crystalline)	As required Personal and area monitoring	0.1 mg/m^3 TWA (respirable dust)	0.05 mg/m^3 TWA (respirable dust)	Wet material, Air-Purifying Respirator (Magenta Cartridges)

000103

5904

TABLE 2
I. H. AMBIENT AIR MONITORING REQUIREMENTS

TASK / OPERATION	CONTAMINANT (1)	FREQUENCY AND TYPE OF MONITORING	PERMISSIBLE EXPOSURE LIMIT	ACTION LEVEL	ACTION (3)
Any activity which could result in contact with UNH solutions (eg., work at the top of tanks during heating or agitation, or repair of leaking pipes, breeching of existing systems, etc.).	Nitrogen Dioxide	Personal and area monitoring as required by IH.	1 ppm STEL	0.5 ppm STEL	Full Face Supplied Air Respirator
	Nitric Acid	Personal and area monitoring as required by IH.	2 ppm TWA 4 ppm STEL	1 ppm TWA 2 ppm STEL	Full Face Supplied Air Respirator
Refer to 8.1.6 and 8.1.7	Uranium	As required Area and Personal monitoring	Soluble 0.05 mg/m^3 TWA Insoluble 0.2 mg/m^3 TWA 0.6 mg/m^3 STEL or DAC levels listed in DOE 5480.11, whichever level is lowest	Soluble 0.025 mg/m^3 TWA Insoluble 0.1 mg/m^3 TWA 0.3 mg/m^3 STEL (2)	Air-Purifying Respirator (Magenta Cartridges)

TABLE 2 NOTES:

(1) The need for monitoring for a specific contaminant will be determined by Industrial Hygiene and Radiological Control representative based on the material being handled.

(2) The action level and required action will be dependent on the concentration of airborne uranium that could potentially be present in the work area.

(3) The action may be upgraded or downgraded depending on the actual concentration found, the particular contaminant present, and protection factors of the PPE.

(4) This action level will be used when monitoring for unknown volatile organic compounds.

000105

5904

8.2 RADIOLOGICAL MONITORING

8.2.1 Radioactive Materials Contamination

Radiological Control Technicians (RCT) will perform routine contamination surveys of the affected work areas to confirm the effectiveness of contamination control practices and to ensure proper area posting.

8.2.2 Radiation

The RCT will perform radiation surveys of the work area and determine maximum allowable stay times for the workers to remain in the affected project areas. This information will be documented and posted on the Radiation Work Permit (RWP). Routine radiation surveys will also be performed to ensure proper area posting and compliance with ALARA principles.

8.2.3 Contamination Monitoring

Prior to the issuance of the FERMCO Work Permit (and attached RWP), contamination surveys will be performed to evaluate radiological conditions in the affected work areas. Based on the radiological conditions of the work area(s), protective clothing and respiratory requirements will be specified on the FERMCO Work Permit. Direct reading instruments for total contamination are utilized as well as smear techniques for detecting removable contamination.

In addition, RCTs perform routine monitoring of the work area and of newly exposed soils, material, and surfaces to ensure radiological conditions have not changed and present controls are adequate. The frequency of surveys in the individual work areas will depend on the degree of hazard as determined by Radiological Control. If contamination (above acceptable limits) is found and the controls are deemed inadequate, the RCT will issue a verbal stop work order and notify the Manager of Radiological Control (or his designee). Work shall not resume until proper controls are in place.

Personnel shall exit radiologically controlled work areas through established control points after performing a whole-body contamination survey. These control points are established by Radiological Control. Contact a Radiological Control Technician if personal contamination levels exceed the alarm settings on a Personal Contamination Monitor (PCM) or on other type of monitoring device if a PCM is not available at the designated control point. **Do not leave the area until released by Radiological Control.**

8.2 RADIOLOGICAL MONITORING (Continued)

All materials and equipment shall be monitored by a RCT. See section 10 for Site Decontamination Requirements.

8.2.4 Airborne Radioactivity Monitoring

Routine area and personal air monitoring is performed by RCTs, and areas are posted for airborne concentrations per the requirements of this PSHSP and the Radiological Protection Requirements (RPRs) in ESH-1-1000. Additional air monitoring requirements may be specified on the Radiological Work Permit, as determined by Radiological Control.

8.2.5 Radiological Work Permits

Radiological "work" includes any physical disturbance (ie. movement of drums, excavation, welding/burning, etc.), or the act of touching, kneeling, or sitting, all of which creates a potential for direct contact with radioactive surface contamination, or creates a potential for radiation exposure from radioactive materials. An RWP will also be required for general "hands off" entries into posted Contamination Areas and with minimum requirements for entry specified on posted FERMCO Work Permit.

A RWP is required for each individual work activity, which includes "hands-off" inspections and observation as mentioned above. The RWP will serve as an addendum to a posted FERMCO Work Permit and will be written to be specific to a work area and/or work activities performed in the work area. The RWP is an administrative mechanism used to establish radiological controls, document radiological conditions, and to communicate special radiological work requirements for each work activity. All PPE requirements for radiological work will be specified on the FERMCO Work Permit.

The function of an RWP is:

- to limit exposure to workers
- to prevent the spread of contamination
- to provide for augmented monitoring and surveillance
- to inform workers of radiological conditions and entry requirements
- to provide a mechanism for relating worker exposure to individual work activities

"Special" RWP (SRWP) shall be used to control non-routine operations or in work areas with changing radiological conditions. SRWPs are used to control jobs of short duration.

"General" RWP (GRWPs) may be used to control routine or repetitive activities, such as tours and inspections. GRWPs shall not be approved for periods of longer than 1 year.

Specification of simple (e.g., shoe covers and gloves) to complex (e.g., two layers of protective clothing and respiratory protection) PPE will be based on specific contaminations, their contamination levels, and on the scope of work to be performed.

8.2.6 Dosimetry

All employees working in radiologically controlled areas are required to comply with the following:

- Urinalysis and In-Vivo monitoring upon arriving on site initially and upon exit or termination
- Wear a TLD while in Controlled Areas, as specified by Dosimetry
- Participate in the routine urinalysis program as specified by Dosimetry
- Annual In-Vivo count
- Other nonroutine monitoring as specified

For activities associated with the UNH project, Dosimetry is requiring monthly urine sample collection from each worker. The increased sample collection frequency for this project is based on the potential for internal exposure to Class D soluble uranium. The requirements are as follows:

- Urine samples will be required prior to the start of the project, weekly, and at the end of the project for all identified field personnel. These samples are to be labelled as "50 (Special)".

- All participants will submit a final "completion of campaign" urine sample after the project is finished.

- Incident initial (end of shift) and post (start of next shift) urine samples will be required on occurrence of any incident.

- If any confirmed positive results occur, a 24-hour follow-up sample will be initiated by Dosimetry for the affected individual.

8.2 RADIOLOGICAL MONITORING (Continued)

Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion, or absorption shall be immediately reported to a supervisor. The supervisor shall immediately report the circumstance of possible radioactive materials intake to ES&H Radiological Control Department for evaluation. When the suspect isotope is uranium, the involved employee(s) shall report to the Urine Sampling Station at the end of their respective shift to complete an Incident Investigation Report (IIR, form FMPC-ES&H-1458), and submit and incident urine sample. The involved employee(s) shall also report to the Urine Sampling Station at the start of their next shift to submit a follow-up urine sample. When the suspect isotope is other than uranium the involved employee(s) shall report to the Dosimetry Section of the Radiological Control Department for further determination of actions.

Any situation which could have resulted in the inhalation, ingestion, or absorption of a hazardous material shall immediately be reported to a Supervisor or to the Assistant Emergency Duty Officer (AEDO), who will immediately report the circumstances to Medical and Industrial Hygiene. The involved personnel shall be directed by the Supervisor or AEDO as to when and where to report for medical evaluation, completion of an Incident Investigation Report (IIR) (Form No. FMPC-ES&H-1458), and submission of bioassay samples (e.g. blood, urine).

8.3 INSTRUMENTATION

8.3.1 Industrial Hygiene

8.3.1.1 Metrosonics/Drager Personal Real-Time Monitor

Personal air sampling for nitrogen dioxide will be conducted as determined by Section 8.1 of this PSHSP, FEMP work permits, the RSO HSO, employees, or IH representative. The Metrosonics/Drager Personal Real-Time Monitor has an alarm mode which will be used to ensure the proper level of respiratory protection is worn during work covered by this PSHSP.

Instrument:	Drager 190 Nitrogen Dioxide Monitor/Data Logger or Metrosonics PM-7700 Toxic Gas Monitor
Hazard Measured:	Nitrogen dioxide

Detection Method:	Chemical sensor which reacts with nitrogen dioxide to indicate concentration of gas present in air.
Application:	Detects concentration of gas in ppm and alarms when concentrations exceed preset level.
General care:	Recharge or replace battery. Regularly clean and maintain the instrument and accessories.
Calibration:	Daily

8.3.1.2 MDA Single Point Monitor

Air sampling for nitrogen dioxide will be conducted as determined by Section 8.1 of this PSHSP, FEMP work permits, the RSO HSO, employees, or IH representative. The MDA Single Point Monitor will be used to determine when supplied air respiratory protection is to be worn during work covered by this PSHSP.

Instrument:	MDA Single Point Monitor
Hazard Measured:	Nitrogen dioxide
Detection Method:	Chemcassete detection system
Application:	Detects concentration of gas in ppm and alarms when concentrations exceed preset level.
General care:	Regularly clean and maintain the instrument and accessories.
Calibration:	At initial start-up of instrument and every fourteen days during continuous use.

8.3 INSTRUMENTATION (Continued)

8.3.1.3 Oxygen/Combustible Gas/Toxic Substance Monitor

Air sampling for combustible gases and oxygen deficient atmospheres will be conducted as determined by Section 8.0 of this PSHSP, FEMP work permits, the RSO HSM, employees or IH representative. The air sampling instrument to be used will be a CGM Multi-gas monitor.*

Instrument:	CGM Multi-gas Monitor or equivalent
Hazard Measured:	Combustible gases, % oxygen, CO, and H_2S
Application:	Detects % LEL, % oxygen, toxic gases in ppm
General care:	Recharge or replace battery. Regularly clean and maintain the instrument and accessories.
Calibration:	Daily

- Other industrial hygiene monitoring instruments may be used as determined to be appropriate.

8.3.1.4 Drager Tubes

Air sampling for nitric acid and nitrogen dioxide gases and vapors will be conducted as determined by Section 8.0 of this PSHSP, FEMP work permits, the RSO HSM, supervisor or IH representative. Direct reading Drager tubes will be used. *

Instrument:	Direct reading Drager tubes
Hazard Measured:	Various inorganic and organic gases and vapors
Detection Method:	Color change in detection tube determines presence of chemical
General Care:	Detection tubes are to be stored in cool dry area
Calibration:	Pumps used to draw air through detector tubes are to calibrated annually

- Other industrial hygiene monitoring instruments may be used as determined to be appropriate.

8.3.1.5 Aerosols

Air sampling for aerosols will be conducted as determined by Section 8.0 of this PSHSP, FEMP work permits, the RSO HSM, supervisor, employee or IH representative. The air sampling instrument to be used will be a MIE RAM-1 Real-Time Aerosol Monitor

Instrument:	MIE RAM-1 Real-Time Aerosol Monitor
Hazard Measured:	Aerosols
Detection Method:	Light diffraction
General Care:	Recharge or replace battery. Regularly clean and maintain the instrument and accessories
Calibration:	Before and after each use

- Other industrial hygiene monitoring instruments may be used as determined to be appropriate.

8.3.1.6 Fibrous Aerosol Monitor

Air sampling for airborne fibers will be conducted as determined by Section 8.0 of this PSHSP, FEMP Work Permits, the RSO HSM, supervisor or IH representative. The air sampling instrument to be used will be a MIE FM-7400 Real-Time Fiber Monitor.

Instrument:	MIE FM-7400 Real-Time Fiber Monitor
Hazard Measured:	Airborne fibers (asbestos)
Detection Method:	Light diffraction
General Care:	Regularly clean and maintain the instrument and accessories
Calibration:	Perform system self-diagnostic check before each use

8.3.1.7 Airborne Particulates

Air samples will be taken by FERMCO Industrial Hygiene personnel in the area where work will be performed. Particulate contaminants which may be sampled to include asbestos, silica dust, nuisance dust, uranium, and inorganic lead.

Instrument:	Air Sampler
Hazard Measured:	Collects airborne particulate for laboratory measurement
Application:	Detects concentrations of specific airborne particulate contaminants
Detection Method:	Dependent on contaminant of concern
General Care:	Recharge battery
Calibration:	Before and after each use

8.3.1.8 Noise Monitor

Noise monitoring will be conducted as determined by this PSHSP, FEMP work permit, the RSO HSM, employee or FERMCO Industrial Hygiene representative. Direct reading Metrosonic noise dosimeters will be used.*

Instrument:	Metrosonic noise dosimeter
Hazard Measured:	Noise level
General Care:	Recharge or replace battery
Calibration:	Before and after use

* Other industrial hygiene monitoring instruments may be used as determined to be appropriate.

8.3.2 Radioactive Monitoring Instrumentation

8.3.2.1 Airborne Radioactivity

Air samples will be taken by the FEMP Radiological Control personnel in the general area where work will be performed, as required by the RCT.

Instrument:	Air Sampler (utilizing PAS, GA, and High Volume Grab sampling methods)
Hazard Measured:	Collects airborne particulate for laboratory measurement
Application:	Measure of air activity when surface contamination is present and where the potential exist for an increase in airborne radioactivity
Detection Method:	Low background proportional counter
General Care:	Daily inspection
Calibration:	Six months, low background proportional counter calibrated monthly

8.3.2.2 Radioactive Surface Contamination

Radioactive surface contamination will be identified by FEMP Radiation Control personnel as they perform the survey for the required radiation work permits. All work area surfaces will be surveyed routinely for contamination, and will be surveyed to evaluate pre-work levels. These survey results will be documented and posted on the work area RWP.

Instrument:	Alpha Scintillators and Geiger-Muller pancake detectors (fixed plus removable contamination, field counting of swipes for removable when appropriate). Swipe samples will also be collected.
Hazard Measured:	Alpha, Beta, and Gamma radiation
Application:	Monitors surfaces for radioactive contamination
Detection Method:	Alpha Scintillation and gas ionization field portable instruments. Gas proportional low background counter for analysis of swipe samples.

General Care:	Daily source and battery check
Calibration:	Six months

8.3.2.3 Radiation Dose Rates

Beta and gamma radiation levels in the workplace will be monitored by FEMP Radiation Control personnel. These measurements will be recorded on Radiation Work Permits (which will be posted in the work area) and on routine surveys which will be maintained the Radiological Control department.

Instrument:	Tissue equivalent ionization chamber (RO-3C)
Hazard Measured:	Beta and Gamma radiation
Application:	Monitors radiation dose rates to skin and whole-body.
Detection Method:	Ionization in air filled chamber
General Care:	Daily source and battery check
Calibration:	Six months

Refer to Section 8.2.6 Dosimetry methods used.

9.0 HANDLING DRUMS AND CONTAINERS

9.1 INSPECTION

Unknown or damaged drums shall be inspected according to FERMCO procedures.

9.2 STORAGE

Storage of drums shall be done in accordance with FERMCO procedures.

9.3 TRANSPORTATION

All lifting and movement of drums shall be mechanically assisted (fork truck, drum dolly, hoist, etc.). The workers that use the drum moving equipment shall be trained in the operation of the equipment.

9.4 MONITORING

Prior to moving filled drums/containers from an area, drums/containers shall be surveyed by Radiological Control.

Whenever filled drums/containers are required to be opened, a FERMCO Work Permit and RWP is required. The Work Permit/RWP will specify the monitoring requirements.

9.5 LABELING

All containers of hazardous materials shall be labeled according to SPR 5-6 and the FEMP drum labeling requirements. As a minimum, the name of the contents and it's hazard shall be clearly labeled on the container.

10.0 DECONTAMINATION

10.1 SITE DECONTAMINATION REQUIREMENTS

Contamination should be avoided where possible by making minimum contact with the contaminant. All instances of personnel radiological contamination and chemical contamination shall be reported to Radiological Control, Industrial Hygiene, RSO Health and Safety Officer, and the Assistant Emergency Duty Officer.

Area decontamination of radiological and some chemical contaminants should be done with a combination of HEPA filtered vacuum units, wet wiping techniques, approved detergents or soaps, and by the use of sealants or fixatives when immediate decontamination is not feasible or practical.

Engineering controls should be developed to reduce the level and types of anti-contamination clothing which are required initially for mobilization, demolition, and excavation activities. These controls will be designed and implemented as is practical.

Examples:

- Eliminate or reduce radioactive surface contamination through line flushings and decontamination techniques
- Use solid barriers or covering to eliminate direct skin contact wherever practical
- Remove lead based paint prior to flame/torch cutting of metal

10.1 SITE DECONTAMINATION REQUIREMENTS (Continued)

Equipment for decontamination of radiological or chemical hazards shall be kept available in the area surrounding the work area exclusion zone (or Contamination Reduction Zone). Upon leaving the work area exclusion zone, workers will be instructed by RCTs and/or IH how to frisk, in which containers to place disposable and launderable equipment, and what to do if personal radioactive contamination is detected.

Personal contamination on the skin, or on the inner personal company-issued clothing shall require contact with a Radiological Control Technician (RCT) immediately. Detection of a count rate above background with a field portable monitoring instrument ("frisker") should alert personnel of possible contamination. The ambient background count rate is not to exceed 300 counts per minute (CPM) in the location of the personnel monitoring. If background levels exceed 300 CPM, proceed to an area of lower background to perform the personal monitoring of the potentially contaminated individual. Surface contaminated skin or clothing is to be limited to 1000 dpm/100 cm^2. Ideal background levels in the monitoring area are less than 100 CPM. Incidents involving personnel contamination on the skin, "clean" company issued clothing, or personal clothing, shall be reported to the AEDO (Radio 202, F2) as soon as is practical. Personnel contaminated through direct contact with UNH, process residues, or other agents, which cannot be removed by the doffing of protective clothing, shall be decontaminated by Radiological Control Technicians in accordance with ES&H procedure SP-P-35-017, "Procedure for Personnel Decontamination".

Equipment must be monitored by a RCT prior to removal from a radiologically controlled area. Equipment found to be contaminated when exiting a controlled point will be taken to the FEMP Decontamination Facility for decontamination. Transport of material to decontamination will be done according to SP-P-35-027, "Radiological Requirements for the On-Site Movement of Radioactive Materials."

When personnel exit a lead regulated area, they shall wash their face and hands prior to breaks/lunch, and shall shower at the end of their shift.

Questions concerning chemical contamination should be directed to the FERMCO Industrial Hygiene.

In case of body contact with an acid or caustic stream, nonpermeable (moisture resistant) PPE should be doffed with extreme caution to prevent cross contamination of the skin when doffing PPE. Contaminated inner clothing shall be removed and the affected body area shall be washed thoroughly (15 minutes, minimum) in a safety shower or eye bubbler. Involved personnel shall report immediately to Medical Services or summon aid (phone 6511, fire alarm or radio 202/303 or CONTROL) as needed. Notification shall also be made to the appropriate supervisor as soon as possible.

10.1 SITE DECONTAMINATION REQUIREMENTS (Continued)

Asbestos contaminated clothing is removed and placed in plastic bags labelled as asbestos contaminated. Respirators have their cartridges discarded with other labelled asbestos contaminated wastes. The respirator face pieces are bagged with asbestos labels so that the Laundry can identify them when washing them. For some asbestos jobs where potential for skin contact is high, a mandatory shower is specified at lunch and at the end-of-shift on the Asbestos Work Permit.

11.0 HAZARD ASSESSMENT

This section addresses the health and safety risks associated with this project. Potential risks to workers may originate from the chemical, physical, radiological, biological and safety hazards present at the project site. Tasks to be performed vary in their hazard level depending on the activity to be performed.
Chemical/Radionuclide Hazards: (Uranium is the radionuclide of concern)

Contaminant:	Mode:	Exposure Limit(1):	Action Level(2):
Uranium (UO_3, U_3O_8, UF_4, MgU_2O_7)	Inhalation	$2x10^{-11}$uCi/cc	$5x10^{-12}$uCi/cc
Asbestos(3)	Inhalation	0.2 fiber/cc	0.1 fiber/cc
Magnesium Hydroxide	Skin contact	None	None
Calcium Hydroxide	Inhalation/ skin contact	5 mg/m^3	2.5 mg/m^3 (8)
Uranium	Inhalation/ skin contact	0.05 mgU/m^3 (4)	0.025 mgU/m^3 (UNH)
Barium, soluble	Inhalation	0.5 mgBa/m^3	0.025 mgBa/m^3 (5)
Chromium + 6	Inhalation/ skin contact	0.05 mgCr/m^3 (5)	
Dicalite	Inhalation	0.069 mg/m^3	0.03 mg/m^3 (6)
Nitric Acid	Inhalation/ skin contact	2 ppm TWA	1 ppm acid 2 ppm STEL
Nitrogen dioxide	Inhalation	1 ppm (max.)	0.5 ppm (7)

11.0 HAZARD ASSESSMENT (Continued)

Notes:

(1) Limit is based on a daily 8-hr time weighted average (TWA) (5 Rem Annual Effective Dose Equivalent @ 2000 hrs/yr).

(2) Full face air purifying respirator is to be worn with magenta filter cartridges (or other respiratory protection as designated by ES&H).

(3) No asbestos hazards are present outside the Digestion, Extraction, or Hot Raffinate ares unless insulated lines or transite panels are damaged or disturbed.

(4) Limit is OSHA limit for soluble uranium which is more restrictive than radiological limit for class D material (Ref: letter, WEMCO:IRS&T(D):91-240).

(5) Barium and Chromium, by analysis, are present at a maximum of 217 and 404 ppm (0.02 and 0.04%), respectively. Uranium is present at 0.3 to 32%. Since chromium and uranium exposure limits are comparable, and uranium concentrations are greater by a factor of 10 or more, monitoring for soluble uranium will provide assurance that chromium and barium exposure limits are not exceeded.

(6) Dicalite is not an expected hazard for construction activities, but may be present in the affected work areas.

(7) Hooded or full-face continuous flow airline respirator is required.

(8) Calcium Hydroxide is not an expected hazard for construction activities, but may be present in the affected work areas.

(9) Although the attached Material Safety Data Sheet for UNH lists this material as a shock hazard, this is only appropriate for dry UNH crystals, not the UNH solution which is being processed in this project.

TABLE 3
HAZARDS BY JOB TASK
Minimum controls required

JOB / TASK	REQUIRED PERMITTING	CONCERNS		CONTROLS
		SAFETY / FIRE	CHEMICAL \ RADIOLOGICAL	
Excavation, Penetration of the ground or building material	Excavation / Penetration Permit, RWP	Penetrate underground utilities	Excavation can expose unknown hazards	Evaluation and selection of appropriate level of PPE
Welding, Open Flame	Welding Permit	Fire control, flammable and or combustible material	Based on the base metal, coatings and the welding rod	Follow permit requirements
Disturbance / handling of asbestos containing material	Asbestos Permit		Release of asbestos fibers worker exposure	Full face APR (follow permit requirements)
Disturbance of loose contamination	RWP		Uranium allowed to become airborne	Follow permit requirements
Hazardous Material	Chemical Hazardous Materials Work Permit	Emergency rescue procedures	Based on the chemical in use	Follow permit and MSDS and IH requirements
Confined spaces	Confined Space Evaluation / Permit	Emergency rescue procedures	Confined space will be evaluated by field personnel	Follow permit requirements
Biological hazards	Chemical / Hazardous Materials Work Permit		Worker exposure to bird droppings (Histoplasmosis)	Full-Face APR with magenta cartridges
Elevated work	Hazardous Work Permit	Falls		Fall protection. Follow Permit requirements.
Working in anti-contamination clothing	FERMCO Work Permit/RWP	Heat Stress		Cool vests, reschedule work hours, work-rest regimen

11.1 INDUSTRIAL HYGIENE ISSUES

11.1.1 Uranyl Nitrate Hexahydrate (UNH)

The primary chemical hazard associated with this work is uranyl nitrate (UNH). UNH is a solution containing uranium compounds dissolved into nitric acid. Nitric acid is a strong acid which is capable of causing severe irritation to the skin, eyes, or mucous membranes. Inhalation may result in irritation of the upper respiratory tract, pneumonitis, or bronchitis. No chronic effects are associated with nitric acid.

When nitric acid is heated or exposed to metals, nitrogen dioxide may be present in the vapors. Health effects related to inhalation of nitrogen dioxide are dependent on the time and level of exposure. Contact with vapors is irritating to the eyes, nose, throat, and wet skin. The discomfort or slight pain occurring at exposure may go unnoticed. Serious results may not be felt until hours or days after exposure, even though heavy damage may have occurred. The cyanosis and pulmonary edema resulting from damaged lung tissue becomes disabling and can be fatal, especially if not promptly treated after exposure.

11.1.2 Asbestos

Asbestos can be found in the building siding (transite) and pipe insulation. The transite siding inside the Digestion, Extraction, and Hot Raffinate areas is in very poor condition and asbestos contamination is present in these areas. Asbestos is a human carcinogen which mainly affects the respiratory system. When working in areas where exposure to asbestos is possible, proper PPE and respiratory protection will be specified on the posted FERMCO Work Permit.

11.1.3 Concrete Cement

Uncured concrete is corrosive to both skin and eyes. Knee-high boots, rubber gloves, and appropriate eye protection shall be used during concrete placement and finishing.

11.1.4 Silica

Airborne silica may be generated by the demolition / disturbance of concrete or sandblasting operations. Silica is moderately toxic as an acute irritant dust, prolonged exposure can cause pulmonary fibrosis (silicosis). Dust control and approved PPE shall be used as protection against this hazard.

11.1.5 Uranium

Uranium can be found in most buildings and in the soil and water on-site. Uranium is a radioactive material and in its soluble forms is highly toxic. Soluble uranium, which is the primary form of uranium that will handled for the UNH project is absorbed through the skin and effects the kidneys. Nonsoluble uranium is an inhalation and radioactive hazard. Proper level of PPE for this hazard will be prescribed and posted in the affected work areas, on a FERMCO Work Permit.

11.1.6 Histoplasmosis

Histoplasmosis is a disease caused by a fungus which can become airborne. The disease effects the lungs similar to influenza and tuberculosis. The disease is usually self-limiting, however, it can have serious consequences in some individuals and can result in death without proper treatment.

The fungus that causes histoplasmosis is found in the soil where birds roost and their droppings have collected or in heavy accumulations of such droppings. Should work be conducted in locations favorable for histoplasmosis, Industrial Hygiene shall be contacted for required PPE and a Chemical Hazardous Materials Permit.

11.1.7 Inorganic Lead

Paints containing lead compounds have been used in many locations in the project area. Inorganic lead is harmful if it is ingested, or when dust or vapors containing lead are inhaled.

11.1.8 Noise

Operations being performed may present a potential noise hazard. Excessive noise can occur during the operation of drilling equipment, pneumatic tools, generators, and other machinery. RSO HSO will request FERMCO I.H. to evaluate suspect hazardous noise operations.

11.1.9 Confined Spaces

A confined space is an area not designed for continuous human occupancy, is large enough for a person to bodily enter and has limited means for entry and exit. All such operations which involve entry and work in a confined space are required to be evaluated by FERMCO Industrial Hygiene prior to entry to determine if a Confined Space Entry Permit is required for the work task. See ESH-1-1000, SPR 5-13 (Confined Space Entry).

11.1 INDUSTRIAL HYGIENE ISSUES (Continued)

As part of the evaluation, all confined spaces will be monitored, as a minimum, for Oxygen, Carbon Monoxide, Hydrogen Sulfide and Explosive atmosphere. If a hazardous atmosphere or safety hazard exists within the space, the space will be classified as a permit-required confined space and a Confined Space Entry Permit shall be required.

11.2 RADIOLOGICAL SAFETY ISSUES

The information that follows gives a general overview of radiological conditions and hazards that are present at the FEMP, and gives some historical background. All Radiological Control requirements and hazards associated with UNH construction activities have been previously identified in this document and will be further clarified within necessary supporting documents (ie. FERMCO Work Permits, RWPs, Construction Matrices, etc.)

The FEMP was a uranium processing facility since the early 1950s. Uranium and uranium-bearing materials are stored or have been processed in almost all parts of the FEMP Production Area, Waste Storage Area, and Laboratory Building. Uranium bearing materials have been found buried or dumped at several locations inside and outside the former process area, and the potential for contamination should be considered prior to penetrating or disturbing any existing surface or soils on the FEMP property. Radioactive contamination is present on all work surfaces in either removable or fixed (non-transferable) forms and is a result of past contamination control practices, which were inadequate. Uranium is the primary radionuclide of concern in most areas within the FEMP site boundary.

Thorium has been processed and is stored at the FEMP. Radium and elevated levels of radon and thoron gases can also be found. However, surface contamination levels for radium and thorium (above DOE guidelines) is limited to only a few areas of the site. Likewise, radon and thoron daughter concentrations do not exceed DOE guidelines for occupational exposure. For questions concerning the locations of areas posted and controlled for thorium or radium contamination, or radon or thoron, contact Radiological Engineering at X-8493.

Radiation exposure hazards at the FEMP requiring the most attention for control are the potential absorption, inhalation, or ingestion of uranium and thorium, and their respective daughters. External exposure rates are elevated in some areas of the FEMP, but are only significant in and around the thorium storage areas. In 1991, a bentonite protective layer was placed over radium bearing residues which are currently stored in K-65 Silos 1 and 2, and this action resulted in a significant decrease in radiation readings on the tops of these silos.

Worker training, contamination control practices, and personal protective equipment are utilized to control inhalation and ingestion of radioactive particles. ALARA principles are used to control worker exposure to radiation fields in Thorium storage areas and other Radiation or High Radiation Areas. At the FEMP the policies and objectives for controlling personnel exposure to ionizing radiation are implemented through the issuance of Radiation Work Permits.

11.3 INDUSTRIAL SAFETY ISSUES

Listed within this section are some of the anticipated or potential hazards or concerns that may be encountered. During the completion of the tasks additional concerns or hazards may be recognized.

11.3.1 Lifting

Lifting is the most common task associated with low back pain. Many of the injuries do not result from single incident, but develop over a period of time. This type of injury may result from repetitive lifting. Personnel should know their lifting limits and the object to be lifted should be limited by factors such as; the route and distance to be traveled, the amount of time required and the center of gravity necessary to handle the load safely.

A worker shall not lift more than 50 lbs without assistance from another person or mechanical help.

11.3.2 Overhead Electrical Lines

Before any activity is to take place, all overhead obstructions must be identified by the supervisor in charge. Where possible the activity site should be moved away from the overhead lines. If site cannot be moved, then the overhead lines should be moved, de-energized, or guarded as to protect against contact. Electric lines of 50kV or below the minimum safe clearance shall be ten (10) feet when operating. Equipment in transit with boom lowered the safe clearance shall be 6 feet. For electrical power lines over 50kV, add one (1) inch for every 1kV over 50kV or twice the length of the power line insulator, but never less than ten (10) feet.

11.3.3 Slips, Trips, And Falls

All personnel should always walk where firm footing is assured, taking short steps in slippery places. Carrying anything bulky that will obstruct vision will be avoided. Personnel will be cognizant of falling, slipping and tripping hazards, such as cluttered traffic areas, unguarded openings and manholes, unsteady or snow-and ice-covered platforms, loose materials underfoot, tools hidden in the grass, and slippery, wet, oily or worn walkways. Climbing over equipment to get other items and falling off/down steep slopes can cause serious and sometimes fatal accidents.

All work paths and work areas shall be kept clear of slip and trip hazards. If workers must work in or near areas where these hazards exist and the hazard cannot be removed, then proper barricades and signs shall be used to route personnel away from the hazards. Some common slip and trip hazards are; mud, trash, electrical cords/airlines lying in walkways, and improperly stored equipment.

The supervisor in charge shall ensure that all personnel are afforded a clear walkway at all times. Exits and Exit paths shall be maintained clear at all times. Poor housekeeping shall not be tolerated.

11.3.4 Power Tools

Proper eye and face protection shall be provided and worn while using all hand and power tools. All tools will be inspected before using. Defective tools will not be used. Only tools designed for the application in mind will be used. Tools with mushroomed heads, sloppy connections or broken handles will not be used. The proper strength tool will be used as specified for each job. The use of handle extensions or cheater bars is prohibited.

Tools and machines will be disconnected from their power source before making adjustments or attachment changes. Guards or safety devices will not be removed. All fuel-powered tools will be shut off before refueling. Ensure that blade guards are in place and working properly. Air-powered tools must have safety clips or retainers on all hose connections. Manufacturer's safe operating pressures will not be exceeded for any fittings. All portable power equipment shall be protected by ground fault circuit interrupters (GFCI). See *ESH-1-1000*, SPR 2-23 (Ground Fault Circuit Interrupters).

The supervisor in charge shall inspect all tools on the job site. Tools found to be defective shall be tagged and removed from service.

11.3.5 Electrical Power

Ground fault circuit interrupters (GFCIs) are required on all 15 and 20 ampere, 120 volt circuits at all work sites. The GFCI shall be placed at the source of the electrical service to protect both the cord and the devices connected.

All flexible cords (extension cords) shall be approved (UL listed) cord sets and be of a type rated for hard usage and damp locations. Only purchased cord assemblies will be permitted, field made cord-sets are not permitted. All cords shall run overhead to avoid damage from being on the ground.

All temporary wiring and lighting shall conform to the requirements of the latest edition of the National Electrical Code, except Article 305-4(b) which shall NOT apply. Note: All temporary lighting shall be securely mounted to the ceiling or other high point 7 feet or more from the floor.

No work shall be permitted within 10 feet of any live exposed electrical device, unless a written work plan is approved by the RSO Health and Safety Officer or the personnel involved are electrically qualified for such work. This level of training shall be documented according to section 5.3.

11.3.6 Lock And Tag

Contractor personnel working at the FEMP shall follow and be fully trained to the FEMP Energy Control Plan. Before commencing work on any energized system or circuit, a lockout is to be completed in accordance with the FEMP Energy Control Procedures. See SSOP-0719 FERMCO Lockout/Tagout (Hazardous Energy & Material Control) Procedure.

11.3.7 Heavy Equipment

The number of personnel working around heavy equipment shall be minimized at all times. All mobile equipment shall be supplied with an electronic back-up alarm. All operators will be qualified to operate their machine. Equipment will be inspected at the beginning of each shift by the equipment operator, prior to use, and the inspection results will be recorded on a daily check sheet to ensure that all safety equipment and devices are fully operational. See *ESH-1-1000* SPR 2-36, 2-38 and 2-39.

Certain tasks may require the use of drill rigs. In order for the equipment to operate in a safe manner, the equipment must be maintained and in good operating condition including back-up alarms, as required by FEMP site procedures. In addition, the operator must be properly trained in the use of the equipment. See 5.3 for additional information.

11.3.8 Material Handling Equipment

All equipment used for hoisting and rigging operations will be tested, inspected, and tagged with current annual test dates. All operators will be qualified to operate the equipment. Equipment will be inspected beginning of each shift by the equipment operator, prior to use, to ensure it is in proper operating condition and all safety equipment is in place and functional. The inspection results will be recorded on a daily check sheet.

All material handling equipment, mobile personnel lifts (both powered & manual) and specialized hand operated powered equipment shall have the factory approved operator/safety manual for use by the operator. This manual shall either be with the equipment at the time of use or shall be on file, available for reference when requested. All material handling equipment shall only be used as the manufacturer intended and with the loading limits defined by the manufacturer. Safety requirements within the manual shall be followed.

All rigging operations shall be performed by persons that are qualified to safely execute such work. The supervisor in charge shall evaluate the training of all personnel involved in rigging operations and provide a letter to the FERMCO Construction Manager and RSO HSM, stating who has been verified to be competent rigger. See *ESH-1-1000* SPR 2-36, 2-38, 2-39, 2-43, 2-44, 2-45, 2-46, 2-47, 2-48, 2-49, 2-50 and 2-51 (Material Handling & Rigging).

Any CRITICAL LIFT shall have a approved LIFT PLAN prior to the start of the lift. This plan shall be written by the subcontractor or FERMCO supervisor preforming the work and approved by FERMCO RSO Management and RSO Health & Safety Officer. See the "Hoist and Rigging Manual," DOE/ID-10500-section 12.0, for additional information on the Critical Lift Requirements.

11.3.9 Fall Protection

A positive means of fall protection is required for any fall of six (6) feet or more. This can be accomplished using appropriate barricades, full body harnesses, lanyards, etc. All work tasks shall have 100% fall protection. See *ESH-1-1000* SPR 2-17 (Fall Protection) for additional information.

NOTE: Safety Belts Are Not Permitted.

Before entry onto any roof, approval from the RSO Health and Safety Officer and the FERMCO Facility Owner must be obtained.

11.3.10 Hidden And Underground Utilities

If the project work scope involves penetrating/excavation into the surrounding earth, roof, floors, and walls of the facility a FERMCO permit is required. Due to serious injury potential from contacting or breaching existing utilities, a FERMCO Excavation/Penetration Permit with a complete mapping/drawings of all utilities and other potential hazards is required prior to start of excavation. The Construction manager and the Supervisor In Charge listed on the permit form shall ensure that any hazard is clearly marked and communicated to the workers involved. Extreme care will be taken when working in the proximity of these utilities. Construction Management shall ensure that all penetration/excavation work is executed safely

11.4 FIRE PROTECTION ISSUES

The potential for fires and explosions may occur during tasks. Explosions and fires can result in intense heat, open flames, smoke inhalation, flying objects and release of toxic chemicals. Such releases can threaten both personnel on site and the nearby public. To protect against explosions and fires, the environment will be monitored for explosive atmospheres and flammable vapors; all potential ignition sources will be kept away from areas where explosive or flammable environments may occur; and work practices that will minimize the agitation or release of chemicals will be used.

11.4 FIRE PROTECTION ISSUES (Continued)

Storage, use or transfer of flammable and/or combustible liquids shall be in accordance with NFPA 30, Flammable and combustible Code, or approved by FERMCO Fire Protection. Flammable or combustible liquids with a flash point of 140° F. or less (i.e., gasoline, diesel fuel, solvents, etc.) shall be handled in Factory Mutual Approved safety cans with operable flame arrester and self-closing lid(s). All safety cans shall be properly marked with the name of the liquid contents. A label identifying the hazard of the material shall be affixed to the container.

All areas where flammable liquids are stored or paints are mixed shall have "NO SMOKING" signs posted and smoking shall not be permitted in the posted areas.

Liquified Petroleum Gas (i.e., propane, butane, etc.) shall not be stored inside any FEMP building.

Combustible scrap and debris shall be removed at regular intervals during the course of construction. Disposal shall be in accordance with established FERMCO requirements.
The storage of combustible materials shall be kept at least 50 feet from any building or structure.

Temporary heating equipment and appliances shall be Listed by UL or FM Approved and installed in accordance with the manufacturers' instructions and the FERMCO site standards.

Only flame resistant tarpaulins or approved materials of equal fire retardant characteristics shall be used for temporary enclosures. Subcontractors shall provide documented verification of fire retardancy to the RSO Health & Safety Officer upon request.

Any task(s) which may involve the impairment of a sprinkler system or a fire alarm system requires an Outage Permit issued by the Fire and Safety Inspectors and signed off by Fire Protection. The demolition of a structure involving these systems may require deactivation of all or part of a system. Fire Protection and the Fire and Safety Inspectors **MUST** be notified so the proper system preparations can be made.

11.4 FIRE PROTECTION ISSUES (Continued)

11.4.1 Welding

Welding and cutting operations are referred to as "hot work". Prior to conducting "hot work", an Open Flame and Welding Permit shall be issued by FEMP site personnel. The purpose of the FERMCO Open Flame and Welding Permit is to establish guidelines by which the use of any flame or spark producing equipment, including gasoline and electric powered equipment, may be safely used in field project work. All welding and cutting shall be performed in accordance with Chapter 3 "Control of Open Flames and Welding" of the Fire Protection Requirements in *ESH-1-1000,* SPR 4-19 (Control of Open Flames and Welding).

11.5 NUCLEAR SAFETY ISSUES

Nuclear safety concerns are expected to be present in some of the RSO current and planned activities. As part of the safety analysis process, nuclear safety items are reviewed. If nuclear safety controls are required, they will be documented in a Criticality Safety Assessment (CSA). A CSA is completed by the Nuclear Criticality section of the Safety Analysis and Risk Assessment (SARA) group. Also the PSHSP will define the location and limitation if nuclear controls are required.

11.6 NATURAL OCCURRENCE ISSUES [WEATHER]

Outside work shall be stopped if lightning, heavy or persistent rain, or other adverse weather conditions are in the area. This includes any weather conditions whose impact is judged to be detrimental by RSO Health and Safety Officer, field supervision, or project management.

Personnel who are in remote locations shall maintain radio contact with FERMCO CONTROL to monitor for adverse weather conditions. The personnel shall follow any instructions given on the radio net.

Refer to section 12.4.6 for addition information

12.0 EMERGENCY / CONTINGENCY PLANS

Personnel shall follow the emergency procedure for the facility in which the work is being performed. (SOP 2-C-916 "Refinery Emergencies")

All personnel shall be familiar with the locations of telephones (6511) and fire alarm pull boxes within the work area to summon emergency assistance and the use of two-way radios (303-F&S/202-AEDO). The AEDO shall instruct Radiological Control and Industrial Hygiene Technicians to perform immediate area surveys to assess potential environmental release, and to restrict access to the affected area.

12.1 REPORTING

12.1.1 Emergency Numbers

NAME	FEMP TELEPHONE NUMBER	Radio*
Ambulance	738-6511	CONTROL
Hospital	738-6511	CONTROL
Fire	738-6511	CONTROL
Security	738-6511	CONTROL
Emergency Response	738-6511	CONTROL
RSO Health & Safety Officer	738-6405	
Industrial Hygiene	738-6207	357
Radiological Control	738-6289/6889	355
Fire and Safety Inspectors	738-6235	303
Assistant Emergency-	738-6295/6431	
	202/CONTROL	
Duty Manager (AEDO)		
Accountability Center	738-6202	

* Call numbers listed are for FERMCO frequency 2.

12.1.2 Site Notification Procedures

All on-site (FEMP) emergencies shall be reported to the FERMCO "Communication Center" to ensure rapid response. Some means to report an emergency shall be available at all work locations whenever personnel are working. This may be accomplished by one of the following methods:

- Phone 738-6511
- Activate a local site fire alarm station
- Radio to "Control"

Any injury, no matter how minor, shall be reported immediately to FEMP Medical for evaluation or treatment. The injured employee shall be accompanied to medical by the supervisor in charge or designee. The AEDO and the FERMCO RSO Health & Safety Officer shall be notified as soon as possible after the injury/accident has occurred. An effective means of communication shall be available at all times.

Employees working on-site will be notified of emergency or abnormal conditions by the plant wide alarm system and radio announcements. This announcement follows the sounding of the site alarm horn signal, 3-3.

12.1 REPORTING (Continued)

12.1.3 What To Report

The following would be examples of emergencies that would justify calling and reporting an emergency:

- Serious Injury
- Injury Complicated by Contamination
- Chemical/Radiation Release
- Chemical Splash (Eye and Skin)
- Any Fire
- Major Property Damage

When an emergency or abnormal condition is observed, personnel shall contact the Communications Center at extension 6511 or via radio (CONTROL) for on-site emergencies. For any off-site emergencies, 911 is the proper phone number. **Stay on the phone line until the dispatcher hangs up.**

The following information **must** be given to the Communications Center operator:

- Name
- Badge number
- Location where emergency has occurred
- Nature of the emergency
- Number of personnel with injuries
- Unusual conditions (odors, symptoms, vapors, smoke)
- Current status of the emergency

12.1.3.1 Additional Reporting Requirements

- Property damage
- Unusual occurrence(s)

12.2 EVACUATION ROUTES / ACCOUNTABILITY

12.2.1 Rally Point Accountability

Should a situation require an emergency evacuation of the work area, all equipment should be turned off (if possible) and left in place. On-site personnel should immediately proceed to the nearest established rally point as identified on the map found in Appendix B.

12.2.2 In Place Accountability

When in place accountability is required, the employee shall contact his or her supervisor and report their current position. The supervisor in charge shall report the names of any unaccounted personnel to the Accountability Center within 10 minutes.

12.3 AVAILABLE EMERGENCY EQUIPMENT

12.3.1 Site Equipment (FEMP)

The FEMP Medical Facility is staffed and equipped to handle most types of medical emergencies that would occur during a task. The medical facility is staffed with Emergency Medical Technicians (EMT) and is equipped with an ambulance to transport the injured person to the nearest off-site hospital should extended or specialized treatment be necessary.

The FEMP Medical Facility is located at the east end of the first floor of the OS&H Building (Building 53). The location of the FEMP Medical Facility can be seen in Appendix C.

12.3.2 Plant Equipment

The FEMP facility has the following safety/emergency systems:

- Manual fire alarms
- Radiation Detection Alarm (RDA)
- Evacuation system
- Fire sprinkler system
- Plant alarm system

12.4 EMERGENCY RESPONSE

The FEMP Emergency Services will handle all on-site emergencies. Any request for emergency help should be requested by telephone (738-)6511 or on any FEMP radio frequency by calling "CONTROL".

12.4.1 Medical Emergencies

The FEMP medical department and emergency site ambulance shall serve as the first-aid person, as they can respond within 3-4 minutes to FEMP site emergencies. The subcontractor may also have a trained first-aid person at the worksite.

12.4.2 Fire Emergencies

All work sites shall maintain effective communication to summon fire fighting assistance. Access to the work area shall be maintained at all times to permit fire trucks and fire fighting crews to safely approach the fire emergency.

Only trained personnel shall attempt to operate any fire fighting equipment and only when the fire is clearly within the capability of the fire fighting equipment. Fire fighting efforts should only be executed if it is safe to do so and all the hazards of the materials involved are known.

The FEMP Emergency Response Team (ERT) will also respond to all on-site fire emergencies. For any fire emergency at FEMP, call (738-)**6511**.

12.4.3 Explosion Emergency

When an Explosion has occurred the following actions are to be taken:

- Activate nearest fire alarm if possible. Note: Notify other employees by alternate method if fire alarm is not available
- Evacuate building or work area
- Proceed to an appointed rally point
- If qualified, render first aid to any injured personnel
- Instruct all persons in transit to avoid the work area and surrounding area
- Contact CONTROL by radio or phone (**6511**)
- Call for medical assistance if necessary
- Report to supervisor for accountability

12.4.4 Chemical Emergency

12.4.4.1 Splashes

Flush the effected area with clean water for 15 minutes. Report to FERMCO Medical Services.

12.4.4.2 Personal Contamination

When contaminated with a corrosive or caustic material, flush the affected area with clean water for 15 minutes. Report to FERMCO Medical Services.

12.4 EMERGENCY RESPONSE (Continued)

When contaminated with other materials, contact Industrial Hygiene and remain at the work location until a representative of Industrial Hygiene arrives.

12.4.5 Radiological Emergencies

12.4.5.1 Releases

The release area shall be evacuated. The supervisor in charge, Assistant Emergency Duty Officer, Radiological Control Technicians, and RSO HSO shall be notified of the release.

12.4.5.2 Personal Contamination

Radiation Control shall be contacted and all affected personnel shall remain at the monitoring location until a representative of Radiation Control arrives.

12.4.6 Weather Limitations / Adverse Conditions

Any outside work will be suspended if warnings for high winds, lightning or tornados are sounded. Any operations utilizing cranes, drill rigs or personnel working on elevated steel type work will be suspended if wind velocity reaches 30 MPH.

12.4.7 Accident Investigations

Any injury or accident shall require the supervisor to complete an accident report. This report shall be completed within 24 hours of the event and forwarded to the FERMCO Worker's Compensation Coordinator at site mailstop 31. Should a serious accident/injury occur, the involved area should not be disturbed until approved by the RSO Health & Safety Officer.

13.0 CHANGES / AMENDMENTS TO HEALTH AND SAFETY PLAN

This Project Specific Health & Safety Plan is based on information available at the time of preparation. It is important that personnel protective measures be routinely reassessed by supervision, project management and the RSO Health & Safety Officer. In addition, unexpected conditions/events may arise which require reassessment of the health & safety issues. Upgrading or downgrading of precautions, personal protective equipment, etc. identified in this plan must be approved by the RSO Health and Safety Officer, or designee. Amendments to this plan are not required for such changes in activity; however, formal documentation of the change must be made.

Unplanned operations and/or changes in work scope shall require a review and may require an amendment to the Project Specific Health & Safety Plan. All amendments must be approved by the RSO Director, RSO Health and Safety Manager.

13.1 CONTROL OF HEALTH & SAFETY PLAN

For the purpose of ensuring that all personnel are informed of any changes in the scope of this Health & Safety Plan, CONTROLLED copies of this document shall be maintained. Only essential personnel shall maintain controlled copies of this document. The following is the list of personnel with the controlled copies of this PSHSP:

RSO Health and Safety Officer	Richard E. Maurer
Radiological Engineering	Kevin Tschaenn
Industrial Hygiene	Don Fleming
Medical Services	Dr. Doran Christensen
OS&H Compliance	Daryl Mills
Project Manager	Jim Tisaranni
Operations Manager	Tim Huey
Construction Manager	Richard L. Maurer
Facility Manager	Brenda Perkins

APPENDIX A
SAFETY PERFORMANCE REQUIREMENTS (SPRs) REFERENCED IN THE PROJECT SPECIFIC HEALTH AND SAFETY PLAN

COMPETENT PERSON DESIGNATION

1.0 GENERAL

This policy provides guidance to ensure that a designated Competent Person is assigned to either perform or supervise work that has been mandated by a specific regulatory agency standard involving hazardous conditions that could endanger the safety and health of themselves, other FERMCO employees, subcontractors, or visitors. A Competent Person has:

A. Capability of identifying existing or predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees.

B. Authorization to take prompt corrective measures to correct or eliminate existing or predicatable hazards or working conditions which are unsanitary, hazardous, or dangerous to employees.

C. Specific training in, and knowledge of, the requirements of the applicable standard pertaining to the work being performed.

The Competent Person shall be designated by management to perform these functions and has authority to stop work, allocate resources or materials, and correct any deficiencies in the progressing work. Designated, Qualified, and Competent Person designation documents are attached.

2.0 RESPONSIBILITIES

A. The Competent Person ensures compliance with regards to required operations, inspections, tests, repairs, machinery and equipment maintenance, and the Safety Performance Requirements, which include, but are not limited to the following:

- Hoisting and lifting equipment
- Electrical assured grounding
- Excavation
- Scaffolds
- Concrete and masonry
- Confined space and vessel entry
- Asbestos
- Welding

3.0 REQUIREMENTS

A. The Competent Person shall have an immediate knowledge of the subject, either by years of experience in the designated field, or specialized training in the:

- Job or activity being performed
- Current operations
- Technology and control
- Potential hazards
- Safety and health standards

000138

COMPETENT PERSON DESIGNATION

B. The Comprehensive Environmental Response, Compensation, and Liability Act/Resource Conservation and Recovery Act (CERCLA/RCRA) Unit or CRU manager, construction manager, RSO manager, or any other affected manager shall designate Competent Person(s), evaluate their performance, and ensure that a Competent Person is available for the required activity. The Competent Person designation document shall be kept in the employee's personnel file, and a copy shall be forwarded to the Occupational Safety and Health department.

C. OS&H shall provide a list of Competent Persons within departments, and update the list when appropriate.

4.0 ATTACHMENTS

Attachment A: Designated Person Document
Attachment B: Qualified Person Document
Attachment C: Competent Person Document

COMPETENT PERSON DESIGNATION

Attachment A
Page 1 of 1

DESIGNATED PERSON DOCUMENT

Project

Contractor/Subcontractor

Area/Shift

Date

Senior Supervisor

Safety Program Coordinator

Area/Shift Supervisor

Area/Shift Competent Person

SUBPARTS		DESIGNATED PERSON	SUBPARTS		DESIGNATED PERSON
1926 .20	Job Site Inspections		1926 .603	Pile Driving-Signalman	
1926 .50	Medical Services/ First Aid		1926 .650	Excavations-Inspections	
1926 .53	Ionizing Radiation Technician		1926 .651	Excavations-Inspections	
1926 .54	Laser Operators*		1926 .651	Excavations-Design*	
1926 .55	Industrial Hygienist/ Technician		1926 .700	Concrete-Inspection	
1926 .101	Hearing Protection-Fitting		1926 .752	Iron Work-Supervision	
1910 .134	Respiratory Protection		1926 .800	Tunnels-Ventilation	
1926 .155	Fire Protection		1926 .800	Tunnels-Inspection*	
1910 .184	Sling/Wire Rope Inspections		1926 .800	Tunnels-Equipment	
1926 .302	Powder-Actuated Tools-Trainer		1926 .803	Compressed Air-Senior Designee	
1926 .354	Welding-Industrial Hygienist		1926 .803	Compressed Air-Gauge Tender	
1926 .400	Assured Equip. Grounding Conductor Program		1926 .850	Demolition-Pre-Job Survey	
1926 .451	Scaffolding		1926 .859	Demolition-Site Surveys	
1926 .500	Roofing-MSS		1926 .900	Blaster-In-Charge	
1926 .550	Cranes-Annual Inspection		1926 .900	Blasters*	
1926 .552	Hoists-Inspections & Tests		1926 .900	Blasting-Program	
1926 .556	Aerial lifts-Operations		1926 .950	Power Transmission-Safety Designee	
1926 .601	Motor Vehicles-Daily Inspections		1926 .955	Live-Line Bare-Hand Supervisor*	

*Denotes requirement of Qualified Persons, all others shall be competent Persons.

000140

COMPETENT PERSON DESIGNATION

Attachment B
Page 1 of 1

QUALIFIED PERSON DOCUMENT

Project

Contractor/Subcontractor | Area/Shift | Date

Senior Supervisor | Safety Program Coordinator | Area/Shift Supervisor | Area/Shift Competent Person

QUALIFIED PERSON	QUALIFIED PERSON
1910 .66	1910 .331
1910 .103	1910 .332
1910 .109	1910 .333
1910 .120	1910 .334
1910 .254	1910 .335
1910 .265	1910 .399 DEF
1910 .303	1910 .1000
1910 .304	1910 .1044
1910 .305	1910 .1045
1910 .306	1910 .1047
1910 .308	

Page 1 of 2

COMPETENT PERSON DESIGNATION

Attachment C
Page 1 of 1

COMPETENT PERSON DOCUMENT

Project

Contractor/Subcontractor | Area/Shift | Date

Senior Supervisor | Safety Program Coordinator | Area/Shift Supervisor | Area/Shift Competent Person

DESIGNATED PERSON(S)	COMPETENT PERSON
1910 .179	1910 .66
1910 .180	1910 .109
1910 .181	1910 .134
1910 .402	1910 .183
1910 .410	1910 .268
1910 .422	1910 .28
1910 .423	1910 .68
1910 .427	
1910 .1048	

Page 2 of 2

FALL PREVENTION

1.0 GENERAL

A. This policy describes a three-step, systematic approach that must be used to protect people from falls when they are working at heights. The program explains how to eliminate fall hazards, prevent falls, and eliminate or reduce injury if a fall does occur. It also lists some of the most common fall hazards, and provides recommendations and guidelines for selecting fall-arrest systems.

B. Fall prevention can be achieved through eliminating fall hazards, minimizing fall exposure, and controlling falls. Eliminating fall hazards with engineering controls is the most desirable of these three. If fall hazards cannot be entirely eliminated, potential falls must be controlled by using fall-arrest systems.

C. Consult IS&H before purchasing any fall-arrest systems. All components of fall-arrest systems must meet the appropriate governmental regulations and consensus standards.

2.0 RESPONSIBILITIES

All personnel at FEMP or other FERMCO locations must avoid any situation or condition that may cause a fall type injury.

3.0 REQUIREMENTS

3.1 FERMCO's 3-Step Approach to Fall Prevention

A. **Eliminate Fall Hazards** - Assess carefully the workplace and the work itself in the earliest stages of project work, during the planning stages of all work and during the actual work performance phase for any fall hazard potential. The objective is to eliminate all fall hazards. Ask "Who, What, When, Where, Why, How, and How Much" questions about each possible exposure to a fall.

B. **Minimize Fall Exposure** - If fall hazards cannot be completely eliminated during the first step, try to prevent falls by improving the workplace.

C. **Use the Proper Fall-Arrest Equipment** - The use of fall protection equipment should be employeed ONLY after determining that potential falls cannot be eliminated by changing work procedures or the workplace. Carefully assess the workplace and work processes to select the most appropriate equipment, and how to install and use it correctly.

3.2 Preparing Written Fall-Protection Plans

In special cases a specific written fall protection plan may be required. The need for this type of written plan will be identified in contracts or can be called out by the appointed Health and Safety Officer assigned to the project. Format of the plan will be mutually agreed upon by the contractor operations personnel and the Health and Safety Officer.

FALL PREVENTION

3.3 Training Employees

Affected employees must be trained to recognize the hazards of falling from heights and to avoid falls to lower levels through holes or openings in walking/working surfaces and walls. Training shall include fall prevention, control, and fall-arrest systems. The supervisor shall make sure that appropriate fall-arrest systems are installed and that employees know how to use them before beginning any work that requires fall control.

3.4 Work Practices

Prior to performing any work that could invove any potential fall hazards, such as elevated work sites:

- All permits and inspection reports must be completed and in place.
- All equipment must be assembled and checked to the manufacturer's specifications and/or recommendations, and shall comply with applicable DOE and OSHA requirements.
- Sound safety practices must be reviewed and applied.
- All safety fall arresting equipment must be thoroughlyl checked and used as required.
- Each and every assigned work area shall be protected from potential fall hazards with the b available engineering prinicples.

4.0 ATTACHMENTS

Attachment A: Safety Harness Inspection Report (Form 70-8-1)

000144

FALL PREVENTION

ATTACHMENT A
Page 1 of 1

SAFETY HARNESS INSPECTION REPORT

QUALIFIED INSPECTOR							DATE			
PROJECT			AREA				CREW NUMBER			
INSTRUCTIONS: 1. All parts of safety belt/harness and attachments are to be checked for excessive wear and damage. 2. "P" is for "Passed Inspection" "F" is for "Failed Inspection" 3. To be inspected Quarterly and report turned in at Safety Department.										
EMPLOYEE'S NAME	BADGE NUMBER	MFG'S. SERIAL NUMBER	BELT/HARNESS WEBBING OR LEATHER	ALL STITCHING	RIVETS AND EYELETS	D-RING(S) BUCKLE(S) (INCLUDE TONGUE)	BODY PAD (IF APPLICABLE)	LANYARD	HOOK-SAFETY LATCH	CERTIFICATION OR DATA TAG

FORM S31-2 (3-92)

GROUND FAULT CIRCUIT INTERRUPTERS (GFCI)

1.0 GENERAL

This policy provides guidelines for using ground fault circuit interrupters (GFCI) in 120 volt, 15- and 20-amp, single-phase circuits.

2.0 RESPONSIBILITIES

2.1 Facility Owner

Tests hard-wired GFCIs once each quarter and documents.

2.2 Employees

Tests portable GFCIs each time the GFCI is plugged into a different outlet. Testing includes both a visual check for deteriorating seals and pushing the test button, and ensuring the power at the outlet is turned off.

3.0 REQUIREMENTS

3.1 Application

Note: Only "Class A" UL tested GFCIs may be used for personnel protection.

A. All electrical equipment used outdoors must be GFCI protected. A portable GFCI m[illegible] temporarily used if it is protected from moisture (including dew). Electrical outlets on (120-[illegible]) portable generators must be GFCI protected.

B. Laboratories must have GFCI protection on all 120-volt outlets in areas where there is any exposure to wet, damp, or conductive surfaces.

C. 120-volt outlets (accessible to personnel) must be GFCI protected with a hard-wired GFCI if they are (but not limited to) any of the following:

- Within 6 feet of a sink
- Outdoors
- Not part of the permanent building wiring and used for construction work
- Located in a restroom
- In a conductive location (e.g. room with concrete floors or exposed metal pipes

D. The test button must be accessible to the user. The same GFCI must not supply both receptacles outlets and lighting. Whenever an extension cord is used with a portable GFCI, the GFCI must protect the extension cord and should be located indoors or in a dry location.

E. GFCI protection is required for all 120-volt portable equipment used inside a vessel or in wet areas.

000146

GROUND FAULT CIRCUIT INTERRUPTERS (GFCI)

3.2 Types of GFCIs

A. **Receptacle-type GFCIs** protect only the receptacle and equipment plugged directly into the receptacle.

B. **Feed-through type GFCIs** protect equipment plugged into the receptacle and all other receptacles connected electrically *downstream*. Downstream receptacles should be identified as protected by a GFCI.

C. **Panel Circuit-Breaker type GFCIs** protect an entire circuit. They are installed in the circuit-breaker panel. Protected receptacles should be identified as protected by a GFCI.

D. **Cord-connected type GFCIs** contain several receptacles, each protected by a GFCI.

E. **In-line GFCIs** are molded into extension cords.

F. **Plug-In GFCIs** can be inserted into normal receptacles, and they protect all equipment plugged into the device.

Note: A GFCI will not protect persons in contact with a circuit other than the one being used.

4.0 ATTACHMENTS

None.

5.0 REFERENCES

UL-943, Ground-Fault Circuit Interrupters
NFPA-70, National Electric Code
29 CFR 1910 Subpart S, Electrical
29 CFR 1926 Subpart K, Electrical

EQUIPMENT PREOPERATIONAL AND PERIODIC INSPECTIONS

1.0 GENERAL

This policy provides guidance for inspecting and recording the condition of construction equipment when it arrives at the site, and subsequent periodic inspections.

2.0 RESPONSIBILITIES

FERMCO Personnel engage in the reception and inspection of new equipment and the periodic inspection of equipment to comply with the requirements of this policy.

3.0 REQUIREMENTS

3.1 Incoming Equipment

A. The inspection report is used to verify the condition of incoming construction equipment and to verify that it is free of mechanical defects and/or safety deficiencies. Equipment should be received in good condition, and not requiring service, repair, or safety devices. The lessor (vendor or owner) must be notified if equipment is received in less than good condition. If the condition of the equipment warrants such action, it will be rejected and returned to the lessor. The lessor will be notified before such action and, if possible, will be given the opportunity to make any necessary repairs at his/her own expense. The equipment or maintenance supervisor and Occupational Safety and Health personnel must be part of this decision-making process. A photocopy of the inspection report will be mailed to the lessor, noting any discrepancies.

B. The purchasing agent will notify both the equipment or maintenance supervisor and Occupational Safety and Health one day before the arrival of any equipment at the job site. These forms are as follows: Form A393-1, which is used to inspect both hydraulic and cable-oriented cranes; Form A393-2, which is used to inspect tractors, excavators and forklifts; Form A393-3, which is used to inspect trucks; and Form A393, which is used to inspect any type equipment not mentioned previously such as air compressors, welding machines, etc.

3.2 Safety Inspections, Incoming Equipment and Periodic Inspections

A. Concurrent with the inspection of incoming equipment, a safety inspection and an inspection of required safety devices will be conducted on each piece of equipment. The results will be recorded on Safety Device Requirements for Construction Equipment Chart , and the Definition of Safety Requirements for Construction Equipment. Any deficiencies observed in the piece of equipment being inspected must be noted on Form S70-2-9, Safety Inspection Checklist for Construction Equipment. The deficiency must be fully explained within the Remarks section of the form, and the repairs made or corrective action taken must be noted on Form S70-2-9.

B. After the inspection of incoming equipment, a monthly safety inspection will be conducted with the results noted on Form S70-2-9. Any deficiencies observed will be noted and explained within the Remarks section, and any repairs made or corrective action taken should be noted on Form S70-2-9.

EQUIPMENT PREOPERATIONAL AND PERIODIC INSPECTIONS

C. On an annual basis, cranes shall be taken out of service, inspected by a qualified person, and the results of the inspection recorded on the Annual Crane Inspection Report, Form 70-9-1. Copies of this annual inspection should be permanently maintained in the equipment maintenance file and in the cab of the crane. Any deficiencies observed shall be noted on Form 70-9-1 and explained within the Comments section. Repairs shall be made or corrective action taken before placing the crane back into service.

Note: It is important to note that repairs, such as welding on crane booms, must be in accordance with the manufacturer's requirements and may require the manufacturers' approval. Such repairs can and often do require an approved welding procedure from the manufacturer and repairs performed only by a certified welder.

3.3 Definition of Safety Device Requirements for Construction Equipment

The following is in accordance with the current OSHA, ANSI, Society of Automobile Engineers (SAE), and FERMCO Environmental Safety and Health Procedural Requirements.

A. Fire Extinguisher

An accessible fire extinguisher not less than 5 BC shall be available at all operator stations or cabs of equipment. See OSHA Section 1926.550 (a) (14) (i).

B. Horn

All equipment shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed. The horn shall be maintained in an operative condition. See OSHA Section 1926.602 (a) (9) (i).

C. Reverse Alarm

All trucks and bidirectional equipment shall be equipped with a reverse signal alarm audible above the surrounding noise level. The alarm shall operate when the equipment direction control is placed in the reverse position. See OSHA Section 1926.602 (a) (9) (ii).

D. Rollover Protective Structures

The design objective shall be to minimize the likelihood of a complete overturn and thereby minimize the possibility of the operator being crushed as a result of a rollover or upset. See OSHA Section 1926.1000.

E. Seat Belts

Seat belts that meet the requirements of the Society of Automobile Engineers, J386-1969, Seat Belts for Construction Equipment, shall be provided. See OSHA Section 1926.602 (a) (2) (i).

EQUIPMENT PREOPERATIONAL AND PERIODIC INSPECTIONS

F. Overhead Protection

All high-life Rider Industrial Trucks shall be equipped with overhead guards that meet the design and structural requirements as defined in paragraph 421 of "Safety Standards for Powered Industrial Trucks" ANSI B56.1-1969 and OSHA Section 1926.602 (c) (1) (v).

G. Boom Angle Indicator

All cranes shall be equipped with a boom angle indicator. ANSI B30.5-1968, Sections 5 -1.9.1 Friction Crane, Power Crane, and Shovel Association Mobile Hydraulic Crane Standards No. 2.

H. Capacity Chart

All cranes shall have a rated load capacity conspicuously posted. ANSI B30.5 - 1968, Section 5 - 1.1.3, Friction Crane, and Shovel Association Mobile Hydraulic Crane Standards No. 2. See OSHA Section 1926.550 (a) (2).

I. Dump Body Support

Trucks with dump bodies shall be equipped with positive means of support permanently attached, and dump bodies shall be capable of being locked in position to prevent accidental lowering of the body while maintenance or inspection work is being done. See OSHA Section 1926.601 (b) (10).

J. Cab Shields or Canopy

A cab shield or canopy shall be adequate to protect the operator from shifting or falling materials. See OSHA Section 1926.601 (b) (6).

K. Annual Crane/Hoisting Inspection

Thorough annual inspections of cranes and hoisting machinery shall be made by a competent and knowledgeable person familiar with the machine or by a government or private agency recognized by the U.S. Department of Labor. The original copy of the inspection shall be kept in the Equipment History File, with a current copy maintained in the crane or piece of equipment. See OSHA Section 1926.550 (a) (6).

L. Load Limits - Boom and Basket

Boom and basket load limit specified by the manufacturer shall not be exceeded. See 1926.556 (b) (2) (vi).

4.0 ATTACHMENTS

Attachment A: Safety Devices Required for Construction Equipment
Attachment B: Inspection Report - General Line Equipment, Form A393 (Rev. 4-85)
Attachment C: Inspection Report - Crane, Form A393-1 (Rev. 2-85)
Attachment D: Inspection Report - Tractors, Loaders, Excavators, Fork Lift, Form A393-2 (Rev. 7-81)
Attachment E: Inspection Report - Trucks, Form A393-3 (Rev. 9-81)
Attachment F: Monthly Safety Inspection Checklist for Construction, Form S70-2-9 (Rev
Equipment

EQUIPMENT PREOPERATIONAL AND PERIODIC INSPECTIONS

5.0 REFERENCE

29 CFR 1926.550
29 CFR 1926.556
29 CFR 1926.601 - .602
29 CFR 1926.1000

FERMCO

EQUIPMENT PREOPERATIONAL AND PERIODIC INSPECTIONS

ATTACHMENT A
Page 1 of 2

Safety Devices Required for Construction Equipment

Equipment Categories	5 BC Rating Fire Ext.	20 BC Rating Fire Ext.	Horn	Reverse Alarm	ROPS	Seat Belt	Overhead Protection	Boom Indicator	Capacity Chart	Other
Automobile			X			X				
Boom truck	X		X	X		X		X	X	Annual Inspections
Bus	X		X	X		X				
Compactor Self Propelled	X		X	X	X*	X*				
Concrete Pump Truck	X		X	X		X				
Concrete Transit Truck	X		X	X		X				
Crane Crawler	X		X							
Crane Rough Terrain	X		X	X				X	X	Annual Inspections
Crane Truck	X		X	X		Carrier		X	X	Annual Inspections
Crawler Loader	X		X	X	X	X		X	X	Annual Inspections
Crawler Crane	X		X							
Dozer	X		X	X	X	X				Annual Inspections
Excavator Crawler	X		X							
Excavator Truck MTD	X		X	X		Carrier				
Farm Tractor	X		X	X	X	X				
FEL - Backhoe	X		X	X	X	X				
Flat bed Truck Dump	X		X	X		X				Dump Body Support
Hustler Mower	X				X	X	X			Semi-Annual Inspections - PM

*Required only when part of original forklift equipment.

000152

EQUIPMENT PREOPERATIONAL AND PERIODIC INSPECTIONS

ATTACHMENT A
Page 2 of 2

Equipment Categories	5 BC Rating Fire Ext.	20 BC Rating Fire Ext.	Horn	Reverse Alarm	ROPS	Seat Belt	Overhead Protection	Boom Indicator	Capacity Chart	Other
Floor Sweeper			X							
Forklift	X		X	X	X*	X*	X		X	
Fuel Truck		X	X	X		X				
Fuel Wagon		X								
Lube Truck		X	X	X		X				
Manlift Hydraulic	X		X							Load limits
Motor Grader	X		X	X	X	X				
Motor Scraper	X		X	X	X	X				
Pick-up Truck	X		X			X				
Scissor Lift	X									
Skid Loader	X		X	X		X	X			
Tandem Dump	X		X	X		X				Dump Body Support - Cab Shield
Tower Hoist	X						X		X	
Trencher	X		X		X*	X*				
Truck Tractor	X		X			X				
Water Truck	X		X	X		X				
Wheel Loader	X		X	X	X	X				

*Required only when part of original forklift equipment.

000153

EQUIPMENT PREOPERATIONAL AND PERIODIC INSPECTIONS

ATTACHMENT B
Page 1 of 1

General Line Equipment. Form A393 (Rev. 4-85)

TYPE EQUIPMENT		EQUIPMENT NUMBER		ENGINE MAKE
MAKE				MODEL #
MODEL #		DATE CHECKED		LOCATION
SERIAL #		YR. MANUFACTURED		HOURS
	IN		OUT	COMMENTS (List percentage of wear on all wear items)
	GOOD	FAIR	REPAIR	
1. GENERAL APPEARANCE				
Hood & Panels				
Paint				
Undercarriage				
Tires - tyres, size				
2. ENGINE COMPARTMENT				
Oil Level & Condition				
Filters, Condition				
Fan/Radiator/Belts				
Gov., Idling Device				
Exhaust System				
Fuel/Water/Oil/Lines				
Coolant-level-Protect.				
Battery - Test Cond.				
3. OPERATOR'S POSITION				
Controls				
Gauges				
Starting/Charging System				
Engine Condition				
- Minor Repair				
- Major Repair				
- Decals & Labels				
4. AIR COMPRESSOR				
Oil Level and Condition				
Leaks				
Air Valves & Receiver				
Oil Separator				
Protection System				
Cooling System				
Operating Pressure				

ATTACHMENT C

000154

5904

EQUIPMENT PREOPERATIONAL AND PERIODIC INSPECTIONS

Page 1 of 1

Inspection Report - Crane

TYPE EQUIPMENT	EQUIPMENT NUMBER	SERIAL NUMBER
MAKE		MODEL NUMBER
HOURS	DATE CHECKED	LOCATION
ENGINE MAKE	ENGINE MODEL	CARRIER NUMBER

	MARK ONE IN/OUT			COMMENTS (List percentage of wear on all wear items)
	GOOD	FAIR	REPAIR	
1. USE TRUCK INSPECTION FOR				
2. GENERAL APPEARANCE				
Panels & hood, etc				
Paint				
Lights				
Under carriage				
3. BOOM				LIST ALL SECTIONS
Base & Wareage				
Cracks				
Wear Pads & Adjust				
Sheaves				
Block & Safety Latch				
Ball & Safety Latch				
Pendants & Pins				
Cable Size, Length				
Load				
Whip				
Boom Hoist				
JIB & PINS				
Jib Shoes				LIST ALL SECTIONS
Base & Wareage				
Cracks				
Sheaves				
Pendants & Pins				
Boom Stress				
4. OUTSIDE UPPER STRUCTURE				
A. Oil Levels & Condition				
1. Engine				
2. Torque Converter				
3. Gear & Chain Drive				

000155

EQUIPMENT PREOPERATIONAL AND PERIODIC INSPECTIONS

Hydraulic System			

ATTACHMENT D
Page 1 of 1

Inspection Report - Tractors, Loaders, Excavators, Fork Lift

TO BE SUPPLIED

EQUIPMENT PREOPERATIONAL AND PERIODIC INSPECTIONS

ATTACHMENT E
Page 1 of 1
Inspection Report - Trucks

TYPE EQUIPMENT	EQUIPMENT NUMBER	SERIAL #
MAKE		MODEL #
MODEL #	DATE CHECKED	LOCATION
SERIAL #	YR. MANUFACTURED	

ENGINE - MAKE: MODEL:	IN		OUT	COMMENTS
	GOOD	FAIR	REPAIR	
1. GENERAL APPEARANCE				
Outside Cab				
Mirrors				
Body Condition				
Tires, Front				
Tires, Rear Type				
Mud Flaps				
License Plates & Empty Weight				
Reflectors				
Lights:				
- Head				
- Tail & Brake				
- Turn Signals				
2. ENGINE COMPARTMENT				
Leaks				
Hoses & Lines				
Belts				
Battery Test Condition				
Fluid Levels				
Radiator & Cap				
Coolant Protection				
Wiring				
Filters & Breathers				
Fan & Shroud				
3. UNDERSIDE				
Mounting				
Body Mounting				
Steering				
Axles & Springs				
Drive Line				

EQUIPMENT PREOPERATIONAL AND PERIODIC INSPECTIONS

ATTACHMENT F
Page 1 of 1

Monthly Safety Inspection Checklist for Construction, Form S70-2-9 (Rev. 1-90) Equipment

MONTHLY SAFETY INSPECTION CHECKLIST FOR CONSTRUCTION EQUIPMENT

PROJECT NAME	PROJECT NO.	DATE

MANUFACTURER AND MODEL	SERIAL NO.	EQUIPMENT NO.

INSPECTED BY	APPROVED BY.

CRANES

	GOOD	REPAIR	NOT APPL.	COMMENTS
All Control Mechanisms				
Maladjusted				
Excessive Wear				
Hydraulic System				
Level of Oil				
Filters				
Hoses and Connections				
Electrical Apparatus				
Excessive Deterioration				
Malfunctioning				
Engine				
Fluid Levels				
Air System and Pressure				
Air Filter				
Belts				
Batteries				
Cab				
Glass				
Signal Horn				
Windshield Wiper				
Operational Aids Anti-Two-Block/ LMI Console				
Gauges and Warning Lights				
Lights				
Mirrors				
Bubble Level				
Load Chart				
Fire Extinguisher				
Brakes and Clutches				
Tires or Tracks				
Wire Rope				
Condition - Damage				
Connections (Sockets, Clips)				
Reeving				
Hooks, Block and Ball				
Cracks				
Excessive Wear				
Bent				
Sockets				
Latch				
Drums				
Locking Devices/Dogs				
Brakes				
Minimum 3 Wraps of Rope				
Boom and Jib				
Pendent Lines				
Sheaves				
Bent Lattices or Cords				
Automatic Stops				
Limiting Device				
Angle Indicator				

FORM S70-2-9 (Rev. 1-90) Page 1 of 2

000158

EQUIPMENT OPERATOR TRAINING

1.0 GENERAL

A. This policy provides guidance for the training of equipment operators and for review of the fundamental principles and operations governing the equipment.

B. These guidelines in this policy were developed to provide assistance for project personnel in developing and administering programs in safety for the training and retraining of equipment operators. In addition to outlining the information necessary for review and approval by Occupational Safety and Health (OS&H), they include suggestions for designing training plans. These guidelines are an attempt to outline a program that project personnel may use in preparing a training plan for approval by OS&H.

C. Each operator will successfully complete the FERMCO training or retraining program concerning the safe operation of his/her assigned machine prior to the assignment. This training program may consist of both classroom instruction and on-the-job experience until satisfactory knowledge has been acquired. Training or retraining programs are required of the following groups:

- New operators
- Newly employed experienced operators
- Operators assigned to equipment on which they had no previous experience
- Refresher training of operators
- Hazard training for equipment operators

2.0 RESPONSIBILITIES

FERMCO personnel engages in developing and administering safety programs for the training and retraining of equipment operators to comply with the requirements of this policy.

3.0 REQUIREMENTS

The following Training Procedure Steps are recommended for cross-training and upgrade training:

3.1 Equipment Operator Preparatory Training

A. Machine terminology

B. Safe operating procedures

C. Preoperational and post-operational maintenance checks

D. The following basic operating principles:

- Machine controls and functions
- Machine components and attachments
- Operation and function of components and attachments

000159

EQUIPMENT OPERATOR TRAINING

E. Review of the following:

- Manufacturer's operator manual
- Occupational Safety and Health Act Regulations
- American National Standards Institute (ANSI B30.5)
- DOE/site regulations

F. It is recommended that the trainee be given a measurable verbal interview or examination on each piece of equipment or category. The trainee will not progress to the next step until they reach a level of competence that satisfies the training instructor.

3.2 Practical Demonstration

A. The trainee shall be assigned to an experienced operator who will provide practical maneuvering demonstrations. At this point the trainee actually performs basic operations of the equipment under the close supervision of the experienced operator. The trainee will be given demonstrations and the opportunity to practice operating on each piece of equipment designated within the skill level category.

B. The immediate supervisor shall observe the trainee's performance during practice operation of equipment and shall conduct a field performance evaluation to document the trainee's ability to perform tasks safely and competently.

3.3 On-the-Job Performance Evaluation

A. After completing Steps 1 and 2, the trainee will be issued a Trainee License. This will allow the individual to operate designated equipment and perform productive work still under close supervision of the experienced operator. Productive work assignments will be developed to minimize safety hazards to personnel and to reduce the risk of damage to property and equipment.

B. Productive work assignments for on-the-job training and opportunity to practice operating on each piece of equipment will be the performance of simple tasks with the machine in a minimum exposure location to people and property and with no critical operations performed. Practical maneuvering to gain experience on a crane, for example, will include such operations as follows:

C. Swinging, booming up and down and traveling in an open area such as a lay-down yard.

D. Making small lifts in a minimum hazard area. These operations would not include lifts in or around:

- Plant process areas
- Process piping or energized electrical lines
- When traveling with a load
- Dual crane lifts
- Personnel lifts or lifts in heavily traveled areas

000160

EQUIPMENT OPERATOR TRAINING

E. The trainee will perform productive work with designated equipment as assigned by his/her immediate supervisor. The immediate supervisor shall conduct a Field Performance Evaluation by observing the trainee's performance of productive work and documenting the trainee's ability to perform required tasks safely and competently. Upon satisfactory completion of the Field Performance Evaluation on each piece of equipment, the trainee will be eligible for licensing per FERMCO procedures.

3.4 Training Guidelines

A. Instructional methods that correspond to the objectives of the course should be chosen. Where the objectives state that students should demonstrate recall of information, appropriate methods should include lecture, discussion, film, videotape or slide/tape presentation, and the use of self-teaching materials. Where the objectives state that the student will discriminate between objects or conditions or operate equipment, methods that include student practice should be chosen. For example, training for students assigned to such positions as mobile equipment operator must include either supervised practice during non-production or supervised operation during production.

B. On-the-job training, defined as training during which the student actually performs job tasks on the project, is an acceptable method of instruction under the following conditions:

- Instructors shall follow a written outline in which each task is broken down into its component operations. The students are required to demonstrate safe performance of each job duty before proceeding to the next.

- All safety and health standards are observed. For example, the instructor may not ride beside a student operator on a piece of mobile equipment that has no second seat.

C. Methods that promote maximum effectiveness in achieving the stated objectives shall be used. A sufficient supply of materials, tools, and equipment shall be provided, and each student must have adequate practice time in their use. Students should not be required to share materials designed for individual use such as programmed instruction workbooks, nor should more than one student at a time work at a simulator position.

D. Lecture, film, and videotape or slide/tape presentations should require student response such as oral reply to questions presented by an instructor, completion of written tests (used as training aids), or directed note taking. If a student will be expected to perform procedures demonstrated to him/her, repeated demonstrations shall be available. Where such demonstrations are presented on film, tape or tape and slides, students should be able to review such presentations as many times as necessary.

E. Subject descriptions shall refer to those given in this section for each course title, and the training should be appropriate to the specific project. For example, the training will include hazards that are common causes of accidents on the site.

F. In developing courses, the following should be included:

- Hazards that have resulted in accidents at the site
- Subjects that are less familiar to the operators
- Changes in law, technology, or safety procedures that have occurred during the year

EQUIPMENT OPERATOR TRAINING

G. To develop a complete and efficient program for new task training, it is necessary to know:

- All jobs that are being performed.
- What tasks each of the jobs entails.
- The skills, knowledge, and abilities necessary to perform the tasks.
- Any hazards that may be associated with the tasks.
- Training may be required to perform the tasks in a safe and efficient manner.

H. Many of the tasks can be listed from recall or from looking at job descriptions. Developing a complete list of tasks should include talking with individuals now working on the job or watching them actually do the job. Talking to the supervisors, consulting established operating procedures, and reviewing or developing Job Safety Analysis (JSA) will help complete the list of tasks.

I. The next step will be to prepare an outline of the training procedures to be followed. A course outline should include the following:

- Subject title
- Title of the person conducting the training
- Materials needed to teach the course
- What the instructor will do
- What the student will do
- The procedures used to evaluate student performance

J. For assistance in development of approved training programs and lesson plans, the Trai Department should be contacted.

4.0 ATTACHMENTS

None.

5.0 REFERENCES

SPR 2-3, Safety Task Assignment
SPR 2-4, Job Safety Analysis
29 CFR 1926.21

000162

MOTORIZED EQUIPMENT

1.0 GENERAL

This policy provides guidance for the protection of personnel engaged in motorized equipment operations or who work in the area of such operations.

2.0 RESPONSIBILITIES

Motorized equipment operator, or personnel (including subcontractors) who work in the area of such operations, complies with the requirements of this policy.

3.0 REQUIREMENTS

3.1 Definition

Motorized equipment is defined as self-propelled equipment not designed and licensed for transportation on the public roads or highways; such equipment includes, but is not limited to, material handling equipment (such as, fork lifts, loaders, or backhoes).

3.2 Operator Licensing and Training

A. The operator's knowledge of operating and safety procedures and requirements of this equipment may be verified by written examination, by a manipulative test, and by observation of his/her performance during the first month of operation. A qualified person, such as a superintendent, will conduct the manipulative test to determine the applicant's operating ability. A manipulative test will be conducted on each type of model of equipment to be operated. Training will be provided to each operator in compliance with SPR 2-38, Equipment Operator Training.

B. The Equipment Operator License Record must be completed and retained on file for the duration of the project. Also, the operator who is issued an Equipment Operator's License must retain this card on his/her person at all times while on the project site. This license is to be reviewed and updated monthly and is valid for the applicable project only.

C. Candidates for a motorized equipment permit must meet the following minimum requirements:

- The candidate must be mentally alert and physically capable of driving motorized equipment safely.
- The candidate must display a responsible attitude.
- The candidate must be familiar with the motorized equipment to be operated or be able to adapt quickly with proper training.

3.3 Inspection

Preoperational inspection of motorized equipment will be conducted in compliance with SPR 2-36, and the Inspection Report-Tractors, Loader, Scrapers, which is to be completed and retained in maintenance records. Monthly inspections will be conducted thereafter in compliance with SPR 2-36 and the Safety Inspection Checklist for Construction Equipment, Form 70-2-9, completed and retained in maintenance records.

MOTORIZED EQUIPMENT

3.4 Rollover Protective Structures (ROPS)

A. All of the following types of material-handling equipment manufactured after June 30, 1969, will be equipped with rollover protective structures:

- Rubber-tired, self-propelled scrapers
- Rubber-tired, front-end loaders
- Rubber-tired dozers
- Wheel-type agricultural and industrial tractors
- Crawler tractors
- Crawler-type loaders
- Motor graders with or without attachments used in construction work

B. The rollover protective structures will meet the federal minimum requirements for performance.

C. All equipment equipped with rollover protective structures will also be equipped with a seat belt to be worn by the operator while the machine is in operation. Forklift trucks with rollover protection will be equipped with seat belts which are to be worn by the employee while operating the forklift.

3.5 Audible Alarms

A. All machines with a reverse gear shall be equipped with an alarm that sounds when machine in reverse gear.

4.0 ATTACHMENTS

None.

5.0 REFERENCES

29 CFR 1910.178
29 CFR 1026.602
SPR 2-38, Equipment Operator Training
SPR 2-36, Equipment Preoperational and Periodic Inspections

000164

FORKLIFT OPERATIONS

1.0 GENERAL

This policy provides minimum requirements for the inspection, operation, and operator qualifications of forklifts. This policy does not include manual pallet jacks.

2.0 RESPONSIBILITIES

A **Qualified Inspector** inspects and documents inspections of all forklifts prior to their use on site and at least daily (29CFR 1910.178) thereafter.

3.0 REQUIREMENTS

3.1 Operator Qualifications

A. The operator must be qualified based on demonstrated competency and experience.

B. Only trained, qualified, and authorized operators may operate forklifts on the site.

3.2 Operation

Use the following guidelines when operating forklifts:

- Operate forklifts according to the manufacturer's instructions.
- Forklifts may carry only the operator.
- Do not modify or alter a forklift without prior written authorization from the manufacturer.
- Do not use forklifts to elevate or lift personnel.
- Whenever the operator is out of the seat, place the lift carriage in its lowest position, set the brake, turn off the engine, and if the forklift is on an incline, chock the wheels.
- Observe all applicable traffic regulations.
- Forklifts routinely operated on roadways with automobile traffic must be equipped with turn signals and brake lights.
- Forklifts operated on public roadways must meet the requirements of the local governing body.
- Loaded forklifts operated on grades exceeding five percent must be driven with the load up grade.
- During refueling, stop the engine, have a fire extinguisher available, and make sure the operator is off the forklift.
- Flammable and explosive classifications must be considered before using a forklift in any operating area.
- Slings or other similar devices shall not be used to support loads directly from the forks.

3.3 Forklift Attachments

Follow these guidelines when using attachments:

- If attachments are needed, use manufacturer-supplied attachments whenever possible.
- Use only attachments that are engineered, designed, and manufactured for the specific forklift on which they are installed.
- Use attachments only for their designed and intended purposes.
- Use manufacturer-supplied fork extensions whenever possible. Any exception must be approved by the OS&H Organization.

FORKLIFT OPERATIONS

3.4 Environmental Considerations

Hydraulic lines must be maintained to prevent leakage. If a leak or a failure of a hydraulic system occurs, the spill must be cleaned up according to site, local, state, governmental regulations and SSOP-0067, Section 7.

4.0 ATTACHMENTS

None.

5.0 REFERENCES

DOE Hoisting and Rigging Manual "Forklift Trucks" Number 5.0
ANSI/ASME B56.1, B56.6
ANSI/UL 558, 583
29 CFR 1910.178

000166

AERIAL LIFTS, VEHICLE-MOUNTED ELEVATING AND ROTATION WORK PLATFORMS, POWER PLATFORMS

1.0 GENERAL

This policy provides guidance for the protection of personnel engaged in operating and using aerial lifts, vehicle-mounted work platforms, or powered platforms.

2.0 RESPONSIBILITIES

An aerial lift, vehicle mounted work platform, or powered platform operator complies with the requirements of this policy.

3.0 REQUIREMENTS

3.1 Inspection

Inspection of the lift or platform will be made in accordance with and at intervals specified in SPR 2-36, Equipment Preoperational Inspection.

3.2 Operation

A. No employee will be permitted to use or operate lifts or platforms unless he/she has been instructed and trained by a competent person in the use and operation of such equipment. Equipment will be operated in the vicinity of electrical distribution or transmission lines only in accordance with SPR 2-48, Mobile Cranes.

B. Equipment will not be moved when the boom is elevated in a working position with employees in the basket or on an elevated platform. Manufacturer's specifications and limitations will be observed. Operators must use safety harnesses with lanyard secured to the platform. Operators must work while standing on the platform floor, never on the top rail, mid-rail or toe-board; they may not climb out of the platform to an elevated work location other than ground level. Rigging shall not be allowed from the platform or boom. Employees who tamper with controls and/or bypass safety devices, such as deadman switches, etc., are subject to disciplinary action.

3.3 Operator Licensing and Training

The operator's knowledge of operating and safety procedures and requirements for this equipment must be verified by a manipulative test and by observation of his/her performance during the first month of operation. A qualified person, designated at the site by management, will conduct the manipulative test to determine an applicant's operating ability. A manipulative test will be conducted on each type and model of equipment to be operated. Training will be provided to each operator in compliance with SPR 2-38, Equipment Operator Training.

3.4 Publications

For additional guidance on the inspection, testing, operation, and maintenance of lifts and platforms, including electrical testing and bursting safety factors, see ANSI A92.1969, American National Standards Institute Standard.

4.0 ATTACHMENTS

None.

000167

AERIAL LIFTS, VEHICLE-MOUNTED ELEVATING AND ROTATION WORK PLATFORMS, POWER PLATFORMS

5.0 REFERENCES

29 CFR 1926.552 through 1926.556
29 CFR 1910.66 through 1910.68
ANSI A 92 - 1969
SPR 2-36
SPR 2-48
SPR 2-38

000168

RIGGING PRACTICES/INSPECTIONS

1.0 GENERAL

This policy provides guidance for the protection of personnel engaged in rigging operations.

2.0 RESPONSIBILITIES

FERMCO and Subcontractor Personnel engaged in rigging operations, comply with the requirements of this policy.

3.0 REQUIREMENTS

3.1 Rigging Operations

A. When temporary rigging such as wire rope lashing, come-alongs, chain falls, etc., are used for support during all erection sequences of machines, piping, platforms, walkways, and steel members, the rigging shall not be removed until all leveling and alignment is complete and the item is secured in its permanent location. At that time rigging may be removed.

B. Rigging equipment will be inspected before each use and as necessary during its use to ensure that it is safe. Rigging equipment shall not be used if deformed, cracked, worn, kinked, crushed, cut, shows evidence of heat damage, or having broken or damaged parts. All rigging equipment including, but not limited to, slings (wire and nylon), chain-falls, come-alongs, spreaders, lifting beams, etc., shall be inspected on a quarterly basis by a qualified person. Records shall be maintained using the Rigging Equipment Inspection Report (Attachment A). The inspection shall be performed by a qualified and trained person and the rigging equipment color coded in accordance with the SPR 2-22, for Assured Equipment Grounding Conductor Program, suggested color cycle for each quarter. Defective rigging equipment will be removed from service immediately and be repaired or destroyed.

C. Rigging equipment, including shackles and hooks, will not be loaded in excess of its manufacturer's recommended safe working load or as specified by federal regulation (see the Code of Federal Regulations, Title 29, Part 1926, Section 1926.251, Tables H-1 through H-20). Special custom designed grabs, hooks, clamps, etc., shall be marked to indicate safe working loads and shall be proof-tested prior to use to 125 percent of their rated loads.

D. ANSI standard hand signals shall be used to direct operations. Rigging equipment shall only be used within its rated capacity or specified lift angle. Rigging equipment shall be labeled with the rated load, manufacturers name , serial number, and weight of equipment over 100 lbs. Rigging equipment shall be stored in designated areas and protected against weather, incompatible chemicals, high temperatures, sharp objects, and corners. Hands fingers, and other body parts shall be kept from between rigging equipment and the load.

E. Rigging equipment shall only be used by trained authorized personnel in accordance with established procedures, Pre-Lift Plans, or Safety and Health Plans. Loads shall be balanced before being lifted; avoid sudden acceleration, deceleration, or swinging. Loads shall not be permitted to come in contact with any obstruction or lifted over personnel. Rigging equipment shall not be used for side pulls or sliding a load unless authorized by a qualified engineer.

F. Job or shop hooks formed from bolts, rods, rebar, etc., will not be used.

RIGGING PRACTICES/INSPECTIONS

3.2 Drums and Sheaves

A. The size of drums and sheaves will vary according to the size and flexibility of the rope. The sheaves will be of the proper size so as not to pinch the rope. The grooves of drums and sheaves should be kept smooth and free of burrs or defects. Sheaves, drums, and rollers should be properly aligned; misalignment causes excessive wear to the rope and, over a period of time, may wear off an entire flange of sheaves. Overwinding and cross-winding should be avoided; either will abrade and distort the rope.

B. Check the groove diameter of all sheaves with a "groove gauge" only. Using wire rope in an oversized sheave causes the rope to become flattened or distorted; using undersized sheave causes the rope to become flattened or distorted; using undersized grooves will pinch and tear the rope.

C. Check the sheaves and blocks for worn bearings; allowing the sheaves to wobble on the pins will cause the rope to rub and wear the sides of the sheaves throat.

3.3 Wire Rope

A. Reels of wire rope shall not be dropped. To keep the wire rope clean and dry during storage, it should be coated with a protective coating that seals out air and moisture. Whether in storage or in use, all wire rope should be kept well lubricated. Wire rope should not be stored where it will be exposed to acid fumes or other corrosive agents.

B. To avoid kinks, the reel of wire rope must be mounted on jacks or a turntable so that it will revolve as rope is pulled off. (If a loop forms in a slack rope, a kink will develop if the rope is drawn tight, and the wire will be weakened at this point.) During installation, the rope should turn the same direction off the reel and onto the drum to avoid reverse bends. During breaking in, the new rope should be run without a load. The first load should be gradually increased to preset the wire.

C. Wire rope shall not be used if there are six (6) randomly distributed broken wires in one rope lay; three (3) broken wires in one strand in one (1) rope lay; or if the rope shows signs of excessive wear, kinks, corrosion, or other defect. Wire ropes that have splices should not have less than three (3) tucks. "U" bolt wire rope clips will be applied so that the "U" section is in contact with the "dead end" of the rope.

4.0 ATTACHMENTS

Attachment A: Rigging Equipment Inspection Report, Form 70-29

5.0 REFERENCES

29 CFR 1926.251
29 CFR 1910.184
ANSI B 30-0, 1, 5, 10, 11, 12, 16, 20
DOE Hoisting and Rigging Manual
SPR 2-22

000170

RIGGING PRACTICES/INSPECTIONS

ATTACHMENT A
Page 1 of 1

RIGGING EQUIPMENT INSPECTION REPORT

RIGGING EQUIPMENT INSPECTION REPORT

MONTH	COLOR CODE	AREA	CREW

INSTRUCTIONS

1. Entire length and attachments are to be checked for condition, wear and damage.
2. The √ indicates indicating inspection satisfactory. X indicates equipment is defective.
3. Forward report to Project Safety Department.

TYPE OF EQUIPMENT	DATE INSPECTED	EQUIPMENT SERIAL NUMBER	BROKEN WIRES	REDUCTION IN DIAMETER DUE TO WEAR	KINKING, CRUSHING, BIRD CAGING	HEAT, MECHANICAL OR CHEMICAL DAMAGE	END ATTACH CRACKED, DEFORMED OR WORN	HOOK SPREAD OR TWIST	BROKEN OR WORN SHEAVES	WEAR OR ELONGATION OF LINKS	BROKEN CLUTCH OR LOCKING DEVICE
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
11.											
12.											
13.											
14.											
15.											

REMARKS ON CORRECTIVE ACTION ON DEFECTS (Indicate line number referred to)

INSPECTED BY

CRANE OPERATOR QUALIFICATION

1.0 GENERAL

This policy provides guidance for ensuring, prior to assignment, that all crane operators are properly qualified for crane operations and to provide guidance for standardizing the certification methods.

2.0 RESPONSIBILITIES

Crane Operator

A. Understands all safety rules and regulations pertaining to operating the different types of cranes, including "cherry pickers" and boom trucks.

B. Understands hand signals associated with crane operations.

C. Understands, reading, and interpreting load charts.

D. Understands basic engineering principles of equipment such as levers, gears, shafts, chain drivers, etc.

E. Has a complete knowledge of basic machine operation, including equipment capabilities and lever and pedal functions.

F. Understands the operation of the crane and being able to "walk" (move) the crane.

G. Understands rigging techniques.

H. Is able to estimate load size and weights.

I. Understands the proper methods of maintenance, care, and inspection of cables and lines.

J. Understands the vocabulary used in crane operations.

K. Has a thorough knowledge of the machine's maintenance and lubrication requirements.

L. Understands methods of time and equipment reporting.

3.0 REQUIREMENTS

3.1 Operator Qualification Prerequisites:

A. A minimum of 6 months of experience in oiling or equivalent work experience on cranes.

B. Mechanical aptitude and ability, as well as the desire to operate construction equipment.

C. Successfully pass a substance abuse test.

CRANE OPERATOR QUALIFICATION

D. Good physical condition, having passed an annual physical examination performed by a medical doctor. The examination includes, but is not limited to, eye examination (depth perception and peripheral vision), blood pressure, and past health history which must be indicated on the Employee Physical Examination Form (Attachment A). An EKG, chest x-ray, and/or audiometric test will be performed only at the doctor's discretion.

E. Vision of at least 20/30 Snellen in one eye and 20/50 in the other, with or without corrective lenses.

F. Ability to distinguish colors, regardless of position, if color differentiation is required for operation.

G. Adequate hearing (with or without hearing aid) for the specific operation.

H. Sufficient strength, endurance, agility, coordination, and speed of reaction to meet the demands of equipment operation.

I. Evidence of medical problems, physical defects, or emotional instability which could render a hazard to the operator or others, or which, in the opinion of the examiner, could interfere with the operator's performance. In such case where there is evidence, specialized clinical or medical judgments and tests may be required.

J. Evidence that an operator is subject to seizures or loss of physical control. Specialized medical tests may be required to determine these conditions.

K. Operators and operator trainees should have normal depth perception, field of vision, reaction time, manual dexterity, coordination, and no tendencies toward dizziness or similar undesirable characteristics.

3.2 Prerequisites for the Following Health Conditions:

Note: If it is determined during the physical examination that the following health conditions exist, a detailed note derived from the physical shall accompany the completed examination form stating severity of condition and ability to perform duties.

A. Diabetes - Assuring the operator's diabetes is well controlled and the operator is having no hypoglycemic episodes. Also stating if the operator has a peripheral neuropathy involving the hands or feet where he/she did not have the proper feeling affecting the operator's ability to operate the crane properly.

B. Epilepsy - A note from a neurologist attesting to the fact that the operator's seizures are well controlled on medication and the operator has been seizure-free for the past 12 months.

C. Heart - A note from a cardiologist attesting to the fact that the operator's heart condition is stable and that the operator is not prone to dizzy spells or fainting.

D. Syncope (fainting spells) - The cause must be determined and treated and there must have been no recurrence within the past six (6) months.

CRANE OPERATOR QUALIFICATION

3.3 Annual physical examinations

The site nurse shall perform some of the annual physical examinations, such as blood pressure, eye examination (depth perception and peripheral vision if trained and qualified), etc. If any discrepancy or abnormality is found, the operator must be referred to the site physician. On completion of the physical examination, a physician's opinion letter will be forwarded back to Human Resources and department supervision (classifications showing limitations if any).

3.4 Operator Licensing

A. A successfully completed FERMCO crane operator's training or retraining program referenced in SPR 2-38, Equipment Operator Training, is required. A refresher course is required annually thereafter.

B. The crane operator applicant must comply with all operator licensing requirements as outlined in SPR 2-47, Crane Operator Licensing Program.

4.0 ATTACHMENTS

Attachment A: Employee Physical Examination, Form 70-1-2 (Rev. 4-87)
Attachment B: Instructions for Performing and Recording Physical Examinations

5.0 REFERENCES

DOE Hoisting and Rigging Manual, Operator Training and Qualifications, Number 2.0
29 CFR 1910.179
SPR 2-38, Equipment Operator Training
SPR 2-47, Crane Operator Licensing Program

000174

5904

CRANE OPERATOR QUALIFICATION

ATTACHMENT A
Page 1 of 1

Employee Physical Examination, Form 70-1-2 (Rev. 4-87)

Form 70-1-2 (Rev. 4-87) DATE OF EXAMINATION _____

TO BE FILLED IN BY EXAMINING PHYSICIAN (Please Print)

NAME		SOCIAL SECURITY NUMBER
DATE OF BIRTH	HEIGHT (Feet and Inches)	WEIGHT (Pounds)

HEALTH HISTORY

YES	NO		YES	NO	
☐	☐	DIABETES	☐	☐	LUNG DISORDERS (ASTHMA, TUBERCULOSIS, SHORTNESS OF BREATH)
☐	☐	MUSCULAR DISEASE	☐	☐	CARDIOVASCULAR DISEASE (RHEUMATIC FEVER, SCARLET FEVER, DIPHTHERIA)
☐	☐	MENTAL DISORDER	☐	☐	NERVOUS SYSTEM DISORDERS (DIZZINESS, EPILEPSY, SYPHILIS)
☐	☐	ARTHRITIS	☐	☐	CURRENTLY UNDER A PHYSICIAN'S CARE
☐	☐	KIDNEY DISEASE	☐	☐	SUFFERING FROM ANY OTHER DISEASES
☐	☐	LIVER DISORDER	☐	☐	PERMANENT IMPAIRMENT FROM ILLNESS, DISEASE OR INJURY
☐	☐	SERIOUS INJURIES			

GENERAL

GENERAL APPEARANCE AND DEVELOPMENT: ☐ GOOD ☐ FAIR ☐ POOR

HEARING: RIGHT EAR LEFT EAR DISEASE OR INJURY

THORAX: HEART

BLOOD PRESSURE SYSTOLIC DIASTOLIC

PULSE: BEFORE EXERCISE IMMEDIATELY AFTER EXERCISE

ABDOMEN: SCARS ABNORMAL MASSES TENDERNESS

REFLEXES: ACCOMMODATION RIGHT LEFT

KNEE JERKS: RIGHT: NORMAL INCREASED ABSENT LEFT: NORMAL INCREASED ABSENT

REMARKS

EXTREMITIES UPPER LOWER SPINE

DUSTY TRADES

LUNGS FVC FEV_1

RADIOLOGICAL DATA: CHEST X-RAY (14 x 17)

CRANE OPERATORS

EYES: FOR DISTANCE, RIGHT 20/ LEFT 20/ ☐ Without Corrective Lenses ☐ With Corrective Lenses, If Worn

EVIDENCE OF DISEASE OR INJURY RIGHT LEFT | COLOR TEST (JAEGERS J1) | HORIZONTAL FIELD OF VISION RIGHT LEFT

RHOMBERG PUPILLARY LIGHT R L

LABORATORY AND OTHER SPECIAL FINDINGS

HEARING LOSS	FREQUENCY	500Hz	1 000 Hz	2,000 Hz	3 000 Hz	4 000 Hz	6 000 Hz
	R dB / L dB						

ELECTROCARDIOGRAPH

URINE SPEC GR ALB SUGAR

OTHER LABORATORY DATA (SEROLOGY, ETC.)

GENERAL COMMENTS

NAME OF EXAMINING DOCTOR (Print) SIGNATURE

— CHECK HERE IF NOT QUALIFIED

ADDRESS OF EXAMINING DOCTOR

FERMCO

CRANE OPERATOR QUALIFICATION

ATTACHMENT B
Page 1 of 1
Instructions for Performing and Recording Physical Examinations

Qualifications for Operators

1. Operators and operator trainees shall meet the following physical qualifications:

   - vision at least 20/30 Snellen in one eye and 20/50 in the other without corrective lenses;
   - ability to distinguish colors, regardless of position, if color differentiation is required for operation;
   - adequate hearing, with or without hearing aid, for for the specific operation;

2. Evidence of physical defects or emotional instability which could render a hazard to the operator or others, or which in the opinion of the examiner could interfere with the operator's performance, may be sufficient cause for disqualification. In such cases, specialized clinical or medical judgements and tests may be required.

3. Evidence that an operator is subject to seizures or loss of physical control shall be sufficient reason for disqualification. Specialized medical tests may be required to determine these conditions.

4. Operators and operator trainees should have normal depth perception, field of vision, reaction time, manual dexterity, coordination, and no tendencies to dizziness or similar undesirable characteristics.

NOTE:
If it is determined during the physical examination that the following health conditions exist, a detailed note from the physician shall accompany the completed examination form stating severity of condition.

- Diabetes: Assuring the operator's diabetes is well controlled ant the operator is having no hypoglycemic episodes. Also stating if the operator has a peripheral neuropathy involving the hands or feet where he/she did not have the proper feeling affecting the operator's ability to operate the crane properly.

- Epilepsy: A note from a neurologist attesting to the fact that the operator's seizures are well controlled on medication and the operator has been seizure-free for the past twelve months.

- Heart: A note from a cardiologist attesting to the fact that the operator's heart condition is stable and that the operator is not prone to dizzy spells or fainting.

- Syncope (fainting spells): The cause must be determined and no recurrence within the past six months.

Qualifications for Dusty Trades

1. Persons who may be exposed to significant amounts of asbestos or crystalline silica shall have normal healthy lungs.

2. Significant reduction in FVC or FEV , shall disqualify a person from work which includes such exposure.

3. X-ray evidence of fibrosis, significant opacities or emphysema shall disqualify a person from significant exposure to asbestos or silica.

4. Any other breathing Impairment which would be significant aggravated by exposure to asbestos or silica disqualify a person.

Other Examinations

1. Site management will provide the physician with a list of job materials and general information on the exertion required to do the job.

2. The physician shall examine the person [illegible]ve laboratory tests performed to assess the function of organs or systems which may be affected by workplace materials or physical agents and the physical exertion required in performing the job.

Examples:

- Liver function test would be performed on a person exposed to more than 90dBA 8hr. TWA

- Lung function test, FEV, and FVC, would be performed on persons exposed to strong irritants such as hydrogen chloride, ozone, sulfur oxides, nitrogen oxides, acid mist and chlorine.

000176

CRANE OPERATOR LICENSING PROGRAM

1.0 GENERAL

Persons who operate cranes on this site must qualify for a FERMCO crane operator's license. These licensing requirements apply to persons who operate any crane (boom truck, industrial, hydraulic, friction, tower, or overhead bridge); hoist operator (with a lift capacity greater than ten (10) tons); or any operator of a lifting device that lifts a person in a manbasket. (See note for subcontracted operators.)

2.0 RESPONSIBILITIES

2.1 Operator in Training

Receives a license by completing the following:

- Successfully passing an operator's skill test (for each piece of equipment to be operated);
- Successfully passing a 30-day performance evaluation;
- Successfully passing a physical examination; and
- Successfully passing the substance abuse test with a negative result.

2.2 Licensed Operator

A. Administers all crane operator's skill tests (except his/her own) to operate a crane.

B. Coordinates the 30-day performance evaluation with the licenser's immediate supervisor.

C. Licenses a crane operator based upon the results of the skill test, performance evaluation, medical examination, and negative result of a substance abuse test.

2.3 IS&H Section

Requests the physician to administer the substance abuse program for crane operators.

2.4 Physician

Arranges for substance abuse testing to be conducted on all potential licensees prior to their skills test by the licenser, and immediately after a crane accident.

3.0 REQUIREMENTS

A. FERMCO licenses are renewed on a yearly basis.

CRANE OPERATOR LICENSING PROGRAM

B. The project manager will select a Crane Operator Licenser who meets the following minimum requirements:

- 5 years of proven experience in operating hydraulic and friction cranes
- 6 months of continuous service with FERMCO
- Ability to read and write
- Has maintained, on a continuous basis, a good safety record and performance
- Recommendation from area superintendent
- Must be supervisor level or above

3.1 Crane Accidents

A. Tests performed as the result of a crane accident will also be handled as site procedures and policies dictate.

B. In the event of a crane accident, the operator involved (licensed or not) will be sent immediately to the physician who will administer the test as he/she would for hiring or recertification and the results would be handled in the same manner. It is the policy that this apply to leased crane operators and subcontractor operators also.

3.2 Licensing

A. The applicable equipment operator's skill test will be given to measure the employee's general operational skills under varying site conditions for a specific model of crane. The skill test will cover the responsibilities for inspection and preventive maintenance and the operational characteristics and limitations of that type of crane.

B. The following equipment operator skills test forms shall be used to measure the Operator's skills:

- Drum Hoist
- Crane-Hydraulic
- Crane-Friction
- Cranes-Tower
- Crane-Bridge/Overhead

C. At his/her discretion, the licenser may discontinue the test if the operator shows an obvious lack of operating skill; is in unsatisfactory physical condition; or shows undue nervousness. If the test is discontinued, licenser will note justification of this on the test form.

D. A checklist of tasks will be used to evaluate the skill of the operator. The licenser will be required to maintain copies of all passed and failed skill tests.

E. After taking the test, the operator will enter a 30-day performance evaluation period. Performance Evaluation-Equipment Operator, (Attachment A), will be used to record the performance evaluation period rating. Upon successful completion of both the skills test and the observation period, an Equipment Operator's License, (Attachment B), will be issued to the employee by the licenser. The license will list the model of crane the employee is authorized to operate on the site and any restrictions placed on such operation.

CRANE OPERATOR LICENSING PROGRAM

F. Potential licensees who fail the skill test will not be eligible for retesting until they have received further training. Potential licensees failing the skill test will not be hired as crane operators. They may be placed in other positions or they may be terminated.

G. Potential licensees who fail the substance abuse policy with a positive test result will be terminated and not eligible for rehire for 6 months.

3.3 Recordkeeping

A. An Equipment Operator License Record, (Attachment C), will be maintained by the site's licenser for each licensed operator. This record lists the cranes that an operator is licensed to operate.

B. The original copy of the form is to be retained in the operator's file by the licenser. Copies of this form and all forms involved are to be forwarded to the site Human Resource Department, and the OS&H Department.

C. The Equipment Operator License Record is to be reviewed for renewal annually, from the date of issue, for all cranes licensed for the operator. All skills tests (passed or failed) taken by operators (whether hired or not) must be forwarded to the OS&H Department for retention.

3.4 Renewal

A. For license renewal, licensed operators will be required to pass a skills test every 12 months for each model of crane operated. If the licensed operator has operated any type of crane for 12 months without a break in service with FERMCO as a crane operator, a performance evaluation period will not be required.

B. It is the joint responsibility of the licenser, the OS&H Organization, and the operator to initiate the renewal procedures within 10 days of the operator's license expiration date. To renew licenses, the licenser must complete both the Equipment Operator's License, and the Equipment Operator License Record.

3.5 Revoking the License

A. A license may be revoked by the licenser with the approval of the area superintendent at any time.

B. Licenses for all cranes will be revoked for a period of 6 months for such reasons as the following:

- Inability to successfully pass the physical exam for crane licenses
- Poor performance
- Safety violations involving hazardous equipment operations

C. Licenses for all cranes will be revoked for a period of not less than 6 months and the operator be subject to termination for such reasons as the following:

- An accident due to operator negligence
- Operating under the influence of drugs or alcohol
- Falsification of licensing records
- Positive results of a substance abuse test

CRANE OPERATOR LICENSING PROGRAM

D. These rules are not to be considered as limiting or restrictive in nature.

E. Upon completion of this period of revocation, an operator must satisfy original licensing requirements (the skills tests, the 30-day performance evaluation and substance abuse test) prior to being reinstated.

F. The reason for revocation of an operator's license must be noted on the Equipment Operator License Record. Written supporting justification of this action will be kept in the operator's personnel file. A copy of this form will be forwarded to the OS&H Department. The licenser is responsible for retrieving the Equipment Operator's License, if the equipment license has been revoked.

3.6 Suspending the License

A. A license may be suspended by the licenser with the approval of the director of the department, at any time.

B. All licenses will automatically be suspended when the operator's physical examination becomes delinquent (one year from date of examination) or if the operator fails to pass the physical examination. Upon successfully passing the physical examination, the valid licenses will be reinstated.

C. All licenses will automatically be suspended and an operator denied permission to operate any crane after an accident has occurred. After a thorough and complete investigation of the accident the licenses will be revoked or reinstated based on the accident facts. The operator will be given a substance abuse test within 24 hours.

D. The reason for suspension of an operator's license must be noted on the Equipment Operator License Record. Written supporting justification for this action will be kept in the operator's personnel file. A copy of this form will be forwarded to the OS&H Department. The licenser is responsible for retrieving the Equipment Operator's License, if all equipment licenses has been suspended.

3.7 Subcontracted Operators

The area manager will assure that all subcontracted operators will have to prove (with satisfactory documentation) their crane operation abilities and experience and pass a substance abuse test with a negative result prior to working on that project. This criteria must be met annually (for long-term contracts) or every 6 months if the crane utilization is short term and at irregular intervals. (An indemnification from the subcontractor and a release of lien from the employee is required.)

4.0 ATTACHMENTS

Attachment A: Performance Evaluation-Equipment Operator
Attachment B: Equipment Operator's License
Attachment C: Equipment Operator License Record
Attachment D: Crane Operator License Record

000180

CRANE OPERATOR LICENSING PROGRAM

5.0 REFERENCES

None.

CRANE OPERATOR LICENSING PROGRAM

ATTACHMENT A
Page 1 of 1

Performance Evaluation-Equipment Operator

CONFIDENTIAL

NAME (LAST, FIRST, MIDDLE)		SOCIAL SECURITY NUMBER		CRAFT AND POSITION
PROJECT NUMBER	PROJECT NAME	BADGE NUMBER	FOR OFFICE USE ONLY OVERALL RATING	

GUIDELINES
Designate the level of achievement for each factor by circling the appropriate number. Do not let your appraisal of one factor influence your appraisal of another. Be objective; do not allow your personal feelings to govern your appraisal of the employee. Each factor to be appraised has five levels of achievement by which it may be measured - 1 being the lowest rating and 5 being the highest rating. The rating N/O means that you did not observe the employee performing the function, therefore cannot rate it.

PERFORMANCE FACTORS

	CIRCLE APPROPRIATE PERFORMANCE RATING					
		LOW				HIGH
GENERAL:						
1. Demonstrates safety awareness.		1	2	3	4	5
SPECIFY CRAFT:						
2. Quality of work.		1	2	3	4	5
3. Quantity of work.		1	2	3	4	5
4. Read and use operator's manual.	N/O	1	2	3	4	5
5. Identify safety equipment on specific piece of equipment.	N/O	1	2	3	4	5
6. Read and use all capacity charts for machines.	N/O	1	2	3	4	5
7. Identify components and controls machine.	N/O	1	2	3	4	5
8. Learn and observe rigging operations.	N/O	1	2	3	4	5
9. Assist with adjustment of brakes and clutches.	N/O	1	2	3	4	5
10. Perform daily service and maintenance of machines.	N/O	1	2	3	4	5
11. Perform machine set-up for operation.	N/O	1	2	3	4	5
12. Perform basic operation of machine.	N/O	1	2	3	4	5
13. perform operation of machine.	N/O	1	2	3	4	5
14. Assist with scheduled service and maintenance.	N/O	1	2	3	4	5
15. perform general cleanup of machine.	N/O	1	2	3	4	5
16. Overall evaluation.		1	2	3	4	5

comments:

PREPARED BY (Immediate Supervisor)	SIGNATURE	DATE
REVIEWED BY	SIGNATURE	DATE

CRANE OPERATOR LICENSING PROGRAM

ATTACHMENT B
Page 1 of 1

Equipment Operator License

This card must be carried at all times when operating equiopment Card Number_____ Date Issued_____			
Operator's Name (Print)			
Permanent Address (Street, State, Zip Code)			
Social Security Number		Phone ( )	
Issuing Project Name	Issuing Proj. No.	Issuing Project Location	
sex	Birth Date	Hair Color	Eye Color
Height	Weight	Date of Last Physical Exam	
Issuing Official's Signature		Operator's Signature	
The holder of this card is qualified to operate the equipment listed (subject to restrictions)			

RESTRICTION: MUST WEAR GLASSES ☐ YES ☐ NO			
TYPE EQUIPMENT	CAPACITY/ ATT.	NAME/TITLE LICENSING OFFICIAL	EXPIR. DATE

CRANE OPERATOR LICENSING PROGRAM

ATTACHMENT C
Page 1 of 1

EQUIPMENT OPERATOR LICENSE RECORD

SOCIAL SECURITY NUMBER			NAME (Last, First, Middle Initial)		
PROJECT NAME			PROJECT NUMBER	PROJECT LOCATION	
PERMANENT ADDRESS - Street, City, State, Zip Code					Phone Number ( )
SEX	BIRTH DATE	HAIR COLOR	EYE COLOR	HEIGHT	WEIGHT
DATE OF LAST PHYSICAL EXAM COPE -				WEAR R GLASSES? ☐ YES ☐ NO	

EQUIPMENT LICENSE RECORD

EQUIPMENT CODE	TYPE EQUIPMENT	CAPACITY ATTR.	NAME/TITLE LICENSING OFFICIAL	EXPIRATION DATE

COMMENTS:

CRANE OPERATOR LICENSING PROGRAM

ATTACHMENT D
Page 1 of 1

Crane Operator License Record

						DATE
SOCIAL SECURITY NUMBER			NAME (Last, First, Initial)			
PROJECT NAME			PROJECT NUMBER		PROJECT LOCATION	
PERMANENT ADDRESS - Street, City, State, Zip Code						PHONE ( )
SEX	BIRTHDATE	HAIR COLOR	EYE COLOR	HEIGHT	WEIGHT	WEAR R GLASSES? ☐ YES ☐ NO

EQUIPMENT LICENSE RECORD

EQUIPMENT CODE	TYPE EQUIPMENT	CAPACITY/ ATTN.	NAME/TITLE LICENSING OFFICIAL	EXPIRATION DATE

COMMENTS

MOBILE CRANES

1.0 GENERAL

This policy provides guidance for the protection of personnel operating mobile cranes or working in the area of operation.

2.0 RESPONSIBILITIES

2.1 Operator

A. Performs a daily inspection.

B. Documents the inspection findings prior to use on each shift.

3.0 REQUIREMENTS

A. Each mobile crane will be inspected by a competent person for mechanical defects upon its arrival, before its use on the project, and monthly thereafter. The Safety Inspection Checklist for Construction Equipment, Form S70-2-9, will be completed and retained in the maintenance records.

B. It is recommended that the equipment be load-tested only in accordance with the manufacturer's specifications and limitations and American National Standard Institute (ANSI) B30.5-1982, Mobile and Locomotive Cranes.

C. No modifications or alterations that affect the capacity or safe operation of the equipment will be made by the project or any individual without the manufacturer's written approval.

3.1 Operator Training and Licensing

A. All mobile crane operators must be instructed in or given the opportunity to read and understand the manufacturer's operations manual for assigned make and model machine, applicable OSHA and ANSI standards, Safety Performance Requirements (SPR), and any additional applicable information concerning the operation of the assigned machine per SPR 2-38, Equipment Operator Training.

B. A mobile crane operator must be licensed to operate the specific make and model crane assigned per SPR 2-47, Crane Operator Licensing Program.

3.2 Operations

A. Accessible areas within the swing radius of the rotating superstructure counterweight of a crane will be barricaded to prevent employees from being struck or crushed by the counterweight.

B. The hand signals to be used are those prescribed by the ANSI standard applicable to each crane. Only 1 individual will assume the flagging duties and no other person shall flag during the lift, or electronic headset signaling, with the exception of a person giving an emergency stop signal.

C. A copy of the manufacturer's operator's manual for each make and model machine must be in the cab of the crane and the manufacturer's specifications and limitations noted in it will be observ

MOBILE CRANES

D. In the operations and use of any hydraulic crane when both an auxiliary and main hoist line are reeved, an anti-two blocking warning system is required on both auxiliary and main hoist lines.

E. Attachments used with cranes will not exceed the capacity rating or scope recommended by the crane manufacturer.

F. No person will ride the headache ball, the hook, or the load being handled by the crane. All operations involving the use of suspended personnel baskets or platforms shall comply with OSHA regulations, SPR 2-50, and ANSI A10.28-1983. The crane shall be equipped with an anti-two blocking device.

G. Equipment will not be lubricated while in use unless it is designed for safe lubrication application during use.

H. Only 1 load will be hoisted at a time. Two or more separately rigged loads (i.e., skip pan and steel beam, etc.), will never be hoisted in one lift even if the combined loads are within the rated capacity.

I. No one shall ride on the machine other than the operator.

3.3 Electrical Hazards

A. A crane will not be operated under any circumstances wherein any part of the crane or load will come within 10 feet of energized electrical distribution lines rated 50 KV or below unless:

- The lines have been de-energized and are grounded at the point of work.
- Insulating barriers that are not part of the equipment have been erected.

B. For lines rated over 50 KV, the minimum clearance between lines and any part of the machine or load will be 10 feet plus 0.4 inches for each kilovolt over 50 KV or twice the length of the line insulator.

C. All lines will be considered energized unless the person or utility owning the lines indicate in writing that they are not energized and that the lines are grounded at the point of operation.

3.4 Traveling with a Load (Pick and Carry)

A. Traveling with a load (pick and carry) is not recommended as a means of transporting loads from one location to another on the project and should be used only with authorized approval as a last resort. The use of farm wagons, forklifts, boom trucks, and flatbed trucks should be used to transport these loads rather than "pick and carry" operations.

B. Traveling with suspended loads entails many variables; i.e., the type of terrain, boom length, momentum in starting and stopping, etc. Therefore, it is impossible to formulate a single standard procedure with any assurance of safety. Thus when traveling with a load, the operator must evaluate the prevailing conditions and determine the applicable safety precautions.

MOBILE CRANES

C. The following precautions would fall into a general category:

- Do not exceed rated "on rubber" capacity chart.
- Position the boom parallel to the direction of travel.
- Engage the swing (house) lock.
- Maintain as short a boom length and as low a boom angle as possible.
- Secure load off to carrier.
- Provide tag or restraint lines to snub load swing.
- Load should be carried close to ground.
- Do not start and travel until outriggers are fully stowed (retracted).
- Terrain must be smooth, firm, and level.
- Maintain travel speed suitable to terrain.
- Avoid sudden starting and stopping.
- Always use flagmen, both front and rear, to give directions and watch for hazards.
- Flagman should watch for power lines and other overhead obstructions.
- No person shall ride on the machine.

3.5 Wire Rope

Wire rope with one or more of the following defects will be removed or replaced immediately.

A. If one wire rope of a set (pendent lines, multi-leg slings, etc.) requires replacement, the entire set of ropes will be replaced.

B. In standing ropes, more than 2 broken wires in one lay in areas beyond end connections or more than 1 broken wire at an end connection.

C. In running ropes, 6 randomly distributed broken wires in one lay or 3 broken wires in one strand in one lay.

D. Wear of one-third of the original diameter of the outside individual wires caused by abrasion, scrubbing, flattening, or peeling.

E. Kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure.

F. Evidence of heat damage from any cause.

G. Reduction from nominal diameter of more than:

- 1/64 inch for diameters up to an including 5/16 inch
- 1/32 inch for diameters from 3/8 inch up to and including 1/2 inch
- 3/64 inch for diameters 9/16 inch to and including 3/4 inch
- 1/16 inch for diameters from 7/8 inch up to an including 1-1/8 inches
- 3/32 inch for diameters from 1-1/4 inches up to an including 1-1/2 inches

MOBILE CRANES

3.6 Notices and Postings

Rated load capacities, recommended operating speeds, special hazard warnings, operating notes, and special instructions will be posted on all equipment and will be visible to the operator while he\she is at the control station. Illustrations of the hand signals used in connection with the operation of equipment will be posted at the project site.

4.0 ATTACHMENTS

Attachment A: Monthly Safety Inspection Checklist for Construction Equipment, Form S-70-2-9

5.0 REFERENCES

ANSI B30.5 - 1982
ANSI A10.28 - 1983
ANSI B30.2 - 1983
ANSI B30.6 - 1984
Power Cranes and Shovel Association Standards #1 & #2
DOE Hoisting and Rigging Manual, Mobile Cranes, #4
DOE Hoisting and Rigging Manual, Overhead & Gantry Cranes, #3
29 CFR 1926.550
SPR 2-15, Barricades
SPR 2-38, Equipment Operator Training
SPR 2-44, Aerial Lifts, Vehicle Mounted Elevating and Rotation work Platforms, Power Platforms
SPR 2-50, Suspended Workbasket

ATTACHMENT A
Page 1 of 1

MONTHLY SAFETY INSPECTION CHECKLIST FOR CONSTRUCTION EQUIPMENT

MONTHLY SAFETY INSPECTION CHECKLIST FOR CONSTRUCTION EQUIPMENT

PROJECT NAME	PROJECT NO.	DATE
MANUFACTURER AND MODEL	SERIAL NO.	EQUIPMENT NO.
INSPECTED BY	APPROVED BY	

CRANES				
	GOOD	REPAIR	NOT APPL.	COMMENTS
All Control Mechanisms				
Maladjusted				
Excessive Wear				
Hydraulic System				
Level of Oil				
Filters				
Hoses and Connections				
Electrical Apparatus				
Excessive Deterioration				
Malfunctioning				
Engine				
Fluid Levels				
Air System and Pressure				
Air Filter				
Belts				
Batteries				
Cab				
Glass				
Signal Horn				
Windshield Wiper				
Operational Aids Anti-Two-Block/ Lift Console				
Gauges and Warning Lights				
Lights				
Mirrors				
Bubble Level				
Load Chart				
Fire Extinguisher				
Brakes and Clutches				
Tires or Tracks				
Wire Rope				
Condition - Damage				
Connections (Sockets, Clips)				
Reeving				
Hooks, Block and Ball				
Cracks				
Excessive Wear				
Bent				
Sockets				
Latch				
Drums				
Locking Devices/Dogs				
Brakes				
Minimum 3 Wraps of Rope				
Boom and Jib				
Pendant Lines				
Sheaves				
Bent Lattices or Cords				
Automatic Stops				
Limiting Device				
Angle Indicator				

FORM 879-2-9 (Rev 1-90) Page 1 of 2

CRANE LIFT PROCEDURE

1.0 GENERAL

This policy provides guidance for control of lifts with cranes that are considered to be critical lifts. Lifts that fall into this category are those lifts that:

- Exceed 75% of the crane's rated capacity for the crane configuration
- Require two or more cranes to make the lift
- Are located such that the load, crane boom, or rigging could fall on electrical lines, transformers, pipe racks or pipe bridges, vessels, or operating units containing flammable, explosive, or hazardous gases or liquids, etc.
- Are specially engineered and designed to handle a specific load that requires the use of lifting equipment; such as, but not limited to, ringers, towers, poles, cableways, etc.

2.0 RESPONSIBILITIES

2.1 The Supervisor

Completes the Crane Lift Permit prior to the critical lift.

2.2 Designated Project Personnel

A. Reviews and signs-off on the lift permit in the order listed on the permit after the permit has been completed by the supervisor.

B. Places a copy of the permit in the cab of the lift-crane with the original permit filed in the site OS&H office.

3.0 REQUIREMENTS

When calculating the total load to be lifted, including all applicable "component weights," if it is determined the lift equals or exceeds 95% of the crane configuration capacity for the greatest radius the load will achieve during pick, swing, or set, this lift shall not be made. If by changing the crane configuration within the manufacturer's specifications a greater gross capacity may be gained, the configuration shall be changed to keep the lift less that the 95% capacity. If not, a larger capacity crane shall be obtained and used.

3.1 Interpretation

Crane configuration as used in this policy refers to such variables of the crane as boom length, boom angle, counterweight, outriggers extended and set/tracks extended or retracted and attachments (jib, headache ball, load block, lifting devices, etc.). All above items affect the gross capacity of the crane and shall be taken into consideration prior to lift.

3.2 Other Hazards

For any electrical, chemical or other hazard(s) involved or associated with the operations, the box marked "Other Hazards" on the Crane Lift Permit shall be checked, explained, and approved.

4.0 ATTACHMENTS

Attachment A: Crane Lift Permit, Form 3-1-16

000191

CRANE LIFT PROCEDURE

5.0 REFERENCES

29 CFR 1926.550
29 CFR 1910.179

CRANE LIFT PROCEDURE

ATTACHMENT A
Page 1 of 1

Crane Lift Permit

1. PROJECT NAME	2. PROJECT NUMBER	3. DATE OF LIFT	4. TIME OF LIFT	5. LOCATION OF LIFT
6. CRANE MANUFACTURER	7. MODEL NUMBER	8. SERIAL NUMBER	9. TOTAL BO LENGTH (F TIME OF LI	
10. MAXIMUM RADIUS DURING LIFT (PICK, SWING & SET)	11. SWING DIRECTION & DEGREE OF SWING	12. LIFT ELEVATION (FT) _____MAX. _____MIN.	13. BOOM ANGLE _____PICK _____	

14. WILL JIB BE USED? ☐ YES ☐ NO LENGTH (FT.) _____ ERECTED ( ) _____ WEIGHT (LBS) _____ STOWED ( ) _____

15. MANUFACTURER RATED CAPACITY FROM PER PARAMETER OUTLINED IN BLOCKS 9 THROUGH 14.

16. COMPONENT WEIGHTS

JIB/BOOM EXTENSION _____

JIB BALL & HOOK _____

UPPER POINT BALL & HOOK _____

LOAD BLOCK _____

SLINGS & MISC LIFTING EQUIP. _____

WIRE ROPE BENEATH TIP IF APPLICABLE _____

LIFTING BEAM OR BARS _____

TOTAL _____

17. LOAD DESCRIPTION & WEIGHT

18. WHO DETERMINED WEIGHT OF LOAD & LIFT?

NAME _____ HOW? _____

19. TOTAL LIFT (TOTAL BLOCKS 16 & 17)	20. LOAD PERCENT OF CRANE CAPACITY (DIVIDE BLOCK 19 BY BLOCK 15)	21. RIGGING SA FACTOR & T ☐ YES

22. CHOKER SIZE & CONDITION

23. TAG LINE REQUIRE ☐ YES ☐ NO	24. PARTS OF WIRE ROPE ON BLOCK	25. WEATHER CONDITIONS (WIND, RAIN, ETC.)

26. ELECTRICAL HAZARDS? ☐ YES ☐ NO IF YES EXPLAIN:	27. SOIL CONDITION
28. UNDERGROUND HAZARDS? ☐ YES ☐ NO IF YES EXPLAIN:	29. OTHER HAZARDS? ☐ YES ☐ NO IF YES E

30. WILL LIFT MEETING BE CONDUCTED ☐ YES ☐ NO	31. RIGGER'S NAME	32. FLAGMAN'S NAME

1. OPERATOR	4. CRAFT SUPERVISOR
2. EQUIPMENT SUPERVISOR	5. SAFETY REPRESENTATIVE
3. RIGGING SUPERVISOR	6. PROJECT/CONSTRUCTION MANAGER

SUSPENDED WORKBASKET/PLATFORM

1.0 GENERAL

This policy establishes the methods to be used when employees are required to work from a workbasket suspended from a crane.

2.0 RESPONSIBILITIES

FERMCO and Subcontractor Personnel comply with the requirements of this policy.

3.0 REQUIREMENTS

A. Alternate methods and safety requirements as outlined in Attachment A shall be investigated before using the work basket as a method. This method shall be used only when other means of access to the work are extremely hazardous or is not possible because of structural design or work site conditions. In no case is a work basket to be used as an elevator.

B. Work baskets shall be designed by a qualified engineer who is competent in structural design. The basket will be constructed for the specific purpose of hoisting personnel by means of a crane. The use of the work basket will require approval by the supervisor, equipment supervisor, project or construction manager, and the OS&H Manager.

3.1 Design Guidelines

A. Lifting bridles on the work basket shall be designed to minimize tripping of the basket due movement of employees occupying the basket. The basket shall be at least 4 feet square, head room should be provided which allows employees to stand upright in the platform, and be of weld construction with a safety factor of <u>five</u>.

B. A 42-inch high guardrail for perimeter protection of personnel within the work basket shall be maintained. It shall be either solid construction or expanded metal having openings of no greater than 1/2 inch, with a gate that swings inward only and equipped with a positive locking mechanism. The work basket weight, maximum number of employees, and the load capacity of the basket must be posted permanently on the basket door. The work basket shall be easily identifiable by color or marking. Personnel work baskets are not to be used to hoist materials or tools without employee(s).

C. A grabrail shall be provided inside the personnel basket. Overhead protection shall also be provided when employees are exposed to falling objects. All welding shall be performed by a welder qualified for the weld grades, types, and material specified in the design. All exposed rough edges shall be ground smooth.

3.2 Rigging Machines

A. Load block or ball hooks shall be a type that can be closed and locked, thereby eliminating the throat opening. As an alternate, a shackle with a screw pin, nut, and retaining pin may be used.

B. When a wire rope lifting bridle is used to connect the work basket to the load line, the bridle legs shall be connected to a single ring or shackle. Lifting bridles and associated hardware used for attaching the work basket to the hoist line shall not be used for any other service.

SUSPENDED WORKBASKET/PLATFORM

C. All eyes in wire rope slings shall be fabricated with thimbles. Wire rope, shackles, rings, and other rigging hardware shall have a minimum safety factor of five.

D. A safety wire rope sling shall be affixed from the uppermost part of the lifting bridle to a point above the ball or the dead-end load line of the load block or to the load block.

E. Tag lines shall be used where practical.

3.3 Crane Setup and Operation

A. The crane shall be uniformly level within one percent of the level grade and located on firm footing. Crane outriggers, if provided, shall be used according to manufacturer's specifications when hoisting employees. Crane travel is prohibited while the work basket is suspended. The crane operator shall remain at the controls at all times, with the engine running, when the work basket is suspended.

B. The total weight of the loaded work basket and related rigging shall not exceed 25 percent of the rated capacity for the radius and configuration of the crane. The minimum load hoist wire rope safety factor shall be seven. Except where rotation resistance ropes are used, the line should be capable of supporting without failure at least 10 times the maximum intended load. Lifting and lowering speeds shall not exceed 100 feet per minute. The load-line hoist drum shall have controlled (power) load lowering capability; free fall is prohibited.

C. Telescoping booms shall be marked or equipped with a device to clearly indicate to the operator, at all times, the boom's extended length.

D. A positive acting device shall be used which prevents contact between the load block or overhaul ball and the boom tip (anti-two-blocking device), or a system shall be used which deactivates the hoisting action before damage occurs in the event of a two-blocking situation (two- block damage prevention feature).

E. Load and boom hoist drum brakes, swing brakes, and locking devices such as dogs and pawls, as equipped, shall be engaged when the occupied work basket is in a stationary working position. If the work is not landed, it shall be secured to the structure before employees exit or enter the basket.

F. Cranes having live booms (booms in which lowering is controlled by a brake without aid from other devices which slow the lowering speeds) are prohibited.

3.4 Inspection and Testing

A. The crane to be used and the work basket shall be inspected by a competent person at the beginning of each shift and before hoisting employees in the work basket after the crane has been used for any material handling operating in which greater than 50 percent of the rated capacity was lifted.

B. A trial lift with the work basket unoccupied shall be made for each new work location and at the beginning of each shift to ensure that all systems, controls, and safety devices are functioning properly. A full-cycle operational test lift at 200 percent of the intended load of the work basket shall also be made at each new setup location before hoisting employees for the first time.

SUSPENDED WORKBASKET/PLATFORM

C. A visual inspection of the crane, work basket, and base support shall be conducted immediately after the test lift to determine whether the testing had any adverse effect upon any component or structure. A copy of the Monthly Safety Inspection Checklist for Construction Equipment, shall be completed for the crane and attached to the Suspended Personnel Work Basket Authorization, (Attachment B).

D. Any defects found during such inspections which may create a safety hazard shall be corrected before further use of the work basket.

E. Employees shall keep all parts of their bodies inside the work basket during raising, lowering, and positioning.

3.5 Safe Work Practices

A. Hoisting of employees shall be discontinued upon indication of any dangerous weather conditions or other impending danger.

B. The work basket shall be hoisted a few inches and inspected to assure that it is secure and properly balanced before employees are allowed to occupy the work basket.

C. Employees being hoisted shall be in continuous sight of and in communication with the crane operator or signal person. If at any time, the operator cannot see hand signals or hear radio-related signals, the employee shall stop all operations until the employee can receive signals.

D. Employees occupying the work basket shall wear a full body harness with a lanyard appropriately attached to a structural member within the work basket.

3.6 Prelift Meeting

A. A meeting attended by the operator, signal person(s) to be lifted, and the person responsible for the task to be performed shall be held to review this procedure and the work procedures to be followed.

B. This meeting shall be held before the beginning of personnel hoisting operations at each new work location and thereafter for any employees newly assigned to the operation.

4.0 ATTACHMENTS

Attachment A: Suspended Workbasket or Platform Checklist
Attachment B: Suspended Personnel Workbasket Authorization

5.0 REFERENCES

29 CFR 1926.550
29 CFR 1910.179
ANSI B30.5

000196

SUSPENDED WORKBASKET/PLATFORM

ATTACHMENT A
Page 1 of 3

Suspended Work Basket or Platform Checklist

A. Description and type of work to be performed (give details concerning duties, location, and surrounding obstructions).

B. LESS HAZARDOUS ALTERNATIVES

Note: Answers shall be based on hazardous exposure to employees performing the work (time and cost of operation shall not be a determining factor in the method used).

Note: State reason(s) after each of the following why method may not be used to perform work operation.

1. Ladder and/or stairways (steps, extension, "A"-Frame)

2. Scaffolds (buck, tubular, two-point suspended)

3. Aerial lifts (power platforms, vehicle mounted.elevating and rotating work platforms--scissor lifts, JLGs, high lift boom truck)

4. Personnel hoist (elevators, spider lift)

5. Other mechanical methods (clam-shell, magnet, drag, etc.)

Note: if one of the above is feasible, that method must be used to perform the work. If not, continue completing this checklist.

FERMCO

SUSPENDED WORKBASKET/PLATFORM

ATTACHMENT A
Page 2 of 3

- Suspended Work Basket or Platform Checklist

C. CRANE REQUIREMENTS

1. Boom angle indicator _____
2. Boom extension indicator _____
3. Anti-two block device or damage prevention features _____
4. Line speed governed (100 ft/min) _____
5. Wire rope, lifting bridle, and associated hardware: safety factor of 5 _____
6. Brakes, pawls, or dogs in good condition _____
7. Controlled (power) load lowering (no free fall) _____
8. Controlled (power) boom (not live) _____
9. Uniformly level (1 percent of level grade) _____
10. Firm footing/support (mats needed) _____
11. Outriggers extended and set _____
12. (a) Crane's gross capacity _____
    (b) net capacity (after all Deductions) _____
    (c) 25 percent of net capacity _____
13. Inspected (crane & support) per ANSI B30.5 & APS 7-3 _____

D. BASKET REQUIREMENTS

1. Designed by a qualified engineer _____
2. welded by a qualified welder _____
3. Suspension system to minimize tipping _____
4. Safety factor of 5 of basket design _____
5. Perimeter guarding _____

000198

SUSPENDED WORKBASKET/PLATFORM

ATTACHMENT A
Page 3 of 3

Suspended Work Basket or Platform Checklist

6. Inward swing gate _____
7. Grabrails entire perimeter _____
8. Overhead protection _____
9. Smooth interior surfaces _____
10. Capacity and weight indicators _____
11. Platforms identification markings _____
12. Radios needed for lift _____
13. Number of workers permitted for work - 4 maximum (250 lbs./person) _____
14. Total weight of basket, rigging, workers and materials _____

WARNING: If item D-14 is greater than C-12(c), DO NOT MAKE LIFT.

E. TESTING AND INSPECTIONS

1. Work basket _____
2. Per work shift _____
3. Trial run at all work locations _____
4. Test lift (200% of basket capacity) at each crane setup _____
5. Crane level after test lift _____
6. Crane lift after test lift _____

F. PRE-LIFT MEETING

1. Operator's responsibilities and duties reviewed _____
2. Signal person's responsibilities and duties reviewed _____
3. Person(s) to be lifted, responsibilities and duties reviewed _____
4. Supervision aware of responsibilities and duties reviewed _____

SUSPENDED WORKBASKET/PLATFORM

ATTACHMENT B
Page 1 of 1

Suspended Personnel Work Basket Authorization

I _____ as project manager do approve the use of a suspended work basket at _____ (location) on _____ (date). The use of the basket will be in accordance with OSHA regulations concerning Hoisting Personnel Basket/Platform from Cranes and Derricks.

APPROVAL SIGNATURES	
IMMEDIATE FOREMAN	PROJECT/CONSTRUCTION MANAGER
EQUIPMENT SUPERINTENDENT	SAFETY MANAGER

000200

MATERIAL AND PERSONNEL HOISTS

1.0 GENERAL

This policy provides guidance for protection of employees using personnel and material hoists.

2.0 RESPONSIBILITIES

Hoist Operator

A. Obtains a physician's certificate of fitness before starting the job and at least annually thereafter.

B. Forwards the physician's recommendation to the OS&H Department or Human Resources or both for filing.

3.0 REQUIREMENTS

3.1 Inspection

A. All hoists must be visually inspected by a qualified inspector before daily use, with written documentation being made at 30-day intervals using the Safety Inspection Checklist for Construction Equipment (see SPR 2-48, Mobile Cranes) and with tests provided in accordance with manufacturer's specifications and with applicable ANSI requirements. All inspections will be made by a qualified employee who will be notified and instructed by supervision in the nature and extent of such inspections. All reports will be kept in the project safety file, and all unsatisfactory conditions will be reported to supervision and corrected before use of material and personnel hoists.

B. All hoists will be inspected and tested at not more than 3-month intervals. Records of such inspections and tests will be in the project safety file.

3.2 Operation

A. Rated load capacities, recommended operating speeds, special hazard warnings, operating rules, signal systems, and operating instructions will be conspicuously posted at the operator's station for the hoist or on the car frame or crosshead. Overhead protection of 2-inch planking, 3/4-inch plywood, or the equivalent will be provided on the top of every hoist.

B. No hoist will be placed in service until it has been inspected and tested by a competent craftsman under competent supervision with a signed and dated written report of such inspection and test.

3.3 Operator Training

A. The operator's knowledge of operating and safety procedures and requirements for this equipment must be verified by a written examination, a manipulative test, and by observation of his/her performance during the first month of operation. A qualified person (such as a superintendent) will conduct the manipulative test to determine an applicant's operating ability. A manipulative test will be conducted on each type and model of equipment to be operated. Training will be provided to each operator in compliance with SPR 2-38, Equipment Operator Training.

MATERIAL AND PERSONNEL HOISTS

B. The Equipment Operator Certification Record must be completed and retained on file for then duration of the project.

3.4 Wire Rope

Wire rope with one or more of the following defects will be removed or replaced immediately. If one wire rope of a set requires replacement, the entire set of ropes will be replaced.

A. **Corrosion** - Any development of slight corrosion should be noted and watched closely. Severe corrosion is cause for replacement.

B. **Broken wires** - One or more valley breaks, six randomly distributed broken wires in one rope lay, or three broken wires in one strand in one rope lay is cause for replacement.

C. **End attachments** - Development of broken wires in the vicinity of attachment is cause for replacement. If this condition is localized in an operating rope and the section in question can be eliminated by making a new attachment, this may be done rather than replacing the entire rope.

D. **Abrasion** - Abrasion, scrubbing, flattening, or peeling causing the loss of more than one-third of the original diameter of the outside wires is cause for replacement.

E. **Kinking** - Sever kinking, crushing, birdcaging, or other damage resulting in the distortion of the rope structure is cause for replacement.

F. **Heat** - Evidence of heat damage resulting from contact with a torch or any damage caused by contact with electrical wires is cause for replacement.

G. **Reduction of rope diameter** - Reduction from the normal rope diameter of more than the following is cause for replacement:

- 3/64 inch for diameters up to and including 3/4 inch
- 1/16 inch for diameters from 7/8 to 1-1/8 inches
- 3/32 inch for diameters from 1-1/4 to 1-1/2 inches

3.5 Material Hoists

A. No person will ride on material hoists at any time except for the purpose of inspecting or maintaining the hoist. A sign stating "No Riders Allowed" will be posted on the car frames or crosshead.

B. All entrances to material hoistways will be protected by gates or bars, which will:

- Guard the full width of the landing entrance
- Be painted with diagonal contrasting colors
- Be equipped with a latching device

000202

MATERIAL AND PERSONNEL HOISTS

C. Bar protectors will be at least:

- 2 x 4-inch lumber or an equivalent
- 42 inches above the floor
- 2 feet from the hoistway line

D. Inspection, testing, construction, operation, and maintenance of material hoists will be in accordance with the requirements of American National Standards Institute standards, ANSI 10.5-1969.

3.6 Personnel Hoists

A. Personnel hoistway doors will be at least 6 feet and 6 inches high. Solid doors, where used, will be provided with a vision panel opening, having a width not exceeding 6 inches and an area not exceeding 80 square inches that is covered with expanded metal.

B. Landing doors will be provided that may be locked mechanically so that they cannot be opened from the landing side.

C. Locks will be of a type that may be released only by a person in the car.

D. For hoists located outside of structures, the enclosures on the building side of the hoistway will be full height or a minimum of 10 feet at each floor landing.

E. Inspection, testing, construction, operation, and maintenance of personnel hoists will meet the requirement of American National Standard Institute standards, ANSI A10.4-1973.

4.0 ATTACHMENTS

None.

5.0 REFERENCES

29 CFR 1910.552
29 CFR 1926.66-.68
DOE Hoisting and Rigging Manual, #3 & #4
ANSI A10.4 - 1973
ANSI A10.5 - 1969
SPR 2-2, Competent Person Designation
SPR 2-38, Equipment Operator Training
SPR 2-46, Crane Operator Qualifications
SPR 2-47, Crane Operator Licensing Program
SPR 2-48, Mobile Cranes

000203

OPEN FLAME, WELDING, AND HAZARDOUS WORK PERMITS

1.0 GENERAL

This policy outlines the basic requirements for obtaining written authorization and instructions before any work begins that requires the following:

- Welding
- Open flames
- Excavations
- Elevated work
- Crane work not covered by a FERMCO Safety Performance Requirements (SPR)
- Electrical work not covered by a FERMCO SPR

2.0 RESPONSIBILITIES

2.1 Fire Protection and Emergency Response Team Manager

Ensures that personnel are available to inspect open flames, welding, and hazardous work operations and to issue permits for such work.

2.2 CERCLA/RCRA Unit Manager

Ensures all open flames, welding and hazardous work operations are conducted in accordance with stated requirements.

2.3 Field Supervisors

A. Ensures that open flame, welding and hazardous work operations have been inspected and that current permits are posted in or near the area of operation.

B. Ensures that special instructions or conditions specified on the permit are followed.

3.0 REQUIREMENTS

3.1 General Requirements

A. The site uses permits to safeguard working personnel. A permit is required because it formalizes job safety planning both by the supervisor and by safety and/or hygiene personnel. It also serves to advise working personnel of health and safety requirements for the job. Finally, it informs safety and hygiene inspectors about the start of a job so they can determine whether job requirements have changed from those anticipated.

B. In addition to a FERMCO Work Permit, a FERMCO Open Flame and Welding, Hazardous Work Permit is required whenever the work involves: (a) open flames or welding [except in areas designated for this purpose], or (b) other hazardous work, including, excavations, aerial work, electrical work, or work involving cranes. Note that for most minor electrical repair work, the SPR 2-24, Energy Control (Lockout/Tagout), is the "lock & tag" procedure to be applied.

C. Required Permits shall be posted at the job site.

D. Open Flame/Welding Permits shall not be valid longer than 24 hours, except in a Welding Shop

OPEN FLAME, WELDING, AND HAZARDOUS WORK PERMITS

E. Open Flame/Welding Permits for welding in a Designated Welding Shop shall not be valid longer than one month.

F. Hazardous Work Permits expiration date shall be determined by Industrial Safety. It may be as long as the estimated completion date of the project.

G. The period of validity for each permit is shown in the Permit Expiration Date block.

H. Supervisors shall maintain contact with their personnel, who are working alone, through the use of a portable radio or frequent visits to the job site. (Caution should be used when operating 2-way radios as their use is restricted in some plant areas).

I. Scaffolding requires tags which show the fall protection required.

J. Barriers (if required) must conform to SPR 2-15.

K. The FERMCO Work Permit must be completed prior to issuance of the FERMCO Open Flame and Welding, Hazardous Work Permit.

3.2 FERMCO Open Flame and Welding, Hazardous Work Permit Initiation and Renewal

A. SUPERVISOR-IN-CHARGE

Contacts a Fires Services (FS) Inspector. For an Open Flame/Welding Permit, also contacts an IH Technician to perform the initial inspection.

B. FS INSPECTOR

- Checks the completeness of the FERMCO Work Permit which is posted at the job site.
- Checks other permits which must be posted, and verifies that their expiration date has not passed.
- Completes any required tests.
- Completes the applicable portions of Sections A, B, and C of the permit, and signs in the appropriate block(s).

C. IH TECHNICIAN [only for the Open Flame/Welding Permit]

- Completes any required tests and adds any additional precautions in (13) "SPECIAL INSTRUCTIONS" of Section B.
- Signs Section B.

D. SUPERVISOR-IN-CHARGE

- Ensures that all employees on the job have read and understand the required precautions and required PPE.
- Ensures that all employees on the job have signed the permit in block D.

OPEN FLAME, WELDING, AND HAZARDOUS WORK PERMITS

- Notes permit expiration date(s).
- Signs the permit.
- Posts the original at the job site, and distributes the copies as indicated on the form.

  Note: If the required precautions or PPE have changed, all employees on the job are considered to be new employees.

- Ensures that all new employees on the job have signed the permit in block D.
- Signs the permit.
- Posts the original and distributes the copies as indicated on the form.

  Note: Both an unexpired permit and the signature of each employee on the job must be posted at the job site. The supervisor may prefer to have all employees sign the permit each time it is issued.

4.0 ATTACHMENTS

Attachment A: FERMCO Flame and Welding, Hazardous Work Permit

5.0 REFERENCES

29 CFR 1910.252
Fire Protection 3.5
SPR 2-15, Barricades
SPR 2-24, Energy Control (Lockout/Tagout)
SPR 4-19, Cutting, Welding, Open Flame Work

OPEN FLAME, WELDING, AND HAZARDOUS WORK PERMITS

ATTACHMENT A
(Page 1 OF 1)

FERMCO OPEN FLAME AND WELDING, HAZARDOUS WORK PERMIT

FEMP WORK PERMIT NO.:

SECTION A - BACKGROUND INFORMATION This permit is only valid when it is attached to a FERMCO Work Permit.

	Today's Date	Time	Est. Completion Date
BUILDING	LEVEL	COORDINATOR	PLANT 258 NO.

SECTION B - OPEN FLAME/WELDING PERMIT

PRECAUTIONS	YES	NO	DNA
1. Combustibles, magnesium, and uranium removed, covered or shielded.	☐	☐	☐
2. Flammable liquids removed or isolated.	☐	☐	☐
3. Wall and floor openings covered or protected.	☐	☐	☐
4. Flame retardant tarp suspended underneath work.	☐	☐	☐
5. Combustible gas check.	☐	☐	☐
6. Combustibles removed from opposite sides. (work on walls or ceilings)	☐	☐	☐
7. Fire watch will remain posted during breaks and for 30 minutes after work is completed.	☐	☐	☐
8. Fire watch has an extinguisher and knows how to activate the nearest alarm.	☐	☐	☐
9. Fire & Safety Inspector shall be present during the burning operation	☐	☐	☐
10. Fire & Safety Inspector shall be present to monitor when the system is initially opened.	☐	☐	☐
11.	☐	☐	☐
12. COMBUSTIBLE GAS TEST RESULTS _____ % LEL			
13. EQUIPMENT/AREA CHECKED	☐	☐	☐
14. SPECIAL INSTRUCTIONS/PRECAUTIONS	☐	☐	☐
15. MSDS REVIEWED (IH)	☐	☐	☐
FEMP WORK PERMIT "C" Items ___, ___, ___, ___, ___, ___, checked	☐	☐	☐
Applicable PPE in use	☐	☐	☐

Signature - "Fire Watch has received training"	Badge
IH Signature	Badge
FS Signature	Badge
Permit Issue Date	Time
Permit Expiration Date	Time

SECTION C - HAZARDOUS WORK

	YES	NO	DNA
Excavations (excavations in holes)			
1. Shored or Sloped to 34 degrees	☐	☐	☐
2. Maximum vertical step 24 inches	☐	☐	☐
"Competent person" authorizes exceptions to "1" or "2" above			
3. Ladder(s) in place	☐	☐	☐
4. Other	☐	☐	☐
5. Atmospheric Tests Required	☐	☐	☐
Elevated Work (greater than 6 feet)			
1. Railings, toeboards	☐	☐	☐
2. Solid footing under scaffold	☐	☐	☐
3. Ladders tied off	☐	☐	☐
Electrical Work	☐	☐	☐
1. Nominal voltage _____			
2. Other	☐	☐	☐
3.	☐	☐	☐
Crane Work			
1. Pre Date O.K.	☐	☐	☐
2. Electric lines deenergized	☐	☐	☐
3.	☐	☐	☐
FEMP WORK PERMIT "C" Items ___, ___, ___, ___, ___, ___, checked	☐	☐	☐
Applicable PPE in use	☐	☐	☐

FS Signature	Badge
Permit Issue Date	Time
Permit Expiration Date	Time

SECTION D - SIGNATURES (employees assigned to work)

I HAVE READ AND UNDERSTAND ALL REQUIREMENTS OF THIS PERMIT.

Employee Signature	Badge	Date
1.		
2.		
3.		
4.		
5.		
6.		

WORK AUTHORIZATION REVIEWED AND FOUND ACCEPTABLE FOR USE

Supervisor-in-charge	Date	Time

NO.	DISTRIBUTION COPIES
1	POST AT JOB
2	SUPERVISOR-IN-CHARGE
3	IND. HYGIENE/IND. SAFETY
4	EMPLOYEE REP.

IN CASE OF EMERGENCY, CALL "CONTROL" BY RADIO, PHONE 6511, OR USE NEAREST FIRE ALARM BOX.

EXCAVATIONS AND TRENCHES

1.0 GENERAL

This policy provides guidance for the protection of personnel working in and around excavations and trenches.

2.0 RESPONSIBILITIES

FERMCO and Subcontractor Personnel comply with the requirements of this policy when working in and around excavations and trenches.

3.0 REQUIREMENTS

3.1 Excavations and Trenches

A. Prior to starting an excavation or trench, a "FERMCO Work Permit" (see SPR 2-13) must be obtained. This permit will detail other permits which are required. These will include a "Construction Excavation/Penetration Permit" (a formal check for underground utilities) and a "Hazardous Work Permit" (see SPR 2-13). Barricades (see SPR 2-15) and danger signs for compliance with Occupational Safety and Health Administration (OSHA) 29 CFR 1926.200, 202, and 203 must be used for trenches.

B. Excavations and trenches, as well as adjacent areas shall be inspected by a competent person: daily (prior to starting work), after every rainfall, and as soil conditions change (e.g., after heavy machinery activity near the excavation).

C. Employees shall not work in excavations where water is accumulating unless adequate precautions have been taken. The competent person must monitor the precautions and/or water removal activities.

D. If the stability of buildings or walls is endangered by an excavation or trench, shoring, bracing or underpinning will be provided. Excavations and trenches that are adjacent to back filled areas, or which are subject to vibrations from railroad traffic, highway traffic, or other sources will be secured by a support system, shield, or other protection.

3.2 Access

A. In trenches 4-feet or more in depth, ladders or other safe means of egress shall be provided. They shall be located at intervals so that less than 25 feet of lateral travel is required to reach the ladder.

B. Walkways, ramps, or bridges with standard guardrails shall be provided at all excavations and trenches where employees are required or permitted to cross.

3.3 Set Back

Employees shall be protected from excavated materials or equipment that could pose a hazard by falling into the excavation. Protection shall be provided by:

A. Placing materials or equipment at least 2-feet from the edge of the excavation.

EXCAVATIONS AND TRENCHES

B. Use of retaining devices to prevent materials or equipment from falling or rolling into excavations.

C. Preventing employees from being in the excavation or trench near the point where the material or equipment is located.

3.4 Equipment

A. No one will be allowed under loads handled by shovels, derricks, or other machinery. Employees exposed to vehicular traffic will wear warning vests or other personnel protective equipment made with highly visible material.

B. When mobile equipment is permitted to operate near an excavation or trench, barricades or "stop logs" will be used. All wells, pits, trenches or similar ground fall hazards will be barricaded or covered.

3.5 Dust

Dust conditions should be kept to a minimum by the use of water or other safe means.

3.6 Confined Space

Every trench or excavation four (4) feet or more in depth shall be tested (see SPR 5-13) to determine if it is a confined space. Appropriate respiratory protection shall be provided if required.

3.7 Training

The Competent Person will be trained in accordance with the OSHA Trenching and Excavation Standard (OSHA 29 CFR 1926 Subpart P). The Competent Person must be able to produce evidence of training and comply with SPR 2-2.

3.8 Protective Systems

Each employee in an excavation or trench shall be protected from cave-ins. When a protective system is required, it will consist of sloping, shoring, trench boxes and/or distance (e.g. a barrier to prevent the employee from coming near the face of an excavation). The determination of which system to use must be documented and the determination must consider the type of work being done (e.g., a job that requires an employee to lay in a trench to weld must have better protection than a standing job), the depth of the hole and the soil type.

3.9 Soil Classification

Soil must be assumed to be type "C" unless it is classified by a competent person. Since most of the soil inside the fenced area at the FEMP has been disturbed, the highest classification in the fenced area is type "B". Soil classification must be documented and must include both a visual test and a manual test. The manual test must be done with a penetrometer or a shearvane.

EXCAVATIONS AND TRENCHES

3.10 Depth

A trench or excavation less than 5-feet deep may not require a protective system if a competent person tests the soil and determines that there is no potential for a cave-in. If personnel are to enter a trench or excavation between 5 and 20 feet deep, a protective system must be selected by a competent person in accordance with this procedure. The protective system for an excavation or trench more than 20-feet deep must be designed by a Registered Professional Engineer, if personnel are to enter.

3.11 Sloping

Sloping an excavation or trench is one protective system which may be used for depths less than 20-feet. While benching type "C" soil is not permitted, steps are acceptable if the maximum height of the steps is less than 2-feet, and the 34-degree angle is observed. Benching is a permitted form of sloping types "A" or "B" soils to achieve the required slope. Maximum allowable slope of types "A" and "B" soils is 63-degrees and 45-degrees, respectively.

3.12 Shoring

Shoring an excavation or trench is a method which may be used as a protective system. Shoring must meet the requirements of OSHA 29 CFR 1926, Subpart P.

3.13 Other Systems

Designs of support systems, shield systems (e.g., trench box), and other protective systems s[illegible] be in accordance with OSHA 29 CFR 1926, Subpart P.

4.0 ATTACHMENTS

Attachment A: Excavation and Trenching Permit

5.0 REFERENCES

SPRs 2-2 and 5-13
29 CFR 1926 Subpart P

000210

EXCAVATIONS AND TRENCHES

ATTACHMENT A
Page 1 of 1

EXCAVATION AND TRENCHING PERMIT

FLUOR DANIEL

EXCAVATION AND TRENCHING PERMIT
(OSHA Section 1926.650)

DATE	TIME	DATE EXPIRES

JOB DESCRIPTION AND LOCATION (Be Specific) _____

BEFORE TRENCHING AND EXCAVATION

- ☐ SOIL CLASSIFICATION
  - ☐ STABLE ROCK ☐ TYPE A ☐ TYPE B ☐ TYPE C
- ☐ REQUIREMENTS HAVE BEEN MET AND REQUIRED DATA DOCUMENTED.
- ☐ PROXIMITY TO UTILITIES, BUILDINGS, FOOTING OR PILINGS AND SOURCES OF VIBRATIONS.
- ☐ OWNERS OF UTILITIES, SERVICE, OR TRANSMISSION PIPING, ETC. (Electrical, Telephone, Water, Sewer)
- ☐ CHECK FOR PREVIOUSLY DISTURBED GROUND.
- ☐ ADEQUACY AND AVAILABILITY OF ALL EQUIPMENT, INCLUDING PERSONAL PROTECTIVE GEAR, SHORING MATERIAL, SIGNS, BARRICADES AND MACHINERY.
- ☐ OTHER KNOWN OBSTRUCTIONS (e.g., Footing cavities, excavations, etc.)
- ☐ ALLOWABLE SLOPE.

COMMENTS

DURING TRENCHING AND EXCAVATION

- ☐ SIZE OF EXCAVATION
  DEPTH _____ WIDTH _____
  LENGTH _____
- ☐ CHANGING GROUND CONDITIONS, PARTICULARLY AFTER RAIN FALL.
- ☐ MONITOR FOR POSSIBLE OXYGEN DEFICIENCY OR GASEOUS CONDITIONS.
- ☐ ADEQUACY OF SHORING AND/OR SLOPING AS WORK PROGRESSES.
- ☐ ENTRANCE AND EXIT FACILITIES
  - ☐ STAIRWAY ☐ LADDERS ☐ RAMP
- ☐ CHANGE IN VEHICULAR AND MACHINERY OPERATION PATTERNS
- ☐ WATER REMOVAL EQUIPMENT AND OPERATION
- ☐ PROTECTIVE SYSTEMS DEPTH OF A TRENCH OR EXCAVATION OF 5 FEET OR MORE.
  CHECK THE APPLICABLE OSHA APPENDIX BELOW
  - ☐ B - Sloping and Benching
  - ☐ C - Timber Shoring for Trenches
  - ☐ D - Aluminum Hydraulic Shoring for Trenching
  - ☐ E - Alternatives to Timber Shoring
  - ☐ F - Selection of Protective Systems
  - ☐ RPE - Designed Shoring (data must be filed on jobsite)

  NOTE: SLOPING OR BENCHING FOR EXCAVATIONS GREATER THAN 20 FEET DEEP SHALL BE DESIGNED BY A STATE REGISTERED PROFESSIONAL ENGINEER.
- ☐ ADEQUACY OF PORTABLE TRENCH BOXES OR TRENCH SHIELDS.

COMMENTS

SIGNATURES AND DATES

COMPETENT PERSON	CIVIL ENGINEER	CIVIL SUPERINTENDENT
ELECTRICAL	SUPERVISOR	EQUIPMENT FOREMAN
EQUIPMENT OPERATOR	MECHANICAL SUPERVISOR	OTHER APPROVAL IF REQUIRED BY CIVIL ENGINEER OR STATE REGISTERED PROFESSIONAL ENGINEER

FORM 870-2-2 (Rev 10-90)

CUTTING, WELDING, OPEN FLAME WORK

1.0 GENERAL

This policy provides the requirements and responsibilities for cutting and welding with electric arcs, oxy-fuel gas flames, and other forms of hot work such as open flames, grinding, or brazing activities.

2.0 RESPONSIBILITIES

FERMCO Managed Facilities, Operations, and Activities are performed in accordance with these procedures.

3.0 REQUIREMENTS

3.1 Managers and Craft Supervisors Responsible for Conduct of Hot Work

Management and craft supervisors shall ensure that the requirements of this standard are observed when hot work (cutting/welding/open flames) is performed.

3.2 Hot Work Restricted to Authorized Personnel And Designated Areas

To the greatest extent practical, cutting and welding shall be done by authorized personnel in designated cutting and welding areas (shops).

3.3 Special Controls Required for Hot Work Outside Designated Areas

When cutting and welding are done outside of designated areas, the following actions are requir

A. A Cutting/Welding Permit shall be completed before each shift.

B. A trained employee shall be assigned to serve as a continuous fire watch, which is to be established and maintained during the work and for 30 minutes after the work is completed. See SPR 4-17, "Fire Watch Requirements," for additional requirements.

C. Fire watches shall be provided with a fully charged portable fire extinguisher, to be kept on hand, ready for use.

D. An additional portable extingisher is required; portable extinguishers mounted in the facility are not to be removed from their stands except in event of fire.

E. A member of supervision (i.e., craft supervisor) shall inspect the job site at least once before the start of each job and at least once every 24 hours until the job is complete.

F. A craft supervisor shall determine the best locations for the fire watch and verify that:

- Automatic fire protection is in service
- Fire and Safety Services bypass any smoke detectors in the area while the hotwork is in progress and restores the detectors to service as soon as practical
- Precautions taken are adequate
- The information on the cutting/welding permit is correct.

CUTTING, WELDING, OPEN FLAME WORK

G. Combustible materials, equipment, or building surfaces within 20 feet of the work or below the work must be either covered with fire-resistant welding blankets, moved, or wetted down.

H. Openings in ducts, tanks, or other confined spaces within 20 feet of the work shall also be covered or plugged. (Fire-resistant welding blankets are to be used for electric arc operations instead of wetting the work area down.)

3.4 Areas and Situations Where Cutting And Welding is Prohibited

Cutting and welding is prohibited in the following places:

- In sprinklered areas while automatic sprinkler protection is out of service
- In explosive atmospheres of gases, vapors, or dusts or where explosive atmospheres could develop from residues or accumulations in confined spaces.
- On metal walls, ceilings, or roofs built of combustible sandwich-type panel construction with combustible insulation, or those having a combustible covering

3.5 Hot Work in Confined Spaces

Confined spaces (such as tanks) shall be tested to ensure that the explosives in the atmosphere are not in excess of 10% of the lower flammable limit before cutting or welding in or on the tank. The atmosphere shall be resampled as conditions warrant, once each shift as a minimum. See SPR 5-13, Confined Space Entry.

3.6 Special Requirements for Hot Work On Tanks, Piping, And Containers

A. When cutting or welding must be done on small tanks, piping, or containers that cannot be entered, they shall be cleaned, purged, and the atmosphere tested before starting the work.

B. For work on piping or tanks used for combustible liquids or gases, intermittent testing shall be performed during the work and a job safety analysis completed before the work commences.

3.7 Adequate Ventilation Required for Hot Work

Adequate ventilation shall be provided for all cutting and welding work.

3.8 Approved Equipment Must be Used

Torches, regulators, pressure-reducing valves, and manifolds used for hot work shall be listed or approved by a nationally-recognized testing laboratory for their intended use.

3.9 Welder's Equipment Must Have Backflow Valves And Pressure-Relief Devices

Oxygen-fuel gas systems (for example, oxygen/acetylene welders) must be equipped with listed and approved backflow valves, and pressure-relief devices.

CUTTING, WELDING, OPEN FLAME WORK

3.10 Personnel Protective Clothing or Devices Required for Hot (Thermal) Work

All cutters, welders, helpers, and fire watches shall wear fire retardant clothing, eye protection and protective clothing as appropriate. Workers adjacent to arc welding areas shall be protected from the rays by screens or shields.

4.0 ATTACHMENTS

None.

CONTROL OF ASBESTOS WORK AND ASBESTOS WORK PERMIT

1.0 GENERAL

A. This policy provides guidance for the protection of personnel who work in buildings where asbestos is present or are engaged in operations where the handling of asbestos or asbestos-containing material is necessary. Strict compliance with the Occupational Safety and Health Administration (OSHA) Asbestos Standard, 29 CFR 1926.58 is required.

B. This policy also outlines the basic requirements for obtaining written authorization and instructions before any work begins which requires work with asbestos

2.0 RESPONSIBILITIES

2.1 Facility Owner

A. Ensures that the requirements of the General Precautions section of the FERMCO Work Permit have been completed to address the facility specific hazards for the proposed work task.

B. Ensures that the work site is provided in as safe a condition as practical.

2.2 Supervisor-In-Charge

A. Identifies and initiates the appropriate work permit(s) based on the work to be performed.

B. Ensures completion of the work permit(s) prior to start of work.

C. Ensures that personnel are qualified and adhere to all permit requirements.

D. Immediately reports any unwanted, unplanned event to the Assistant Emergency Duty Officer (AEDO), Emergency Response Team (ERT) and/or the area supervisor as appropriate.

E. Ensures that Industrial Hygiene (IH) personnel are notified of any changes in work site conditions since permit issuance.

2.3 FERMCO Employees

A. Adheres to all requirements listed on each permit.

B. Ensures that they have signed section D of the permit stating that they understand all permit requirements.

C. Notifies personnel in the vicinity, the supervisor-in-charge, or the Communication Center when the supervisor is not present, if they recognize an emergency condition.

2.4 Industrial Hygiene Representative

A. Reviews the FERMCO Work Permit to ensure that it is complete.

B. Inspects the work site for compliance with the conditions listed on the Work Permit.

CONTROL OF ASBESTOS WORK AND ASBESTOS WORK PERMIT

C. Performs atmospheric testing as required to ensure the proper level of protective equipment is specified on the permit.

D. Completes the Asbestos Work Permit.

3.0 REQUIREMENTS

3.1 Asbestos Hazard Control

A. All asbestos containing materials, particularly pipe insulation, shall be maintained in good condition.

B. All employees shall be alert to the presence of damaged asbestos containing materials and shall notify the Facility Owner when such materials are found in damaged condition.

C. The Facility Owner shall ensure that repairs are made and shall contact the IH group, when necessary, for the posting of hazard warnings.

D. Where asbestos containing material is seriously damaged, creating a potential exposure to dust, the AEDO and IH shall be contacted immediately for proper regulation of the area, clean-up, and repair.

3.2 Planning for Work that May Involve Asbestos

A. All construction/maintenance activities shall be evaluated as early as possible to determine the presence and potential for disturbance of suspect asbestos containing materials.

B. When suspect asbestos is to be disturbed as part of the work activity, and there is no time to sample the suspect materials, the materials shall be handled as asbestos.

C. An OSHA "competent person" shall supervise the asbestos work project and shall be present at the work site anytime workers are in the asbestos work area.

D. Specifications for all construction activities involving work with asbestos shall include requirements for:

- Compliance with all applicable asbestos work regulations; including, those of OSHA, the Environmental Protection Agency (EPA), and the State of Ohio.
- Submission of documentation of respirator training, quantitative respirator fit-test and medical certification to the IH group for approval prior to the start of work.
- Submission of an Asbestos Abatement Work Plan after award of the contract.

E. Quantitative fit-testing shall conform with the requirements of 29 CFR 1926.58, Appendix C.

F. The Asbestos Abatement Work Plan shall contain all the information listed in 29 CFR 1926.58, Appendix F, Planning the Removal Project, and shall be provided to the Occupational Safety and Health (OS&H) Department for approval prior to the start of asbestos work.

CONTROL OF ASBESTOS WORK AND ASBESTOS WORK PERMIT

G. An Asbestos Abatement Work Plan shall not be required for construction activities involving minor asbestos work such as the drilling of holes in transite or floor tile.

H. The local area agency (EPA), must be notified by FERMCO before any asbestos removal.

3.3 Supervision of Asbestos Work

A. A supervisor of any asbestos removal shall qualify as an OSHA "competent person".

- A competent person is someone who has successfully completed a state or federally approved asbestos abatement supervisor's course and required annual refresher training or is a certified industrial hygienist knowledgeable in asbestos control.

- Competent person also means one who is capable of identifying existing asbestos hazards in the work place and who has the authority to take prompt corrective measures to eliminate them.

B. A competent person shall supervise:

- Setting up the enclosure/work area.

- The integrity of the enclosure/work area.

- Entry to and exit from the enclosure/work area.

- All employee exposure monitoring.

- Ensuring that employees working within the enclosure/work area wear protective clothing and respirators.

- Ensuring that employees are trained in work practices, personal protective equipment and engineering controls.

- Ensuring the employees use the hygiene facilities.

- Ensuring that engineering controls are functioning properly.

3.4 Asbestos Work Permit

Prior to the start of any work which involves the clean-up, disturbance, removal, or repair of asbestos containing materials, the IH group shall be contacted for issuance of an Asbestos Work Permit after all regulatory requirements are met. The permit shall be posted at the perimeter of the job site so that it can be seen without entering the area.

CONTROL OF ASBESTOS WORK AND ASBESTOS WORK PERMIT

3.5 Initiation of FERMCO Asbestos Work Permit

Where FERMCO Asbestos Work Permit is required, a FERMCO Work Permit is also necessary (see SPR 2-13).

A. SUPERVISOR-IN-CHARGE

Contacts Industrial Hygiene for an IH Technician to perform the initial job site evaluation.

B. INDUSTRIAL HYGIENE TECHNICIAN

- Checks the completeness of the FERMCO Work Permit which is posted at the job site.
- Checks other permits which must be posted, and verifies that their expiration date has not passed.
- Completes the applicable portions of Sections "A", "B" and "C" of the permit, and signs in the appropriate block(s).

C. SUPERVISOR-IN-CHARGE

- Ensures that all employees on the job have read and understand the required precautions and required personal protection equipment (PPE).
- Ensures that all employees on the job have completed training required for the job.
- Ensures that all employees on the job have signed the permit in block "D".
- Notes permit expiration date(s).
- Signs the permit.
- Posts the original at the job site, and distributes the copies as indicated on the form.

3.6 Work Practice Controls

A. Establish negative pressure enclosures before commencing removal, demolition, and renovation operations involving asbestos.

B. Hygiene facilities shall be established adjacent to the work area for employees to remove asbestos from the face, hands, and any other part of the body not protected by clothing. Hygiene facilities shall consist of a clean room, shower area, and equipment room.

C. The requirement for establishing negative pressure enclosures and hygiene facilities does not apply to asbestos work which can be classified as a small-scale, short-duration operation.

CONTROL OF ASBESTOS WORK AND ASBESTOS WORK PERMIT

D. For an activity to qualify as small-scale, short-duration, all of the following criteria must be met:

- A maintenance or renovation task, such as pipe insulation repair, valve replacement, drilling holes in transite to mount conduit, and/or installing conduit or piping through transite, where the removal of asbestos containing materials is not the primary goal of the work.
- An activity where employee exposure to asbestos can be kept below the OSHA action level by work practices and worker isolation techniques; such as, glove bags, mini-enclosures, or the removal of an entire asbestos-covered pipe or structure.
- No large-scale asbestos project shall be reduced in size to create one or more small-scale, short-duration asbestos projects.

E. Respiratory protection is required based on the expected level of asbestos exposure.

F. Full body covering shall be used that will prevent contamination of the employee's skin or clothing.

G. Workers shall be provided a place to store and consume food, beverages, and tobacco products so that these items will not be contaminated by asbestos.

3.7 Engineering Controls and Work Practices

A. Before removal, all asbestos-containing materials shall be adequately wetted (thoroughly soaked) with a wetting agent applied by a gentle spray or mist.

B. The wetting shall continue until the material is bagged and sealed.

C. Friable asbestos containing materials shall not be handled in a dry condition.

D. If friable asbestos must be removed dry, then the dry removal must be approved by the local area agency (EPA).

E. Enclosures will be used when friable asbestos must be removed, and a HEPA-filtered exhaust system shall be established to remove fibers from the enclosure.

F. Removed asbestos shall be bagged, labeled, and stored or disposed of daily in a way which will prevent the release of fibers.

G. For work that will release fibers from non-friable asbestos (asbestos-cement, floor tile); such as, sawing, grinding, or drilling, the tools will be equipped with a local exhaust system or a water spray. If the tools are not equipped with these controls, HEPA filtration or a water spray will be provided at the point of operation.

H. Barricades and/or enclosures will be used to limit the number of employees exposed to asbestos.

I. Work areas which have been barricaded or enclosed shall have asbestos hazard warning signs posted at all entrances to the work area. The signs shall have the wording required by the OSHA Asbestos Standard.

CONTROL OF ASBESTOS WORK AND ASBESTOS WORK PERMIT

J Each enclosed or barricaded area shall be cleaned at the end of work each day with a HEPA vacuum cleaner, by wet cleaning, or any other effective means of fiber cleanup.

K. Insulation which contains greater than 1 percent shall not be installed or reinstalled.

L. Asbestos waste containers shall be labeled with the waste label required by OSHA and the hazardous substance shipping label required by the Department of Transportation.

M. Air handlers in the immediate area of the removal will be shut down or isolated from the removal operation.

3.8 Air Monitoring Requirements for Asbestos Work Activities

A. Employee exposure to asbestos shall be determined from analysis of breathing zone air samples collected during asbestos work activities as required by OSHA.

B. The sampling shall be used to evaluate the effectiveness of control measures in maintaining exposure levels below the OSHA excursion and OSHA permissible exposure limits.

C. During each asbestos work activity, a 30-minute breathing zone air sample will be collected where the potential for releasing asbestos fibers is greatest.

- Worker exposure during this 30-minute period shall not exceed the OSHA excursion limit of 1.0 fibers per cubic centimeter (f/cc).
- When this limit may be exceeded, respirators and protective clothing shall be worn.
- Where there are several periods during an activity when the potential for releasing asbestos fibers may exceed the excursion limit, several 30-minute excursion samples must be collected.

D. Personal air samples shall be collected on workers for the entire period of time they are working with asbestos containing materials when the task they are performing requires more than 30 minutes to complete.

- This sampling shall be conducted during the entire work shift where possible to comply with the OSHA requirement for measuring the 8-hour, time-weighted-average (TWA) for exposure to asbestos.
- The result of TWA sampling shall not exceed the OSHA permissible exposure limit of 0.2 f/cc. When this limit may be exceeded, respirators and protective clothing shall be worn.

E. Workers shall be notified of the results of all personal air samples collected on them.

F. General area air samples will be collected outside the asbestos work area to evaluate the effectiveness of control measures used during asbestos work activities.

000220

CONTROL OF ASBESTOS WORK AND ASBESTOS WORK PERMIT

G. When asbestos removal activities are performed inside an enclosure, general area clearance air samples shall be collected after final cleanup is completed.

- Results of this clearance air sampling must be less than 0.01 f/cc.
- When the results of this sampling exceed 0.01 f/cc, the result shall not be greater than the results of air sampling conducted outside the enclosure.
- When the results of clearance air sampling fail to meet this criteria, the area must be re-cleaned and re-sampled.

3.9 Training and Qualification of Workers

A. The following training requirements apply to subcontractor and vendor asbestos personnel only:

- Subcontractor/vendor asbestos workers and supervisors shall be trained in accordance with the requirements of the State of Ohio, Department of Health, unless performing minor asbestos work such as drilling holes in floor tile or transite.
- Workers who perform these minor work tasks, must meet the training requirements specified in the OSHA Asbestos Standard (29 CFR 1926.58).

B. The following training requirements apply to FERMCO personnel:

- Any individual who may remove 50 linear or 50 square feet or more of friable asbestos-containing material shall have completed training required for asbestos workers by the State of Ohio.
- Every supervisor of an asbestos removal shall qualify as an OSHA "competent person" by completing training approved by the State of Ohio.
- A supplemental 8-hour refresher training class approved by the State of Ohio shall be taken annually by supervisors and workers, enabling them to remain qualified to supervise or perform asbestos removal tasks.
- Any individual who may remove less than 50 linear or 50 square feet of asbestos containing materials must complete annual training as required by the OSHA Asbestos Standard.

C. Every individual required to wear a negative pressure respirator while working with asbestos shall have been quantitatively fit-tested within the last 6 months as required by the OSHA Asbestos Standard and shall have attended respirator training within the last 12 months.

3.10 Handling Spills/Incidents/Emergencies Involving Asbestos

A. Every spill or incident that could release asbestos fibers shall be reported immediately to the Facility Owner, the AEDO, and to IH.

B. When airborne fibers are likely to be present, the affected area shall be evacuated immediately.

CONTROL OF ASBESTOS WORK AND ASBESTOS WORK PERMIT

C. The AEDO and IH will evaluate the damaged asbestos and determine the corrective action to be taken.

D. If friable asbestos is damaged where personnel are likely to be exposed, the following actions shall be taken to prevent exposure and the spread of asbestos contamination:

- The area shall be evacuated; asbestos warning tape and/or other barriers shall be placed to control access to the area and all personnel entering the area shall comply with the respirator and protective clothing specified by IH.
- All building ventilation systems in the immediate area shall be turned off or sealed off.

E. The Facility Owner or the AEDO shall ensure that the area of damaged asbestos is repaired and that cleanup is completed as soon as possible.

F. Where immediate cleanup of fallen material is not possible, tarps or plastic shall be used to cover the material and the tarps or plastic shall be secured with weights or taped to the floor.

G. After repairs and cleanup have been completed, IH shall visually inspect the area and collect air samples, when required, to ensure the area has been properly cleaned.

H. When IH has determined that the area has been cleaned, the AEDO shall approve the removal of all warning barriers and the area can be reoccupied.

4.0 ATTACHMENTS

Attachment A: FERMCO Asbestos Work Permit

5.0 REFERENCES

None.

000222

CONTROL OF ASBESTOS WORK AND ASBESTOS WORK PERMIT

ATTACHMENT A
Sheet 1 of 2

FERMCO Asbestos Work Permit

FERMCO ASBESTOS WORK PERMIT

This permit is only valid when it is attached to the FERMCO Work Permit Form which has Section A through D completed.

FERMCO WORK PERMIT NUMBER:

SECTION A - BACKGROUND AND REGULATORY INFORMATION *(To be supplied by supervisor-in-charge)*

1. Exact location:
2. Exact description of work to be conducted:
3. Amount of asbestos to be removed (in linear or/square feet):
4. Regulatory approval received to begin work: ☐ YES ☐ DNA
   * If yes, regulatory approval for this job starts ☐ Incidental
   _____ (Date) and stops _____ (Date).
5. Does job description meet requirements for small-scale, short-duration work? ☐ YES ☐ NO

Sections B contains items which shall be complied with on this job as indicated.

SECTION B - PRE-JOB REQUIREMENTS SPECIFIED BY: _____ TECHNICIAN INITIALS _____ DATE _____ TIME

PREPARATION OF WORK SITE *(All Asbestos Jobs)*

	REQ'D	DNA
1. Work area barricades and/or roped off		
2. Asbestos warning signs posted at work site		
3. Pre-cleaning of work area required		
4. All small items removed from designated work area		
5. Large equipment secured and covered with plastic		
6. Floor and ledges covered with plastic		
7. Area ventilation systems locked and tagged out		
8. Shower established adjacent to work area		
9. Waste water filtered (5 micron filter)		
10. Personnel air sampling required during work		
11. Nearby building occupants shall be notified of asbestos work to prevent unauthorized access to work area		
12. Contact IH Technician to inspect work area preparation before asbestos removal begins		

PREPARATION OF WORK SITE *(For Total Enclosure Jobs Only)*

	REQ'D	DNA
1. Floor and wall penetrations covered and sealed		
2. Negative air enclosure set-up around work area		
3. Negative air machine operating continuously		
4. Negative pressure achieved at 0.02 inches or greater		

WORK PRACTICES

	REQ'D	DNA
1. Personnel air samples required (samples collected for entire shift when possible)		
2. No smoking, eating or drinking permitted in work area		
3. HEPA-Filtered vacuum required for clean-up		
4. HEPA vacuum required at point of cut/drilling		
5. Glove bag removal of pipe insulation required		
6. Transite panels shall be removed whole		
7. Asbestos material shall not be allowed to dries		
8. Transite panels shall be wet down/encapsulated before removal		
9. Amended water shall be used to wet down material		
10. Asbestos material thoroughly wet down before removal		
11. Removed material promptly bagged (not allowed to dry out)		
12. Surfaces shall be sealed with a sealant to encapsulate any remaining fibers		
13. Work area cleaned after completion of work each day		
14. Tools and equipment shall be cleaned of all residual dust before removal from work area.		
15. Personnel to decontaminate at each departure from work area		
16. Bag contaminated clothing and waste promptly		
17. Bagged waste material shall be placed in containers and labeled as asbestos waste (exterior of containers shall be clean and asbestos-free)		
18. Shower before lunch and at end of shift		

SECTION C - FINAL INSPECTION REQUIREMENTS

	REQ'D	DNA
1. Visual inspection of work area for residual dust required after completion of job (contact IH Technician)		
2. General area air samples required after completion of job (contact IH Technician)		
3. Obtain IH Technician approval before removal of barriers & warning signs		

SECTION D - SIGNATURES *(Employees assigned to job)*
I have read and understand all requirements of this permit.

EMPLOYEE(S) SIGNATURE(S)	BADGE NO.	DATE	EMPLOYEE(S) SIGNATURE(S)	BADGE NO.	DATE
1.			4.		
2.			5.		
3.			6.		

APPROVAL TO BEGIN WORK		
IH TECHNICIAN SIGNATURE:	DATE:	TIME:

APPROVAL TO REMOVE BARRIERS AND WARNING SIGNS		
IH TECHNICIAN SIGNATURE:	DATE:	TIME:

NO.	DISTRIBUTION OF COPIES
1	POST AT JOB
2	SUPERVISOR IN CHARGE
3	INDUSTRIAL HYGIENE/INDUSTRIAL SAFETY
4	EMPLOYEE REPRESENTATIVE

WORK AUTHORIZATION REVIEWED AND FOUND ACCEPTABLE FOR USE		
SUPERVISOR/COMPETENT PERSON** SIGNATURE:	DATE:	TIME:

* *This Asbestos Work Permit expires when removal of barriers and warning signs is approved, preparation of additional work area is needed, employees assigned to the job are changed, or job conditions require changes in permit requirements. In no case shall the permit be valid beyond the date in Section A.4. above.*

** *For a job which requires the removal of asbestos-containing materials, the signature in this box indicates this supervisor has been trained as an asbestos qualified "Competent Person" per OSHA and as an "On-Site Representative" per NESHAP.*

FS-4-3040 (REV 3/1/93)

CONTROL OF ASBESTOS WORK AND ASBESTOS WORK PERMIT

ATTACHMENT A
Sheet 2 of 2

The **FEMP Asbestos Work Permit** is required to control any task involving the cleanup, disturbance, handling, removal, or repair of asbestos containing materials.

Materials containing **Refractory Ceramic Fibers (RCFs)** shall be handled using the same work practice controls which are used for asbestos, including issuance of the FEMP Asbestos Work Permit. RCFs are a man-made product which were manufactured as a high temperature replacement for asbestos. RCFs can be found at the FEMP as thermal lining materials in boilers, dissociators, furnaces, kilns, and reactors.

Small-scale, short-duration job: a maintenance or renovation task where the removal of asbestos containing materials is not the primary goal of the work and any activity where employees exposure to asbestos can be kept below the OSHA action level by use of specific work practices and worker isolation techniques. No large-scale asbestos job shall be reduced in size to create one or more small-scale, short-duration asbestos jobs.

Incident renovations: any small, minor removal of asbestos, not reasonably foreseen or planned, necessary to facilitate normal conduct of business. (In this definition, small refers to less than the reporting quantities of 260 linear feet or 160 square feet of friable asbestos.)

Competent person: a supervisory level individual who has successfully completed a 32-hour classroom and hands-on asbestos training class approved to supervise asbestos removal tasks.

A competent person is required to sign the Asbestos Work Permit as the Supervisor-in-Charge when the work task involves the removal of any quantity of asbestos containing material (this includes the removal of non-friable materials and the drilling of small holes in non-friable materials.

QUALIFICATIONS OF ASBESTOS WORKERS:

Any individual performing work controlled by this Asbestos Work Permit shall have successfully completed asbestos worker training required by the OSHA Asbestos Standard in the last 12 months.

Any individual require to remove 50 linear or 50 square feet of more of friable asbestos-containing material on a job shall have successfully completed asbestos worker training required by the State of OHIO. This training shall have been completed within the last 12 months.

Any individual required to wear a negative pressure respirator while working with asbestos shall have been quantitatively fit-tested within the last 6 months as required by the OSHA Asbestos standard and shall have attended respirator training within the last 12 months.

NOTE: The requirement for quantitative fit-testing in the last 6 months does not apply to individual using positive pressure respirators (i.e., supplied air respirators, powered-air purifying respirators).

000224

WORKING IN EXTREME TEMPERATURES (HOT & COLD)

1.0 GENERAL

This policy explains how to recognize the hazards of working in hot and cold work environments.

2.0 RESPONSIBILITIES

2.1 Industrial Safety and Health Organization

A. Conducts area and personal temperature monitoring.

B. Develops criteria for working in hot and cold environments.

C. Recommends engineering and administrative controls to be implemented.

D. Assists in the worker training.

2.2 Manager or Supervisor

A. Ensures that controls are implemented and followed.

B. Contacts Industrial Hygiene (IH) when temperature monitoring is required.

C. Knows the signs, symptoms for temperature related illnesses and the correct responses to be taken.

D. Provides fluid replacement and where feasible temperature controlled break areas.

2.3 Employee

A. Follows the controls implemented by IH and supervision.

B. Notifies the supervisor of and physical impairment and/or condition that may affect their performance.

C. Notifies the supervisor or medical of any illness.

D. Knows the signs and symptoms of temperature related illnesses.

2.4 Medical

A. Conducts annual physical examinations on employees who work in extreme temperature environments and determines there ability to work in these environments.

B. Informs the employee, his supervisor and the Industrial Safety and Health Organization, in writing, about restrictions for working in extreme temperature environments.

C. Assists in the training on temperature-related illnesses.

WORKING IN EXTREME TEMPERATURES (HOT & COLD)

3.0 REQUIREMENTS

3.1 Heat Stress

A. Heat stress occurs when the workers body is unable to maintain the normal body temperature. Environmental conditions, work demands and clothing requirements are the major factors that cause heat related illnesses. Additional factors contribute to susceptibility to heat stress:

- Personal physical fitness and health (weight, age, heart and respiratory condition)
- Workers state of acclimatization
- Fluid replacement
- Personal habits (ex. alcohol intake, smoking habits)
- Pre-existing dehydration
- Medication (diuretics, sedatives, tranquilizers, blood pressure medicine)

B. The potential for heat stress is greatest when working for long periods near heat sources, or when a worker is required to wear protective clothing for extended periods. During hot weather, the potential for heat stress is present in any un-air-conditioned work location where temperature exceed 80°F (26°C).

3.2 Workplace surveillance

Since measurement of deep body (rectal) temperature is an impractical method of monitoring workers heat load, ambient environmental factors correlates to deep body temperature and other physiological responses to heat. The simplest, most widely accepted measure of environmental heat factors is the wet-bulb globe temperature (WBGT).

3.3 Recommended Heat-Stress Alert Limits

A The figures and tables in Attachment A show the combinations of environmental and metabolic heat that can be tolerated by unacclimatized (Figure A) and acclimatized (Figure B) workers without exceeding a deep body temperature of 100.4°F (38°C) 100.4°F. (Rates are time-weighted-averaged for an eight-hour work period.)

B. When heat-stress conditions exceed the limits shown in Attachment A; when other conditions take effect, such as employee physical condition; or when heavier clothing is worn, consult the Industrial Safety and Health (IS&H) Manager for further guidance.

3.4 Personal Protective Equipment (PPE)

A. Employees should wear clothing with adequate air and vapor permeability. When employees are required to wear clothing that does not have adequate air and vapor permeability, such as fire bunker gear, anticontamination coveralls, and acid suits, then the recommended limits found in Attachment A are to be adjusted accordingly.

B. Ice vest or vortex tubes can be used to control employee heat stress. Contact IH for the equipment.

WORKING IN EXTREME TEMPERATURES (HOT & COLD)

3.5 Engineering Controls

A. Convective heat gain, which occurs when air temperature exceeds skin temperature, can be reduced by cooling the work environment by air conditioning.

B. Radiative heat gain, which occurs when the air temperature of surrounding solid objects exceeds skin temperature, can be reduced by the following:

- Placing radiant-reflective or heat-absorbent shields or barriers between the employee and the source of radiant heat
- Isolating the source of radiant heat
- Modifying an operation or process

C. Evaporative heat loss, which occurs when the body loses excess heat through evaporation, can be increased by the following:

- Increasing air movement around the employee by fan or some other means of ventilation
- Reducing the water vapor content (humidity) of the air by air conditioning

3.6 Administrative Controls

When engineering controls are inadequate or not feasible, work modifications and hygienic practices must be introduced to control exposures to both environmental and metabolic heat. The following examples of preventive work and hygienic practices have proven to be effective for reducing heat stress:

A. Limiting the time a worker spends in a hot environment through implementation of a work/rest program.

B. Reducing the metabolic demands of the job through procedures such as mechanization, use of special tools, or increase the number of employees per task.

C. Raising heat tolerance through either a heat acclimatization program or an increase in physical fitness.

D. Training supervisors and employees to prevent heat stress conditions, to recognize the early symptoms of heat illnesses.

E. Implementing a buddy system in which employees must observe fellow employees for the early symptoms of heat stress such as weakness, unsteady gait, irritability, perspiration levels, disorientation, or changes in skin color.

F. Providing adequate amounts of cool (50 to 59°F) [10 to 15°C~), potable water near the work area and encouraging all employees to drink one cup of water every 15 to 20 minutes.

G. Providing temperature controlled break areas where feasible.

H. Select employee clothing of the proper air- and water-vapor permeability. Control the type and amount of clothing worn. Restrict the layers of protective clothing to two, the company issued clothing shall count as a layer. Should additional layers be required IH shall be contacted to develop controls.

WORKING IN EXTREME TEMPERATURES (HOT & COLD)

3.7 Information and Training

All unacclimatized employees who work in areas where there is a likelihood of heat injury or illness must participate in continuing safety and health education programs that keep them informed on the following topics:

- Heat stress hazards
- Signs and symptoms of heat injury and illness (For more information on the symptoms of heat disorders, see Attachment B.)
- Heat-stress prevention and first aid procedures (For more information on prevention and first aid, see Attachment B.)
- Work practices and control procedures that protect the health and safety of employees including reporting the development of heat-stress symptoms
- The effects of therapeutic drugs, over-the-counter medications, ailed alcohol; which may reduce heat tolerance and increase the risk of heat injury or illness
- Proper use of protective clothing and equipment

3.8 Cold Stress

A. Cold stress occurs when deep body temperature falls below 97°F (36°C). To protect all parts of the body, especially the head, hands, and feet, from cold injuries, deep body temperature (or core temperature) must not drop lower than 95°F (35°C) during audio single exposure to a cold environment.

B. Unless there are unusual circumstances, cold injury, except to the head, hands,or feet, will usually be accompanied by the initial signs of hypothermia.

3.9 Wind Chill Factor

A. The cooling effect of any combination of temperature and wind velocity or air movement is represented by the Wind Chill Factor. The Wind Chill Index, a tabulation of the chill factors, can be utilized to determine the Equivalent Temperature (ET).

B. When referring to temperatures, use the Wind Chill Index from the ACGIH Threshold Limit Values and Biological Exposure Indices, ~ shown in Attachment C to determine the ET.

3.10 Cold Protection Clothing and Equipment

A. Employees working in air temperature below 40°F (4°C) must wear dry, insulating clothing to help maintain a core temperature above 97°F (36°C). Wind chill cooling rate of the cooling power of air are critical factors that may affect the workers' ability to maintain this core temperature.

B. Do not expose skin for prolonged periods when the Equivalent Temperature is less to 26°F (-4°C). Superficial or deep, local tissue-freezing may occur at temperatures below 30°F (-1 °C), regardless of wind speed.

C. At air temperatures of 36°F (2°C), or less, workers who become immersed in water or whose clothing becomes wet must be provided an immediate change of clothing and be treated for hypothermia.

D. When employees work at temperatures below 0°F (-18°C) work/warm-up ratios should be considered.

000228

WORKING IN EXTREME TEMPERATURES (HOT & COLD)

E. Special protection for the hands is required, according to the following criteria, to maintain manual dexterity:

- When intricate work is being preformed bare-handed for more than 10 to 20 minutes in temperatures below 61°F (16°C), use special equipment to keep the workers' hands warm such as warm-air jets, radiant heaters, or contact warm plates.

- Make proper use of protective clothing and equipment.

- At temperatures below 30°F (-1°C), cover metal handles of tools and control bars with thermal insulating material.

F. When fine manual dexterity is not required, workers must wear gloves in the following situations:

- For sedentary work in temperatures below 61°F (16°C)
- For light work in temperatures below 39°F (4°C)
- For moderate work in temperatures below 19°F (-7°C)

G. To prevent contact frostbite, employees must observe the following precautions:

- Wear gloves when working with objects that have a surface temperature of less than 19°F (-7°C). The supervisor must warn each employee against inadvertent contact between cold surfaces and bare skin.

- Wear mittens when working in air temperatures of 0°F (-18°C) or less. Machine controls and tools used in cold conditions must be designed for use without removing the mittens.

H. Employees with circulatory problems must take special precautions to protect against cold injury. Two such precautionary measures are the use of additional insulating clothing and a reduction of exposure time. Determine the precautionary measures that are necessary on the basis of the employees physical condition and the advice of a physician who is knowledgeable about cold stress.

3.11 Work and Hygiene Practices

A. When working continuously in an equivalent temperature of 19°F (7°C) or below, heated warming shelters should be made available nearby. Employees should be encouraged to use these shelters at regular intervals, the frequency depend on the severity of the environmental exposure.

B. When employees work at temperatures below 0°F (-18 C), suggested work/warm-up regime shown in Attachment D.

C. When entering the heated shelter, workers should remove outer layers of clothing and either loosen remaining clothing to permit sweat evaporation or into dry work clothing.

D. Dehydration occurs without warning in cold environments. It may cause a significant change in blood flow to the extremities, and may, therefore, increase the susceptibility of employees to cold injury. Employees should drink warm, sweet drinks and soup during breaks.

E. In work environments at or below 10°F (-12°C), observe the following practices:

- Keep employees under constant observation, through either the buddy system or supervision.

WORKING IN EXTREME TEMPERATURES (HOT & COLD)

- Maintain a work rate that does not cause heavy sweating and result in wet clothing if heavy work must be done, provide rest periods in heated shelters and the opportunity to change into dry clothing.

- Include the weight and balkiness of protective clothing when estimating an employees required work performance and the weights he or she may lift.

- Minimize work in stationary positions for long periods of time, and protect employees from drafts as much as possible.

3.12 TRAINING

Employees who work in areas where there is likelihood of cold injury must participate continuing safety and health education programs that keep them informed on the following topics:

- Rewarming procedures
- First aid treatment
- Protective clothing practices
- Eating and drinking habits
- Recognition of frostbite
- Recognition of symptoms of hypothermia and excessive body cooling, even when shivering does not occur
- Safe work practices

4.0 ATTACHMENTS

Attachment A: Recommended Heat Stress Alert Limits
Attachment B: Heat Stress Disorders
Attachment C: Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature
Attachment D: Recommended Work/Warm-up Regime Maximum Daily Time Limits for Exposure at Low Temperatures

000230

WORKING IN EXTREME TEMPERATURES (HOT & COLD)

ATTACHMENT A
Page 1 of 1

ATTACHMENT A

Figure A – Recommended Heat-Stress Alert Limits
Heat-Unacclimatized Workers

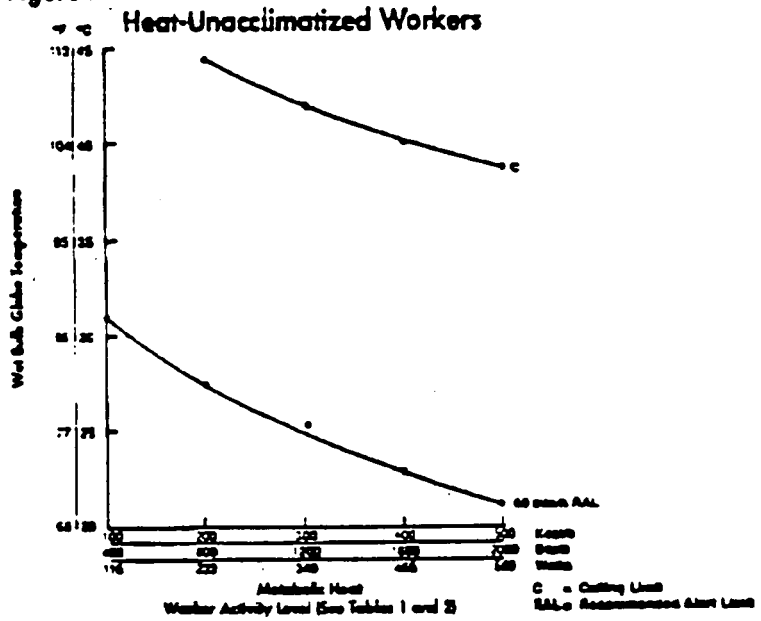
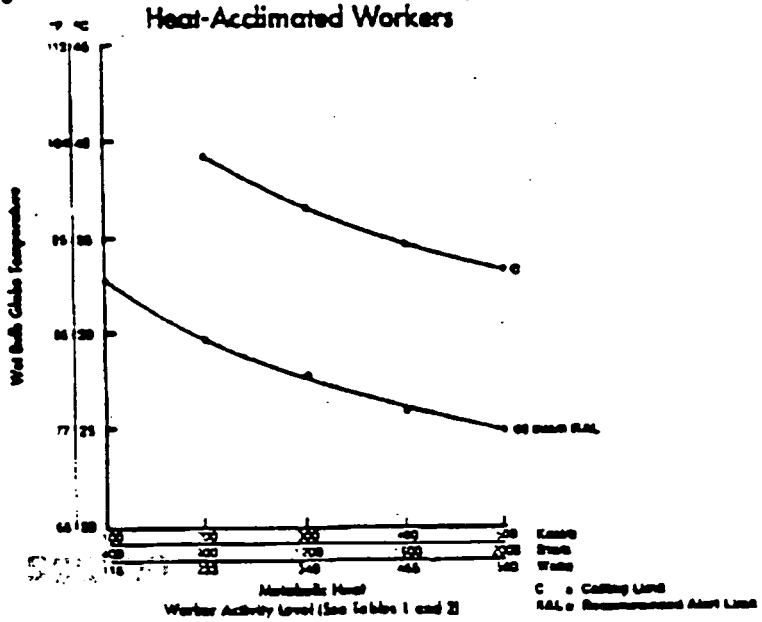


Figure B – Recommended Heat-Stress Exposure Limits
Heat-Acclimated Workers



WORKING IN EXTREME TEMPERATURES (HOT & COLD)

ATTACHMENT B
Page 1 of 1

ATTACHMENT B

Heat-Stress Disorders

	Symptoms	Cause	Prevention/First Aid
Heat Rash	• Red rash • Itching	• Hot, humid environment • Sweat won't evaporate • Skin stays moist most of the time • Sweat ducts become clogged	• Ointments • Bathe regularly • Keep skin clean and dry
Heat Cramps	• Sudden onset of muscle cramps • Hot, moist skin • Normal pulse • Normal to slightly higher temperature	• Loss of water (sweating) • Loss of electrolytes (sodium and potassium) • Replacing water loss but not electrolytes	• Move into shade • Loosen clothing • Drink lightly salted liquids • Report to first aid if symptoms persist
Heat Exhaustion	• Victim usually pale and sweaty with cold, clammy skin • Victim thirsty from dehydration • Victim may show fatigue, weakness, nausea, loss of coordination	• Excessive loss of body fluids and salt	• Move victim into shade • Loosen clothing • Cool as fast as possible by fanning or with water • Summon medical aid • Stay with the victim until aid arrives
Heat Stroke	• High body temperature (>103 degrees) • Absence of sweating • Hot, red (flushed), dry skin • Victim may be delirious • Seizures may occur	• Failure of body's cooling (sweating) mechanisms	• Summon medical attention immediately • Start the cooling process without delay to lower the victim's body temperature as soon as possible

000232

WORKING IN EXTREME TEMPERATURES (HOT & COLD)

ATTACHMENT C
Page 1 of 1

ATTACHMENT C

Cooling Power of Wind on Exposed Flesh Expressed as Equivale. Temperature (under calm conditions)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	38	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	Little Danger In < hr with dry skin. Maximum danger of false sense of security.				Increasing Danger Danger from freezing exposed flesh within one minute.				Great Danger Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											

* Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA

000233

WORKING IN EXTREME TEMPERATURES (HOT & COLD)

ATTACHMENT D
Page 1 of 1

ATTACHMENT D

Recommended Work/Warm-up Regime
Maximum Daily Time Limits for Exposure at Low Temperatures

Temperature Range		Maximum Daily Exposure
Celsius	Fahrenheit	
0 to -18	30 to 0	No limit, providing that the person is properly clothed.
-18 to -34	0 to -30	Total work time: 4 hours. Alternate 1 hour in and 1 hour out of the low-temperature area.
-34 to -57	-30 to -70	Two periods of 30 minutes each, at least 4 hours apart. Total low-temperature work allowed: 1 hour. (Note that some difference exists among individuals: one report recommends 15-minute periods—not over 4 periods per 8-hour work shift; another limits periods to 1 hour out of every 4, with low chill factor, i.e., no wind; a third says that continuous operation for 3 hours at -53 has been experienced without ill effect.)
-57 to -73	-70 to -100	Maximum permissable work time: 5 minutes during an 8-hour working day. At these extreme temperatures, completely enclosed headgear, equipped with a breathing tube running under the clothing and down the leg to preheat the air, is recommended.

* Source: NSC Data Sheet [illegible], Cold Peoples Treating of Gasoline and Diesel Engines

000234

HAZARD COMMUNICATION

1.0 GENERAL

A. This policy describes communication of information to employees about the hazardous chemicals to which they may be exposed. Such communication may take the form of a hazard communication program, labels, Material Safety Data Sheets (MSDSs), and training. This program may also be referred to as Right-to-Know or HazCom. This policy implements the requirements of OSHA 29 CFR 1910.1200

B. Chemicals shall be used only for their intended purpose and with the precautions established for their use.

C. All ill effects and/or injuries resulting from the handling and use of chemicals shall be reported promptly to a supervisor who shall send the affected employee to Medical for treatment. The Assistant Emergency Duty Officer (AEDO) shall also be notified.

2.0 RESPONSIBILITIES

FERMCO personnel comply with the requirements of this policy.

3.0 REQUIREMENTS

3.1 Communicating Hazard Information

A. The Safety and Health Organization and management are responsible for communicating information about potential hazards in the workplace.

B. Hazard information must be made readily available to employees through a written hazard communication program (refer to RM-2086). The written hazard communication program is required to include the method by which the following information is to be provided:

- Labels and other forms of warning
- MSDSs
- Employee information and training requirements
- List of the hazardous chemicals known to be present; use MSDS identifiers.
- Methods used to inform employees of the hazards of nonroutine tasks and the hazards associated with chemicals contained in unlabeled pipes in their work areas.
- Additional requirements for multi-employer workplaces (for example, construction contractors).

C. Chemicals shall not be stored near or in the same enclosure with food items and/or their containers such as refrigerators.

D. Periodic checks shall be made of stored chemicals. Useless and/or no longer-needed substances shall be properly disposed of.

HAZARD COMMUNICATION

3.2 Controlling the Purchase of Chemicals

A. Chemicals not approved for purchase, or only approved for purchase under certain conditions, shall include:

- Controlled substances and selected chemicals, Handling of Controlled Substances and Selected Chemicals
- Carcinogens
- Asbestos
- Polychlorinated Biphenyls (PCBs)
- Pesticides requiring application only by a licensed applicator

B. The appropriate MSDS shall be available at the FEMP site prior to the requisitioning of any chemical.

C. When no MSDS is available for the requisitioning of a chemical new to the site, the MSDS shall be generated and authorization from Industrial Hygiene shall be obtained before any purchase is made.

D. Industrial Hygiene shall review and approve all purchase documents for chemicals.

E. Only the type and amount of chemicals required shall be purchased.

3.3 Determining Potential Health Hazards

A. All chemical substances that are produced, used, stored, and/or imported must be evaluated by the manufacturer to determine if they are hazardous. Hazards are determined on the definitions and criteria found in Appendices A and B of OSHA 29 CFR 1910.1200 which includes:

- Carcinogens
- Corrosives
- Highly toxics
- Irritants
- Sensitizers
- Toxic
- Those with target organ effects

B. In addition, FERMCO also evaluates those chemicals such as explosives, peroxide-forming chemicals, or flammable substances.

C. The primary method for hazard evaluation shall be the data supplied by the producer, manufacturer, or vendor of the particular chemical. Therefore, prior to purchasing a new (not previously used) chemical or product, the MSDS for that chemical or product must be obtained by the Requisitioner and reviewed to determine the acceptability of its ingredients and precautions. MSDSs shall be provided to FERMCO by the supplier for every chemical used, or considered for use on site.

HAZARD COMMUNICATION

3.4 Material Safety Data Sheets (MSDSs)

A. An MSDS is required for all hazardous chemicals produced, used, stored and/or imported. An up-to-date MSDS for each hazardous chemical in the workplace must be readily accessible at all times to any employee on site.

B. Personnel shall use and handle chemicals in conformance with the precautions on the container label and the hazards identified on the particular MSDS.

3.5 Container Labels

A. All containers of hazardous chemicals (except for immediate-use portable containers) in the work area must be labeled, tagged, or otherwise marked. Labels are not required on portable containers in which hazardous chemicals are transferred from labeled containers, and that are intended only for the immediate use of the employee who performs the transfer. Labeled containers must display the following information:

- Identity of the hazardous chemicals
- Appropriate hazard warnings (for categories of health, flammability, and reactivity)

B. In addition, if the container is leaving the workplace, the label must also display the name and address of the chemical manufacturer, importer, or other responsible party.

C. The NFPA diamond label is used for a hazard warning at the site.

D. Labels on incoming containers of hazardous chemical should not be removed or defaced.

E. No unlabeled commercial products/substances shall be used. When unlabeled or improperly labeled products are received, supervisors shall be notified to contact the manufacturer.

F. All containers of site-generated hazardous substances shall be labeled. All secondary containers holding employee-placed products shall be labeled.

G. Industrial Hygiene shall be contacted for proper labeling information.

3.6 Training

A. Employees must receive hazard information and training at the time of their initial assignment, whenever a new hazardous chemical is brought into the work area, and if transferring to new or different assignments or areas.

B. Training programs must be kept up-to-date with new information on hazardous chemical as it becomes available. Annual review training for new employees must be documented and include at least the following:

- Requirements of Hazard Communication
- Work procedures or practices for using, handling, and storing hazardous chemicals to prevent exposure
- How to obtain, use, and understand chemical lists, toxicology references, MSDSs, and container labeling system

HAZARD COMMUNICATION

- Hazardous properties, all potential sources of exposure, and potential effects of exposure
- Methods for detecting the presence or release of hazardous chemical into the work area
- Personal protective equipment (PPE) required for routine tasks
- Additional work procedures or practices required for nonroutine tasks; such as, handling spills or releases

3.7 Non-routine Work

A. Where information is beyond and/or outside the expertise of the supervisor, assistance from IH shall be requested.

B. The supervisor shall obtain from IH a Work Permit that states the following:

- The known hazardous chemical present
- The specific mandated precautions

C. Before employees begin work in any area containing unlabeled pipes, the supervisor shall escort employees through the area and:

- Point out the pipes containing the hazardous chemicals
- Review the applicable MSDSs
- Explain the mandated safety precautions

4.0 ATTACHMENTS

None.

PERMIT-REQUIRED CONFINED SPACE PROGRAM

1.0 GENERAL

A. The site uses permits to safeguard working personnel. A permit is required because it formalizes job safety planning both by the supervisor and by safety and/or hygiene personnel. It also serves to advise working personnel of health and safety requirements for the job. Finally, it informs Industrial Hygiene Technicians about the start of a job so they can determine whether job requirements have changed from those anticipated.

B. This procedure outlines the minimum safety requirements for work inside a permit-required confined space (permit space). This program also lists requirements for protecting individuals in a permit space from hazards such as hazardous atmospheres, hazardous materials, moving parts, and blocked escape routes.

C. To qualify as a confined space, a space must meet all of the following requirements: large enough and so configured that a worker may bodily enter and perform work; has limited or restricted means for entry and exit; and not designed for continuous occupancy by personnel.

D. There are many types of confined spaces found at the FEMP site. Confined spaces include but are not limited to storage tanks, process vessels, pits or permanent structures (e.g., silos, vats, degreasers, reaction vessels, furnaces, boilers, ventilation and exhaust ducts, manholes, sewers, tunnels, underground utility vaults and pipelines).

E. A confined space shall be classified as a permit space if it has one or more of the following characteristics: contains or has the potential to contain a hazardous atmosphere, contains a material that has the potential for engulfing an entrant, has an internal configuration such that an entrant could be trapped or asphyxiated, or contains any other recognized serious safety or health hazard.

F. All confined spaces at the FEMP shall be identified as permit spaces and labels affixed to the exterior of the space. This labeling provides instruction that a Confined Space Entry Permit is required to be issued before entry into the permit space may be authorized.

G. A permit space may be re-classified as a non-permit confined space if it does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm. A permit-space may be re-classified as a non-permit space by Industrial Hygiene through completion of a Confined Space Evaluation.

H. Prior to any entry into a confined space, a Confined Space Evaluation must be performed by Industrial Hygiene.

I. Based on the Confined Space Evaluation, if no hazards are present inside the space and no hazard will be created by the work to be performed inside the space, the permit space may be re-classified by Industrial Hygiene as a non-permit confined space.

J. Industrial Hygiene may authorize extended work inside a non-permit space when the potential for hazards do not exist.

K. The goal of the FERMCO permit space program is that prior to any entry into a permit space, every effort should be made to remove any hazard which may be present inside a space as well as any potential hazards so that the space can be re-classified as a non-permit confined space.

PERMIT-REQUIRED CONFINED SPACE PROGRAM

L. Anytime a permit space must be entered and all hazards cannot be removed, a Confined Space Entry Permit shall be issued by Industrial Hygiene prior to any personnel entering the permit space.

M. The FERMCO Permit-Required Confined Space Program shall be reviewed on an annual basis and revised as necessary. Anytime deficiencies are found in the program which may subject personnel to permit space hazards, those deficiencies shall be corrected immediately and the program revised accordingly.

2.0 RESPONSIBILITIES

2.1 Facility Owner

A. Signs the FERMCO Work Permit authorizing the Supervisor-In-Charge to perform the work task in their facility.

B. Ensures that the work site is provided in as safe a condition as practical.

2.2 Supervisor-In-Charge (Entry Supervisor)

A. Identifies the need and initiates the work permit based on the work to be performed.

B. Ensures completion of the work permit by checking that the appropriate entries have been made on the permit, that all tests have been conducted and that all procedures and equipment specified by the permit are in place before signing the permit and allowing entry to begin.

C. Ensures that personnel are trained and adhere to all permit requirements.

D. Immediately reports any unwanted, unplanned event to the Assistant Emergency Duty Officer (AEDO), Emergency Response Team (ERT) and/or the Facility Owner as appropriate.

E. Ensures that Industrial Hygiene personnel are notified of any changes in work site conditions since permit issuance.

F. Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and the consequences of exposure to the hazards.

G. Terminates the entry and cancels the permit when the entry operations have been completed or when a condition that is not allowed under the entry permit arises in or near the permit space.

H. Verifies that the means to summon rescue services are available and operable.

I. Ensures the removal of unauthorized individuals who enter or may enter the permit space during entry operations.

J. Ensure that entry operations remain consistent with the terms of the entry permit whenever responsibility for a permit space entry is transferred and at intervals dictated by the hazards of operations performed within the space.

2.3 Authorized Permit Space Entrant

A. Adheres to all requirements listed on the work permit.

B. Ensures that they have signed section D of the permit stating that they understand all permit requirements.

C. Knows the hazards that may be faced during permit space entry, including information on the mode, signs or symptoms, and consequences of exposure to the hazards.

D. Ensures proper use of equipment required for the permit space entry.

E. Communicates with the standby person as necessary to enable the standby to monitor the status of entrants and to enable the standby to alert entrants of the need to evacuate the space when required.

F. Alerts the standby whenever the entrant recognizes any warning sign or symptom of exposure to a dangerous situation or when the entrant detects a prohibited condition.

G. Exits the permit space as quickly as possible whenever; an order to evacuate is given by the standby or the entry supervisor, the entrant recognizes any warning sign or symptom of exposure to a hazardous condition, the entrant recognizes a prohibited condition, or an evacuation alarm is activated.

2.4 Standby Person

A. Adheres to all requirements listed on the permit.

B. Ensures that they have signed section D of the permit stating that they understand all permit requirements.

C. Notifies personnel in the vicinity, the permit space entrant(s), the entry supervisor, or the Communication Center when the supervisor is not present, when they recognize an emergency or prohibited condition.

D. Knows the hazards that may be faced during permit space entry, including information on the mode, signs or symptoms, and consequences of exposure to the hazard.

E. Ensures awareness of possible behavioral effects of hazard exposure in authorized entrants.

F. Continuously maintains a count of authorized entrants in the permit space and ensures that the names of authorized entrants in the permit space are listed on the entry permit.

G. Remains outside the permit space during entry operations until relieved by another standby person.

H. Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space when necessary.

PERMIT-REQUIRED CONFINED SPACE PROGRAM

I. Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the entrants to evacuate the permit space immediately if a prohibited condition is detected, if the behavioral effects of hazard exposure are detected in entrants, if a situation is detected outside the space that could endanger the entrants, or if the standby cannot effectively and safely perform all their assigned duties.

J. Summons rescue and other emergency services as soon as the standby determines that the entrants may need assistance to escape from permit space hazards.

K. Ensures the following actions are taken when unauthorized persons approach or enter a permit space while entry is underway; warn the unauthorized persons that they must stay away from the permit space, advise the unauthorized persons that they must exit immediately if they have entered the permit space, and inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.

L. Performs non-entry rescue of entrants when required.

M. Performs no duties that might interfere with the standby's primary duty to monitor and protect the authorized entrants.

2.5 Industrial Hygiene Representative

A. Reviews the FERMCO Work Permit (Attachment A) to ensure that it is complete.

B. Inspects the work site for compliance with the conditions listed on the Work Permit.

C. Performs atmospheric testing as required to ensure the proper level of protective equip ent is specified on the permit.

D. Evaluates the confined space and completes the Confined Space Evaluation/Permit and ıemical Hazardous Materials Work Permit (Attachment B) to classify the confined space as permit-required confined space or a non-permit confined space.

E. Completes the Confined Space Entry Permit when required.

3.0 REQUIREMENTS

3.1 Permit Requirements

A. Entry into a confined space occurs when any part of an individual's body breaks the plane of any opening of a confined space.

B. When a "FERMCO Confined Space Evaluation/Permit" is required, a "FERMCO Work Permit" is also necessary (see SPR 2-13).

C. Prior to workers entering a confined space, the supervisor-in-charge must complete and sign a FERMCO Work Permit authorizing entry into the confined space and outlining specific requirements. The Work Permit is valid only for the job, location, and time period specified. permit must be approved by the supervisor, Facility Owner, and IS&H organization.

000242

PERMIT-REQUIRED CONFINED SPACE PROGRAM

D. After completion of the Work Permit, the confined space shall be evaluated by IS&H to determine whether the space is a permit-required confined space or a non-permit space for the work to be performed. The IS&H representative will complete a Confined Space Evaluation classifying the space as a permit space or a non-permit space.

E. When the confined space is classified as a non-permit space, sections 3.2, 3.3, 3.7, and 3.9 through 3.16 of this procedure apply.

F. When the confined space is classified as a permit space, all sections of this procedure apply.

G. All persons entering the permit space, standby personnel, and backup personnel must review and sign the Confined Space Permit. All personnel signing the permit shall be qualified to enter the permit space.

H. The Confined Space Permit must be posted near the entry point of the permit space.

I. If conditions change significantly from those listed on the permit, the entrants shall exit the space, and the permit is no longer valid. The permit shall be terminated and a new permit is required.

J. If any unplanned or unwanted event occurs while performing work under the guidelines of the permit, it must be reported immediately to the Supervisor-in-Charge.

K. When working in a non-permit space, if the conditions change significantly or an unplanned/unwanted event occurs, Industrial Hygiene shall be contacted to re-evaluate the space to determine if it should be re-classified as a permit space.

L. The IH Technician, has the "Stop Work Authority" (terminate the work permit for the job).

M. When Confined Space Permit work has been completed, the space shall be closed and Industrial Hygiene contacted to terminate the permit.

N. Terminated permits shall be returned to IS&H for review and maintained in IS&H files.

3.2 Initiation of FERMCO Confined Space Evaluation/Permit

A. SUPERVISOR-IN-CHARGE

Contact Industrial Hygiene for an IH Technician to perform the initial evaluation.

B. INDUSTRIAL HYGIENE TECHNICIAN

- Check the completeness of the "FERMCO Work Permit" which is posted at the job site.
- Check other permits which must be posted, and verifies that their expiration date has not passed.
- Complete the required atmospheric tests.
- Complete section "D" of the Work Permit specifying the proper personal protective equipment required for the work to be performed.

000243

PERMIT-REQUIRED CONFINED SPACE PROGRAM

- Complete the applicable portions of Sections "A" and "B" of the Confined Space Evaluation/Permit, and signs in the appropriate block(s).

C. SUPERVISOR-IN-CHARGE

- Ensure that all employees on the job have read and understand the required precautions and required PPE.
- Ensure that all employees on the job have signed the permit in block "D".
- Note permit expiration date(s)/time(s).
- Sign the permit.
- Post the original at the job site, and distributes the copies as indicated on the form.

3.3 Renewal of FERMCO Confined Space Evaluation/Permit

A. SUPERVISOR-IN-CHARGE

Contact an IH Technician to perform a re-evaluation of the permit space.

B. INDUSTRIAL HYGIENE TECHNICIAN

- Check the completeness of the "FERMCO Work Permit" which is posted at the job site.
- Check other permits which must be posted, and verifies that their expiration date has not passed.
- Complete the required atmospheric tests.
- Check section "D" of the posted Work Permit verifying that the specified personal protective equipment (PPE) is proper for the work to be performed. If necessary, PPE requirements should be modified as appropriate. The Technician will initial any changes in PPE required.
- Complete the applicable portions of Sections "A" and "B" of the Confined Space Evaluation/Permit, and signs in the appropriate blocks.

C. SUPERVISOR-IN-CHARGE

- Ensure that any new employees on the job have read and understand the required precautions and required PPE.

  Note: If the required precautions or PPE have changed, all employees on the job are considered to be new employees.

- Ensure that all new employees on the job have signed the permit in block "D".
- Note permit expiration date(s)/time(s).
- Sign the permit.

000244

- Post the original and distributes the copies as indicated on the form.

  Note: Both an unexpired permit and the signature of each employee on the job must be posted at the job site. This will usually require that more than one "FERMCO Confined Space Evaluation/Permit" must be posted. The supervisor may prefer to have all employees sign the permit each time it is issued.

3.4 Rescue Plan

A rescue plan must be developed and reviewed by the entry supervisor with all personnel entering a permit space and all standby personnel. The rescue plan must include the following:

A. Who and how to call for assistance in case of emergency (phone 6511; radio Control, or pull nearest fire alarm pullbox).

B. How persons are to be removed from the permit space in case of emergency.

3.5 Rescue Procedures

A. If a person inside a permit space is unconscious, it shall be assumed that there is a hazardous atmosphere present in the space. The standby person should not enter the confined space, but should try to remove the person by non-entry rescue using the safety harness and retrieval system.

B. For emergency situations on the FEMP site, the Communication Center shall be notified by radio, telephone (extension 6511), or by pulling the lever of the nearest fire alarm pullbox. The Communication Center shall be told that the Emergency Response Team (ERT) is needed because a person is down and/or injured inside a confined space. The ERT officer shall evaluate the situation and determine the rescue method to be used.

C. When rescuing an unconscious victim, self-contained breathing apparatus (SCBA) shall be worn by every individual conducting the rescue inside the confined space, and shall be available for each backup individual. A safety harness and lifeline shall be worn by any rescue personnel entering the confined space, unless the harness and lifeline would not assist in the rescue procedure.

D. Any rescue situation involving the use of SCBA shall include a backup person outside the confined space at all times to: monitor the rescue efforts; maintain unobstructed lifelines; and communicate with all personnel inside the space.

E. The designated standby person shall not enter the permit space for rescue purposes unless told to do so by the Emergency Response Team officer. The standby person shall not make even an ordered entry into the confined space unless wearing the proper personal protective equipment.

F. Under no circumstance shall the standby person enter the permit space until a backup standby person is at the entrance of the permit space.

G. When developing a rescue plan for permit space work off the FEMP site, special arrangements need to be made. Offsite emergency response personnel may need to be notified of the permit space work. Mutual aid response arrangements may need to be made to deal with permit space rescue situations.

PERMIT-REQUIRED CONFINED SPACE PROGRAM

H. Consult the Fire Protection and Emergency Response organization for additional information on rescue procedures.

3.6 Training

A. All personnel entering a permit space, standby personnel, and backup standby personnel shall be provided training so they acquire the understanding, knowledge, and skills necessary for the safe conduct of permit space work.

B. This training shall include instruction on the nature of permit space hazards; the mode, signs or symptoms, and consequences of exposure to hazardous conditions; the precautions to be taken to avoid incidents; and the use of emergency and personal protective equipment required to work inside a permit space.

C. Training shall be provided before an employee is first assigned duties for a permit space entry.

D. Additional training shall be provided whenever there is a change in permit space operations which presents a hazard which the employees entering the permit space have not previously been trained or whenever a deviation from permit space entry procedures indicate that a worker's knowledge or use of permit space procedures are inadequate.

3.7 Evaluating the Confined Space Hazards

A. Prior to personnel entering a confined space, the space shall be evaluated by Industrial H to determine whether any hazards may be present inside the space.

B. The hazards or potential hazards which may be present inside a permit space are: the space may contain or have the potential to contain a hazardous atmosphere, contain a material that has the potential for engulfing an entrant, has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or a floor which slopes downward and tapers to a smaller cross-section, or contains any other recognized serious safety or health hazard.

C. The confined space shall be evaluated with respect to its previous contents to ensure that the necessary ventilation, protective clothing, respiratory equipment, and fire prevention precautions are specified and provided.

3.8 Alternate Permit Space Entry Procedure

A. When a permit space has been evaluated, and the only hazard identified within the space is the potential for the development of a hazardous atmosphere, the following alternate procedures may be used to reduce the requirements for the permit space entry: the atmosphere within the permit space shall be controlled through the use of forced air ventilation from a clean air supply and the atmosphere within the space shall be continuously monitored to ensure the atmosphere within the space remains safe for entry.

B. When this alternate procedure is used to work in a permit space, a Confined Space Entry Permit shall be issued and all personnel performing the permit space work shall have completed training as required by section 3.6. Other sections of this SPR may apply when required by the supervisor-in-charge and/or the IH Technician authorizing the permit space entry.

PERMIT-REQUIRED CONFINED SPACE PROGRAM

3.9 Testing the Atmosphere

A. The atmosphere in the confined space must be tested by IH prior to personnel entering the space, and special care must be taken to ensure that all accessible areas of the confined space are sampled. IH must determine the type and frequency of sampling which is required during the entry. Atmospheric testing may also be required in the area outside the space.

B. The atmosphere must meet the following conditions for entry;

- Oxygen - 19.5 percent minimum, 23.5 percent maximum
- Flammable gases - less than 10 percent of the lower explosive limit (LEL)
- Toxic gases - less than one-half OSHA permissible exposure limit or the ACGIH threshold limit value (whichever is more stringent)
- Radioactivity - not to exceed limits established by Radiation Control

C. If the above atmospheric conditions are not attainable, ensure that a special job plan is written. The job plan must be approved by the IS&H organization.

D. Continuous atmospheric testing for oxygen and flammable gases shall be performed while personnel are working inside permit spaces. Continuous and/or periodic atmospheric testing shall be conducted for other contaminants when necessary.

E. If work inside the permit space could generate flammable vapors or produce an oxygen-deficient or hazardous atmosphere, the space shall be provided with continuous forced ventilation and the atmosphere shall be tested continuously with an instrument capable of producing an audible alarm while work is being performed inside the permit space.

F. Smoking is not allowed in a confined space or in areas immediately adjacent to entrances of confined spaces.

G. No internal combustion pumps, generators, or blowers shall be used in any confined space. Observe caution when locating this equipment near the openings of confined spaces due to the possibility of carbon monoxide entering the space.

H. Consult the IS&H organization for additional information on toxic or explosive vapors.

3.10 Lock and Tag

A. Follow the steps outlined in SPR 2-24 for lockout and tagout of process systems before entry into a confined space.

B. Take confined space drive or agitator out of service by uncoupling the drive, removing belts, or disconnecting the motor leads.

3.11 Low-Voltage Lighting and Electrical Equipment

A. Low-voltage (12 volt) lighting is preferred for use inside a confined space. All other lighting sources must be protected by an approved ground fault circuit interrupter (GFCI). All electrical tools used inside a confined space must be protected by an approved GFCI.

PERMIT-REQUIRED CONFINED SPACE PROGRAM

B. Lighting and tools should be on separate circuits. The GFCI, transformer, and disconnects must be located outside the confined space. For more information on using GFCI devices, see SPR 2-23, Ground Fault Circuit Interrupters.

C. Adequate lighting shall be provided for the work to be performed in the confined space and shall meet the illumination requirements of 29 CFR 1910.120.

D. All flashlights and/or lamps shall be approved for use in the atmosphere within the confined space.

E. All electrical equipment shall be in good condition, grounded, protected against physical abuse, and approved for the atmosphere in which it is to be used.

F. All potential for ignition in confined spaces shall be removed.

3.12 Grounding Cable

If the confined space is equipped with a grounding cable, it must be Megger tested to confirm the existence of a firm mechanical joint.

3.13 Process Isolation

All pipe lines to the confined space must be physically disconnected or blanked before en accordance with SPR 2-24.

3.14 Cleaning Procedures

A. No confined space shall be entered which contains an IDLH atmosphere.

B. All noxious, toxic and/or flammable material, gases and vapors shall be eliminated as much as possible from tanks and other confined spaces by such methods as washing, inerting, neutralizing, purging or ventilating.

C. Continuous forced ventilation from a clean air source shall be provided in such a manner to maintain the confined space safe for entry.

3.15 Barriers/Barricades

A. When personnel working inside a confined space may be exposed to hazards from vehicle or pedestrian traffic, barricades shall be established around the opening of the space.

B. Where appropriate, barricades shall be established around the entry of a confined space to prevent unauthorized entry into the space.

C. All barricades and barricade tags shall be used in accordance with SPR 2-15.

3.16 Ladders

When ladders are required for entry into confined spaces, they shall be secured and shall n removed while persons are inside the confined space except in response to an emergency.

000248

PERMIT-REQUIRED CONFINED SPACE PROGRAM

3.17 Safety Harness

All persons entering a permit space must wear a safety harness and lifeline. Where the entrance is too restricted to allow removal of a person equipped with safety harness, use a shoulder-type safety harness or a wrist harness.

3.18 Lifelines

When making a vertical entry into a permit space which is five (5) feet or deeper, fall protection is required. Due to the configuration of a permit space or the large number of people involved, it may not be practical to keep lifelines attached. In such cases, the safety harness must be worn, and the lifeline must be kept ready at the permit space exit point in case of emergency.

3.19 Personal Safety and Escape Equipment

Personnel who work inside a permit space, including all standby personnel, must be aware of personal safety, escape procedures, and equipment.

3.20 Respirators

A. Respiratory protection shall be determined based on atmospheric testing performed as part of the confined space evaluation. The need for 5-minute escape air packs should be considered for personnel entering the permit space. A SCBA or air-supplied respirator equipped with escape provisions must be available in case rescue assistance is needed.

B. Only those persons trained to use SCBAs shall use them for permit space entry or rescue.

3.21 Standby Person

A. A minimum of one standby person must be at the entry point to the permit space. The standby person's primary responsibility is to be attentive to the personnel inside the permit space. The standby person shall make every effort to constantly observe workers who are in the permit space. There shall be constant communication between persons working in the permit space and the standby person. Two-way radios may be required for communication during some entry operations.

B. A standby person shall not be assigned to observe work being conducted in more than one permit space at a time. If work must be performed simultaneously in multiple permit spaces, one standby person must be assigned to cover each separate entry.

C. The standby person shall know the location of the nearest telephone, fire alarm pullbox, safety shower, fire extinguisher, and evacuation exit; the practices or procedures to shut down all equipment on the job; be observant to determine any malfunction of the respiratory equipment in use by personnel inside the permit space; and the way to contact the ERT in an emergency.

D. The standby person should be observant of activities outside the permit space. Unauthorized personnel should not be allowed around the permit space during authorized entry. Unplanned activities outside the permit space may require evacuation of the permit space. The permit space shall immediately be evacuated if any building alarm (e.g., evacuation, fire) is activated.

PERMIT-REQUIRED CONFINED SPACE PROGRAM

3.22 Backup Standby Person

In case of an emergency during a permit space entry and the ERT would not be immediately available, one or more backup standby person(s) must be available to assist the standby person to perform a non-entry rescue of entrants inside the permit space.

3.23 Protective Clothing and Equipment

If entry is required to clean the permit space, the appropriate protective clothing and equipment shall be provided to the workers performing the entry.

3.24 Breathable Atmosphere

A. A breathable atmosphere should be maintained inside a permit space through use of either natural draft or forced fresh air ventilation. Compressed air must not be blown into a permit space.

B. Air-supplied respiratory equipment with escape provisions is required when entering a permit space where there is the potential for an oxygen deficiency (less than 19.5 percent).

3.25 Welding and Burning

A. Personnel involved in welding or burning inside a confined space must consider personal safety, equipment requirements, and potentially hazardous conditions. An Open Flame/Welding Permit is required for all welding and burning operations (see SPR 2-57).

B. Welding or burning operations inside a confined space will result in the space being classified a permit space.

C. When burning inside a confined space, locate all cylinders outside the space. Check hose connections for leakage prior to entry. When welding inside a confined space, locate welding machines outside the space. Remove all hoses from the confined space at the end of the work shift unless multishift work is in progress.

D. Where welding/cutting operations are indefinitely suspended, all gas and/or electrical supply to equipment used in the confined space shall be shut off, and all torches, leads and hoses shall be removed from the area.

E. No welding equipment except hoses, stingers, torches and lead cable shall be taken into the confined space.

F. All welding and burning equipment taken into a confined space shall have shutoffs the standby person can control to quickly secure the gas and/or electric supply.

3.26 Shell Material

Consider the possibility of flammable, explosive, or toxic materials being absorbed into the shell material of the confined space prior to burning or welding.

3.27 Stripping Toxic Coatings

Strip all surfaces covered with toxic coatings at least 6 inches from the area of heat application. If toxic coatings are not stripped, protect employees with air-supplied respirators, ventilation, and, if applicable, protective clothing.

000250

Attachment 4

PERMIT-REQUIRED CONFINED SPACE PROGRAM

3.28 Fume Releases

The Confined Space Permit is automatically cancelled in the event of any plant emergency alarm or area fire alarm (except a test alarm). Personnel inside the permit space must exit the space and follow emergency procedures. When the "all clear" has sounded, the Confined Space Permit can be reinstated after atmospheric tests are retaken and the results are noted on the permit.

3.29 Non-FERMCO Personnel Working in Permit Spaces

A. Non-FERMCO personnel who may enter a permit space controlled by FERMCO shall be required to follow all the requirements of this SPR.

B. FERMCO shall inform non-FERMCO personnel that permit spaces are located in their work area and that permit space entry is only allowed through compliance with this SPR.

C. FERMCO shall inform non-FERMCO personnel of any hazards identified in a permit space that they may be required to enter.

D. FERMCO shall inform non-FERMCO personnel of any precautions or procedures which FERMCO has implemented for the protection of workers in or near the permit space.

E. FERMCO shall coordinate entry operations when both FERMCO and non-FERMCO personnel will be working in or near permit spaces so that workers of each company do not endanger each other during permit space entry activities.

F. FERMCO will debrief non-FERMCO personnel at the conclusion of entry operations regarding any hazards confronted or created in permit spaces during entry operations.

4.0 ATTACHMENTS

Attachment A: FERMCO Work Permit
Attachment B: FERMCO Confined Space Evaluation/Permit and Chemical Hazardous Materials Work Permit

PERMIT-REQUIRED CONFINED SPACE PROGRAM

ATTACHMENT A
Page 1 of 1

FERMCO Work Permit

FERMCO
WORK PERMIT

WORK PERMIT NUMBER

SECTION A - BACKGROUND INFORMATION *(Completed by Supervisor-in-Charge)*

WORK NUMBER	JOB START DATE	ESTIMATED COMPLETION DATE
CONSTRUCTION WORK ORDER NUMBER	COMPANY	EXACT LOCATION

EXACT DESCRIPTION OF WORK

SUPERVISOR-IN-CHARGE NAME	BADGE NUMBER	PHONE/RADIO NUMBER
PROJECT ENGINEER/CONSTRUCTION COORDINATOR	BADGE NUMBER	PHONE/RADIO NUMBER

SECTION B - TYPES OF PERMITS REQUIRED *(Completed by Supervisor in Charge)*

- ☐ OUTAGE
- ☐ ASBESTOS (posted)
- ☐ CONFINED SPACE (posted)
- ☐ HAZARDOUS WORK (posted)
- ☐ PENETRATION
- ☐ CHEM/HAZ MATERIAL (posted)
- ☐ OPEN FLAME/WELDING (posted)
- ☐ RADIATION (posted)

SECTION C - GENERAL PRECAUTIONS *(Completed by Supervisor-in-Charge)*

	REQ'D.	DNA
PRELIMINARY		
1. Check for Utilities	☐	☐
2. Health & Safety Plan	☐	☐
3. Work Plan	☐	☐
4. Working surface safe for mud (especially roof work)	☐	☐
5.	☐	☐
ENERGY CONTROL (Lock & Tag)		
6. Electrical	☐	☐
7. Chemical	☐	☐
8. Mechanical	☐	☐
9. Other (Steam, etc.)	☐	☐
10. Specific Equipment Plan Required	☐	☐
11.	☐	☐
ACCIDENT PREVENTION		
12. Fire Extinguisher	☐	☐
13. Safety Shower Operable & Less Than 100 ft. Away	☐	☐
14. Eye Wash Operable & Less Than 100 ft. Away	☐	☐
15. Spill Protection	☐	☐
16. Communications	☐	☐
17. Magnetic Survey for Buried Utilities/Objects	☐	☐
18.	☐	☐
19.	☐	☐
AREA ISOLATION		
20. Area Barricades	☐	☐
21. Signs (PPE)	☐	☐
22. Signs (Warning)	☐	☐
23.	☐	☐
24.	☐	☐
OTHER CONTROLS		
25. Exhaust Ventilation	☐	☐
26. Supplied Air Ventilation	☐	☐
27. GFCI	☐	☐
28. Screen/Shield	☐	☐
29. Non-Sparking Tools	☐	☐
30. Intrinsically Safe Equipment	☐	☐
31.	☐	☐

NO.	DISTRIBUTION OF COPIES
1	Post at Job (OS&H Copy)
2	Supervisor in Charge
3	OS&H Field Copy

SECTION C (CONTINUED)

EGRESS/FALL PROTECTION	REQ'D.	DNA
32. Ladder	☐	☐
33. Scaffolds/Railings	☐	☐
34. High Lift Platform	☐	☐
35. Safety Belt	☐	☐
36. Safety Harness	☐	☐
37. Safety Line	☐	☐
38. Tripod/Retrieval System	☐	☐
39.		
40.		

SECTION D1 - TASK/AREA/LOCATION *(If PPE requirements depend on these)*

1.
2.
3.
4.

SECTION D2 - PPE REQUIRED *(Completed by OS&H)*

HEAD PROTECTION ☐ None	___ Hard Hat	___ Face Shield	___ Glasses
	___ Goggles	___ Welding Goggles	
GLOVES ☐ None	___ Cotton	___ Leather Palm	___ Rubber
	___ Nitrile	___ Viton	___ Neoprene
	___ Vinyl Liner	___ Other:	
PROTECTIVE CLOTHING ☐ None	___ Level A	___ Paper	___ Acid Splash Suit
	___ Level B	___ Tyvek	___ Fire Retardant
	___ Level C	___ Saranex	___ Shoe Covers
	___ Level D	___ Other:	
RESPIRATOR ☐ None	___ Full Face	___ Belt-Mount Half Mask	___ Hooded Air Line
	___ Half Mask	___ Air Line w/Escape	___ SCBA
	___ PAPR	___ Air Line w/Dual Flow	___
CARTRIDGE ☐ None	___ HEPA	___ Organic/HEPA Comb	___ Acid Gas
	___ HF Canister	___ Organic Vapor	___ Mercury
	___ Ammonia	___	___
OTHER ☐ None	___ Ear Plugs	___ Cool Vest	___ Steel-Toe Boots
	___ Ear Muffs	___	___

SUPERVISOR-IN-CHARGE SIGNATURE	BADGE NUMBER	DATE
HSAS SIGNATURE	BADGE NUMBER	DATE

WORK TASK REVIEWED, APPROVAL TO PERFORM WORK

FACILITY OWNER'S SIGNATURE	BADGE NUMBER	DATE

IN CASE OF EMERGENCY: CALL "CONTROL" BY RADIO, PHONE 6511, OR USE NEAREST FIRE ALARM BOX.

PERMIT TERMINATION (WORK COMPLETED/JOB CONDITIONS HAVE CHANGED)

SUPERVISOR-IN-CHARGE SIGNATURE	DATE

Return Copy 1 to OS&H (MS 631)

PERMIT-REQUIRED CONFINED SPACE PROGRAM

ATTACHMENT B
Page 1 of 1

FERMCO Confined Space Evaluation/Permit and Chemical Hazardous Materials Work Permit

FERMCO
CONFINED SPACE EVALUATION/PERMIT AND CHEMICAL HAZARDOUS MATERIALS WORK PERMIT

WORK PERMIT NUMBER

SECTION A - BACKGROUND INFORMATION (*This permit is only valid when attached to a FERMCO WORK PERMIT*)

TODAY'S DATE | TIME | ESTIMATED COMPLETION DATE

BUILDING/PLANT | LEVEL | COORDINATES | PLANT JOB NUMBER

SECTION B - CONFINED SPACE EVALUATION

HAZARDS OF SPACE
- ☐ HAZARDOUS ATMOSPHERE
- ☐ MECHANICAL/MOVING PARTS
- ☐ SPACE CONFIGURATION/ENTRAPMENT
- ☐ ELECTRICAL
- ☐ ENGULFMENT
- ☐ OTHER: _____

ATMOSPHERIC TEST RESULTS

GAS	ACCEPTABLE ENTRY CONDITIONS	INITIAL CONCENTRATION	PEAK CONCENTRATION	TWA
Oxygen %	19.5 to 23.5			
L.E.L. %	<10%			
CO (ppm)	<25			
H_2S (ppm)	<10			
ALT	<5			

INSTRUMENT ID NUMBER | FIELD CALIBRATION DATE

SPACE HAS BEEN EVALUATED AND ☐ IS ☐ IS NOT A PERMIT-REQUIRED CONFINED SPACE FOR THIS WORK.

IH SIGNATURE: | BADGE NO.:

Contact Industrial Hygiene if there is any change in work activity.

CONFINED SPACE ENTRY PERMIT

Entry/Exit Points Evaluated ☐ Yes

Monitoring Required ☐ Continuous ☐ Periodic

Standby to Worker Communication ☐ Voice ☐ Sight ☐ Radio ☐ Other: _____

Standby to ERT Communication ☐ Radio ☐ Phone ☐ Fire Alarm

PRECAUTIONS	REQ'D.	DNA
Mechanical Ventilation	☐	☐
Additional Lighting	☐	☐
Explosion-Proof Lights	☐	☐
Safety Line & Harness	☐	☐
Retrieval Equipment	☐	☐

SPECIAL INSTRUCTIONS:

IH SIGNATURE | BADGE NUMBER

PERMIT ISSUE DATE | TIME

PERMIT EXPIRATION DATE | TIME

Permit void if conditions change from original issuance conditions!
Call IH to pick up equipment and close permit when finished

PERMIT TERMINATION (*Work Completed/Job Conditions Have Changed*)

IH SIGNATURE | DATE

DISTRIBUTION OF COPIES

1 Post at Job	3 Industrial Hygiene/Industrial Safety
2 Supervisor in Charge	4 Employee Representative

*S-8-0745 (REV 3/13/93)

SECTION C - CHEMICAL/HAZARDOUS MATERIAL PERMIT

NAME OF MATERIAL: | HAZARDOUS COMPONENT:

NAME OF MATERIAL: | HAZARDOUS COMPONENT:

NAME OF MATERIAL: | HAZARDOUS COMPONENT:

1. TYPE OF HAZARD ☐ Chemical ☐ Biological ☐ Physical
2. PHYSICAL STATE ☐ Solid/Dust ☐ Liquid/Mist ☐ Gas/Vapor
3. TYPE OF OPERATION ☐ Sampling ☐ Clean Up ☐ Repair ☐ Inspection ☐ Other _____
4. MSDS REVIEWED ☐ Yes ☐ DNA ☐ Not Available (Hazards Reviewed)
5. POTENTIAL HAZARDS ☐ Skin ☐ Inhalation/Ingestion ☐ Eye ☐ Oxygen Deficiency ☐ Explosive (contact FS if >2%)
6. MONITORING REQUIRED ☐ BZ ☐ GA ☐ Perimeter ☐ Clearance ☐ None ☐ Other _____
7. WORKER-TO-RESCUE COMMUNICATION ☐ Radio ☐ Phone (6511) ☐ Pull Box
8. HYGIENE REQUIREMENTS ☐ Wash Hands at Breaks ☐ Shower at Lunch/End of Shift ☐ Other _____

SPECIAL INSTRUCTIONS:

IH SIGNATURE | BADGE NUMBER

PERMIT ISSUE DATE | TIME | PERMIT EXPIRATION DATE | TIME

Permit Void If Conditions Change Significantly During The Job!

SECTION D - SIGNATURES (*Employees assigned to job*)

I have read and understand all requirements of this permit.

EMPLOYEE(S) SIGNATURE(S)	BADGE NO.	DATE
1.		
2.		
3.		
4.		
5.		
6.		

WORK AUTHORIZATION REVIEWED AND FOUND ACCEPTABLE FOR USE

SUPERVISOR IN CHARGE | DATE | TIME

IN CASE OF EMERGENCY CALL "CONTROL" BY RADIO PHONE 6511, OR USE NEAREST FIRE ALARM BOX.

CHEMICAL HAZARDOUS MATERIAL WORK PERMIT

1.0 GENERAL

This policy outlines the basic requirements for obtaining written authorization and instructions before any work begins which requires: (1) work with hazardous chemicals or materials when the work is not covered by a FERMCO Standard Operating Procedure (SOP), (2) work with hazardous chemicals requiring a permit which includes chemicals, chemical products or hazardous materials for which a Material Safety Data Sheet is required by OSHA and there is a potential for exposure approaching regulatory limits, or (3) work in the vicinity of hazardous chemicals or materials.

2.0 RESPONSIBILITIES

2.1 Facility Owner

A. Ensures that the requirements of the General Precautions section of the FERMCO Work Permit have been completed to address the facility specific hazards for the proposed work task.

B. Ensures that the work site is provided in as safe a condition as practical.

2.2 Supervisor-In-Charge

A. Identifies the need and initiates the work permit based on the work to be performed.

B. Ensures completion of the work permit prior to start of work.

C. Ensures that personnel are qualified and adhere to all permit requirements.

D. Immediately reports any unwanted, unplanned event to the Assistant Emergency Duty Officer (AEDO), Emergency Response Team (ERT) and/or the area supervisor as appropriate.

E. Ensures that Industrial Hygiene (IH) personnel are notified of any changes in work site conditions since permit issuance.

2.3 FERMCO Employees

A. Adheres to all requirements listed on permit.

B. Ensures that they have signed section D of the permit stating that they understand all permit requirements.

C. Notifies personnel in the vicinity, the supervisor-in-charge, or the Communication Center when the supervisor is not present, if they recognize an emergency condition.

2.4 Industrial Hygiene Representative

A. Reviews the FERMCO Work Permit to ensure that it is complete.

B. Inspects the work site for compliance with the conditions listed on the Work Permit.

C. Performs atmospheric testing as required to ensure that the proper level of protective equipment is specified on the permit.

CHEMICAL HAZARDOUS MATERIALS WORK PERMIT

D. Completes the Chemical Hazardous Materials Work Permit.

3.0 REQUIREMENTS

3.1 Permit Requirements

The site uses permits to safeguard working personnel. A permit is required because it formalizes job safety planning both by the supervisor and by safety and/or hygiene personnel. It also serves to advise working personnel of health and safety requirements for the job. Finally, it informs safety and hygiene inspectors about the start of a job so they can determine whether job requirements have changed from those anticipated.

A. Situations which require a permit include:

Use of materials containing carcinogens (see SPR 5-12), work with biological hazards (see 5-10), use of solvents (> 1 pint), work with mercury, lead, cadmium, arsenic or other toxic metals, (or materials containing these), coal tar pitch, benzene, toluene diisocynate (TDI), methylene bisphenyl isocynate (MDI), and others identified specifically in OSHA 1910 and 1926.

B. Situations which do not require a permit include:

- Incidental use of paints
- Application of latex paints
- Incidental use of chemical products in routine Maintenance activities

C. Industrial Hygiene shall be contacted when questions arise regarding the need for a permit.

D. When a "FERMCO Chemical Hazardous Materials Work Permit" is required, a "FERMCO Work Permit" is also necessary [see SPR 2-13].

E. Required Permits shall be posted at the job site.

F. Chemical/Hazardous Material Permits expiration date shall be determined by Industrial Hygiene. It may be as long as the estimated completion date of the project.

G. Work involving hazardous materials (that are applicable to OSHA Standard 29 CFR 1910.120) will require a completed Specific Health and Safety Plan with an all worker safety meeting briefing before work can begin.

H. The period of validity for the permit is shown in the "Permit Expiration Date" block. Work covered by several permits may have several different expirations dates. In this case, only the expired permit must be renewed.

I. Supervisors shall maintain contact with their personnel, who are working alone, through the use of a portable radio or frequent visits to the job site. (Caution should be used when operating 2-way radios as their use is restricted in some plant areas.)

J. If conditions change significantly from those listed on the permit, the permit is no longer valid, and a new permit is required.

CHEMICAL HAZARDOUS MATERIAL WORK PERMIT

K. If any unplanned or unwanted event occurs while performing work under the guidelines of this permit, it must be reported immediately to the Supervisor-in-Charge or the AEDO.

L. The IH Technician, has the "Stop Work Authority" (suspend the work permit of the job).

M. Expired permits shall be kept in the job file.

3.2 Initiation of FERMCO Chemical Hazardous Material Work Permits

A. SUPERVISOR-IN-CHARGE

Contacts Industrial Hygiene for an IH Technician to perform the initial inspection.

B. INDUSTRIAL HYGIENE TECHNICIAN

- Check the completeness of the "FERMCO Work Permit" which is posted at the job site.
- Check other permits which must be posted, and verifies that their expiration date has not passed.
- Complete the required tests.
- Complete the applicable portions of Sections "A" and "C" of the permit, and signs in the appropriate block(s).

C. SUPERVISOR-IN-CHARGE

- Ensure that all employees on the job have read and understand the required precautions and required PPE.
- Ensure that all employees on the job have signed the permit in block "D".
- Note permit expiration date(s).
- Sign the permit.
- Post the original at the job site, and distributes the copies as indicated on the form.

3.3 Renewal of FERMCO Chemical Hazardous Material Work Permits

A. SUPERVISOR-IN-CHARGE

Contact an IH Technician to perform the inspection.

B. INDUSTRIAL HYGIENE TECHNICIAN

- Check the completeness of the "FERMCO Work Permit" which is posted at the job site.
- Check other permits which must be posted, and verifies that their expiration date has not passed.
- Complete the required tests.

CHEMICAL HAZARDOUS MATERIALS WORK PERMIT

- Complete the applicable portions of Sections "A" and "C" of the permit, and signs in the appropriate blocks.

C. SUPERVISOR-IN-CHARGE

- Ensure that any new employees on the job have read and understand the required precautions and required PPE.

  Note: If the required precautions or PPE have changed, all employees on the job are considered to be new employees.

- Ensure that all new employees on the job have signed the permit in block "D".

- Note permit expiration dates.

- Sign the permit.

- Post the original and distributes the copies as indicated on the form.

  Note: Both an unexpired permit and the signature of each employee on the job must be posted at the job site. This will usually require that more than one "FERMCO Chemical Hazardous Materials Work Permit" must be posted. The supervisor may prefer to have all employees sign the permit each time it is issued.

3.4 General Requirements

A. Each employee must be shown the location and ensured the operability of the nearest exit, safety shower and eye-wash station prior to starting work.

B. Entire work areas shall be barricaded as well as adjacent areas that could potentially be exposed. For line breaks, the volume and pressure of the system must be considered when placing barricades.

C. Required PPE and clothing shall be indicated on the chemical hazardous material work permit. Employees must be trained in the use of special protective equipment such as air-supplied respirators, self contained breathing apparatus, and respirators. Protective equipment must be worn until the line is broken and the system has been cleared.

D. Respirators must be worn where concentrations of a toxic substance might exceed allowable units. Contact the Industrial Safety and Health (IS&H) Section office for assistance.

E. Employees must be instructed in emergency first-aid procedures; i.e., washing or applying cold packs. Employees must report to site medical if any hazardous process or other toxic substances comes in contact with eyes, skin, clothing, or shoes, or if they inhale a hazardous process or other toxic substances.

F. No subcontractor employee may begin making a line break until they have received an acknowledged understanding of specific safety instruction from their supervisor.

CHEMICAL HAZARDOUS MATERIAL WORK PERMIT

G. Service contractors, operations personnel, etc., shall remain outside barricades; i.e., if they are required to be in the barricaded area, they shall be protected by the same clothing and equipment as the person(s) making the line break.

H. It shall be the responsibility of the pipe fitter supervisor to determine if a standby worker is required and designate personal protective equipment to be worn by the standby worker. The permit must specify both if a standby worker is required and what personal protective equipment is to be worn.

I. All efforts shall be made to ensure that no unknown substances, chemicals, or processes are in the system. A method shall be planned for collecting, or containing and disposing of spilled materials.

J. Standard practice for breaking a flange is to loosen the bolts on the lower and opposite side from the mechanic, keeping the bolts nearest the mechanic under control and allowing the line to separate in a manner that causes any spillage to be away from the mechanic. The flange should then be spread apart. The mechanic should always be positioned on the upwind side of the flange being broken.

K. When a valve bonnet is removed, the line must be drained and the valve placed in the open position before the bonnet bolts are loosened. Ball and plug valves that are to be removed from the system must be opened, closed, and reopened to relieve pressure after the line is drained.

L. If a plugged condition is discovered or suspected, stop work immediately and develop a plan to dislodge the plug. A new evaluation and permit may need to be issued of working conditions have changed.

3.5 Acid Suits

A. Acid suits shall consist of rubber boots, pants, jacket, long gauntlet gloves, and hood. Acid suits shall be issued to employees through the S&F Services and returned.

B. A complete acid suit shall be worn when disconnecting and removing lines or equipment pieces which have contained acid or base (caustic). All will be specified on the line break permit.

C. Acid suits shall be approved by the Industrial Hygiene group prior to purchase.

D. Prior to wearing the acid suit, each employee shall be instructed by the foreman to:

- Inspect suit for physical defects prior to wearing. Do not use a defective suit.
- Put suit on and check for leaks by standing under operating shower. (If suit leaks, it is defective or was put on improperly.)
- Locate and test safety shower nearest the work location or decontamination shower when safety shower is not available.
- Return to nearest safety shower after performing work and with the suit still on, rinse suit to remove any hazardous materials which might have gotten on it.
- Store suit in proper place afterwards and make sure it is not contaminated or physically damaged.
- Never tuck pant legs of acid suits inside of rubber boots.

CHEMICAL HAZARDOUS MATERIALS WORK PERMIT

3.6 Hot Suits

A. Hot suits shall consist of boots, gloves, hood, one-piece coverall, jacket, and pants. Hot suits shall be issued to employees through the tool room or otherwise signed for and returned.

B. Hot suits shall be approved by the Industrial Safety group prior to purchase.

C. To store, hang hot suits on hangers so they are not creased. This will reduce the possibility of physical damage.

D. Prior to wearing the hot suit, each employee shall be instructed by the foreman on the following:

- Inspect hot suit for physical defects (facepiece must be clear) prior to donning. Do not use a defective suit.
- While performing assigned work, keep complete hot suit on until job is finished. If sprayed with hot liquid, take measure to cool liquid before removing hot suit.
- A minimum 10-foot barricade is required around all hot suit jobs.

3.7 Preparing and Authorizing First Line Breaks

A. The CRU manager or designee must determine the need for and ask the pipe fitter supervisor or construction manager for line or system breaks.

B. The CRU must use a lockout plan identifying break points and must physically mark each break point with the pipe fitter supervisor. The CRU and the pipe fitter supervisor must agree on the location of the first breaks.

C. A chemical/hazardous materials work permit shall be issued to specify precautions and safety equipment required to perform the line break.

D. CRU personnel must close isolating valves and stop pumps. The system must be locked, tagged, tried and tested per SPR 2-24.

E. Where possible, the CRU must depressurize, drain, flush and vent to prepare the system for safe opening.

F. If the pipe fitter supervisor and the CRU manager agree that subcontractors will do the work, a chemical/hazardous material work permit must be completed and signed (see Attachment A). Employees assigned to the work must sign the permit indicating they understand job requirements and potential hazards.

G. Only employees who have been approved by the pipe fitter supervisor and trained to make first line breaks may perform this type of work. A list of approved employees must be maintained by the pipe fitter supervisor.

H. The pipe fitter supervisor and the CRU manager or designee must be present when the first break is made.

CHEMICAL HAZARDOUS MATERIAL WORK PERMIT

4.0 ATTACHMENTS

Attachment A: FERMCO Confined Space and Chemical Hazardous Materials Work Permit.

5904

FERMC

CHEMICAL HAZARDOUS MATERIALS WORK PERMIT

ATTACHMENT A
Page 1 of 1
FERMCO Confined Space and Chemical Hazardous Materials Work Permit.

FERMCO
CONFINED SPACE EVALUATION/PERMIT AND CHEMICAL HAZARDOUS MATERIALS WORK PERMIT

WORK PERMIT NUMBER

SECTION A - BACKGROUND INFORMATION (This permit is only valid when attached to a FERMCO WORK PERMIT)

TODAY'S DATE | TIME | ESTIMATED COMPLETION DATE

BUILDING/PLANT | LEVEL | COORDINATES | PLANT JOB NUMBER

SECTION B - CONFINED SPACE EVALUATION

HAZARDS OF SPACE
- ☐ HAZARDOUS ATMOSPHERE
- ☐ MECHANICAL/MOVING PARTS
- ☐ SPACE CONFIGURATION/ENTRAPMENT
- ☐ ELECTRICAL
- ☐ ENGULFMENT
- ☐ OTHER: _____

ATMOSPHERIC TEST RESULTS

GAS	ACCEPTABLE ENTRY CONDITIONS	INITIAL CONCENTRATION	PEAK CONCENTRATION	TWA
Oxygen %	19.5 to 23.5			
L.E.L. %	<10%			
CO (ppm)	<25			
H_2S (ppm)	<10			
ALT	<5			

INSTRUMENT ID NUMBER | FIELD CALIBRATION DATE

SPACE HAS BEEN EVALUATED AND
☐ IS ☐ IS NOT A PERMIT-REQUIRED CONFINED SPACE FOR THIS WORK

OS&H SIGNATURE | BADGE NO

Contact OS&H if there is any change in work activity.

CONFINED SPACE ENTRY PERMIT

Entry/Exit Points Evaluated ☐ Yes

Monitoring Required ☐ Continuous ☐ Periodic

Standby to Worker Communication ☐ Voice ☐ Signal ☐ Radio ☐ Other _____

Standby to ERT Communication ☐ Radio ☐ Phone ☐ Fire Alarm

PRECAUTIONS	REQ'D.	ONA
Mechanical Ventilation	☐	☐
Additional Lighting	☐	☐
Explosion-Proof Lights	☐	☐
Safety Line & Harness	☐	☐
Retrieval Equipment	☐	☐

SPECIAL INSTRUCTIONS

OS&H SIGNATURE | BADGE NUMBER

PERMIT ISSUE DATE | TIME

PERMIT EXPIRATION DATE | TIME

Permit void if conditions change from original issuance conditions!
Call OS&H to pick up equipment and close permit when finished!

PERMIT TERMINATION (Work Completed/Job Conditions Have Changed)

OS&H SIGNATURE | DATE

DISTRIBUTION OF COPIES

1. Post at Job
2. Supervisor in Charge
3. OS&H Field Copy

SECTION C - CHEMICAL/HAZARDOUS MATERIAL PERMIT

NAME OF MATERIAL | HAZARDOUS COMPONENT

NAME OF MATERIAL | HAZARDOUS COMPONENT

NAME OF MATERIAL | HAZARDOUS COMPONENT

1. TYPE OF HAZARD ☐ Chemical ☐ Biological ☐ Physical
2. PHYSICAL STATE ☐ Solid/Dust ☐ Liquid/Mist ☐ Gas/Vapor
3. TYPE OF OPERATION ☐ Sampling ☐ Clean Up ☐ Repair ☐ Inspection ☐ Other _____
4. MSDS REVIEWED ☐ Yes ☐ ONA ☐ Not Available (Hazards Reviewed)
5. POTENTIAL HAZARDS ☐ Skin ☐ Inhalation/Ingestion ☐ Eye ☐ Oxygen Deficiency ☐ Explosive (contact FS if >2%)
6. MONITORING REQUIRED ☐ BZ ☐ QA ☐ Perimeter ☐ Clearance ☐ None ☐ Other _____
7. WORKER-TO-RESCUE COMMUNICATION ☐ Radio ☐ Phone (6611) ☐ Pull Box
8. HYGIENE REQUIREMENTS ☐ Wash Hands at Breaks ☐ Shower at Lunch/End of Shift ☐ Other _____

SPECIAL INSTRUCTIONS

IH SIGNATURE | BADGE NUMBER

PERMIT ISSUE DATE | TIME | PERMIT EXPIRATION DATE | TIME

Permit Void If Conditions Change Significantly During The Job

SECTION D - SIGNATURES (Employees assigned to job)

I have read and understand all requirements of this permit

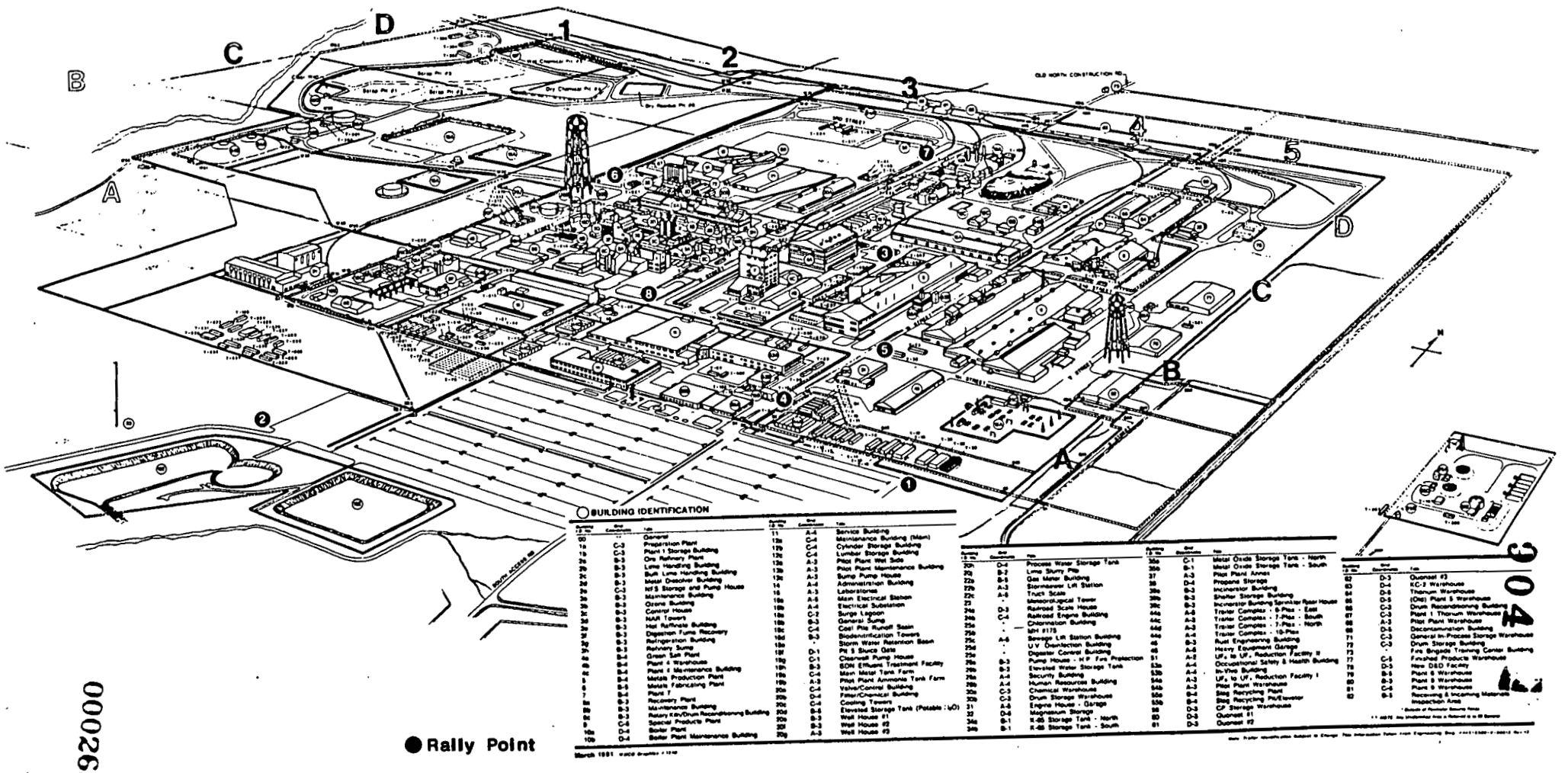
EMPLOYEE(S) SIGNATURE(S)	BADGE NO.	DATE
1.		
2.		
3.		
4.		
5.		
6.		

WORK AUTHORIZATION REVIEWED AND FOUND ACCEPTABLE FOR USE

SUPERVISOR IN CHARGE | DATE | TIME

IN CASE OF EMERGENCY CALL "CONTROL" BY RADIO PHONE 6511, OR USE NEAREST FIRE ALARM BOX.

APPENDIX B
FEMP RALLY POINTS



Building ID No.	Grid Coordinate	Title
100	--	General
1a	C-3	Preparation Plant
1b	C-3	Plant 1 Storage Building
2a	B-3	Ore Refinery Plant
2b	B-3	Lime Handling Building
2c	B-3	Bulk Lime Handling Building
2d	B-3	Metal Detector Building
2e	C-3	NFS Storage and Pump House
2f	B-3	Maintenance Building
2g	B-3	Ozone Building
2h	B-3	Control House
2i	B-3	NAR Towers
2j	B-3	Hot Refinery Building
2k	B-3	Digestion Fume Recovery
2l	B-3	Refrigeration Building
2m	B-3	Refinery Sump
2n	B-3	Green Salt Plant
4a	B-4	Plant 4 Warehouse
4b	B-4	Plant 4 Maintenance Building
4c	B-4	Metals Production Plant
4	B-3	Metals Fabricating Plant
7	B-4	Plant 7
7a	B-4	Recovery Plant
8a	B-3	Maintenance Building
8b	B-3	Refinery R&V/Drum Reconditioning Building
9a	C-4	Special Products Plant
9	C-4	Boiler Plant
10a	C-4	Boiler Plant Maintenance Building

Building ID No.	Grid Coordinate	Title
11	A-4	Service Building
12a	C-4	Maintenance Building (Main)
12b	C-4	Cylinder Storage Building
12c	C-4	Lumber Storage Building
13a	A-3	Pilot Plant Wet Side
13b	A-3	Pilot Plant Maintenance Building
13c	A-3	Sump Pump House
14	A-4	Administration Building
15	A-3	Laboratories
16	A-4	Main Electrical Station
17	A-4	Electrical Substation
18	C-2	Surge Lagoon
19	B-3	General Sump
19a	C-3	Cast Pile Runoff Basin
19d	B-3	Biodenitrification Towers
19e	-	Storm Water Retention Basin
19f	-	PN 5 Sluice Gate
19g	C-1	Clearwell Pump House
19h	B-3	SDN Effluent Treatment Facility
19i	C-3	Main Metal Tank Farm
19j	A-3	Pilot Plant Ammonia Tank Farm
20	C-3	Valve/Control Building
20a	C-3	Filter/Chemical Building
20b	C-4	Cooling Towers
20c	B-4	Elevated Storage Tank (Potable : UO)
20d	B-3	Well House #1
20e	B-3	Well House #2
20f	A-3	Well House #3

Building ID No.	Grid Coordinate	Title
20h	D-4	Process Water Storage Tank
20i	B-3	Lime Slurry Pile
20j	B-3	Gas Meter Building
20k	A-3	Stormwater Lift Station
20l	A-3	Truck Scale
21	A-4	Meteorological Tower
22a	D-3	Railroad Scale House
22b	C-3	Railroad Engine Building
23	-	Chlorination Building
23a	-	SPI #175
23b	A-4	Sewage Lift Station Building
23c	-	U.V. Disinfection Building
23d	-	Digester Control Building
23e	B-3	Pump House - H.P. Fire Protection
23f	B-3	Elevated Water Storage Tank
23g	A-4	Security Building
23h	A-4	Human Resources Building
23i	C-3	Chemical Warehouse
23j	C-3	Drum Storage Warehouse
23k	A-4	Engine House - Garage
31	D-4	Magnesium Storage
34a	B-1	K-65 Storage Tank - North
34b	B-1	K-65 Storage Tank - South

Building ID No.	Grid Coordinate	Title
35a	C-1	Metal Oxide Storage Tank - North
35b	B-1	Metal Oxide Storage Tank - South
37	A-3	Pilot Plant Annex
38	D-4	Propane Storage
39a	B-3	Incinerator Building
39b	B-3	Shelter Storage Building
39c	B-3	Incinerator Building Sprinkler Riser House
40	B-3	Trailer Complex - 6-Plex - East
41	A-4	Trailer Complex - 7-Plex - South
42	A-3	Trailer Complex - 7-Plex - North
43	A-3	Trailer Complex - 10-Plex
44	A-4	Rust Engineering Building
45	B-3	Heavy Equipment Garage
46	A-4	UF6 to UF4 Reduction Facility II
51	A-3	Occupational Safety & Health Building
52	A-4	In-Vivo Building
53	A-4	UF6 to UF4 Reduction Facility I
54	A-3	Pilot Plant Warehouse
55	A-3	Bldg Recycling Plant
56	B-4	Bldg Recycling Pit/Excavator
59	B-4	CP Storage Warehouse
60	D-3	Quonset #1
61	D-3	Quonset #2

Building ID No.	Grid Coordinate	Title
62	D-3	Quonset #3
63	D-4	KC-3 Warehouse
64	D-4	Thorium Warehouse
65	D-3	(Old) Plant 5 Warehouse
66	C-3	Drum Reconditioning Building
67	C-3	Plant 1 Thorium Warehouse
68	A-3	Pilot Plant Warehouse
69	D-3	Decontamination Building
71	C-3	General In-Process Storage Warehouse
72	C-3	Drum Storage Building
73	-	Fire Brigade Training Center Building
77	C-3	Finished Products Warehouse
78	D-3	New D&D Facility
79	B-3	Plant 6 Warehouse
80	B-3	Plant 6 Warehouse
81	C-3	Plant 5 Warehouse
82	B-3	Receiving & Incoming Materials Inspection Area

* Outside of Operation Security Fence

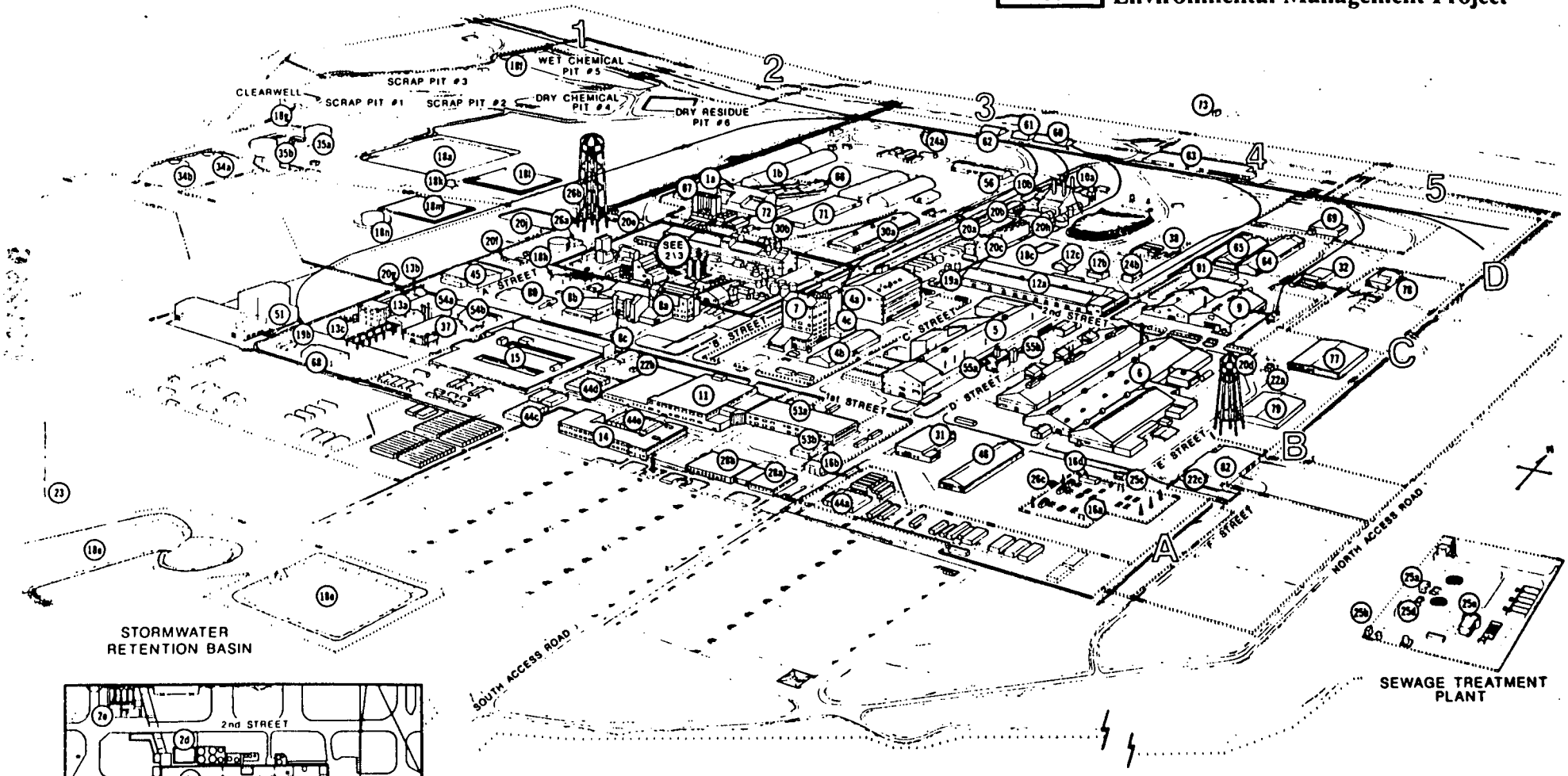
March 1991

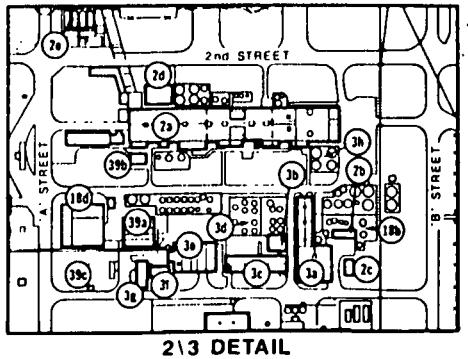
904

000263

APPENDIX C
LOCATION OF FEMP
MEDICAL FACILITY

FERNALD
Environmental Management Project





2\3 DETAIL

Graphics

000265

5904

(1A) BUILDING IDENTIFICATION

Building I.D. No.	Grid Coordinates	Title
00	**	General
1a	C-3	Preparation Plant
1b	C-3	Plant 1 Storage Building
2a	B-3	Ore Refinery Plant
2b	B-3	Lime Handling Building
2c	B-3	Bulk Lime Handling Building
2d	B-3	Metal Dissolver Building
2e	C-3	NFS Storage and Pump House
3a	B-3	Maintenance Building
3b	B-3	Ozone Building
3c	B-3	Control House
3d	B-3	NAR Towers
3e	B-3	Hot Raffinate Building
3f	B-3	Digestion Fume Recovery
3g	B-3	Refrigeration Building
3h	B-3	Refinery Sump
4a	B-4	Green Salt Plant
4b	B-4	Plant 4 Warehouse
4c	B-4	Plant 4 Maintenance Building
5	B-4	Metals Production Plant
6	B-5	Metals Fabricating Plant
7	B-4	Plant 7
8a	B-3	Recovery Plant
8b	B-3	Maintenance Building
8c	B-3	Rotary Kiln/Drum Reconditioning Building
9	C-5	Special Products Plant
10a	D-4	Boiler Plant
10b	D-4	Boiler Plant Maintenance Building
11	A-4	Service Building
12a	C-4	Maintenance Building (Main)
12b	C-4	Cylinder Storage Building
12c	C-4	Lumber Storage Building
13a	A-3	Pilot Plant Wet Side
13b	A-3	Pilot Plant Maintenance Building
13c	A-3	Sump Pump House
14	A-4	Administration Building
15	A-3	Laboratories
16a	A-5	Main Electrical Station
16b	A-4	Electrical Substation
18a	C-2	Surge Lagoon
18b	B-3	General Sump
18c	C-4	Coal Pile Runoff Basin
18d	B-3	Biodenitrification Towers
18e	*	Storm Water Retention Basin
18f	D-1	Pit 5 Sluice Gate
18g	C-1	Clearwell Pump House
18h	B-3	BDN Effluent Treatment Facility
18k	B-2	Methanol Tank
18l	C-2	Low Nitrate Tank
18m	B-2	High Nitrate Tank
18n	B-2	High Nitrate Storage Tank
19a	C-4	Main Metal Tank Farm
19b	A-3	Pilot Plant Ammonia Tank Farm
20a	C-4	Pump Station and Power Center
20b	D-4	Water Plant
20c	C-4	Cooling Towers
20d	B-5	Elevated Storage Tank (Potable H_2O)
20e	B-3	Well House #1
20f	B-3	Well House #2
20g	A-3	Well House #3
20h	D-4	Process Water Storage Tank
20j	B-2	Lime Slurry Pits
22a	B-5	Gas Meter Building
22b	A-3	Stormsewer Lift Station
22c	A-5	Truck Scale
23	*	Meteorological Tower
24a	D-3	Railroad Scale House
24b	C-4	Railroad Engine Building
25a	*	Chlorination Building
25b	*	MH #175
25c	A-5	Sewage Lift Station Building
25d	*	U.V. Disinfection Building
25e	*	Digester Control Building
26a	B-3	Pump House - H.P. Fire Protection
26b	B-3	Elevated Water Storage Tank
26c	A-5	Main Electrical Strainer House
28a	A-4	Security Building
28b	A-4	Human Resources Building
30a	C-3	Chemical Warehouse
30b	C-3	Drum Storage Warehouse
31	A-5	Engine House - Garage
32	D-5	Magnesium Storage
34a	B-1	K-65 Storage Tank - North
34b	B-1	K-65 Storage Tank - South
35a	C-1	Metal Oxide Storage Tank - North
35b	B-1	Metal Oxide Storage Tank - South
37	A-3	Pilot Plant Annex
38	D-4	Propane Storage
39a	B-3	Incinerator Building
39b	B-3	Shelter Storage Building
39c	B-3	Incinerator Building Sprinkler Riser House
44a	A-5	Trailer Complex - 6-Plex - East
44c	A-3	Trailer Complex - 7-Plex - South
44d	A-3	Trailer Complex - 7-Plex - North
44e	A-4	Trailer Complex - 10-Plex
45	B-3	Rust Engineering Building
46	A-5	Heavy Equipment Garage
51	A-2	UF_6 to UF_4 Reduction Facility II
53a	A-4	Occupational Safety & Health Building
53b	A-4	In-Vivo Building
54a	A-3	UF_6 to UF_4 Reduction Facility I
54b	A-3	Pilot Plant Warehouse
55a	B-4	Slag Recycling Plant
55b	B-4	Slag Recycling Pit/Elevator
56	D-3	CP Storage Warehouse
60	D-3	Quonset #1
61	D-3	Quonset #2
62	D-3	Quonset #3
63	D-4	KC-2 Warehouse
64	D-5	Thorium Warehouse
65	D-5	(Old) Plant 5 Warehouse
66	C-3	Drum Reconditioning Building
67	C-3	Plant 1 Thorium Warehouse
68	A-3	Pilot Plant Warehouse
69	D-5	Decontamination Building
71	C-3	General In-Process Storage Warehouse
72	C-3	Drum Storage Building
73	*	Fire Brigade Training Center Building
77	C-5	Finished Products Warehouse
78	D-5	New D&D Facility
79	B-5	Plant 6 Warehouse
80	B-3	Plant 8 Warehouse
81	C-5	Plant 9 Warehouse
82	B-5	Receiving & Incoming Materials Inspection Area

* Outside of Perimeter Security Fence

**NOTE: Any Unidentified Area is Referred to as 00 Gene

ATTACHMENT C
FEMP MINUTES OF
SAFETY MEETING

GROUPS ATTENDING:

5083

FEMP
MINUTES OF SAFETY MEETING

1. CHECK ONE:

☐ SECTION
☐ SUB-SECTION
☐ DEPARTMENT

SAFETY MEETING WAS HELD:

Date ______________

Time ______________

Location ______________

2. ATTENDED BY*

NAME	NO.

3. CHECK VISUAL AIDS USED: (RECORD TITLE AND/OR SUBJECT MATERIAL COVERED)

☐ Film ☐ Slides ☐ Videotape ☐ Other ______________

Subject ______________

4. CHECK ADDITIONAL MATERIAL DISCUSSED OR REVIEWED:

☐ (A) Monthly Statistics ☐ (D) ES&H Manual Procedures ☐ (G) Unsafe Practices/Conditions
☐ (B) Accident/Injury Report ☐ (E) Rules & Regulations ☐ (H) Newsletters/Other Media
☐ (C) Safety Inspection Report ☐ (F) S.O.P's ☐ (I) Other

COMMENTS: (RECORD, BRIEFLY, THE INFORMATION COVERED IN THE ITEM(S) CHECKED ABOVE. INCLUDE AND RECOMMENDATIONS OR COMMENTS MADE DURING THE MEETING WHICH MAY IMPROVE OUR SAFETY PROGRAM.

NO.	DISTRIBUTION OF COPIES
1	Safety Eng. & Fire Svcs. (RECORD COPY)
2	Section copy
3	Sub-section copy

* RECORD ADDITIONAL ATTENDANCE ON ADDITIONAL FORMS

______________ (CHAIRMAN) ______________ (SECTION) ______________ (DATE)

000268

FS-F-470 (REV. 2/9/93)

APPENDIX D
WORK AREA MAP

Project Specific Work Area

Maps Will Be Included

In This Appendix

ATTACHMENT A
ACKNOWLEDGEMENT FORM

ACKNOWLEDGEMENT FORM
PROJECT SPECIFIC HEALTH AND SAFETY PLAN
Neutralization and Stabilization of UNH Solutions at Plants 2/3 and 8

The undersigned individuals have been oriented on the requirements of the attached Health and Safety Plan and understand the provisions of the plan and agree to abide by each.

Signature	Date	Badge No.

ATTACHMENT B
OSHA / DOE
EMPLOYEES RIGHTS POSTER

ATTACHMENT D
PROJECT SPECIFIC HEALTH & SAFETY REQUIREMENTS MATRIX

5904

HEALTH AND SAFETY REQUIREMENTS MATRIX

Project: UNH - Plant 8 & 2/3 Construction Activities

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONNEL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	DECONTAMINATION & DISPOSAL PROCEDURES
1) General Project 1.1) Access to work site	* Uranium contaminated surfaces (general plant) At Plants 2/3 and 8: uranium dissolved in dilute nitric acid (~300 g/L U_{ss}) - UNH (Uranyl Nitrate Hexahydrate). pH is in the range of 1-2. Uranium contaminated surfaces. * Nitric acid and nitrogen dioxide vapors may be present near openings to UNH storage tanks * Asbestos contamination present in digestion, extraction areas and Hot Raffinate Building	* Thermoluminiscent Dosimeter (TLD) for each individual working in the Controlled Area * Real-time monitoring for nitrogen dioxide required for any entry into Digestion or Hot Raffinate Building	* FERMCO issued clothing * Hard hat * Safety glasses w/ rigid side shields * Steel toed safety shoes * Entry into contamination areas require a minimum of smock, shoe covers, and gloves * Half-mask respirator with magenta cartridges required for entry into asbestos contamination areas in Digestion, Extraction, and Hot Raffinate Building	* Site GET Training * Site Worker Training * RAD Worker II Training * 24 Hr. Supervised Field Experience * 8 Hr. Supervisor's Training for Supervisory Personnel * Orientation on Project Specific Health & Safety Plan and Requirements Matrix * Orientation on Project Specific MSDSs * Respirator Training required for workers required to wear respirators. * Respirator Fit-test required for workers required to wear respirators	* Initial Medical Screening * Initial, annual, and termination in-vivo exam (whole body count) * Bioassay: Initial urine, bi-monthly, and at project completion. * Incidents will require followup in-vivo and/or bioassay * Documentation of respirator medical surveillance for workers required to wear respirators	* FERMCO Work Permit * Radiological Work Permit (for each phase of project and for each specific task/area of work identified in this matrix	Personnel and material monitoring required to exit contamination area

000275

000276

HEALTH AND SAFETY REQUIREMENTS MATRIX
Project: UNH - Plant 8 & 2/3 Construction Activities

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONNEL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	DECONTAMINATION & DISPOSAL PROCEDURES
1.2) Work site mobilization - Plant 2/3 & 8	* Uranium contaminated surfaces (general plant). At Plants 2/3 and 8: Uranium dissolved in dilute nitric acid (~300 g/L U_{nat}) - UNH (Uranyl Nitrate Hexahydrate). pH is in the range of 1-2. Uranium contaminated surfaces. * Nitric acid and nitrogen dioxide vapors may be present near openings to UNH storage tanks * Asbestos contamination present in Digestion, Extraction Areas, and Hot Raffinate Building * Heat stress concerns when wearing additional protective clothing	* Thermoluminescent Dosimeter (TLD) for each individual working in the Controlled Area * Real-time monitoring for nitrogen dioxide required for any entry into Digestion or Hot Raffinate Building * O2 sampling required when working in potential airborne radiological areas for 25% of workers	* FERMCO issued clothing * Hard hat * Safety glasses w/ rigid side shields * Steel toed safety shoes * Entry into contamination areas require a minimum of smock, shoe covers, and gloves * Half-mask respirator with magenta cartridges required for entry into asbestos contamination areas in Digestion, Extraction, and Hot Raffinate Building * Full Anti-Cs required for work with contamination areas * MarMac paper or launderable Anti-Cs required for dry work in contamination areas * Water resistant Anti-Cs required for wet work conditions in contamination areas * Saranex or equivalent Anti-Cs when potential for contact with UNH solutions * Cool (ice) vests for heat stress control	* Site GET Training * Site Worker Training * RAD Worker II Training * 24 Hr. Supervised Field Experience * 8 Hr. Supervisor's Training for Supervisory Personnel * Orientation on Project Specific Health & Safety Plan and Requirements Matrix * Orientation on Project Specific MSDSs * Respirator Training required for workers required to wear respirators. * Respirator Fit-test required for workers required to wear respirators * HVO 325 Training for supervisors required to load waste containers * Training required to operate specialized equipment	* Initial Medical Screening * Initial, annual, and termination in-vivo exam (whole body count) * Bioassay: Initial urine, bi-monthly, and at project completion * Incidents will require followup in-vivo and/or bioassay * Documentation of respirator medical surveillance for workers required to wear respirators	* Rinsing/flushing lines prior to disassembly * Local HEPA ventilation when weld/flame cutting. * Ventilated HEPA containment may be necessary when excavating concrete (cutting/jack hammering etc.) unless these materials can be kept damp while work is in progress - depends on contamination levels present, location of cuts. * Provide warning signs and safety fencing/barriers to establish construction area * GFCI required when using electrical equipment	All equipment found to be contaminated will require rinse and wash down prior to leaving the FEMP. This may be done locally at Plants 2/3 or 8, or materials may be transported to the Decontamination facility, under the direction of Radiological Control. This applies to all work performed in all work areas associated with this project.

5904

HEALTH AND SAFETY REQUIREMENTS MATRIX

Project: UNH - Plant 8 & 2/3 Construction Activities

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONNEL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	DECONTAMINATION & DISPOSAL PROCEDURES
2) Demolition Work 2.1) Flame cutting and structural steel demolition 2.2) Concrete demolition work	* Uranium contaminated surfaces, uranium dissolved in dilute nitric acid (~300 g/L U_{tot}) - UNH (Uranyl Nitrate Hexahydrate), pH is in the range of 1-2. * Nitric acid and nitrogen dioxide vapors may be present near openings to UNH storage tanks. * Asbestos contamination present in Digestion, Extraction Areas, and Hot Raffinate Building * Heat stress concerns when wearing additional protective clothing * Lead contained in paint * nuisance/silica dust generated during concrete demolition * Noise generated during concrete demolition	* Thermoluminiscent Dosimeter (TLD), Personal Air Sampling (PAS) on atleast 25% of work force, and General Area (GA) - daily sampling for each. * Real-time monitoring for nitrogen dioxide required for any entry into Digestion or Hot Raffinate Building * Initial on periodic BZ sampling for lead during any disturbance of lead paint * Initial BZ sampling for respirable silica and nuisance dust during concrete demolition * Initial sound level survey during concrete demolition to ensure need for hearing protection	* FEMCO tissued clothing * Hard hat * Safety glasses w/ rigid side shields * Steel toed safety shoes * Entry into contamination areas require a minimum of smock, shoe covers, and gloves * Half-mask respirator with magenta cartridges required for entry into asbestos contamination areas in Digestion, Extraction, and Hot Raffinate Building * Full Anti-Cs required for work with contamination areas * MarMac paper or launderable Anti-Cs required for dry work in contamination areas * Water resistant Anti-Cs required for wet work conditions in contamination areas * Saranex or equivalent Anti-Cs when potential for contact with UNH solutions * Cool (Ice) vests for heat stress control Fire retardant clothing required when using open flame/torch * Safety harness w/lanyard required when working in elevated locations * Full face respirator w/magenta cartridges required for lead work and concrete demolition to ensure need for	* Site GET Training * Site Worker Training * RAD Worker II Training * 24 Hr. Supervised Field Experience * 8 Hr. Supervisor's Training for Supervisory Personnel * Orientation on Project Specific Health & Safety Plan and Requirements Matrix * Orientation on Project Specific MSDSs * Respirator Training required for workers required to wear respirators. * Respirator Fit-test required for workers required to wear respirators * HVO 325 Training for supervisors required to lead waste containers * Training required to operate specialized equipment * Lead Worker Training required for workers lead paint disturbing * Respirator fit-test for lead required for lead workers	* Initial Medical Screening * Initial, annual, and termination in-vivo exam (whole body count) * Bio-assay: Initial urine, bi-monthly, and at project completion * Incidents will require follow-up in-vivo and/or bio-assay * Documentation of respirator medical surveillance for workers required to wear respirators * Documentation of lead medical surveillance for workers exposed to lead	* Rinsing/flushing lines prior to disassembly * Local HEPA ventilation when weld/flame cutting. * Ventilated HEPA containment may be necessary when excavating concrete (cutting/jack hammering etc.) unless these materials can be kept damp while work is in progress - depends on contamination levels present, location of cuts. * Provide warning signs and safety fencing/barriers to establish construction area * GFCI required when using electrical equipment * Open Flame/Weld Permit required for any use of torch or open flame * Chemical Hazardous Material Work Permit required for lead work * Post warning signs and establish lead work area when cutting/grinding on metal * Remove lead paint by mechanical methods (w/HEPA ventilation) prior to torch cutting of metal * Water spray or HEPA ventilation required to control dust generation during concrete demolition	* All equipment found to be contaminated will require rinse and wash down prior to leaving the FDWP. This may be done locally at Plants 8/3 or 9, or materials may be transported to the Decontamination facility, under the direction of Radiological Control. This applies to all work performed in all work areas associated with this project. * Lead workers shall wash hands and face prior to breaks and lunch * Lead workers shall shower at end of work shift

000277

HEALTH AND SAFETY REQUIREMENTS MATRIX
Project: UNH - Plant 8 & 2/3 Construction Activities

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONNEL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	DECONTAMINATION & DISPOSAL PROCEDURES
3) UNH Handling System - Installation **A) Plant 2/3** 3.1) Dedicated 3" header installed in Plant 2/3 to transfer UN solution from individual storage tank to dilution tank F1-608 3.2) Full port plugs valves installed along the header (CD blend tank area, digestion area, east/west rack along 102 Street 3.3) Hand piping installed from existing rack from the Hot Raffinate Bldg. to east/west rack along 102 Street. Install pipe between Or liquor tank to east/west rack along 102 Street	* Uranium contaminated surfaces, uranium dissolved in dilute nitric acid (~300 g/L U_{nat}) - UNH (Uranyl Nitrate Hexahydrate), pH is in the range of 1-2. * Nitric acid and nitrogen dioxide vapors may be present near openings to UNH storage tanks * Asbestos contamination present in Digestion, Extraction Areas, and Hot Raffinate Building * Heat stress concerns when wearing additional protective clothing	* Thermoluminescent Dosimeter (TLD), General Air (GA) Sampling * Real-time monitoring for nitrogen dioxide required for any entry into Digestion or Hot Raffinate Building	* FERMCO issued clothing * Hard hat * Safety glasses w/rigid side shields * Steel toed safety shoes * Entry into contamination areas require a minimum of smock and gloves * Half-mask respirator with magenta cartridges required for entry into asbestos contamination areas in Digestion, Extraction, and Hot Raffinate Building * Full Anti-Cs required for work with contamination areas * MarMac paper or launderable Anti-Cs required for dry work in contamination areas * Water resistant Anti-Cs required for wet work conditions in contamination areas * Saranex or equivalent Anti-Cs when potential for contact with UNH solutions * Cool (ice) vests for heat stress control	* Site GET Training * Site Worker Training * RAD Worker II Training * 24 Hr. Supervised Field Experience * 8 Hr. Supervisor's Training for supervisory personnel * Orientation on Project Specific Health & Safety Plan and Requirements Matrix * Orientation on Project Specific MSDSs * Respirator Training required for workers required to wear respirators * Respirator Fit-test required for workers required to wear respirators * NVQ 325 Training for supervisors required to load waste containers * Training required to operate specialized equipment	* Initial Medical Screening * Initial, annual, and termination in-vivo exam (whole body count) * Bio-assay: Initial urine, bi-monthly, and at project completion * Incidents will require followup in-vivo and/or bio-assay * Documentation of respirator medical surveillance for workers required to wear respirators	* FERMCO Work Permit * Radiological Work Permit (for each phase of project and for each specific task/area of work identified in this matrix *Rinsing/flushing lines prior to disassembly * Local HEPA ventilation when weld/flame cutting * Ventilated HEPA containment may be necessary when excavating concrete (cutting/jack hammering etc.) unless these materials can be kept damp while work is in progress - depends on contamination levels present, location of cuts * Provide warning signs and safety fencing/barriers to establish construction area * GFCI required when using electrical equipment * Open Flame/Weld Permit required for any use of torch or open flame	* All equipment found to be contaminated will require rinse and wash down prior to leaving the FEMP. this may be done locally at Plants 2/3 or 8, or materials may be transported tot he Decontamination facility, under the direction of Radiological Control. This applies to all work performed in all work areas associated with this project. * personnel and material monitoring required to exit contamination area

000278

5904

HEALTH AND SAFETY REQUIREMENTS MATRIX

Project: UNH - Plant 8 & 2/3 Construction Activities

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONNEL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	DECONTAMINATION & DISPOSAL PROCEDURES
8) Liquor Tank 3.4) Install cavity pump to pump UN solution to individual storage tank. Pump discharge will be connected to the main transfer header at each valve point 3.5) After a tank has been emptied of UN solution it will be rinsed with nitric acid and then water. Pump skid will be disconnected and reconnected to another tank	* Uranium contaminated surfaces, uranium dissolved in dilute nitric acid (~300 g/L U_{eq}) - UNH (Uranyl Nitrate Hexahydrate), pH is in the range of 1-2. * Nitric acid and nitrogen dioxide vapors may be present near openings to UNH storage tanks * Asbestos contamination present in Digestion, Extraction Areas, and Hot Raffinate Building * Heat stress concerns when wearing additional protective clothing	* Thermoluminescent Dosimeter (TLD), General Air (GA) Sampling - daily * Real-time monitoring for nitrogen dioxide required for any entry into Digestion or Hot Raffinate Building	* FERMCO issued clothing * Hard hat * Safety glasses w/rigid side shields * Steel toed safety shoes * Entry into contamination areas require a minimum of smock and gloves * Half-mask respirator with magenta cartridges required for entry into asbestos contamination areas in Digestion, Extraction, and Hot Raffinate Building * Full Anti-Cs required for work with contamination areas * MarMac paper or launderable Anti-Cs required for dry work in contamination areas * Water resistant Anti-Cs required for wet work conditions in contamination areas * Saranex or equivalent Anti-Cs when potential for contact with UNH solutions * Cool (ice) vests for heat stress control	* Site GET Training * Site Worker Training * RAD Worker II Training * 24 Hr. Supervised Field Experience * 8 Hr. Supervisor's Training for supervisory personnel * Orientation on Project Specific Health & Safety Plan and Requirements Matrix * Orientation on Project Specific MSDSs * Respirator Training required for workers required to wear respirators * Respirator Fit-test required for workers required to wear respirators * NVO 325 Training for supervisors required to load waste containers * Training required to operate specialized equipment	* Initial Medical Screening * Initial, annual, and termination in-vivo exam (whole body count) * Bio-assay: Initial urine, bi-monthly, and at project completion * Incidents will require followup in-vivo and/or bio-assay * Documentation of respirator medical surveillance for workers required to wear respirators	* FERMCO Work Permit * Radiological Work Permit (for each phase of project and for each specific task/area of work identified in this matrix *Rinsing/flushing lines prior to disassembly * Local HEPA ventilation when weld/flame cutting * Ventilated HEPA containment may be necessary when excavating concrete (cutting/jack hammering etc.) unless these materials can be kept damp while work is in progress - depends on contamination levels present, location of cuts * Provide warning signs and safety fencing/barriers to establish construction area * GFCI required when using electrical equipment * Open Flame/Weld Permit required for any use of torch or open flame	* All equipment found to be contaminated will require rinse and wash down prior to leaving the PIMP. this may be done locally at Plants 2/3 or 8, or materials may be transported tot he Decontamination facility, under the direction of Radiological Control. This applies to all work performed in all work areas associated with this project. * personnel and material monitoring required to exit contamination area

000279

HEALTH AND SAFETY REQUIREMENTS MATRIX
Project: UNH - Plant 8 & 2/3 Construction Activities

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONNEL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	DECONTAMINATION & DISPOSAL PROCEDURES
C) Dilution System 3.6) A cavity pump will be installed to transfer dilute UN solution from F1-60A to precipitation tanks F1-600 & F610 3.7) New piping will be installed and a new circulating line will be installed from the pump discharge back in F1-60B 1.8) Temporary diking for secondary containment will be installed (approx. 12" high, encompassing the entire refinery Sump Area)	* Uranium contaminated surfaces, uranium dissolved in dilute nitric acid (~300 g/L U_{tot}) - UNH (Uranyl Nitrate Hexahydrate), pH is in the range of 1-2. * Nitric acid and nitrogen dioxide vapors may be present near openings to UNH storage tanks * Asbestos contamination present in Digestion, Extraction Areas, and Hot Raffinate Building * Heat stress concerns when wearing additional protective clothing	* Thermoluminiscent Dosimeter (TLD), General Air (GA) Sampling - daily * Real-time monitoring for nitrogen dioxide required for any entry into Digestion or Hot Raffinate Building	* FERMCO issued clothing * Hard hat * Safety glasses w/rigid side shields * Steel toed safety shoes * Entry into contamination areas require a minimum of smock and gloves * Half-mask respirator with magenta cartridges required for entry into asbestos contamination areas in Digestion, Extraction, and Hot Raffinate Building * Full Anti-Cs required for work with contamination areas * MarMac paper or launderable Anti-Cs required for dry work in contamination areas * Water resistant Anti-Cs required for wet work conditions in contamination areas * Saranex or equivalent Anti-Cs when potential for contact with UNH solutions * Cool (Ice) vests for heat stress control	* Site GET Training * Site Worker Training * RAD Worker II Training * 24 Hr. Supervised Field Experience * 8 Hr. Supervisor's Training for supervisory personnel * Orientation on Project Specific Health & Safety Plan and Requirements Matrix * Orientation on Project Specific MSDSs * Respirator Training required for workers required to wear respirators * Respirator Fit-test required for workers required to wear respirators * HVO 325 Training for supervisors required to load waste containers * Training required to operate specialized equipment	* Initial Medical Screening * Initial, annual, and termination in-vivo exam (whole body count) * Bio-assay: Initial urine, bi-monthly, and at project completion * Incidents will require followup in-vivo and/or bio-assay * Documentation of respirator medical surveillance for workers required to wear respirators	* FERMCO Work Permit * Radiological Work Permit (for each phase of project and for each specific task/area of work identified in this matrix *Rinsing/flushing lines prior to disassembly * Local HEPA ventilation when weld/flame cutting * Ventilated HEPA containment may be necessary when excavating concrete (cutting/jack hammering etc.) unless these materials can be kept damp while work is in progress - depends on contamination levels present, location of cuts * Provide warning signs and safety fencing/barriers to establish construction area * GFCI required when using electrical equipment * Open Flame/Weld Permit required for any use of torch or open flame	* All equipment found to be contaminated will require rinse and wash down prior to leaving the PIMP. this may be done locally at Plants 8/3 or 8, or materials may be transported tot he Decontamination facility, under the direction of Radiological Control. This applies to all work performed in all work areas associated with this project. * personnel and material monitoring required to exit contamination area

5904

HEALTH AND SAFETY REQUIREMENTS MATRIX

Project: UNH - Plant 8 & 2/3 Construction Activities

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONNEL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	DECONTAMINATION & DISPOSAL PROCEDURES
D) Neutralization/ Precipitation 3.9) Existing tanks F1-609 & F1-610 will be revamped with new instrumentation and cavity pump. A new 3" header line will be installed to transfer the slurry to Plant 8	Uranium contaminated surfaces, uranium dissolved in dilute nitric acid (~300 g/L U_{nat}) - UNH (Uranyl Nitrate Hexahydrate), pH is in the range of 1-2.	Thermoluminiscent Dosimeter (TLD), General Air (GA) Sampling - daily	* FEMPCO issued clothing * Hard hat * Safety glasses w/rigid side shields * Steel toed safety shoes * Entry into contamination areas require a minimum of smock and gloves * Half-mask respirator with magenta cartridges required for entry into asbestos contamination areas in Digestion, Extraction, and Hot Raffinate Building * Full Anti-Cs required for work with contamination areas * MarMac paper or launderable Anti-Cs required for dry work in contamination areas * Water resistant Anti-Cs required for wet work conditions in contamination areas * Saranex or equivalent Anti-Cs when potential for contact with UNH solutions * Cool (ice) vests for heat stress control	* Site GET Training * Site Worker Training * RAD Worker II Training * 24 Hr. Supervised Field Experience * 8 Hr. Supervisor's Training for supervisory personnel * Orientation on Project Specific Health & Safety Plan and Requirements Matrix * Orientation on Project Specific MSDSs * Respirator Training required for workers required to wear respirators * Respirator Fit-test required for workers required to wear respirators * NVO 328 Training for supervisors required to load waste containers * Training required to operate specialized equipment	* Initial Medical Screening * Initial, annual, and termination in-vivo exam (whole body count) * Bio-assay: Initial urine, bi-monthly, and at project completion * Incidents will require followup in-vivo and/or bio-assay * Documentation of respirator medical surveillance for workers required to wear respirators	* FEMPCO Work Permit * Radiological Work Permit (for each phase of project and for each specific task/area of work identified in this matrix *Rinsing/flushing lines prior to disassembly * Local HEPA ventilation when weld/flame cutting * Ventilated HEPA containment may be necessary when excavating concrete (cutting/jack hammering etc.) unless these materials can be kept damp while work is in progress - depends on contamination levels present, location of cuts * Provide warning signs and safety fencing/barriers to establish construction area * GFCI required when using electrical equipment * Open Flame/Weld Permit required for any use of torch or open flame	* All equipment found to be contaminated will require rinse and wash down prior to leaving the FEMP. this may be done locally at Plants 2/3 or 8, or materials may be transported tot he Decontamination facility, under the direction of Radiological Control. This applies to all work performed in all work areas associated with this project. * personnel and material monitoring required to exit contamination area
E) Plant 8 3.10) New installation will be done to the existing filter feed tanks F43-203 and F43-203A. These tanks will be provided with new level indication and alarm devices, and a cavity pump will be installed to transfer neutralized UN slurry to the Fimco filters	Neutralized UN slurry (magnesium di-uranate) at concentrations of 50 - 100 g/L U (residuals present). Uranium contaminated surfaces						

000281

HEALTH AND SAFETY REQUIREMENTS MATRIX
Project: UNH - Plant 8 & 2/3 Construction Activities

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONNEL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	DECONTAMINATION & DISPOSAL PROCEDURES
4) Test And Activate The System 4.1) Test for leaks and defects and make the necessary corrections	* Uranium contaminated surfaces, uranium dissolved in dilute nitric acid (~300 g/L U_{tot}) - UNH (Uranyl Nitrate Hexahydrate), pH is in the range of 1-2. * Nitric acid and nitrogen dioxide vapors may be present near openings to UNH storage tanks * Asbestos contamination present in Digestion, Extraction Areas, and Hot Raffinate Building * Heat stress concerns when wearing additional protective clothing	* Thermoluminiscent Dosimeter (TLD), General Air (GA) Sampling - daily * Real-time monitoring for nitrogen dioxide required for any entry into Digestion or Hot Raffinate Building	* FERMCO issued clothing * Hard hat * Safety glasses w/rigid side shields * Steel toed safety shoes * Entry into contamination areas require a minimum of smock, shoe covers, and gloves * Half-mask respirator with magenta cartridges required for entry into asbestos contamination areas in digestion, Extraction, and Hot Raffinate Building * Full Anti-Cs required for work with contamination areas * MarMac paper or launderable Anti-Cs required for dry work in contamination areas. * Water resistant Anti-Cs required for wet work conditions in contamination areas * Saranex or equivalent Anti-Cs when potential for contact with UNH solutions * Cool (ice) vests for heat stress control	* Site GET Training * Site Worker Training * RAD Worker II Training * 24 Hr. Supervised Field Experience * 8 Hr. Supervisor's Training for supervisory personnel * Orientation on Project Specific Health & Safety Plan and Requirements Matrix * Orientation on Project Specific MSDSs * Respirator Training required for workers required to wear respirators * Respirator Fit-test required for workers required to wear respirators * HVO 325 Training for supervisors required to load waste containers * Training required to operate specialized equipment * Site Energy Control Training (SSOP-0719) required for any worker accessing existing utilities/piping	* Initial Medical Screening * Initial, annual, and termination in-vivo scan (whole body count) * Bio-assay: Initial urine, bi-monthly, and at project completion * Incidents will require follow-up in-vivo and/or bio-assay * Documentation of respirator medical surveillance for workers required to wear respirators	* FERMCO Work Permit * Radiological Work Permit (for each phase of project and for each specific task/area of work identified in this matrix * Rinsing/flushing lines prior to disassembly * Local HEPA ventilation when weld/flame cutting * Ventilated HEPA containment may be necessary when excavating concrete (cutting/jack hammering etc.) unless these materials can be kept damp while work is in progress - depends on contamination levels present, location of cuts * Provide warning signs and safety fencing/barriers to establish construction area * GFCI required when using electrical equipment	* Personnel and material monitoring required to exit contamination area * All equipment found to be contaminated will require rinse and wash down prior to leaving the FDWP. This may be done locally at Plants 2/3 or 8, or materials may be transported to the Decontamination facility, under the direction of Radiological Control. This applies to all work performed in all work areas associated with this project.

000282

5904

HEALTH AND SAFETY REQUIREMENTS MATRIX
Project: UNH - Plant 8 & 2/3 Construction Activities

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONNEL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	DECONTAMINATION & DISPOSAL PROCEDURES
5) Decommissioning 5.1) Remove enclosure at the NFS tanks, the CD tank, and the OK liquor tank - Remove HEPA filtration 2/blower system (HEPA filters) NOTE: Decommissioning labor includes "load out" into a burial box.	* Uranium contaminated surfaces, uranium dissolved in dilute nitric acid (~300 g/L U_{tot}) - UNH (Uranyl Nitrate Hexahydrate), pH is in the range of 1-2. * Nitric acid and nitrogen dioxide vapors may be present near openings to UNH storage tanks * Asbestos contamination present in Digestion, Extraction areas, and Hot Raffinate Building * Heat stress concerns when wearing additional protective clothing	* Thermoluminiscent Dosimeter (TLD), General Air (GA) Sampling and PAS on at least one individual - daily * Real-time monitoring for nitrogen dioxide required for any entry into Digestion or Hot Raffinate Building * BZ sampling required when working in potential airborne radiological areas for 25% of workers	* FERMCO issued clothing * Hard hat * Safety glasses w/rigid side shields * Steel toed safety shoes * Entry into contamination areas required a minimum of smock, shoe covers, and gloves * Half-mask respirator with magenta cartridges required for entry into asbestos contamination areas in Digestion, Extraction, and Hot Raffinate Building * Full Anti-Cs required for work with contamination areas * MarMac paper or launderable Anti-Cs required for dry work in contamination areas * Water resistant Anti-Cs required for wet work conditions in contamination areas * Saranex or equivalent Anti-Cs when potential for contact with UNH solutions * Cool (ice) vests for heat stress control	* Site GET Training * Site Worker Training * RAD Worker Training * 20 Hr. Supervised Field Experience * 8 Hr. Supervisor's Training for supervisory personnel * Orientation on Project Specific Health & Safety Plan and Requirements Matrix * Orientation on Project Specific MSDSs * Respirator training required for workers required to wear respirators * Respirator Fit-test required for workers required to wear respirators * HVO 328 Training for supervisors required to load waste containers * Training required to operate specialized equipment	* Initial Medical Screening * Initial, annual, and termination in-vivo exam (whole body count) * Bio-assay: Initial urine, bi-monthly, and at project completion * Incidents will require followup in-vivo and/or bio-assay * Documentation of respirator medical surveillance for workers required to wear respirators	* FERMCO Work Permit * Radiological Work Permit (for each phase of project and for each specific task/area of work identified in this matrix) * Rinsing/flushing lines prior to disassembly * Local HEPA ventilation when weld/flame cutting * Ventilated HEPA containment may be necessary when excavating concrete (cutting/jack hammering etc.) unless these materials can be kept damp while work is in progress - depends on contamination levels present, location of cuts * Provide warning signs and safety fencing/barriers to establish construction area * GFCI required when using electrical equipment	* Personnel and material monitoring required to exit contamination area * All equipment found to be contaminated will require rinse and wash down prior to leaving the PDWP. This may be done locally at Plants 2/3 or 8, or materials may be transported to the Decontamination facility, under the direction of Radiological Control. This applies to all work performed in all work areas associated with this project

000283

HEALTH AND SAFETY REQUIREMENTS MATRIX

Project: UNH - Plant 8 & 2/3 Construction Activities

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONNEL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	DECONTAMINATION & DISPOSAL PROCEDURES
6) Clean Up 6.1) Perform clean-up of the work area	* Uranium contaminated surfaces, uranium dissolved in dilute nitric acid (~300 g/l U_{tot}) - UNH (Uranyl Nitrate Hexahydrate), pH is in the range of 1-2. * Nitric acid and nitrogen dioxide vapors may be present near openings to UNH storage tanks * Asbestos contamination present in Digestion, Extraction Areas, and Hot Raffinate Building * Heat Stress concerns when wearing additional protective clothing	* Thermoluminiscent Dosimeter (TLD), General Air (GA) Sampling and PAS on at least one individual - daily * Real-time monitoring for nitrogen dioxide required for any entry into Digestion or Hot Raffinate Building	* FERMCO issued clothing * Hard hat * Safety glasses w/rigid side shields * Steel toed safety shoes * Entry into contamination areas require a minimum of smock, shoe covers, and gloves * Half-mask respirator with magenta cartridges required for entry into asbestos contamination areas in Digestion, Extraction, and Hot Raffinate Building * Full Anti-Cs required for work contamination areas * MarMac paper or launderable Anti-Cs required for dry work in contamination areas * Water resistant Anti-Cs required for wet work conditions in contamination areas * Saranex or equivalent Anti-Cs when potential for contact with UNH solutions * Cool (Ice) vests for heat stress control	* Site GET Training * Site Worker Training * RAD Worker II Training * 24 Hr. Supervised Field Experience * 8 Hr. Supervisor's Training for supervisory personnel * Orientation on Project Specific Health & Safety Plan and Requirements Matrix * Orientation on Project Specific MSDSs * Respirator Training required for workers required to wear respirators * Respirator fit-test required for workers required to wear respirators	* Initial Medical Screening * Initial, annual, and termination in-vivo scan (whole body count) Bio-assays: Initial urine, bi-monthly, and at project completion * Incidents will require followup in-vivo and/or bio-assay * Documentation of respirator medical surveillance for workers required to wear respirators	* FERMCO Work Permit * Radiological Work Permit (for each phase of project and for each specific task/area of work identified in this matrix * Rinsing/flushing lines prior to disassembly * Local HEPA containment may be necessary when excavating concrete (cutting/jack hammering etc.) unless these materials can be kept damp while work is in progress - depends on contamination levels present, location of cuts. * Provide warning signs and safety fencing/barriers to establish construction area * GFCI required when using electrical equipment	* Personnel and material monitoring required to exit contamination area * All equipment found to be contaminated will require rinse and wash down prior to leaving the FEMP. This may be done locally at Plants 2/3 or 8, or materials may be transported to the Decontamination Facility, under the direction of Radiological Control. this applies to all work performed in all work areas associated with this project.

5904

PROJECT-SPECIFIC SAMPLING AND ANALYSIS PLAN
#94-795

Drummed Waste Material
Project-Specific Sampling and Analysis Plan

Number: 94-795
Date: 5-17-94

A. Identifying Information

1) **Project Name:** Uranyl Nitrate (UNH) Precipitation
2) **Plan No.:** 94-795
3) **Material Description/Matrix Code(s):** Magnesium Diurinate/M119
4) **Number of Drums in Sub-Waste Stream:** Approx. 5,000 drums.
5) **Material Type:** 091
6) **Source Code:** 815
7) **Material Evaluation Form #:** 1186
8) **Sampling Location for Drums:** Plant 8
9) **Process Knowledge:** Uranyl nitrate (UNH) solution of various concentrations was contained in 20 tanks (approx. 226,000 gallons) in the refinery area of the plant. Under a RCRA closure and a CERCLA Removal Action the UNH was converted to magnesium diurinate filter cake for disposal at NTS. See the "Process Knowledge File Narrative" for additional Process Knowledge and historical Sampling and Analysis information for this waste stream.

B. Sampling Information

1) **General:** Samples taken will be contained in glass or polyethylene jars with teflon lined lids.
2) **Preservation Method:** See Analytical Requirements in Section C.
3) **Holding Times:** See Preservative and Holding Time Guidelines in Section G. Holding times and sample volume/container requirements for media-specific analyses not listed in the SCQ are provided by the FEMP laboratory facility.
4) **Sample Technique:** Scoop
5) **Number of Drums to be Sampled and Analyzed:** See Page two.
6) **Composite Samples:** No
7) **Visual Inspection to be Performed?:** No
8) **Field Contact:** Camila Wehrfritz, ext. 9306
9) **Send Results to:** Chris Wernert, ext. 8927, MS 65
10) **Charge No./Project Manager:** 3BPW1 / Matt Tepe, ext. 9049
11) **Required QA/QC Samples:**

Field QC	Yes	No	Notes
Trip Blank		X	no volatile organic samples
Field Blank	X		1 per this sample plan
Equipment Rinsate	X		1 per this sample plan
Duplicate	X		1 per this sample plan
Container Blank		X	analytical data supplied by supplier
Preserv. Blank		X	assay data supplied by supplier

Laboratory QC

Laboratory QC sample type and frequency requirements are provided in Appendix G of the SCQ.

Chris Wernert / 5-17-94 — Authorized Signature/Date

Michael F. Ramirez / 5-17-94 — Approved/Date

Sampling Information

Batch processing of the UNH solution will produce two distinct waste streams: filter cake and aqueous filtrate. The filter cake will be placed into 55-gallon drums in a series of batches. Samples will be extracted from the filter cake waste stream.

Two sets of samples will be collected from each batch. A set of samples will be extracted from the first and third drums generated in the first batch. A set of samples will also be extracted from the fifth and seventh drums generated in batches two through seven.

If a strong correlation can not be drawn between feed materials, process conditions and analytical results, then sampling will continue for further batches. For these batches after the seventh run (ie. eighth through last batch) a set of samples will be extracted from the fifth and seventh drums generated in each batch.

Start with Sample Number 94-795-1 for the first drum sample, then number consecutively until sampling is completed. The drum to be sampled in duplicate will be indicated with an asterisk (*). The duplicate samples will be given different sample numbers.

Sample Number	Batch Number	Drums generated in Batch
94-795-1	1	First (drum #1)
94-795-2	1	Third (drum #3)
94-795-3	2	Fifth (drum #5)
94-795-4	2	Seventh (drum #7)
94-795-5	3	Fifth (drum #5)
94-795-6	3	Seventh (drum #7)
94-795-7	4	Fifth (drum #5)
94-795-8	4	Seventh (drum #7)
*94-795-9	*5	*Fifth (drum #5)
*94-795-10	*5	*Fifth (drum #5)
94-795-11	5	Seventh (drum #7)
94-795-12	6	Fifth (drum #5)
94-795-13	6	Seventh (drum #7)
94-795-14	7	Fifth (drum #5)
94-795-15	7	Seventh (drum #7)

Chris Wernert / 5-17-94
Authorized Signature/Date

Michael F. Ramirez / 5-17-94
Approved/Date

Drummed Waste Material
Project-Specific Sampling and Analysis Plan

C. Analytical Requirements (cont.)

Analysis Requested (Analysis Code)	Solid Matrix Samples Container and Preservative/Unit Codes		Concentrated Liquid Waste Samples Container and Preservative/Unit Codes		Quality Control Samples Container and Preservative/Unit Codes	
Total Metals (2402)* ASL B	-----	---	(1) x 1l glass,TLC	P01/U02	(1) x 1 L jar, polyethylene	P13/U02
TCLP Metals (2401)* ASL B	(1) x 8oz/(1) x 250g glass or polyethylene	P01/U02	-----	---	-----	---
% Moisture (1058) ASL B	(1) x 8oz/(1) x 250g glass or polyethylene	P00/U31	-----	---	-----	---
PFLT (2053) ASL B	(1) x 120ml/ (1) x 100g glass	P00/U99	-----	---	-----	---
Corrosivity (2433) ASL B	-----	---	(1) x 1l glass	P00/ mm/yr	-----	---
Flash Point (2434) pH (2435) ASL B	-----	---	(1) x 250 ml glass, TLC	P00/U37 P00/U35	-----	---
Total U (2442) ASL B	(1) x 8oz/(1) x 250g glass or polyethylene	P00/U07	(1) x 250ml glass or polyethylene	P00/U06	(1) x 1 L jar glass or polyethylene	P11/U06
U-235 (2027) ASL B	(1) x 8oz/(1) x 250g glass or polyethylene	P00/U31	(1) x 250ml glass or polyethylene	P00/U31	(1) x 1 L jar glass or polyethylene	P11/U31
Alpha-Beta (2005) ASL B	(1) x 4oz/(1) x 100g polyethylene	P00/U19	(1) x 120ml polyethylene	P00/U18	(1) x 120ml polyethylene	P00/U18
Description of material (Color, appearance, consistency, etc.)						

Note: * - Note on Chain of Custody that metal analysis should be run using GFAA (CVAA for Mercury).

If not enough material to meet volume requirements do not sample drum, perform visual inspection on the drum.

Chris Weinert 5-17-94
Authorized Signature/Date

Michael F. Ramirez 5-17-94
Approved/Date

D. Sub-Waste Stream Description

The sub-waste stream consists of approximately 226,000 gallons of UNH solution. The material type of "091" and the source code of "815" indicate that this material is Magnesium Diurinate from the Eimco Filters in Plant 8.

E. Safety Concerns

See SOP 20-C-805, Sections 6.0 to 6.14 for Health and Safety requirements. Due to their unknown nature, concentrated liquid waste samples will not be acidified.

F. Representative Sampling Procedure

The drums to be sampled are listed on page 2 of this form. If visual inspection indicates that the material has free liquid or is completely dry, then a P.F.L.T is not necessary. Record pertinent information in the Field Log Book for each drum sampled as specified in SOP 20-C-805, Section 7.2.13.

G. Preservative and Holding Time Guidelines

See Tables 6.1 and 6.2 of the "Prototype Sampling and Analysis Plan for Containerized Waste at the FEMP" and/or Table 6-1 "Sample Container and Preservation Requirements," of the Sitewide CERCLA Quality Assurance Project Plan (SCQ). Sample container, preservative, and holding time requirements for analytical parameters not provided in these tables have been obtained from federal or state of generation policies/directives, or from the FEMP or FEMP-contracted laboratory facility; and incorporated into this PSAP as permitted in Section 3.3.2 of the SCQ.

This form must be dated and signed by an authorized individual.

If this Sub-Waste Stream is sampled and analyzed according to the information on this form, the results generated will be in agreement with the sampling and analysis requirements of NVO-325 (Rev. 1), Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements; and the Fernald Environmental Management Project (FEMP) Sitewide CERCLA Quality Assurance Project Plan (SCQ).

Chris Wernert 5-17-94 — Authorized Signature/Date

Michael F. Ramirez 5-17-94 — Approved/Date

ENCLOSURE A

USEPA COMMENT #1: In its discussion of the neutralization process (Section 2.1.3 and 2.1.4, page 7), the US Department of Energy (DOE) should specify names, structures, and oxidation states for each of the neutralization reactants and products.

RESPONSE: ***Language has been incorporated into the work plan which provides more specific information for the neutralization process.***

USEPA COMMENT #2: In Section 2.1.4, page 7, DOE states that the filtrate must meet certain uranium concentration criteria before discharge to the biodenitrification facility. However, DOE does not include the specific uranium concentration. The uranium concentration criteria for discharge to the biodenitrification facility should be included in the text.

RESPONSE: ***The uranium concentration criteria for discharge to the biodenitrification facility has been included in the text.***

USEPA COMMENT #3: In Section 5.5, page 16, DOE states that neutralizing 20,000 gallons of UNH generated 501 55-gallon drums of filter cake. The work plan proposes treating 200,000 gallons of UNH in 30 to 50 batches. Neutralizing 200,000 gallons of UNH should generate a total of approximately 5,000 55-gallon drums of filter cake, which would equal from 100 to 167 drums per batch. Although the filter cake is assumed to be homogeneous, DOE's proposal to collect only two samples per batch is not adequate to characterize the filter cake. USEPA believes that DOE should collect a sample from every twentieth drum to adequately characterize the filter cake.

RESPONSE: ***By design, the filter cake generated from the UNH treatment process will, on a per batch basis, be extremely homogeneous with low levels of leachable RCRA metals. Analytical results based on simple random sampling of the filter cake generated from the initial processing of UNH solution yielded the following:***

Constituent	UNH Solution Mean (ppm)	UNH Filter Cake # of samples (n)	Mean (ppm)	Variance (s_x)	90% CL[1] (ppm)	Reg. Limit (ppm)	# of samples required[2]
chromium	290.2	7	0.007	< 0.0001	0.0095	5	1
barium	51.8	7	0.3	0.0194	0.3758	100	1

[1] 90% Confidence Limit (one-tailed) same as an 80% Confidence Interval (two-tailed)
[2] SW-846, Chapter 9, Equation 8

The remaining batches of UNH solution to be processed have chromium and barium concentrations within the same order of magnitude as the initial UNH processed (for remaining batches, the highest chromium is about 1,000 ppm and highest barium is about 410 ppm). Bench scale tests verified that processing the remaining batches of UNH solution will generate filter cake well below the TC regulatory limits for chromium and barium. Two samples will be pulled from each batch because this is the minimum number of samples required to do simple statistics to form an 80% confidence interval. The results from each batch will be evaluated using SW-846 Equation 8 to verify that a sufficient number of samples have been drawn to adequately characterize the filter cake generated from each batch.

The number of samples required, according to SW-846, will depend on the mean concentration and standard deviation from those first two samples pulled. The closer the mean is to the regulatory limit, and the higher the variance, the more samples will be required. For each batch, if additional samples are warranted they will be collected and analyzed.

ENCLOSURE B

OEPA COMMENT #1: This document would be more user friendly if tables and charts were to follow their first reference in the text. Please modify this document accordingly.

RESPONSE: *The UNH Removal Action Work Plan will be modified to reflect the comment. Tables and charts will follow the first reference in the text.*

OEPA COMMENT #2: Please clarify in the text at what time the UNH Processing Team will conduct laboratory tests on the tank contents (i.e., prior to full scale mobilization of removal action #20, or after full scale mobilization?). If this time is indeed after full scale mobilization, why not conduct the laboratory tests prior to mobilization to ensure that appropriate neutralization can adequately be achieved.

RESPONSE: *The laboratory tests have been conducted (prior to full scale mobilization) to ensure that appropriate neutralization can be achieved.*

OEPA COMMENT #3: Information in this section regarding proposed processing tanks F1-25 and F1-26 is not clear with respect to secondary containment issues for these tanks. The fourth bullet on page 5 reads: "The location of the tanks inside the building provides improved containment in the event of a tank failure." Please provide additional information to indicate the ability of the processing tanks to meet the secondary containment provisions of hazardous waste regulations.

RESPONSE: *In order to meet the volume capacity for secondary containment area of Tanks F1-25 and F1-26 inside the Digestion Area of Plant 2/3, the temporary stainless steel 6" sills between the hot and cold sides of the Digestion area will be removed. This will bring the total capacity of the digestion containment up to about 31,500 gallons. Also, this secondary containment area will be filled with water to verify the exact capacity of the area and to provide a leak check.*

OEPA COMMENT #4: The project plan calls for a hydrostatic test of tanks F1-2 and F1-26. It would seem the test should also apply to tank F1-25.

RESPONSE: *Yes, the FEMP will apply the leak test to Tank F1-25. Tank F1-25 is the second dilution/neutralization tank and will be required to be emptied prior to construction activities completing the installation of new piping and instrumentation. After completion of these construction activities, Tank F1-25 will be filled with water to determine if it is free of leaks.*

The work plan will be modified to reflect the leak testing of Tank F1-25.

OEPA COMMENT #5: Information given appears to indicate tanks F1-25 and F1-26 are to be equipped with automatic shut-off devices to UNH and water inlet lines to prevent overfilling of the tanks. In this event, would the transfer pumps be left pumping against a closed valve? Please clarify information regarding shut-off controls or procedures to provide adequate safeguards in this event.

RESPONSE: *Yes, the inlet lines would be left pumping against a closed valve. However, standard operating procedures and shut-off controls are in place to provide adequate safeguards in this event. In accordance with standard operating procedures, operators will monitor a pressure gauge located on the transfer pump and will shut off the pump if necessary. Also, the transfer pumps are equipped with a high-pressure switch to shut off the pump.*

OEPA COMMENT #6: Information in this section regarding representative sampling appears to conflict with information in section 5.5, Sampling Plan Approach. Section 5.3 states that drummed filter cake will be sampled and analyzed in accordance with Section C (Waste Analysis Plan) of the FEMP RCRA Part B Application to confirm that no hazardous waste is present. The Waste Analysis Plan indicates that 10% of container populations are to be sampled to ensure representatives. Section 5.5 proposes that only 2 samples be collected from each batch in order to characterize the filter cake. Reliance on 2 samples per batch may not be sufficient to adequately characterize the filter cake.

RESPONSE: *Section C (Waste Analysis Plan) of the FEMP RCRA Part B Permit Application is being revised to incorporate, by reference, the FEMP Prototype Sampling and Analysis Plan (SAP) for Containerized Waste, Revision 2, dated June 1994. This SAP identifies those sampling approaches, consistent with SW-846 Chapter 9, which are currently used at the FEMP to characterize containerized waste populations. Incorporation of this SAP will mitigate the apparent conflict. A copy of the prototype SAP is provided for your review. Chapter 4.0 entitled "Site Selection/Sampling Procedures" provides the sample stategy rationale the FEMP follows during sampling activities.*

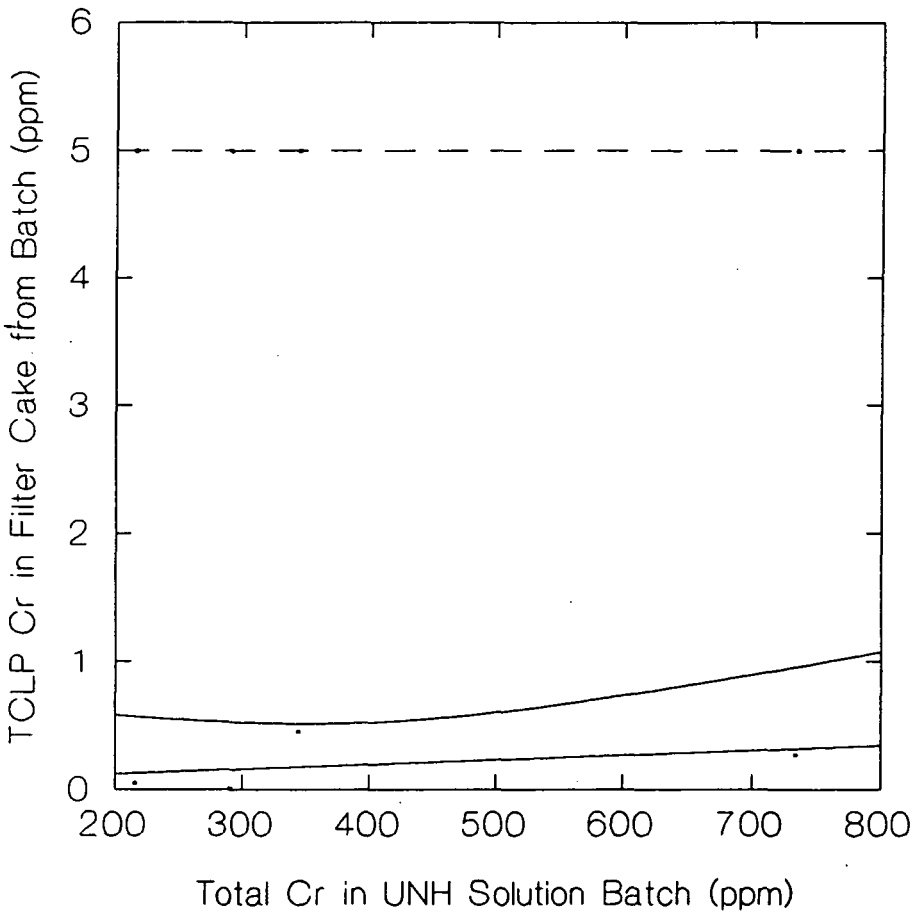
Also, please see the FEMP response to the U. S. EPA's comment #3 regarding the number of samples per batch.

OEPA COMMENT #7: Is seven batches sufficient enough to draw a correlation between the feed materials, process conditions, and the analytical results for the final filter cake product. Please explain the rationale for selecting seven batches, and explain in further detail with the text.

RESPONSE: *As indicated in the work plan, a correlation will be drawn between feed materials, process conditions, and the analytical results for the final filter cake product. With the mix time and pH of the neutralized solution controlled, the leachable (TCLP) concentration of RCRA metals in the filter cake will be dependent on the initial total concentration in the UNH solution. A fitted regression line with an 80% confidence interval (90% confidence limit) about the mean response will be generated after seven batches have been processed. An example of the analysis to be completed is provided in the attached graphic. Note that there are only four data points in this analysis and that the data points are based on results from the initial UNH processing and results from the bench scale testing.*

The correlation to be drawn on results from actual processing will be based on the first seven batches. The confidence interval on the mean response presented in the attached graphic is a function of a t-statistic with n-2 degrees of freedom, where n is the number of batches in the regression. Although the cost of sampling rises as a linear function, the incremental change in t-value diminishes (is less than linear). Selecting seven batches strikes a balance between the cost and benefit of continuing to pull two samples from the filter cake generated from each batch.

Chromium in UNH Filter Cake



——— 90% Confidence Limit for Mean Response
— — - TC Regulatory Limit

SMS-93-290
Revisi 5904

Prototype Sampling and Analysis Plan for Containerized Wastes at the FEMP

June 1994

Prepared for:

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

Executive Summary

The Fernald Environmental Management Project (FEMP) has prepared a prototype containerized waste sampling and analysis plan (SAP) for characterization of waste materials stored in cans or pails, drums, white metal boxes, and Sea/Land[R] or Top Load containers. This SAP replaces waste characterization protocol described in FMPC-2185, "Sampling Plan for Drummed Waste at the FMPC," October 1989. Project-specific sampling and analysis plans (PSAPs) will be developed based on requirements in this SAP. The PSAPs will be implemented in accordance with standard operating procedures (SOPs) which govern aspects of sampling and analysis (S&A), such as sample collection, chain-of-custody, decontamination of equipment, sample management, etc.

The primary objective of this SAP is to generate data of sufficient quality to identify the regulatory status of, and safely manage, containerized waste materials. Secondary objectives are to develop information to determine the appropriate waste disposition option, including treatment and/or disposal. This SAP has been developed to meet the requirements for waste management and disposal within the DOE complex and at commercial facilities. It is consistent with EPA guidance contained in SW-846, Test Methods for Evaluating Solid Waste, and meets the DOE/NV requirements of NVO-325 (Rev. 1), Nevada Test Site (NTS) Defense Waste Acceptance Criteria, Certification, and Transfer Requirements.

In general, the sampling approach for containerized wastes at the FEMP is dependent on the characteristics of the sub-waste stream as determined by process knowledge (PK), previous analytical data reviews and visual inspections. Sub-waste streams which contain heterogenous materials and lack sufficent PK data will be subjected to "comprehensive" sampling and analysis. Sub-waste streams which contain homogenous materials and/or have preliminary determinations based

on PK/previous analytical/visual inspection reviews will be subjected to "confirmatory" sampling and analyses.

Simple-, systematic-, or stratified-random sampling techniques may be employed based upon the material characteristics, process history, and project-specific data needs. Systematic or stratified random sampling methods will be used for sub-waste streams that have been segregated into multiple container groups (lots) based upon differences in: physical characteristics (i.e., phase and degree of homogeneity) of the waste materials, origin (time and location) of waste materials and their generation processes, or distribution and concentration of contaminants.

The primary method for determining the number of samples required for "comprehensive" analyses (based on a 90% level of confidence) consists of a combination of sampling 10% of the containers (for sub-waste streams of 100 containers or less) and the cube root method (for sub-waste streams of > 100 containers). For "confirmatory" analyses, the primary method for determining the number of required samples is equal to the $\log_{10}$ of the number of containers plus one additional sample. EPA SW-846 Equation 8 may be used in lieu of the previously metioned sample frequencies for sub-waste streams which contain sufficient PK/analytical data to approximate a sample mean and standard deviation. EPA SW-846 Equation 8 may also be used as a secondary method for "comprehensive" or "confirmatory" analyses, in situations where the upper limit of a 90% confidence level approximates or exceeds the regulatory threshold value for a given analyte, to determine if additional sample collection and analysis is warranted.

Factors to be considered in the determination of the number of samples required are: 1) the availability of process knowledge, previous analytical data, or visual inspection results; 2) the volume and nature of the sub-waste stream; and 3) the feasibility and cost-effectiveness of sample collection and analysis.

Executive Summary

All work will be conducted in accordance with the FEMP Sitewide CERCLA Quality Assurance Project Plan (SCQ). The SCQ is designed to ensure that work performed at the FEMP is of sufficient quality to fulfill project-specific Data Quality Objectives (DQOs) and to satisfy Department of Energy (DOE), United States Environmental Protection Agency (EPA), Ohio Environmental Protection Agency (OEPA), and public data needs. The SCQ meets current FEMP site needs and retains the flexibility to incorporate changes in the FEMP mission, analytical methods, operating procedures, field techniques, etc. EPA guidance documents, FEMP SOPs, DOE Orders, and a variety of other documents may be used to support the SCQ.

Table of Contents

Executive Summary i
List of Tables vii
List of Figures viii
List of Acronyms ix
1.0 Project Description 1
1.1 General Site Description 2
1.1.1 FEMP-Specific Description 2
1.1.2 SEG-Specific Description 3
1.2 Description of Wastes and Generating Processes 4
1.2.1 Overview of Waste Types 4
1.2.1.1 FEMP-Specific Waste Types 4
1.2.1.1 SEG-Specific Waste Types 6
1.2.2 Overview of Waste Generation Processes 7
1.2.2.1 FEMP-Specific Waste Generation Processes .. 7
1.2.2.1 SEG-Specific Waste Generation Processes .. 10
1.3 Description of Containerized Waste Sampling Locations 13
1.4 SAP Objectives 13
1.5 Use of Process Knowledge/Existing Analytical Data/Visual Inspections 14
1.6 Use of Results/Statistical Treatment of Data 15
1.6.1 Evaluation of Sample Distributions 16
1.6.2 Treatment of "Less Than" Values 17
1.6.3 Treatment of Duplicate Analyses 17
1.6.4 Forming the 90% Confidence Interval 17
1.7 Sampling and Analysis Schedule 17
2.0 Organizations and Responsibilities 19

3.0 **Data Quality Objectives** 21
- 3.1 Representativeness 22
- 3.2 Sampling Accuracy 22
- 3.3 Sampling Precision 22
- 3.4 Method Detection Limits 23
- 3.5 Completeness 23
- 3.6 Comparibility 24

4.0 **Site Selection/Sampling Procedures** 25
- 4.1 Sampling Approach 25
  - 4.1.1 Sampling Approach for Previously Generated Wastes..... 34
  - 4.1.2 Sampling Approach for Currently Generated Wastes..... 36
- 4.2 Number of Samples 26
- 4.3 Sample Volumes, Containers, Preservation, and Holding Times . 27
- 4.4 Sample Collection Procedures/Equipment 27
- 4.5 Sample Handling and Shipment 30
- 4.6 Field Quality Control 30

5.0 **Documentation and Sample Custody** 32
- 5.1 Sample Identification and Labeling 32
- 5.2 Recordkeeping 32
- 5.3 Sample Custody and Analysis Requests 32
- 5.4 Other Miscellaneous Forms 33

6.0 **Analysis of Waste Samples** 34
- 6.1 Waste Analytical Parameters and Methods 34
  - 6.1.1 Non-Radiological Parameters and Methods 34
  - 6.1.2 Radiological Parameters and Methods 36
- 6.2 Sample Container, Preservation, and Holding Time Requirements 36
  - 6.2.1 Non-Radiological Analyses 36
  - 6.2.2 Radiological Analyses 36

7.0 **Quality Assurance/Quality Control** 39
- 7.1 Field QA/QC 39
  - 7.1.1 Field QC Samples 39
  - 7.1.2 Field Screening Equipment Calibration and Documentation 40

Table of Contents

7.1.3 Field Audits/Surveillances 41

7.2 Laboratory QA/QC 41

7.2.1 Laboratory QC Samples 41

7.2.2 Analytical Instrumentation/Equipment Calibration and Documentation 42

7.2.3 QA/QC Checks and Procedures 42

7.3 Data Reporting and Validation 43

8.0 Waste Disposition 44

8.1 Contact Wastes 44

8.2 Decontamination Solutions 44

Appendix A PSAP Format for Drummed and Boxed Wastes 45

Appendix B SMS Statistical Report Format 55

Appendix C DQO Logic Statement and Summary Form NTW-002 57

Appendix D FEMP Miscellaneous Forms 80

Appendix E Glossary 93

Appendix F List of Supporting Documents 96

List of Tables

5904

Table 3.1 Summary of Data Needs and Appropriate ASLs 22

Table 6.1 Sample Container, Preservation, and Holding Time Requirements, Non-Radiological Samples 37

Table 6.2 Sample Container, Preservation, and Holding Time Requirements, Radiological Samples 38

Table 7.1 FEMP-Approved Contract Laboratory Facilities 43

List of Figures

Figure 1.1 FMPC Uranium Metal Production Processes 11
Figure 1.2 SEG Metal-Melt Process 12
Figure 2.1 FEMP Waste Characterization Flow Diagram 20

List of Acronyms

5904

ALARA	As Low As Reasonably Achievable
ASL(s)	Analytical Support Level(s)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COLIWASA	Composite Liquid Waste Sampler
CRU	CERCLA/RCRA Unit
DEs	Drum Equivalents
DL	Detection Limit
DOE	United States Department of Energy
DOE/NV	Department of Energy/Nevada Field Office
DOT	United States Department of Transportation
DQO(s)	Data Quality Objective(s)
DVD	Data Validation Department
EPA	United States Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FMPC	Feed Materials Production Center
GMR	Great Miami River
LAB/ACS	Analytical Laboratory/Analytical Customer Support
LAB/DR&A	Analytical Laboratory/Data Review and Assembly
LLW	Low Level (radioactive) Wastes
MEF	Material Evaluation Form
nCi/g	nano-Curies per gram
NTS	Nevada Test Site
NVO-325	Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer requirements, Revision 1, June 1992
NVO-325LRD	NVO-325 Laboratory Reference Document

OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
OU	Operable Unit
P&CC	Project and Configuration Control
PCB(s)	Poly-Chlorinated Biphenyl(s)
pCi/g	pico-Curies per gram
PK	process knowledge
PPE	Personal Protective Equipment
ppm	parts per million
PSAP(s)	Project-specific Sampling and Analysis Plan(s)
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFA/OSCTR	Request for Analyses/Off-site Custody Transfer Record
RSA	Request for Sampling and Analysis
RSO	Remedial Support Operations
S&A	Sampling and Analysis
SAA	Satellite Accumulation Area
SAP	Sampling and Analysis Plan
SAR/CR	Sitewide Analysis Request/Custody Record
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SEG	Scientific Ecology Group, Inc.
SMS	Site Media Sampling
SOP(s)	Standard Operating Procedure(s)
SW-846	Test Methods for Evaluating Solid Wastes
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TSCA	Toxic Substances Control Act
VR	Variance Request
WC	Waste Characterization

1.0 Project Description

The Fernald Environmental Management Project (FEMP) has prepared a prototype containerized waste sampling and analysis plan (SAP) for characterization of waste materials stored in drums, white metal boxes, and Sea/Land[R] or Top Load containers. This SAP replaces waste characterization protocol described in FMPC-2185, "Sampling Plan for Drummed Waste at the FMPC," October 1989. Project-specific sampling and analysis plans (PSAPs) will be developed based on requirements in this SAP. The PSAPs will be implemented in accordance with standard operating procedures (SOPs) which govern aspects of sampling and analysis (S&A), such as sample collection, chain-of-custody, decontamination of equipment, sample management, etc.

This SAP applies to waste materials stored within cans or pails, drums, white metal boxes, and Sea/Land[R] or Top Load boxes. Ultimately, all solid waste materials at the FEMP requiring shipment to a treatment or disposal facility will be contained within drums, white metal boxes, or Sea/Land[R] or Top Load boxes. However, the FEMP is developing additional prototype SAPs to characterize these wastes in-situ prior to their containerization, if necessary. Types of wastes addressed by these additional SAPs include:

- Soil/Waste Stockpile Materials
- In-Situ Soils/Landfill Materials
- Tank/Sump Materials
- Surface Impoundment Materials

In addition, this SAP shall also be applicable to and followed by FEMP-specific subcontractors for sampling, analysis, and characterization of waste materials generated during recycling or treatment of FEMP materials. Specifically, this

SAP will be used by Scientific Ecology Group, Inc. (SEG) for sampling, analysis, and characterization of wastes generated as the result of metal melting or compaction of FEMP-specific materials.

1.1 General Site Description

This subsection provides site-specific information for the FEMP and Scientific Ecology Group (SEG) facilities.

1.1.1 FEMP-Specific Description

The FEMP, formerly called the Feed Materials Production Center (FMPC), is a United States Department Of Energy (DOE) facility located on approximately 1,050 acres of land in a rural area 27 kilometers (16 miles) northwest of downtown Cincinnati, Ohio. The FMPC operated from 1951 to 1989, by processing uranium ore and feed materials for the production of low-enriched uranium metal products. Subsequent to 1989, the site name and mission changed towards implementation of environmental restoration initiatives to address environmental impacts associated with FMPC operational and FEMP remediation activities.

In general, the FEMP site is divided into the following Operable Units (OUs) or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/ Resource Conservation and Recovery Act (RCRA) Units (CRUs):

- OU/CRU 1 - the Waste Pit Area
- OU/CRU 2 - Other Waste Units
- OU/CRU 3 - the Former Production Area
- OU/CRU 4 - Silos 1 - 4
- OU/CRU 5 - Environmental Media

OU/CRU 1, the Waste Pit Area, consists of a total of eight impoundments used to store a variety of solid and liquid wastes generated by uranium metal production processes.

OU/CRU 2, Other Waste Units, consists of a solid waste landfill, two lime sludge settling ponds, an inactive and an active flyash disposal area, and a former construction rubble disposal area.

OU/CRU 3, the Former Production Area, consists of process/production plants (Plants 1 - 9), container storage pads, RCRA storage facilities, process-support/maintenance buildings, an impoundment used to separate suspended solids from stormwater prior to discharge, a sewage treatment plant, and a solid-material incinerator.

OU/CRU 4, Silos 1 - 4, consists of two silos (K-65) which contain residues from pitchblende processing operations, a silo which contains dry metal oxide materials, and an empty silo.

OU/CRU 5, Environmental Media, consists of surface water and sediments, soils, flora and fauna, ambient air, and groundwater for the entire FEMP facility and adjacent affected areas.

More detailed information concerning site characteristics can be obtained from the Amended Consent Agreement between the DOE and the United States Environmental Protection Agency (EPA), annual site environmental reports, and other records/documents submitted for public inspection.

1.1.2 SEG-Specific Description

The SEG Metal Processing facility is located at 1560 Bear Creek Road, Oak Ridge, Tennessee. This facility is designed to handle and process approximately 25,000 tons of scrap metal per year. Metal processes performed at this facility include size-reduction, decontamination, and/or recycling (i.e., high-temperature melting) to support a variety of DOE programs and commercial nuclear industries. Detailed site-descriptive information has not been provided; however, this information may be obtained from SEG, if warranted.

1.2 Description of Wastes and Generating Processes

A variety of the FEMP's restoration activities, as well as facility support and maintenance functions, are currently generating and will continue to generate waste materials. In addition, when the FMPC ceased production in 1989, a large, but finite inventory of materials associated with the uranium metal production processes were retained. Lastly, as part of the FEMP's waste management and minimization programs, a portion of FEMP materials are shipped to the SEG facility for volume reduction or recycling (metal melting). These wastes/materials require characterization to ensure safe, compliant, and appropriate management to support environmental restoration and waste management goals at the FEMP and supporting programs and facilities.

1.2.1 Overview of Waste Types

This subsection provides a generalized description of the types of waste materials generated at the the FEMP and SEG facilities.

1.2.1.1 FEMP-Specific Waste Types

The types of wastes generated at the FEMP can be grouped into three broad categories: low-level wastes (LLW), hazardous or mixed wastes, and conventional industrial wastes.

Low-level wastes are materials that exhibit radionuclide concentrations which are not economically feasible to recover. Common FEMP low-level wastes that may be characterized by sampling and analysis include:

- Process residues
- Construction rubble
- Thorium materials
- Surface impoundment sediments
- Lime sludge residues

- FEMP or offsite laboratory generated contact wastes, such as gloves, personal protective equipment (PPE), rags, wipes, filters, unused sample materials, sample extracts, etc.

In general, low-level wastes are sent to a viable low-level waste disposal facility (e.g., NTS) for proper disposition. However, soil materials exhibiting total uranium activities of less than 100 pico-Curies per gram (pCi/g) may be retained at the FEMP for unrestricted use as backfill materials.

Hazardous wastes are waste materials that exhibit properties of listed- or characteristic wastes defined in the Ohio Administrative Code (OAC), Chapter 3745-51 (in lieu of 40 CFR Part 261). Mixed wastes are waste materials which contain both radioactive and hazardous components. Common FEMP hazardous or mixed wastes that may be characterized by sampling and analysis include:

- Solvent still-bottoms and sludges
- Barium chloride salts
- Polychlorinated biphenyl (PCB)-containing materials
- Spent solvents
- Sand blasting residues
- FEMP or offsite laboratory generated contact wastes, such as gloves, personal protective equipment (PPE), rags, wipes, filters, unused sample materials, sample extracts, etc.

In general, hazardous and mixed wastes are stored at the FEMP site at approved RCRA storage facilities until the appropriate treatment or disposal option can be identified. Hazardous or mixed waste are only shipped to EPA approved and permitted hazardous/mixed waste facilities.

Conventional industrial wastes are materials that do not exhibit properties of low-level or hazardous wastes. Common conventional industrial wastes include:

- Trash from the Administrative Areas (not within Production Area)
- Boiler plant flyash

- Construction rubble (non-contaminated)

In general, conventional industrial wastes are shipped to an approved solid waste landfill for disposal.

1.2.1.2 SEG-Specific Waste Types

In general, recycling (metal melting) and compaction of FEMP-specific materials at the SEG facility should not generate any hazardous or mixed wastes. FEMP-specific materials shipped to SEG for recycling and compaction are low-level radiologically-contaminated stockpiled scrap metals and other debris generated during construction or remediation projects. These materials are as follows:

- Scrap metal
- Tanks
- Equipment/Machinery
- Structural steel
- Scrap vehicles
- Heat exchangers
- Pipe metal
- Tools

At SEG, low level scrap metal is segregated from loose oxides and other stockpile debris (i.e., paper, cardboard, plastic, gloves, glass, soil, etc.) included with the scrap metal shipments. Subsequent to segregation, scrap metal materials are recycled (i.e., melted) to produce rectangular metal boxes for radioactive material storage or burial.

Typical wastes generated by segregation and recycling of FEMP scrap metals and associated debris include:

- Iron oxides (rust scale)
- Segregated trash/debris

- Refractory brick
- Non-recyclable metal scrap
- Metal slag

These wastes will be placed in overpack containers for shipment to NTS. If warranted or feasible, these materials may be compacted to reduce waste volumes. Detailed information on these wastes are provided in ONL0000000009, Meatl Melt Wastes, as part of the FEMP's Waste Generator Application to NTS.

1.2.2 Overview of Waste Generation Processes

A brief, thorough description of the waste generation process is provided by the waste generator on the Material Evaluation Form (MEF). This brief description is incorporated into Section A.9 of the PSAP (Appendix A). Detailed information pertaining to the waste generation process is provided as an attachment to the PSAP and in the waste characterization file.

1.2.2.1 FEMP-Specific Waste Generation Processes

A majority of the wastes generated at the FEMP are either a direct or indirect result of the former uranium metal production processes at the FMPC. A summary of these processes is provided, to orient SAP users with historical production operations, as follows:

> The initial step in the uranium metal production process was to obtain uranium-containing materials from other DOE facilities and FMPC scrap metals recycling operations. These materials were then subjected to refining or reduction processes to produce Uranium tetrafluoride (UF4) or green salt. The green salt material was then blended with magnesium granules for reduction (in furnaces) to produce uranium metal forms called derbies. The derbies were then melted in vacuum induction furnaces and cast in graphite molds to produce ingots (flat or cylindrical). Flat ingots were subjected to heat treatment and final machining prior to shipment to other DOE sites. Cylindrical ingots were center-drilled to produce a billet. Billets were shipped offsite for extrusion then returned to the FMPC for heat treatment and final machining.

The uranium metal production processes were conducted at the following facilities at the FEMP site:

- Plant 1, the Sampling Plant
- Plant 2/3, the Refinery Plant
- Plant 4, the Green Salt Plant
- Building 13, the Pilot Plant
- Plant 5, the Metals Production Plant
- Plant 9, the Special Products Plant
- Plant 6, the Metals Fabrication Plant
- Plant 8, the Scrap Recovery Plant

Plant 1, the Sampling Plant, was responsible for the following functions:

- shipping, receiving, sampling and storing depleted, normal, and enriched uranium-containing materials
- drying, crushing, milling, grinding, and classifying uranium - containing materials
- reconditioning or baling of steel drums
- digesting enriched feed materials (up to 5% U^{235}) in geometrically safe equipment

Plant 2/3, the Refinery Plant, was responsible for the following functions:

- digesting recycled materials in nitric acid to produce an uranyl nitrate (UNH) solution for solvent extraction purification
- converting purified UNH to Uranium trioxide (UO_3) or orange oxide by thermal denitration processes
- recovering nitric acid from nitrogen oxide (NO_x) discharges from digestion and denitration operations

Plant 4, the Green Salt Plant, was responsible for the following functions:

- converting Uranium trioxide (UO_3) or orange oxide to Uranium dioxide (UO_2), or brown oxide by hydrogen reduction

- converting UO_2 to Uranium tetrafluoride (UF_4) by hydrofluorination processes (using anhydrous hydrogen fluoride - AHF)
- blending and packaging depleted green salt for the Metals Production Plant (Plant 5)

Building 13, the Pilot Plant, was responsible for the following functions:

- reducing Uranium hexafluoride (UF_6) to Uranium tetrafluoride (UF_4) by autoclavinq processes
- coating crucibles used in uranium metal casting processes by plasma spray equipment

Plant 5, the Metals Production Plant, was responsible for the following functions:

- reducing Uranium tetrafluoride (UF_4) to high-purity depleted, normal, and enriched uranium derby metal
- remelting derby and recycled metals in vacuum induction furnaces for casting into ingots
- cutting ingots and milling Magnesium fluoride (MgF_2) slag byproduct for reuse in lining reduction pots

Plant 9, the Special Products Plant, was responsible for the following functions:

- machining ingots for extrusion
- casting derbies and high-grade recycled metals into large diameter ingots
- chemically decladding unirradiated fuel elements

Plant 6, the Metals Fabrication Plant, was responsible for the following functions:

- heat-treating products in neutral salt and salt-oil baths
- performing final machining of target element cores
- cropping, surface milling, and inspecting products for shipment

- performing metal pickling and chip briquetting operations

Plant 8, the Scrap Recovery Plant, was responsible for the following functions:

- screening recycled materials
- drying wastes for offsite disposal
- drum washing
- filtering contaminated water for recovery and waste operation

Figure 1.1 illustrates the FEMP uranium metal production processes. A more complete summary of these processes is provided by A Closer Look at Uranium Metal Production, A Technical Overview, prepared by the FMPC in March 1988. Detailed information on specific processes may be found in FMPC production SOPs, manufacturing specifications, and technical reports.

1.2.2.2 SEG-Specific Waste Generation Processes

In general, SEG-specific wastes result from scrap metal and debris segregation and treatment operations. A brief summary of the typical waste generation process is as follows:

> FERMCO scrap metal and appropriate waste manifest documentation are received at the SEG facility. These wastes are visually inspected for lead or lead-bearing materials and other non-desirable debris not amenable to the metal-melt process. When present, lead or lead-bearing metal scrap and other debris are physically segregated from the waste stockpile and transported to appropriately labeled storage bins for disposition. The resulting waste stockpile materials are subjected to size-reduction and/or surface decontamination (high pressure rinse or steel/glass bead shot blasting), if warranted. These materials are then melted in a 20-ton, 7200 kilowatt, high-energy induction furnace and deslagged. Metal slag material is removed , cooled, sampled, and placed in overpack containers with non-lead debris segregated prior to the metal-melt process. If warranted, these materials are subjected to volume-reduction operations prior to shipment to NTS.

Figure 1.2 illustrates typical SEG metal-melt processes. Detailed information on specific processes may be found in SEG-specific SOPs, specifications, and technical reports.

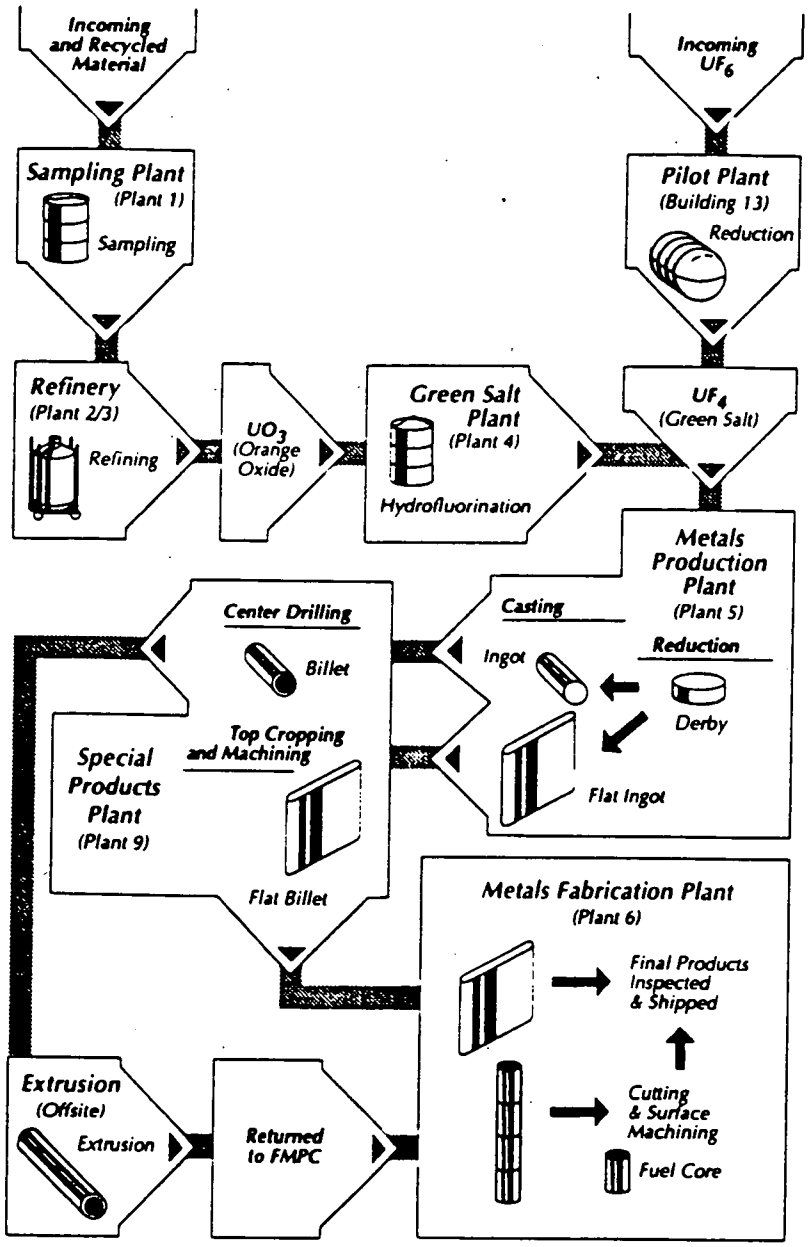


Figure 1.1 FMPC Uranium Metal Production Process

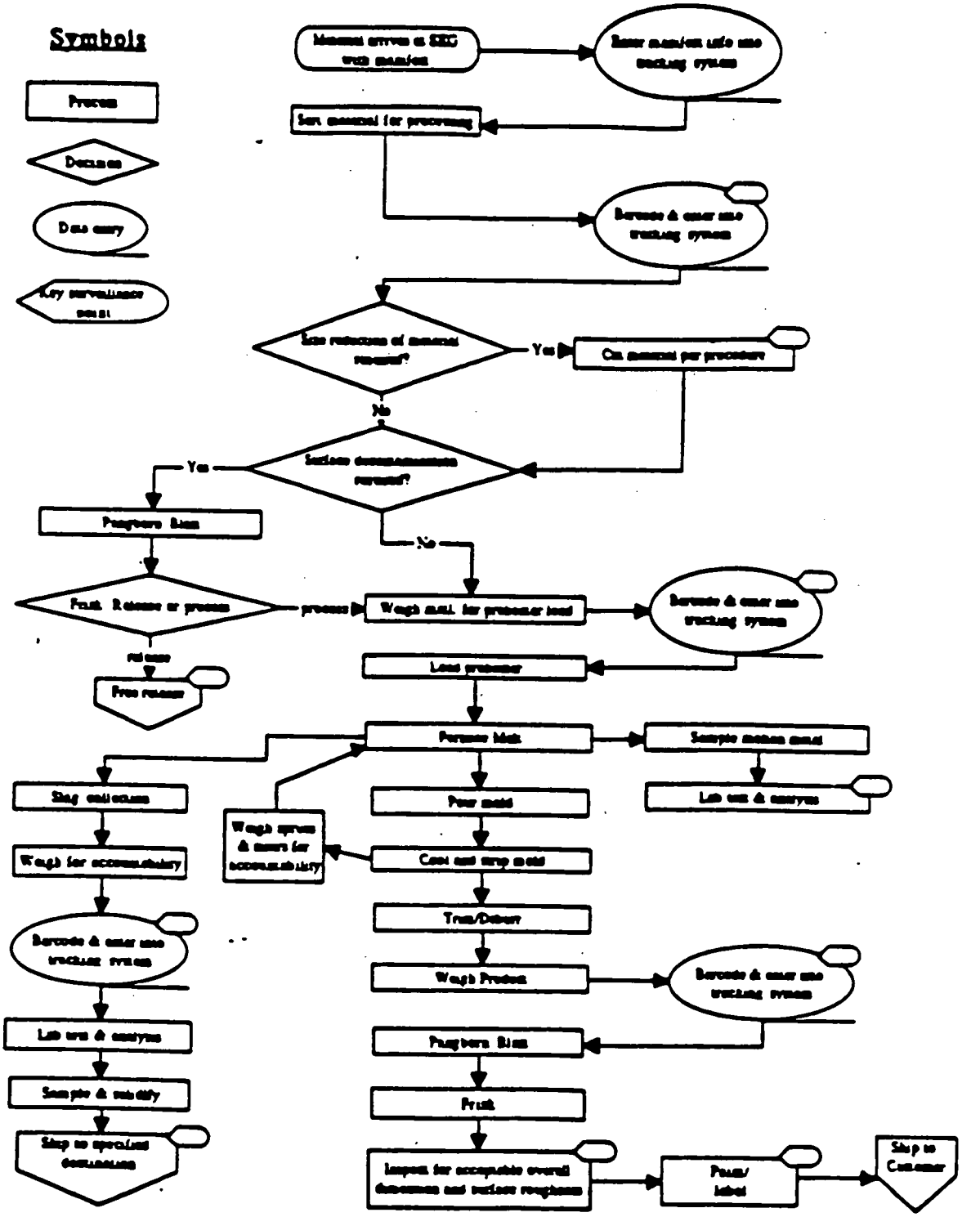


Figure 1.2 SEG Metal-Melt Process

1.3 Description of Containerized Waste Sampling Locations

Containerized waste may be sampled at one of following general locations:

- the container storage area,
- a container staging area established for sampling activities, or
- an established container sampling line

The sample plan writer determines the appropriate container sampling location based on the environmental setting, the contaminants of concern, the logistics and feasibility of transporting containers from their staging/storage area to a different site location. The selected container sampling location shall be identified in Section A.8 of the PSAP. If the container sampling location identified in Section A.8 of the PSAP must be changed, the sampling crew shall contact the sample plan writer to obtain verbal approval of the venue change. This variance will be documented on the PSAP and the associated field logbook page(s).

1.4 SAP Objectives

The primary objective of this SAP is to generate data of sufficient quality to identify the regulatory status of, and safely manage containerized waste materials. Secondary objectives are to develop information required to determine appropriate waste disposition options, including disposal and/or treatment. This SAP has been developed to meet the requirements for waste management and disposal within the DOE complex and at commercial facilities. Specifically, it meets the requirements of NVO-325 (Rev. 1), Nevada Test Site (NTS) Defense Waste Acceptance Criteria, Certification, and Transfer Requirements.

Specific objectives of this SAP are as follows:

1) Determine the presence and concentrations of RCRA hazardous constituents and radiological activities to support waste characterization,

2) Provide sufficient information to ensure that the sub-waste stream is managed safely,

3) Support identification of the appropriate disposal or treatment option (e.g., determine if the sub-waste stream meets NVO-325 Rev. 1 waste acceptance criteria), and

4) Identify potential hazards or risks to public health or the environment associated with storage of the sub-waste stream, if disposal or treatment is not feasible or practical.

1.5 Use of Process Knowledge/Existing Analytical Data/Visual Inspections

In general, the use of process knowledge (PK) alone (without confirmatory sampling and analyses) shall be appropriate for waste characterization when one or more of the following conditions exist:

1) The sub-waste stream is difficult to sample because of physical form. This primarily applies to solid matrix waste such as metal, glass, or wood, rather than as a residue that could be removed for testing or in a decontamination process.

2) Sampling and analysis of sub-waste stream would result in unacceptable risk of radiation exposure, (i.e., violate the As Low As Reasonably Achievable, ALARA, precept of the DOE)

3) Sub-waste stream is too heterogenous in composition (e.g., compactible trash containing clothing, booties, plastic, paper, experiment-driven, and decontamination and decommissioning waste).

In general, PK is used to provide information related to the waste materials and their generation process(es). This information may be used for waste material segregation to ensure that representative samples are collected for sub-waste stream characterization. In addition, PK may be used to support "non-RCRA" (not RCRA hazardous) or "RCRA" (RCRA hazardous) determinations for appropriate waste materials. The use of PK to support a "non-RCRA" determination generally requires a greater amount of supporting documentation, which must reasonably support a case that the material could not exhibit a characteristic or meet a threshold criteria for regulation.

Previous analytical data may be used for waste material segregation to ensure that representative samples are collected for sub-waste stream characterization. In addition, these data may be used to determine the number of samples required to characterize the waste materials (using the SW-846 equation, or parametric method), determine the appropriate analyses required for waste characterization, and determine the appropriate level of personal protective equipment (PPE) required during sampling activities.

Visual inspections are typically used to verify that the container's contents match the description provided on the MEF and document the physical characteristics of the waste materials. In addition, visual inspections may be used for waste material segregation to ensure that representative samples are collected for sub-waste stream characterization.

PK, previous analytical data, and visual inspection review documentation is prepared by Waste Characterization (WC) and transmitted to Site Media Sampling (SMS). A brief, thorough summary of this document is incorporated into Section A.9 of the PSAP. The entire PK/previous analytical data/visual inspection review document is provided as an attachment to the PSAP and in the waste characterization file.

1.6 Use of Results/Statistical Treatment of Data

Data obtained from the sampling and analyses of the waste materials will be used to:

- support waste identification,
- determine waste handling and storage requirements, and
- identify treatment or disposal options

Laboratory reviewed and validated analytical data are submitted to SMS for statistical analyses and reporting to assist WC in the RCRA determination process. For decisions that require comparison with a regulatory threshold, a 90% confidence limit (based on a one-sided Student "t" Test) is formed. An

example of the SMS Statistical Analysis Report is provided in Appendix B. A summary of the statistical analysis methodology, in accordance with the FEMP Waste Characterization Plan, is provided in the following subsections.

1.6.1 Evaluation of Sample Distributions

The inferential calculations used to form the 90% confidence limit are based on the assumption that the population is approximately normally distributed. Two primary criteria for determining whether a population is normally distributed based on review of a sample set are:

1) Visual inspection of the data (i.e., a graph or plot of the data) and/or

2) Mathematical comparison of the values for the sample mean ($\bar{x}$) and the sample standard deviation ($s\bar{x}$)

When the coefficient of variance is less than 1.25 (i.e., $s\bar{x}/\bar{x} < 1.25$), the data may be assumed to be approximately normally distributed. If this test indicates that the data are not normally distributed, then the following steps are taken in accordance with established guidance at the FEMP:

1) PK and the S&A effort are revisited to determine if the apparent distribution may be an artifact of S&A. Resampling may be necessary if this is deemed to be the case.

2) If the data correlate to an apparent stratification of the sub-waste stream and this correlation is substantiated by PK, then the waste may be evaluated as a stratified sub-waste stream.

3) If the data are determined to meet an alternate distribution profile, a data transformation and subsequent statistical evaluation may be performed (e.g., log-normal transformation followed by anti-log transformation of the 90% confidence limit).

4) If the transformation does not normalize the data, non-parametric approaches may be utilized to form the required 90% confidence limit.

5) Alternatively, additional samples may be collected to expand the number of data points representing the waste. This additional data provides a broader base with which to evaluate assumptions of normality.

1.6.2 Treatment of "Less Than" Values

In cases where the constituent concentration is expressed as "less than" the detection limit (DL), a value of 1/2 the DL is used as an input for statistical treatment. For data to be considered valid, however, the reported DL must be below the regulatory limit with which data are to be compared. This approach minimizes error in decision making (as opposed to using a value of zero or the actual DL in the decision making). If the reported DL exceeds its respective regulatory threshold level, the actual DL value will be input to minimize false negative errors in the waste determination decision-making process.

1.6.3 Treatment of Duplicate Analyses

Sample duplicate analyses are an integral part of SW-846 quality assurance protocol and are used to measure sampling performance in terms of precision (reproducability). A sample and its duplicate are designed to be equivalent (i.e., sampled and analyzed in precisely the same manner), therefore any distinction between a sample and its duplicate is arbitrary. For purposes of statistical treatment of data, the average value of the duplicate analyses for each constituent for a given sample is used for calculating statistics.

1.6.4 Forming the 90% Confidence Interval

Statistical treatment of data is performed by Site Media Sampling. A minimum of two sample points is required to form the 90% confidence limit in accordance with SW-846's Equation No. 6. A summary of sample results and sample statistics, including the 90% confidence interval, is prepared by SMS and sent to WC for evaluation.

1.7 Sampling and Analysis Schedule

To manage the large amount of sampling and analyses conducted by the FEMP, schedules for individual projects are controlled by an independent support organization within Project and Configuration Control (P&CC). Start and end dates associated with the following specific milestones are generally tracked:

- Request Sampling and Analysis
- Prepare PSAP
- Collect Samples
- Analyze Samples
- Conduct Data Review and Validation
- Prepare Statistical Analysis Report
- Document Waste Characterization

000324

2.0 Organizations and Responsibilities

Figure 2.1 illustrates the process flow chart from waste generation to waste characterization. Key technical and quality assurance personnel implementing these activities are identified in the documentation generated for each sampling and analysis event.

In general, WC receives a MEF from the waste generator. WC conducts a PK/previous analytical data/visual inspection review, prepares appropriate documentation, and submits a Request for Sampling and Analysis (RSA) form to SMS. SMS prepares a PSAP, based on information supplied on the RSA, and obtains the required concurrences and approvals prior to initiating sampling activities. Remedial Support Operations (RSO) or SMS collects and delivers the waste samples to Analytical Laboratory/Analytical Customer Support (LAB/ACS) for analyses or shipment to FEMP-approved laboratories. Subsequent to waste sample analyses, Analytical Laboratory/Data Review and Assembly (LAB/DR&A) reviews the data package and forwards these data to SMS for statistical analyses. SMS conducts the statistical analyses, generates a statistical report, and submits all information to WC for waste characterization. WC maintains supporting documentation traceable to the sub-waste stream and characterization file.

Examples of a MEF and a RSA are provided in Appendix D.

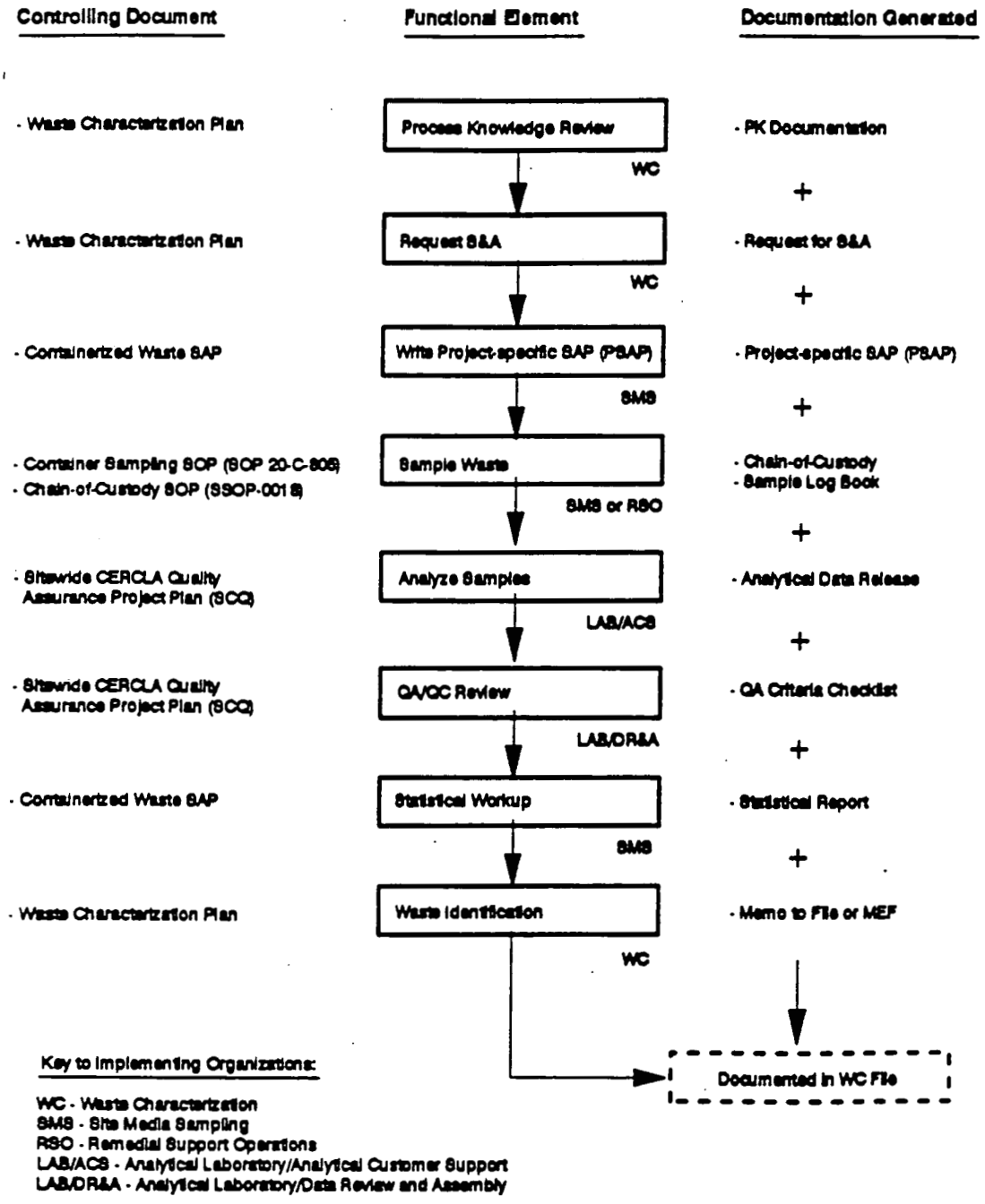


Figure 2.1 FEMP Waste Characterization Flow Diagram

3.0 Data Quality Objectives

5904

Containerized waste sampling and analysis is required to satisfy the following data needs:

1) Determine the regulatory status of the waste materials (at a 90% confidence level) and ensure compliance with NVO-325 (Rev. 1) requirements

2) Determine the appropriate level of health and safety requirements for protection of site workers during waste disposal, treatment, or storage

3) Determine the waste characteristics to evaluate the proper disposal, treatment, or storage option

4) Assess risks to human health or the environment if wastes must be stored at the FEMP

Analytical Support Levels (ASLs), used to support DQOs, are defined in Appendix C of the FEMP Sitewide CERCLA Quality Assurance Project Plan (SCQ). Appropriate ASLs for each data need are presented in Table 3.1.

DQO Logic Statement and Summary Form NTW-002 for containerized waste material sampling, analysis, and characterization is provided in Appendix C.

In general, the DQO provides a technically-sound sampling and analysis approach capable of satisfying the following items: representativeness, sampling accuracy, sampling precision, analytical method detection limits, completeness, and comparability. These items are addressed in the following sections of this sampling and analysis plan.

Table 3.1 Summary of Data Needs and Appropriate ASLs		
Analytical Parameter	ASL (s)	Data Need Satisfied
Organic/Radiologic Screening	A	1 and 2
Total/TCLP VOAs, SVOAs, Metals, Pesticides/Herbicides	B	1, 2, and 3
Flash Point, pH, Corrosivity	B	1, 2, and 3
F001 - F005 Solvents, Cyanides, Sulfides, PCBs	B	1, 2, and 3
Paint Filter Liquids Test	B	1 and 3
Total/Isotopic U and Th	B	1, 2, and 3
TAL VOAs, SVOAS, Pesticides/PCBs, Inorganics	C and D	1, 2, 3, and 4
Full Radiological	D and E	1, 2, 3, and 4

3.1 Representativeness

Representativeness, or the collection of samples that are unbiased and exhibit average properties of the population sampled, is achieved by segregating the containerized wastes into sub-waste streams. A sub-waste stream is generally comprised of a group of containers labeled with the same Material Type and Source Code. Material Type and Source Code identifiers are provided in each PSAP, in Sections A.5 and A.6, respectively.

3.2 Sampling Accuracy

Sampling accuracy, or the closeness of a sample value to its true value, is achieved through randomized sampling of the waste containers within a given sub-waste stream. Randomized sampling minimizes bias in the sample selection process by giving each container an equal probability of being sampled.

3.3 Sampling Precision

Sampling precision, or the closeness of repeated sample values, is achieved by

increasing the number of samples to be collected, increasing the actual volume of the samples, or dividing a population into appropriate strata prior to sampling. Additional samples may be collected when the uniformity of the waste is not known and when sample collection is difficult. In general, the volume of sample material collected at the FEMP exceeds the minimum amount needed for analytical sample preparation and analysis. Lastly, when a sub-waste stream is suspected or known to contain separate physical phases (i.e., solids and liquids), the number of samples required is calculated for each waste phase. During sample collection activities, a sample is collected from each waste phase from the randomly selected waste containers.

3.4 Analytical Method Detection Limits

In general, analytical method detection limits are provided in Appendix G of the SCQ (Vol. II). Method detection limits for solid- and liquid-phased non-radiological analyses, are based upon EPA SW-846 or Contract Laboratory Program (CLP) protocol. Method detection limits for radiological analyses are based upon performance-based standards and protocol.

3.5 Completeness

To satisfy SCQ completeness requirements of 90%, the number of samples required to be collected will be calculated in accordance with methods described in EPA/230-02-89-042, Feb. 1989, Methods for Evaluating the Attainment of Cleanup Standards, Vol. I, Soils and Solid Media. The following equation will be used to determine the number of samples to obtain a 90% completeness level:

$$\#\ \text{of Samples}_{(90\%\ \text{comp})} = \frac{\text{Minimum number of samples required}}{(1 - R)}$$

where,

R = 0.20 (20%), the expected percent of missing or unusable data (i.e., sample holding times exceeded, improper preservation of samples, sample container breakage during shipment to laboratory, etc.)

An R-value of 0.20 (20%) was selected to take the most conservative approach for minimization or elimination of the potential need for resampling activities.

3.6 Comparability

Laboratory facilities contracted to provide analytical services are required to comply with all provisions in the SCQ. Therefore, data sets from differing laboratory facilities should be comparable since the same analytical method and method detection limit is required. However, in order to measure comparability between data sets from distinct laboratories, the FEMP may periodically use split samples. Split sample analytical data may also be used to identify false negative or false positive errors.

4.0 Site Selection/Sampling Procedures

This section provides sample strategy rationale; sample collection, handling, preservation, and shipment procedures; and field quality assurance protocol to be followed during containerized and process generated waste sampling activities. The SCQ shall serve as the primary guidance document for containerized and process generated waste sampling activities. EPA guidance documents (i.e., SW-846), and FEMP standard operating procedures (SOPs) shall serve as support documents to the SCQ.

4.1 Sampling Approach for Containerized Waste

The sampling approach for containerized wastes at the FEMP is dependent on the characteristics of the sub-waste stream as determined by PK/previous analytical data/visual inspection reviews. Sub-waste streams which contain heterogenous materials and lack sufficent PK data will be subjected to "comprehensive" sampling and analysis (i.e., rate of 10% or cube root). Sub-waste streams which contain homogenous materials and/or have preliminary determinations based on PK/previous analytical/visual inspection reviews will be subjected to "confirmatory" sampling and analyses (i.e., log base 10 + 1).

Simple-, systematic-, or stratified-random sampling techniques may be employed based upon the material characteristics, process history, and project-specific data needs. Systematic or stratified random sampling methods will be used for sub-waste streams that have been segregated into multiple container groups (lots) based upon differences in: physical characteristics (i.e., phase and degree of homogeneity) of the waste materials, origin (time and location) of waste materials and their generation processes, or distribution and concentration of contaminants.

Methods of determining simple random sample locations include using a random number generator or random number lists. Computer generation of random numbers is preferred, since it eliminates the potential for error in reading a random number list and reduces bias in the selection of the origin point for a random number list. Systematic or stratified random sample locations will be determined by selecting random sample locations or time intervals as previously described for each container group or lot.

4.1.1 Sampling Approach for Previously Generated Wastes

Sub-waste streams generated by previous FMPC/FEMP operations which contain homogenous waste materials or have preliminary determinations based on PK/previous analytical data/visual inspections, will be subjected to "confirmatory" sampling and analysis using simple-random sample selection techniques. Heterogenous sub-waste streams which lack sufficient PK/previous analytical/visual inspection data will be subjected to comprehensive sampling and analysis using simple-, systematic-, or stratified-random sample selection techniques.

4.1.2 Sampling Approach for Currently Generated Wastes

Sub-waste streams generated by current FMPC/FEMP operations which contain homogenous waste materials based on PK/previous analytical data/visual inspection reviews will be subjected to "confirmatory" sampling and analysis. Confirmatory samples will be collected during the first day of material processing at random 1-hour intervals. Appropriate process control will be identified and documented in WC files to demonstrate that the process generates homogenous sub-waste stream materials.

Heterogenous sub-waste streams which lack sufficient PK/previous analytical/visual inspection data will be subjected to "comprehensive" sampling and analysis using simple- or systematic-random sample selection techniques. Comprehensive samples will be collected at random time intervals from initiation to completion of respective material processing operations. Comprehensive samples may be

collected in distinct batches for long-term processes that may generate volumes of waste materials in excess of respective storage capacities.

4.2 Number of Samples

For drummed waste sampling at the FEMP, typically the number of samples required equals 10% of the number of drums in a sub-waste stream. However, for sub-waste streams containing more than 100 drums, collecting samples for analyses at a rate of 10% may not be economically feasible or practical. Therefore, the FEMP intends to use the 10% method for sub-waste streams with < 100 drums and the cube root method for sub-waste streams with > 100 drums. Using this approach, the number of samples required for waste characterization is as follows:

Number of Drums	Min. # of Samples for Analysis	Number of Samples for Completeness*
1 to 20	2	3
21 to 100	10%	12.5%
101 to 1000	10	13
1001 to 10000	22	28

* - Total number of samples required to maintain 90% completeness using a conservative R-value of 0.20 (20%).

For white metal box, Sea/Land[R], or Top Load container sampling, the proposed number of samples required shall be as follows:

Number of Boxes	Min. # of Boxes to be Sampled	# of Samples/Boxes for Completeness*
1	1	3
2 to 100	10% + 1	12.5% + 1.25
101 to 1000	11	14
1001 to 10000	23	29

* - Total number of samples required to maintain 90% completeness using a conservative R-value of 0.20 (20%). This number includes collecting one random sample from white metal box, Sea/Land[R], or Top Load containers in addition to the minimum number of containers to be sampled.

For sub-waste streams that have been characterized by process knowledge but do

not meet one of the conditions in Section 1.5 of this SAP, the number of required confirmatory samples per sub-waste stream is as follows:

Number of Containers	Min. # of Samples for Analysis	Number of Samples for Completeness*
1 to 10	2	3
11 to 100	3	4
101 to 1000	4	5
over 1001	5	6

* - Total number of samples required to maintain 90% completeness using a conservative R-value of 0.20 (20%). If the containers are white metal, Sea/Land[R], or Top Load boxes, the required number of samples is equal to the number of samples in this table plus one additional sample.

Parametric analysis, or EPA SW-846 Equation 8, is the preferred method to select the required number of samples required to satisfy the NVO-325 90% confidence level requirement. However, EPA SW-846 Equation 8 requires previous analytical data to determine the mean and associated standard deviation for the analyte with the most restrictive regulatory threshold level. EPA SW-846 Equation 8 may be used as a tertiary method, in situations where the upper limit of a 90% confidence level approximates or exceeds the regulatory threshold value for a given analyte, to determine if additional sample collection and analysis is warranted. In addition, in situations where sufficient previous analytical data exists for a sub-waste stream, EPA SW-846 Equation 8 may be used in lieu of the sample frequency identified above.

4.3 Sample Volumes, Containers, Preservation and Holding Times

Required sample volumes, containers, preservatives, and holding times are provided in Appendix A, Table 6.1 of the SCQ. Sample volumes, containers, preservatives, and holding times are presented in Section 6.0 of this SAP, and in Sections B.2, B.3, and C of each PSAP.

4.4 Sample Collection Procedures/Equipment

Drummed waste sample collection procedures and appropriate sampling equipment, in accordance with Appendix K (Sections K.5.5.4 through K.5.5.6) of the SCQ and

FEMP SOP 20-C-805, "Sampling Drummed Waste for Hazard Identification," are as follows:

Solid Matrix Waste Materials

1. Use a **grain sampler** for free-flowing (loose) particulate solids that are easy to penetrate. Extract a sample as follows:

   a. Ensure that grain sampler is in closed position with slots in the outer tube facing upwards.

   b. Insert grain sampler diagonally at a point near the side of the drum, through the center, to a point at the drum base directly opposite to the entry point.

   c. Rotate inner tube of the grain sampler to the open position, collect sample, then rotate inner tube to closed position.

   d. Withdraw grain sampler and place in a horizontal position with slots in the outer tube facing upwards.

   e. Rotate inner tube to the open position and transfer material to appropriate sample containers as specified in Tables 6.1 and 6.2 of this SAP.

2. Use a **stainless steel pipe sampler, hand-auger, or coring device** for moist or cohesive particulate solids that can be extracted as a core. Extract a sample as follows:

   a. Insert pipe sampler diagonally at a point near the side of the drum, through the center, to a point at the drum base directly opposite to the entry point.

   b. Rotate pipe sampler twice until slot is facing upwards.

   c. Withdraw pipe sampler and place in a horizontal position. Ensure that the entire length of pipe contains sample material. If not, repeat steps a and b.

   d. Use a clean stainless steel spatula to transfer material to appropriate sample containers as specified in Tables 6.1 and 6.2 of this SAP.

Liquid Matrix Waste Materials

1. Use a **glass COLIWASA** for liquid wastes that can degrade a plastic COLIWASA or for Volatile Organics sample collection. Extract a sample as follows:

a. Insert inner rod of the glass COLIWASA inside the sheath.

b. Lower glass COLIWASA vertically, keeping the ground glass end of inner rod away from hole in sheath bottom, at a rate so that the liquid levels inside and outside the sample tube remain even.

c. Push inner rod downwards to close the sampling device (ground glass end placed in hole of sheath bottom) when the drum base has been encountered.

d. Withdraw glass COLIWASA with one hand while decontaminating outside surface with a clean, disposable cloth. Dispose of cloth as described in Section 8 of this SAP.

e. Pull inner rod upwards to transfer material to appropriate sample containers as specified in Tables 6.1 and 6.2 of this SAP.

f. Collect Volatile Organics samples as follows:

(1) Fill 40-milliliter (mL) septum vial to lip until meniscus forms.

(2) Slide teflon septum across vial opening and screw lid on vial.

(3) Turn vial upside down and gently tap to check for air bubbles.

(4) Repeat steps 1, 2, and 3 if air bubbles are present.

For white metal box, Sea/Land[R], and Top Load containers, waste material sample collection procedures and appropriate sampling equipment are provided in Appendix K (Section K.8) of the SCQ, and Chapter 5 of EPA 600/R-92/033, Characterizing Heterogeneous Wastes: Methods and Recommendations. A generalized procedure, based on excerpts of these documents, is as follows:

1. Establish a 1-foot length by 1-foot width grid pattern at the container top.

2. Collect waste material samples from the grid and random sample depth locations indicated in the PSAP for each container identified. Extract a waste material sample as follows:

a. Use a stainless-steel hand auger or coring tube device for soils and solid media that can be easily penetrated.

(1) Advance auger or coring tube device to random depth indicated

for given grid location.

(2) Transfer waste material from auger or coring device, using a clean, stainless-steel spatula or scoop, to appropriate sample containers as specified in Tables 6.1 and 6.2 of this SAP.

b. Use **scissors or shears** for paper, cloth, rags, plastic, etc., that exhibit evidence of stains or surface residues. Sample collection processes for volatile and semi-volatile organic samples will be expedited to minimize devolatilization of such compounds.

(1) Collect samples by cutting material into pieces of less than 9.5 millimeter (mm) diameter and placing in appropriate sample containers as specified in Tables 6.1 and 6.2 of this SAP.

c. Use **a rotary drill and decontaminated bits** for wood, concrete, etc., that exhibit evidence of stains or surface residues. Sample collection processes for volatile and semi-volatile organic samples will be expedited to minimize devolatilization of such compounds.

(1) Collect wood or concrete cuttings in a clean, stainless steel pan or tray.

(2) Transfer cuttings from pan or tray, using stainless steel scoop or spoon to appropriate sample containers as specified in Tables 6.1 and 6.2 of this SAP.

Sampling equipment decontamination procedures are presented in Appendix K, (Section K. 11) of the SCQ, SOP 20-C-805, and EP-SMS-003, "Equipment Decontamination."

4.5 Sample Handling and Shipment

Field storage and shipment of samples procedures are presented in Section 6.7 and Appendix K (Section K.10) of the SCQ, SOP-C-805, and EP-SMS-004, "Conduct and Coordination of Field Operations."

4.6 Field Quality Control

A discussion of the types and frequency of field quality control samples are presented in Section 7.1.1 of this SAP, and Section 4.1.1 and Appendix A, Table 2.2 of the SCQ. The type of field quality control samples will be determined based on the project-specific needs and identified in Section B.11 of the PSAP.

5.0 Documentation and Sample Custody

This section provides specific references to the SCQ and FEMP SOPs for sample identification and labeling, recordkeeping, chain-of-custody and analysis request documentation requirements.

5.1 Sample Identification and Labeling

Sample identification and labeling procedures are presented in Section 7.1.3 and Appendix K (Section K.10) of the SCQ, SOP 20-C-805, and EP-SMS-004. An example of a sample label used at the FEMP is provided in Appendix B of the SCQ and Appendix D of this SAP.

5.2 Recordkeeping

Field activities will be recorded on sequentially-numbered pages in bound logbooks. Media-specific sample collection logs, calibration logs, sketches, and photographs may also be used to document field activities, site conditions, or unusual observations.

Detailed recordkeeping requirements are provided in Section 7.1.2 and Appendix J of the SCQ, SOP 20-C-805, and EP-SMS-001, "Field Logbook Procedure." Examples of recordkeeping documents used at the FEMP, are provided in Appendix B of the SCQ and Appendix D of this SAP.

5.3 Sample Custody and Analysis Requests

Pertinent sample collection data will be recorded on the FEMP Sitewide Analysis Request/Custody Record (SAR/CR), which will accompany the respective samples to the FEMP analytical laboratory facility for analysis or shipment to a FEMP-contracted laboratory for analysis. Samples shipped to offsite laboratories are accompanied by a Request for Analyses/Off-Site Custody Transfer Record

(RFA/OSCTR).

Detailed sample custody and request for analysis procedures are provided in Sections 6.7, 7.1, and Appendix K (Section K.10) of the SCQ and SSOP-0018, "Processing the Site Wide Analysis Request/Custody Record for Sample Control." An example of the FEMP SAR/CR and RFA/OSCTR, is provided in Appendix B of the SCQ and Appendix D of this SAP.

5.4 Other Miscellaneous Forms

All sampling and analysis projects at the FEMP require a Radiation Work Permit as a minimum. Other forms, such as a Chemical Hazard/Confined Space Entry Permit or a Construction/Excavation Permit may be required based on the nature of the project. In addition, SMS personnel complete a FEMP Minutes of Safety Meeting form at the initiation of each project. This form is valid for a period of one week or until project conditions change, whichever is more frequent. Copies of other miscellaneous forms used at the FEMP to support sampling and analysis activities are provided in Appendix D.

6.0 Analysis of Waste Samples

This section provides the required non-radiological and radiological analyses to be conducted for this characterization, and sample container, preservation, and holding time requirements for solid and liquid matrix samples. Non-radiological analyses will be performed in accordance with EPA SW-846 or CLP methods. Standard analytical procedures for radiological analyses shall be selected based on the project performance requirements.

6.1 Waste Analytical Parameters and Methods

In general, WC personnel determine the appropriate waste analytical parameters based on PK and/or reviews of previous analytical data. This information is provided to SMS via a RSA and is incorporated into the PSAP.

6.1.1 Non-Radiological Parameters and Methods

Based on PK and/or previous analytical data reviews, one or more of the following non-radiological analyses may be performed to characterize the chemical constituents within, and identify the regulatory status of the waste materials:

Analytical Parameter	Test Method(s)
RCRA Analyses	
Ignitability	EPA 1010/1020
Reactivity	40 CFR 261.23
Corrosivity	EPA 9040
Toxicity Characteristic	EPA 1311
LDR Solvents	TCLP (F001-F005)
LDR Halogenated Org.	EPA 9020
Cyanides	EPA 9010/9012
Sulfides	EPA 9030
Other NVO-325 (Rev. 1) Analyses	
Free Liquids	EPA 9095
PCBs	EPA 8080

The FEMP intends to use analytical screening methods (Total concentrations) to determine if Toxicity Characteristic Leaching Procedure (TCLP) or Land Disposal Restriction (LDR) analyses are warranted. The proposed analytical screening methods are as follows:

Analytical Parameter	Test Methods (EPA)
Organics (Gas Chromatography)	8010, 8015, 8020 8030, 8040, 8060 8080, 8090, 8120 8140, 8150
Organics (Gas Chromatography/ Mass Spectroscopy)	8240, 8250 8270, 8280
Inorganics/Metals (Atomic Absorption Spectroscopy)	40 CFR 261, App. III
Inorganics/Metals (Inductively Coupled Plasma/ Atomic Emission Spectroscopy)	

In general, the FEMP uses a 20:1 ratio of Total concentration results for solid matrix samples to TCLP regulatory threshold limits to determine if TCLP analyses are required. If the analyte-specific upper limit of the 90% confidence interval exceeds the 20:1 ratio to its associated TCLP regulatory value, WC will evaluate the leachability of this analyte to determine if TCLP analyses are warranted. If additional analyses are not warranted, WC will prepare a letter to the waste characterization file documenting the reason(s) for this decision.

Additional analytical parameters may be required to satisfy secondary objectives identified in this SAP. For example, if the sub-waste stream is determined to be "mixed hazardous waste", then Target Analyte List (TAL) or Target Compound List (TCL) analytical data may be required to assess the potential risks of storing these containers at the FEMP. The need for these parameters will be reviewed on a case-by-case basis.

6.1.2 Radiological Parameters and Methods

Based on PK and/or previous analytical data reviews, one or more of the following radiological analyses may be performed to characterize the radiological component of the waste materials:

Analytical Parameter
Total/Isotopic Uranium
Total/Isotopic Thorium

To satisfy secondary objectives identified in this SAP, additional waste samples may be collected and analyzed for ASL D Total Radiological Parameter analyses to determine the following constituents:

- Uranium (U-234, U-235, U-238), in pCi/g
- Thorium (Th-230, Th-232), in pCi/g
- Radium (Ra-226, Ra-228), in pCi/g
- Actinium (Ac-230, Ac-232), in pCi/g
- Lead (Pb-210), in pCi/g
- Polonium (Po-210), in pCi/g
- Technetium (Tc-99), in pCi/g
- Neptunium (Np-237), in pCi/g
- Plutonium (Pu-238, Pu-239, Pu-240), in pCi/g
- Strontium (Sr-90), in pCi/g
- Ruthenium (Ru-106), in pCi/g
- Cesium (Cs-137), in pCi/g

6.2 Sample Container, Preservation, and Holding Time Requirements

6.2.1 Non-Radiological Analyses

Sample container, preservation, and holding time requirements for non-radiological analyses are provided in Table 6.1.

6.2.2 Radiological Analyses

Sample container, preservation, and holding time requirements for radiological analyses are provided in Table 6.2.

Table 6.1
Sample Container, Preservation, and Holding Time Requirements
Non-Radiological Samples

Analytical Parameter	Sample Matrix	Sample Container	Preservation	Holding Time
Total/TCLP VOAs	Liquid	3 x 40-mL VOA vials, TLS	HCl to pH < 2 Cool 4 deg. C	14 days
Total/TCLP SVOAs/Pest. Herb./PCBs	Liquid	1 Gal. Amber Glass, TLC	Cool 4 deg. C	7 days
Total/TCLP Metals	Liquid	1 x 1-liter polyethylene	50% HNO_3 to pH < 2	180 days 28 days (Hg)
Cyanide	Liquid	1 x 1-liter polyethylene	NaOH to pH > 12 Cool 4 deg. C	14 days
Flash Point pH	Liquid	8-oz. widemouth Glass, TLC	None	28 days, ASAP for pH
Sulfides	Liquid	1 x 1-liter polyethylene	NaOH to pH > 9 Cool 4 deg. C	7 days
Total/TCLP VOAs	Solid	3 x 4-oz. jars* glass, TLC	Cool 4 deg. C	14 days
Total/TCLP SVOAs/Pest. Herb./PCBs	Solid	1 x 8-oz jar** Amber Glass, TLC	Cool 4 deg. C	14 days
Total/TCLP Metals	Solid	1 x 8-oz jar** Glass, TLC	Cool 4 deg. C	180 days 28 days (Hg)
PFLT	Solid	1 x 4-oz. glass or polyethylene	None	28 days

Notes:

VOA, SVOA = Volatile Organic Analysis, Semi-Volatile Organic Analysis
Pest., Herb., PCBs = Pesticides, Herbicides, Polychlorinated Biphenols
PFLT = Paint Filter Liquids Test
TLC, TLS = Teflon-Lined Closure, Teflon-Lined Septum
HCl, HNO_3, NaOH = Hydrochloric acid, Nitric acid, Sodium hydroxide
* - Minimum of 25 grams/container for low-density waste materials
** - Minimum of 100 grams/container for low-density waste materials

Table 6.2
Sample Container, Preservation, and Holding Time Requirements
Radiological Samples

Analytical Parameter	Sample Matrix	Sample Container	Preservation	Holding Time
Total Uranium	Solid	8-ounce jar Plastic/Glass	None	180 days
Total Uranium	Liquid	1-liter bottle Plastic/Glass	HNO_3 to pH <2	180 days
Isotopic Uranium	Solid	8-ounce jar Plastic/Glass	None	180 days
Isotopic Uranium	Liquid	1-liter bottle Plastic/Glass	HNO_3 to pH <2	180 days
Total Thorium	Solid	8-ounce jar Plastic/Glass	None	180 days
Total Thorium	Liquid	1-liter bottle Plastic/Glass	HNO_3 to pH <2	180 days
Isotopic Thorium	Solid	8-ounce jar Plastic/Glass	None	180 days
Isotopic Thorium	Liquid	1-liter bottle Plastic/Glass	HNO_3 to pH <2	180 days
Total Radiological Parameter	Solid	1-Quart Jar Plastic/Glass	None	180 days
Total Radiological Parameter	Liquid	4-Liter Cubetainer	HNO_3 to pH <2	180 days

7.0 Quality Assurance/Quality Control

This section provides field and laboratory quality assurance/quality control (QA/QC) requirements and protocols applicable to this SAP. Detailed information concerning QA/QC requirements and protocol is provided in Sections 3.0, 4.0, 8.0, 10.0, 11.0, 15.0, and 16.0; and Appendices A, C, D, E, F, I, and J of the SCQ.

7.1 Field QA/QC

7.1.1 Field QC Samples

The following field QC samples may be collected (types selected based on the project-specific needs and identified in Section B.11 of the PSAP) and analyzed for the constituents identified in Section 6.0:

- Container blanks - not required when vendor-supplied assay data is provided with container shipment. When required, collect one blank per each container batch or one per sampling round, whichever is more frequent.
- Duplicate samples - one per every twenty samples per media matrix or one per sampling round per media matrix, whichever is more frequent.
- Equipment rinsates - one per twenty pieces of a type of equipment cleaned by a specific decontamination method or one per sampling round, whichever is more frequent.
- Field Blanks - one per twenty samples or one per sampling round, whichever is more frequent.
- Field Spikes - if required, one per every sixty days, one per project, or when accuracy of a particular laboratory is in question.
- Preservative blanks - not required when vendor-supplied assay data is provided with preservative shipment. When required, collect one blank per each container batch or one per sampling round, whichever is more frequent.
- Split samples - if required, one per every twenty samples per media matrix or one per sampling round per media matrix.

- Trip blanks - daily, one trip blank per cooler containing Volatile Organics samples sent to laboratory. Analyzed for Volatile Organics only.

In accordance with Section D of the SCQ, field duplicate sample analytical data may be used to calculate the relative percent difference (RPD) for evaluation of sampling precision or degree of homogeneity/heterogeneity of the waste materials.

Equipment rinsate analytical data may be used to evaluate the effectiveness of the decontamination procedure or estimate the amount of cross contamination between sample point locations.

Field blank analytical data may be used to estimate the amount of contamination associated with the sampling environment.

Field spike results may be used to evaluate the accuracy of the analytical data generated by the FEMP laboratory or a contracted laboratory facility and identify any false positives or false negatives. In accordance with Section D of the SCQ, field spike recovery shall be within 75 to 125 percent; however, spike recovery limits shall not apply when sample concentration exceeds spike concentration by a factor of four or more.

Split sample analytical data may be used to evaluate the accuracy of analytical performance between two distinct laboratory facilities and identify the potential for false positives or false negatives.

7.1.2 Field Screening Equipment Calibration and Documentation

Field screening instrumentation, such as radiation detection and photoionization detection (PID) devices, will be checked on a daily basis for proper operation. Any equipment that fails calibration (limit of +/- 10% of calibration gas value) or becomes inoperable will be tagged and taken out of service. Such equipment will be repaired and recalibrated before reuse.

Radiation detection devices will be checked before each use to ensure that the date of required calibration has not been exceeded. PID devices will be calibrated, on a daily basis and prior to use, to a known concentration of volatile gas in air mixture (i.e., isobutylene, benzene, etc.). Subsequent to completion of field activities, on a daily basis, the PID instrument will be checked by analyzing the respective gas-air mixture used for calibration. Field screening instrumentation checks and calibration will be recorded in bound field logbooks or field activity daily logs and instrument-specific calibration logs.

7.1.3 Field Audits/Surveillances

In accordance with NVO-325 Rev. 1, DOE-NV will conduct an annual audit of the sampling activities covered under this SAP. In addition, the FEMP may conduct surveillances of sampling activities to verify conformance with the requirements and procedures identified in this SAP. These surveillances will be documented by checklists similar to Form 12-1 of the SCQ, provided in Appendix D of this SAP.

Upon completion of each sampling event, QC shall review field logbook entries, SWAR/CRs, etc., to ensure that sample collection and documentation were conducted in accordance with requirements of this SAP, its respective PSAP, and the SCQ. This review will be documented through the use of data validation checklists provided in Appendix B of the SCQ. The completed field-generated documentation and data validation checklist(s) will be retained in SMS project and WC MEF files.

7.2 Laboratory QA/QC

7.2.1 Laboratory QC Samples

Laboratory QC sample requirements are provided in Appendix A (Table 2-4) and Appendix G of the SCQ and based upon the requested ASL. In general, the types of laboratory QC samples will be selected based on project-specific needs.

7.2.2 Analytical Instrumentation/Equipment Calibration and Documentation

Analytical laboratory instrument and equipment calibration procedures are provided in Section 8.0 and Appendix E of the SCQ. The FEMP and FEMP-contracted analytical laboratory facilities will be responsible for ensuring that all analytical instrumentation and equipment is operating properly and is within prescribed calibration limits.

7.2.3 QA/QC Checks and Procedures

Laboratory quality control checks and procedures for inorganic, organic, and radiological analyses are provided in Section 10.0 and Appendices A, B and E of the SCQ. The FEMP and FEMP-contracted laboratory facilities will be responsible for adherence to these quality control checks and procedures.

In accordance with NVO-325LRD Rev. 1 and Section 12.4 of the SCQ, the FEMP will conduct a laboratory qualification audit prior to contract award for analytical services. In addition, a system audit will be conducted for each FEMP-contract laboratory on an annual basis to assure continued acceptable performance. Lastly, each data package submitted by a FEMP-contract laboratory is reviewed by DR&A to ensure that contractual issues have been satisfied. A list of FEMP-approved laboratory facilities is provided in Table 7.1.

7.3 Data Reporting and Validation

The FEMP laboratory and FEMP-contracted laboratory facilities shall provide data packages on floppy disk and/or hard copy in such a fashion that allows for DOE-NV to validate data as required in NVO-325LRD Rev. 1. In addition, field- and laboratory-generated data packages shall be validated in accordance with the FEMP Validation Plan in Appendix D of the SCQ and SSOP-1004, "FEMP Data Validation Procedure." Data Validation forms are currently being reviewed by OEPA and EPA personnel and will provided in Appendix B of the SCQ upon approval by these agencies. Validated data shall be used to support waste determinations as described in Section 1.6 of this SAP.

5904

Table 7.1
FEMP-Approved List of Laboratories

Laboratory Name and Location	Analysis Category	Contract	Period of Performance	Date of Last Audit	Approval Status	Remarks
Clemson Technical Center, Inc. Clemson Research Park 100 Technology Drive Anderson, SC 29625	Chemical	RCRA/CERLA	9/93 - 9/94	10/13/93 thru 10/17/93	Approved & Contracted	Available for NTS
DataChem Laboratories 960 West Levoy Drive Salt Lake City, UT 84123	Chemical Radiological	RCRA/CERCLA RLS -TOS	9/93 - 9/94	10/11/93 thru 10/15/93 Rad Audit Pending	Approved & Contracted	Available to send samples for both Chem and Rad
ITAS - St. Louis 13715 Rider Trail North Earth City, MO 63045	Chemical	RCRA/CERCLA	9/93 - 9/94	10/13/93 thru 10/17/93	Approved & Contracted	Available for NTS
Lockheed Analytical Laboratories 975 Kelly Drive Las Vegas, NV 89119-3705	Chemical Radiological	RCRA/CERCLA RLS-TOS	9/93 - 9/94	9/27/93 thru 10/1/93	Approved & Contracted	Radiological data pending review of SCQ data. Estimated date available 6/13/94. Available for NTS for Chem, Rad pending
Twin City Testing 1908 Innerbelt Business Center St. Louis, MO 63114-5700	Chemical	RCRA/CERCLA	9/93 - 9/94	9/13/93 thru 9/17/93	Approved & Contracted	Available for NTS
FERMCO Analytical 7400 Willey Road Fernald, OH 45030	Chemical Radiological	N/A	1/94 - 1/95	1/24/94 thru 1/28/94	Approved	Available for NTS

000349

8.0 Waste Disposition

The following materials may be generated during containerized waste sampling and analysis activities:

- Contact wastes
- Equipment decontamination solutions

The following subsections provide the proposed disposition methodology for each type of waste generated.

8.1 Contact Wastes

Contact wastes, such as personal protective equipment (PPE) and rags or wipes (paper towels, Chemwipes[R], etc.), are typically placed in 5-gallon pails or 55-gallon drums, lot marked so that they can be traced to (associated with) the waste stream sampled, and stored at the FEMP for appropriate disposition. Separate 55-gallon drums will be provided, for segregation of PPE wastes, and labeled as follows:

- Used Respirators
- Used Rubber Shoe Covers
- Used Tyvek/Saranex, Cartridges, Tape, Gloves

8.2 Decontamination Solutions

Equipment decontamination solutions are typically transferred to DOT-approved, bung-type, 55-gallon drums or 5-gallon pails, lot marked so that they can be traced to (associated with) the waste stream being sampled. The drums are placed within a Satellite Accumulation Area (SAA) with diked Herculite sheeting or containment devices, capable of capturing 1/2 the capacity of the drum volume, to prevent contaminant migration resulting from spills, or leaks. The drummed decontamination solutions are stored at the FEMP until the appropriate disposal or placement option can be identified.

Appendix A PSAP Format for Drummed and Boxed Wastes

5904

Drummed Waste Material
Project-Specific Sampling and Analysis Plan

Number:
Date: 8-19-94
Page 1 of 5

A. Identifying Information
1) **Project Name:**
2) **Plan No.:**
3) **Material Description/Matrix Code(s):**
4) **Number of Drums in Sub-Waste Stream:**
5) **Material Type:**
6) **Source Code:**
7) **Material Evaluation Form #:**
8) **Sampling Location for Drums:**
9) **Process Knowledge:**

B. Sampling Information
1) **General:** Samples taken will be contained in glass or polyethylene jars with teflon lined lids.
2) **Preservation Method:** See Analytical Requirements in Section C.
3) **Holding Times:** See Preservative and Holding Time Guidelines in Section G and/or Tables 6.1 and 6.2 of "Prototype Sampling Anad Analysis Plan for Containerized Waste at the FEMP."
4) **Sample Technique:**
5) **Number of Drums to be Sampled and Analyzed:** x, see page 2.
6) **Composite Samples:** Yes (No)
7) **Visual Inspection Performed?:** Yes (No)
8) **Field Contact:**
9) **Send Results to:**
10) **Charge No./Project Manager:**
11) **Required QA/QC Samples:**

Field QC	Yes	No	Notes
Trip Blank	___	___	daily, for VOA samples only
Field Blank	___	___	1 per 20 samples or 1 per sampling round
Equipment Rinsate	___	___	1 per 20 samples or 1 per sampling round
Duplicate/Split	___	___	1 per 20 samples or 1 per sampling round
Field Spike	___	___	1 per sixty days or 1 per sampling round

Laboratory QC

Laboratory QC sample type and frequency requirements are provided in Appendix A (Table 2-4), and Appendix G of the SCQ.

_____ _____
Authorized Signature/Date Approved/Date

Drummed Waste Material
Project-Specific Sampling and Analysis Plan

Number:
Date: 8-19-94
Page 2 of 5

Sampling Information

Start with Sample Number xx-yyy-1 for the first drum sample, then number consecutively until sampling is completed. The drum that is to be sampled in duplicate will be indicated with an asterisk (*). The duplicate samples will be given different sample numbers.

Sample Number	Sample Matrix	Inv. Number	Lot Number	Drum Number

Authorized Signature/Date Approved/Date

Drummed Waste Material
Project-Specific Sampling and Analysis Plan

Number:
Date: 8-19-94
Page 3 of 5

C. Analytical Requirements

In order to satisfy waste characterization requirements the following analyses may be performed:

Analysis Requested (Analysis Code) ASL = Analytical Support Level VOA = Volatile Organics Analysis SVOA = Semi-Volatile Organics Analysis U,Th = Uranium, Thorium PFLT = Paint Filter Liquids Test	Solid Matrix Samples Container and Preservative/Unit Codes oz., g, L = ounce, gram, liter kg, mg, ug = kilogram, milligram, microgram P00, P01 = No preservation, Cool 4 deg. C U02, U04, U07, U19 = mg/L, mg/kg, ug/g, pCi/g U99 = present/absent TLC = Teflon Lined Closure		Concentrated Liquid Waste Samples Container and Preservative/Unit Codes mL, L = milliliter, Liter P00, P01 = no preservation, cool 4 deg. C P11, P13 = HNO_3 to pH < 2, HNO_3 to pH < 2 + cool 4 deg C U02, U06, U18 = mg/L, ug/L, pCi/L U35, U37 = pH units, degrees Fahrenheit TLS = Teflon Lined Septum	
Total VOAs (2411)* TCLP VOAs (2459)** ASL B	(3) x 4-oz. or (3) x 25 grams glass, TLC	P01/U04 (U02 for TCLP)	(3) x 40 mL glass vial TLS	P01/U02
Total SVOAs (2470)* TCLP SVOAs (2471)** ASL B	(1) x 8-oz. or 100 grams amber glass, TLC	P01/U04 (U02 for TCLP)	(1) x 250 mL amber glass, TLC	P01/U02
Total Metals (2402)* TCLP Metals (2401)** ASL B	(1) x 8-oz. or 100 grams glass or polyethylene	P01/U04 (U02 for TCLP)	(1) x 250 mL glass, TLC	P13/U02
Flash Point (2434) pH (2435) ASL B	-----	---	(1) x 250 mL glass, TLC	P00/U37 P00/U35
Total U (2442) Total Th (2002) ASL B	(1) x 8-oz. glass or polyethylene	P00/U07	(1) x 120 mL glass or polyethylene	P11/U06
Isotopic U (2026-29) Isotopic Th (2015-17) ASL B	(1) x 8-oz. glass or polyethylene	P00/U19	(1) x 250 mL glass or polyethylene	P11/U18
PFLT (2053) ASL B	(1) x 4-oz. glass or polyethylene	P00/U99	-----	---
Alpha-Beta (2005)	(1) x 4-oz. polyethylene	P00/U19	(1) x 120 mL polyethylene	P11/U18
Description of material (Color, appearance, consistency, etc.)				

Note: * - Perform analysis for concentrated waste samples.
** - For solid matrix samples only. Prepare sample extract, then conduct Total concentration screening analyses. If Total concentrations exceed 20 times the TCLP regulatory value, then analyze the sample extract.

Drummed Waste Material
Project-Specific Sampling and Analysis Plan

Number:
Date: 8-19-94
Page 4 of 5

C. Analytical Requirements (cont.)

Analysis Requested (Analysis Code) ASL = Analytical Support Level VOA = Volatile Organics Analysis SVOA = Semi-Volatile Organics Analysis U,Th = Uranium, Thorium PFLT = Paint Filter Liquid Test	Low to Medium Concentration Liquid Samples Container and Preservative/Unit Codes mL, L = milliliter, Liter P01, P09 = Cool 4 deg. C, HCl to pH < 2, P11, P13 = HNO_3 to pH < 2, HNO_3 to pH < 2 + cool 4 deg C U02, U06, U18 = mg/L, ug/L, pCi/L U35, U37 = pH units, degrees Fahrenheit TLS = Teflon Lined Septum TLC = Teflon Lined Closure		Quality Control Samples Container and Preservative/Unit Codes mL, L = milliliter, Liter P01, P09 = Cool 4 deg. C, HCl to pH < 2, P11, P13 = HNO_3 to pH < 2, HNO_3 to pH < 2 + cool 4 deg C U02, U06, U18 = mg/L, ug/L, pCi/L U35, U37 = pH units, degrees Fahrenheit TLS = Teflon Lined Septum TLC = Teflon Lined Closure	
Total VOAs (2411) ASL B	(3) x 40 mL glass vials, TLS	P01,P09/U02	(3) x 40 mL glass vials, TLS	P01,P09/U02
Total SVOAs (2470) ASL B	(1) x 1 gallon jar amber glass, TLC	P01/U02	(1) x 1 gallon jar amber glass, TLC	P01/U02
Total Metals (2402) ASL B	(1) x 1 L jar, polyethylene	P13/U02	(1) x 1 L jar, polyethylene	P13/U02
Flash Point (2434), pH (2435) ASL B	(1) x 250 mL glass, TLC	P00/U37 P00/U35	Not Applicable	Not Applicable
Total U (2442) Total Th (2002) ASL B	(1) x 1 L jar, glass or polyethylene	P11/U06	(1) x 1 L jar glass or polyethylene	P11/U06
Isotopic U (2026-29) Isotopic Th (2015-17) ASL B	(1) x 1 L jar, glass or polyethylene	P11/U18	(1) x 1 L jar glass or polyethylene	P11/U18
PFLT (2053) ASL B	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Alpha-Beta (2005)	(1) x 120 mL polyethylene	P11/U18	(1) x 120 mL polyethylene	P11/U18
Description of material (Color, appearance, consistency, etc.)				

Authorized Signature/Date Approved/Date

Drummed Waste Material
Project-Specific Sampling and Analysis Plan

Number:
Date: 8-19-94
Page 5 of 5

D. Sub-Waste Stream Description

The sub-waste stream consists of "x" drums in "x" lots. The material type of "yyy" and the source code of "zzz" indicate that this material is " ".

E. Safety Concerns

See SOP 20-C-805, Sections 6.0 to 6.14 for Health and Safety requirements.

F. Representative Sampling Procedure

"x" drums were chosen at random, and are listed on page 2 of this form. If visual inspection indicates that the material has free liquid or is completely dry, then a P.F.L.T is not necessary. Record pertinent information in the Field Log Book for each drum sampled as specified in SOP 20-C-805, Section 7.2.13.

G. Preservative and Holding Time Guidelines

Preservative and holding time requirements are provided in Tables 6.1 and 6.2 of the "Prototype Sampling and Analysis Plan for Containerized Wastes at the FEMP," and Volume II of the SCQ, Appendix A, Table 6-1 "Sample Container and Preservation Requirements." Preservative and holding time requirements for analyses not covered by the SCQ are provided by the FEMP laboratory. These requirements are provided in this PSAP as permitted in Section 3.3.2 of the SCQ.

This form must be dated and signed by an authorized individual.

If this Sub-Waste Stream is sampled and analyzed according to the information on this form, the results generated will be in agreement with the sampling and analysis requirements of NVO-325 (Rev. 1), Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements; and the Fernald Environmental Management Project (FEMP) Sitewide CERCLA Quality Assurance Project Plan (SCQ).

Authorized Signature/Date Approved/Date

Boxed Waste Material
Project-Specific Sampling and Analysis Plan

Number:
Date: 8-19-94
Page 1 of 4

A. Identifying Information
1) **Project Name:**
2) **Plan No.:**
3) **Material Description/Matrix Code(s):**
4) **Number of Boxes in Sub-Waste Stream:**
5) **Material Type:**
6) **Source Code:**
7) **Material Evaluation Form #:**
8) **Sampling Location for Boxes:**
9) **Process Knowledge:**

B. Sampling Information
1) **General:** Samples taken will be contained in glass or polyethylene jars with teflon lined lids.
2) **Preservation Method:** See Analytical Requirements in Section C.
3) **Holding Times:** See Preservative and Holding Time Guidelines in Section G and/or Tables 6.1 and 6.2 of "Prototype Sampling Anad Analysis Plan for Containerized Waste at the FEMP."
4) **Sample Technique:**
5) **Number of Boxes to be Sampled and Analyzed:** x, see page 2.
6) **Composite Samples:** Yes (No)
7) **Visual Inspection Performed?:** Yes (No)
8) **Field Contact:**
9) **Send Results to:**
10) **Charge No./Project Manager:**
11) **Required QA/QC Samples:**

Field QC	Yes	No	Notes
Trip Blank	___	___	daily, for VOA samples only
Field Blank	___	___	1 per 20 samples or 1 per sampling round
Equipment Rinsate	___	___	1 per 20 samples or 1 per sampling round
Duplicate/Split	___	___	1 per 20 samples or 1 per sampling round
Field Spike	___	___	1 per sixty days or 1 per sampling round

Laboratory QC

Laboratory QC sample type and frequency requirements are provided in Appendix A (Table 2-4), and Appendix G of the SCQ.

Authorized Signature/Date Approved/Date

Boxed Waste Material
Project-Specific Sampling and Analysis Plan

Number:
Date: 8-19-94
Page 2 of 4

B. Sampling Information

12) **Box/Grid/Random Depth Information:**

Sample Number	Sample Type	Box Number	Grid Number	Random Depth (ft)

Authorized Signature/Date Approved/Date

Boxed Waste Material
Project-Specific Sampling and Analysis Plan

Number:
Date: 8-19-94
Page 3 of 4

C. Analytical Requirements

In order to satisfy waste characterization requirements the following analyses may be performed:

Analysis Requested (Analysis Code) ASL = Analytical Support Level	Solid Matrix Samples Containers and Preservative/Unit Codes oz., g, L = ounce, gram, liter kg, mg, ug = kilogram, milligram, microgram P00, P01 = No preservation, Cool 4 deg. C U02, U04, U06, U19 = mg/L, mg/kg, ug/g, pCi/g TLC = Teflon Lined Closure		Quality Control Samples Container and Preservative/Unit Codes mL, L = milliliter, Liter P01, P09 = Cool 4 deg. C, HCl to pH < 2 P11, P13 = HNO_3 to pH < 2, HNO_3 to pH < 2 + cool 4 deg. C U02, U07, U18 = mg/L, ug/L, pCi/L U35, U37 = pH units, degrees Fareinheit TLS = Teflon Lined Septum	
Total VOAs (2411)* TCLP VOAs (2471)** ASL B	(3) x 4-oz. or (3) x 25 grams glass, TLC	P01/U04	(3) x 40 mL glass vial TLS	P01/U02
Total SVOAs (2470)* TCLP SVOAs (2459)** ASL B	(1) x 8-oz. or (1) x 100 grams amber glass, TLC	P01/U04	1 x 4 L amber glass, TLC	P01/U02
Total Metals (2402)* TCLP Metals (2401)** ASL B	(1) x 8-oz. or 100 g glass or polyethylene	P01/U04	(1) x 1 L polyethylene	P13/U02
Total U (2442) Total Th (2002) ASL B	(1) x 8-oz. glass or polyethylene	P00/U06	(1) x 1 L glass or polyethylene	P11/U07
Alpha-Beta (2005)	(1) x 4-oz. glass or polyethylene	P00/U19	(1) x 120 mL glass or polyethylene	P11/U18
Description of material (Color, appearance, consistency, etc.)				

Note: * - Perform analysis for concentrated waste samples.
** - For solid matrix samples only. Prepare sample extract, then conduct Total concentration screening analyses. If Total concentrations exceed 20 times the TCLP regulatory value, then analyze the sample extract.

Authorized Signature/Date Approved/Date

Boxed Waste Material
Project-Specific Sampling and Analysis Plan

Number:
Date: 8-19-94
Page 4 of 4

D. Waste Stream Description

The sub-waste stream consists of "x" boxes in "x" lots. The material type of "yyy" and the source code of "zzz" indicate that this material is " ".

E. Safety Concerns

See Site Media Sampling project-specific health and safety plan for 13~.

F. Representative Sampling Procedure

"x" boxes were chosen at random, and are listed on page 2 of this form. If visual inspection indicates that the material has free liquid or is completely dry, then a P.F.L.T is not necessary. Record pertinent information in the Field Log Book for each box sampled as specified in the Sitewide CERCLA Quality Assurance Project Plan (SCQ) - Volume II, Appendix J, Section J.4.1 and EM-SM-001.

G. Preservative and Holding Time Guidelines

See the Sitewide CERCLA Quality Assurance Project Plan (SCQ) - Volume II, Appendix A, Table 6-1 "Sample Container and Preservation Requirements."

This form must be dated and signed by an authorized individual.

If this Sub-Waste Stream is sampled and analyzed according to the information on this form, the results generated will be in agreement with the sampling and analysis requirements of NVO-325 (Rev. 1), Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements; and the Fernald Environmental Management Project (FEMP) Sitewide CERCLA Quality Assurance Project Plan (SCQ).

Authorized Signature/Date Approved/Date

Appendix B SMS Statistical Report Format

5904

Project Name:
Mat. Type:
Revised:

Statistical Calculations

Attachment B
Part II

Rev.

Analyte	TCLP Reg. Level (ppm)	Number of Samples	Statistical Mean (ppm)	Standard Deviation	Sample Variance	Standard Error	Upper CI Limit (90%)	COV sx/x	COV x/s2	# of Additional Samples Required
Arsenic	5	0	0	0	0.0000	ERR	ERR	ERR	ERR	0
Barium	100	0	0	0	0.0000	ERR	ERR	ERR	ERR	0
Cadmium	1	0	0	0	0.0000	ERR	ERR	ERR	ERR	0
Chromium	5	0	0	0	0.0000	ERR	ERR	ERR	ERR	0
Lead	5	0	0	0	0.0000	ERR	ERR	ERR	ERR	0
Mercury	0.2	0	0	0	0.0000	ERR	ERR	ERR	ERR	0
Selenium	1	0	0	0	0.0000	ERR	ERR	ERR	ERR	0
Silver	5	0	0	0	0.0000	ERR	ERR	ERR	ERR	0
Alpha			0	0	0.0000	ERR	ERR	ERR	ERR	ERR
Beta			0	0	0.0000	ERR	ERR	ERR	ERR	ERR
Total U (%)			0	0	0.0000	ERR	ERR	ERR	ERR	ERR
Total Th (ppm)			0	0	0.0000	ERR	ERR	ERR	ERR	ERR

000362

Appendix C DQO Logic Statement and Summary Form NTW-002

Step 1: Statement of the Problem

The following FEMP personnel may be involved in planning input and decision-making processes associated with containerized waste sampling, analysis, characterization, and disposition activities:

Rick Bardo, Environmental Safety & Health, Statistician
Neal Frink, Waste Management, Technical Consultant
Jerome Gnoose Jr., Site Media Sampling, SAP Author
David Rast, Department of Energy Fernald Office
Jeff Rowe, Waste Storage & Disposition, Technical Consultant
Analytical Customer Support/Laboratory
Environmental Programs
Environmental Safety & Health
Legal Affairs
Office of the President
Quality Assurance/Quality Control
Regulatory Programs
Remedial Support Operations
Waste Characterization

According to NVO-325 Rev. 1, DOE Nevada Field Office waste acceptance criteria, characterization, and certification requirements became effective in June 1992. Although a formal milestone has not been established, the FEMP has taken a pro-active approach to satisfy NVO-325 requirements regardless of budgetary or manpower constraints.

NVO-325 Rev. 1 requires that the waste generator must submit a sampling and analysis plan (SAP) for each potential waste stream prior to sampling and characterization efforts. This requirement was deemed necessary to ensure that: 1) samples collected will be representative of the waste inventory, 2) appropriate analytical procedures are used, and 3) quality control procedures are implemented to provide defensible data.

As stated the NVO-325 Rev. 1 requirement for DOE-NV approval of each SAP prior to waste stream sampling and characterization may have the following impacts:

1) Milestones covered under the Consent Decree with OEPA may not be met due to the amount of time required for SAP review and revision cycles

2) Review of each SAP prior to sampling and characterization would not be cost- or time-effective for either the FEMP or DOE-NV

In order to satisfy NVO-325 Rev. 1 requirements with the most cost- and time-effective approach, the FEMP petitioned DOE-NV to create a generic (prototype) SAP to support characterization of containerized wastes. This prototype SAP will serve as the controlling document to govern sampling, analysis, characterization,

and evaluation of these waste streams. In addition, this SAP will contain a project-specific sampling and analysis plan (PSAP) format that will be generated for each sub-waste stream.

In order to ensure compliance with NVO-325 Rev. 1, DOE-NV has agreed to review each prototype SAP and associated PSAP format. Subsequent to DOE-NV approval, the FEMP will generate appropriate PSAPs. DOE-NV will select a representative sample of PSAPs for review and approval. Subsequent to DOE-NV approval of the PSAP documents, the FEMP will implement sampling and analysis of the sub-waste streams. Lastly, DOE-NV will conduct annual recertification audits.

The prototype SAP has been designed to satisfy NVO-325 Rev. 1 requirements; however, it should be flexible to include CERCLA- or other ARAR-driven requirements. By taking this approach, the FEMP would have one generic plan for containerized waste material sampling and analysis for projects covered under CERCLA, RCRA, CWA, NPDES, etc. In other words the sampling approach and techniques would remain constant regardless of the regulatory driver; while, the types of analyses (ASLs and methods), level of quality control, and data uses would fluctuate dependent on the regulatory requirements or the data user's needs.

Lastly, NTS will only accept low-level radiological wastes from the FEMP. Therefore, the FEMP must generate representative data of sufficient quality to determine the correct regulatory status (at a 90% level of confidence) and proper disposition of the waste materials. Inadvertent shipment of materials to NTS that are found to be hazardous or mixed wastes could result in termination of the FEMP's permit by DOE-NV, as well as various legal and social/economic problems.

A variety of the FEMP's restoration activities, as well as facility support and maintenance functions, are currently generating and will continue to generate waste materials. In addition, when the FMPC ceased production in 1989, a large, but finite inventory of materials associated with the uranium metal production processes were retained. These wastes/materials require characterization to ensure safe, compliant, and appropriate management to support environmental restoration and waste management goals at the FEMP and supporting programs and facilities.

Step 2: Identification of a Decision that Addresses the Problem

The first step of waste characterization is to conduct process knowledge, previous analytical data, and visual inspection reviews for an accurate assessment of the physical, chemical, and spatial characteristics of the containerized waste material. The next step is to determine the target analytes and number of samples required to generate data at a 90% confidence level to support a RCRA determination. According to NVO-325 Rev. 1, EPA SW-846 Equation 8 is the preferred method for generating the number of sample points. However, this requires previous analytical data to estimate the analyte-specific mean and standard deviation in comparison to its associated regulatory threshold level (RTL). If previous analytical data are not available or are not of sufficient quality, then a minimum of four samples must be collected, analyzed, and evaluated to determine if additional samples are warranted. This alternative method may not be cost- or time-effective; therefore, the FEMP has recommended the use of alternative methods, such as a combination of the 10% and Cube-Root methods (based on the number of containers), or the Log Base 10 Method (for confirmatory sampling projects) to determine the number of required samples. EPA SW-846 Equation 8 may then be used as a tertiary method to determine if additional samples are warranted.

Subsequent to determination of the number of required samples, the sample plan writer must evaluate sampling strategies, identify required equipment, and provide sampling methodologies or references to SCQ procedures. The sample plan writer must also ensure that sampling personnel are adequately trained in the use of the prescribed sampling equipment and methods and that they are capable of generating quality work. Lastly, the sample plan writer must clearly define the required analytical methods, level of quality associated with these analyses, and the level of effort required to ensue that the data is valid for the intended use.

Subsequent to sample collection and analysis, the sample plan writer must evaluate the population mean and the standard error of the mean to the appropriate RTL (i.e., determine the upper limit of the 90% confidence interval). This information is submitted to Waste Characterization for additional data evaluation and a determination of the regulatory status of the material or the need for additional sampling for a more accurate estimate of the mean.

Subsequent to data analysis and evaluation, the initial action taken is to accurately determine the physical/chemical/ radiological characteristics and regulatory status (e.g., conventional waste, non-RCRA low-level radioactive waste, RCRA or hazardous waste, or mixed waste) of the containerized materials. This action is extremely critical since the following actions are dependent on this initial action.

The next action is to determine the appropriate disposition (e.g., disposal, treatment, or storage) of the containerized waste materials based upon their characteristics and regulatory status. This action is be dependent on the

initial action; therefore, an error in the initial action could have a significant impact on the selection of the appropriate disposition option. The final action is to determine the impacts to the environment and health and safety of the workers/surrounding population if storage at the FEMP is the only viable disposition option for the containerized waste materials.

Criteria used to determine the appropriate action to be taken are as follows:

Action No. 1

a) If the containerized waste materials do not contain radiological nuclides regulated under the Atomic Energy Act of 1954 or exhibit properties of listed- or characteristic-waste as defined in Chapter 3745-51 of the Ohio Administrative Code (OAC), then consider these materials as conventional waste.

b) If the containerized waste materials contain radiological nuclides regulated under the Atomic Energy Act of 1954 in concentrations which are not economically feasible to recover, but do not exhibit properties of listed- or characteristic-waste as defined in Chapter 3745-51 of the Ohio Administrative Code (OAC), then consider these materials as low-level radiological waste.

c) If the containerized waste materials do not contain radiological nuclides regulated under the Atomic Energy Act of 1954, but do exhibit properties of listed- or characteristic-waste as defined in Chapter 3745-51 of the Ohio Administrative Code (OAC), then consider these materials as hazardous waste.

d) If the containerized waste materials contain radiological nuclides regulated under the Atomic Energy Act of 1954 in concentrations which are not economically feasible to recover, and exhibit properties of listed- or characteristic-waste as defined in Chapter 3745-51 of the Ohio Administrative Code (OAC), then consider these materials as mixed waste.

Action No. 2

a) If the containerized waste materials are liquids and determined to be conventional waste, then manage these materials in accordance with appropriate FEMP procedures or regulatory directives/policies for conventional wastes. Conventional liquid materials that meet NPDES permit requirements may be dispositioned to the General Sump.

b) If the containerized waste materials are liquids and determined to be low-level radiological waste, then manage these materials in accordance with appropriate FEMP procedures or regulatory directives/policies for low-level waste.

c) If the containerized waste materials are liquids and determined to be hazardous waste, then manage these materials in accordance with appropriate FEMP procedures or regulatory directives/policies for hazardous waste.

d) If the containerized waste materials are liquids and determined to be mixed waste, then manage these materials in accordance with appropriate FEMP procedures or regulatory directives/policies for mixed waste.

e) If the containerized waste materials are solids with less than 0.5% free liquids and determined to be conventional waste, then retain for unrestricted FEMP use or ship to an approved solid waste landfill for disposal. Conventional solid materials with greater than 0.5% free liquids must be treated prior to disposal.

f) If the containerized waste materials are solids with less than 0.5% free liquids and determined to be low-level radiological waste, then ship to NTS for disposal as low-level waste. Low-level radiological solids with greater than 0.5% free liquids, must be treated to remove the free liquid (e.g., filtered, dried, etc.) prior to shipment to NTS for disposal.

g) If the containerized waste materials are solids and determined to be hazardous waste, then manage these materials in accordance with appropriate FEMP procedures or regulatory directives/policies for hazardous waste.

h) If the containerized waste materials are solids and determined to be mixed waste, then manage these materials in accordance with appropriate FEMP procedures or regulatory directives/policies for mixed waste.

i) If the containerized waste materials consist of distinct physical phases (i.e., liquids and solids), then segregate these phases and manage each phase in accordance with the appropriate FEMP procedure or regulatory directives/policies for the respective waste determination.

<u>Action No. 3</u>

a) If the containerized waste materials must be stored at the FEMP, then resample materials for Target Analyte List constituents at a sufficient level of quality to allow for a risk assessment of the potential impact to human health or the environment associated with storage of these materials.

In general, the uranium metal production processes did not generate transuranic or high-level radioactive wastes. Therefore, the objective of radiological characterization is to provide total and isotopic activity concentrations for safe management and proper disposition of the waste material at the FEMP.

The FEMP will use process knowledge/previous analytical data/visual inspection review to obtain as much information as possible concerning the characteristics of the waste materials. In situations where there is sufficient information, a limited number of samples will be collected and analyzed to verify/refute the RCRA determination and/or radiological characterization. In situations where there is insufficient information, a more comprehensive sampling and analysis program (based on total concentrations of TCLP constituents) will be implemented to accurately characterize the waste material.

Subsequent to data collection, the FEMP will use statistical methodologies described in EPA SW-846 and other supporting documents/literature to estimate the analyte-specific population mean to its respective RTL. In situations where the upper limit of the 90% confidence interval approaches or slightly exceeds the RTL, the FEMP may evaluate the leachability of the respective analyte in question and/or determine the normality of the data distribution. Actions that may be taken are: 1) analyze the samples using TCLP extraction protocol, 2) transform the original data to produce a normal distribution, or 3) no action. In a majority of these situations, the FEMP will probably resample for the analyte in question using TCLP extraction/analysis methodology to verify/refute the upper limit of the 90% confidence interval.

Subsequent to regulatory status determination, the FEMP will identify safe management and disposition options for the waste materials. Conventional solid wastes may be managed in stockpiles or shipped to an approved solid waste disposal facility; while, conventional liquid wastes may be transferred to the FEMP General Sump for discharge to the Great Miami River. Low-level solid wastes will be shipped to NTS; while, low-level liquid wastes may be transferred to an uranium wastewater treatment facility then discharged to the Great Miami River. Lastly, hazardous or mixed wastes (solid or liquid) will be managed at approved RCRA storage facilities at the FEMP until the appropriate disposition option can be identified and implemented.

Step 3: Identify Inputs that Affect the Decision(s)

The following inputs are required to accurately characterize and disposition containerized waste materials:

Physical Characteristics - nature of waste phases (liquid vs. solid)
Radiological/Chemical Properties

* Radionuclides, such as uranium, thorium, and radium, using gamma spectroscopy, alpha spectroscopy, fluorimetry, liquid scintillation, alpha counting, beta counting, and thermal ionization mass spectroscopy.

* Organics using gas chromatographic methods, such as EPA 8010 or 8020; or gas chromatographic/mass spectroscopy methods, such as EPA 8270.

* Inorganics/Metals using atomic absorption spectroscopy (AAS) or inductively coupled plasma-atomic emission spectroscopy (ICPES).

** Ignitability using EPA Method 1010

** Reactivity using 40 CFR 261.23, EPA SW-846, Part 7.3.3.2 and 7.3.4.3

** Corrosivity using EPA Method 9040

** Toxicity using EPA Method 1311

** LDR solvents (TCLP F001 - F005)

** LDR halogenated organic compounds using EPA Method 9020

** Cyanides using EPA Method 9010

** Sulfides using EPA Method 9030

** Free Liquids using EPA Method 9095 (Paint Filter Liquids Test)

** PCBs using EPA Method 8080

Note : * - Primary target analytes, list may vary based on results of process knowledge/previous analytical data reviews.

** - Secondary target analytes, list may vary based on result of process knowledge/previous analytical data/visual inspection review and/or analysis of primary target constituents.

Physical Characteristics

The physical characteristics of the waste phases may dictate the type of analyses that may or may not be conducted and/or impact a decision. In general, solid matrix samples do not typically require ignitability, reactivity, or corrosivity analyses; while, liquid matrix samples do not require Paint Filter Liquids Test analysis. In addition, the nature of the waste phase may directly or indirectly determine its disposition. For example, consider a drum lot which contains liquid- phased material overlying a layer of solids/sludge. NVO-325 Rev. 1 waste acceptance criteria are pertinent to dry solid wastes only (i.e., no liquid waste will be accepted at NTS); however, the liquid phase requires characterization to evaluate any impacts to or from the solid/sludge material and its appropriate disposition option.

Radionuclides

Removal Action 17 Work Plan has identified maximum uranium, thorium, and radium concentrations of 100 pCi/g, 50 pCi/g, or 5 pCi/g, respectively, for addition of solid waste materials to the FEMP OU-3 controlled stockpile. Waste materials containing radiological concentrations in excess of these levels must be managed as low-level waste.

Organics, Inorganics/Metals

In accordance with the FEMP Waste Characterization Plan, total screening concentrations in excess of 20 times Toxicity Characteristic Leachate Procedure (TCLP) regulatory threshold values as listed in Title 40 CFR 261 or Chapter 3745-51 of the Ohio Administrative Code (OAC) may trigger additional analyses for TCLP extraction constituents, LDR solvents or halogenated organic compounds, or Target Analyte List (TAL) constituents.

In general, each variable can be qualitatively or quantitatively measured through process knowledge/previous analytical data/visual inspection reviews and detailed sampling and analysis.

Step 4: Specification of the Domain of the Decision

The containerized waste materials are separated into the following distinct populations: Newly Generated Materials (NGM), Newly Identified Materials (NIM), and Legacy Wastes. There are no spatial or temporal population boundaries to be considered per se, since containerized waste materials may generated from any physical location or during any given time frame at the FEMP.

Process knowledge, previous analytical data, or visual inspection information may be required in cases where there is distinct layering effects of liquid and/or solid phases. This information may allow for segregation of waste strata into individual sub-populations based on differences in: physical or chemical/radiological properties; time, nature, and location of waste generation processes; or volume of waste generated. If applicable or warranted, multi-layered phases segregated by differences in volume may be considered as a single sub-population by applying a weighted correction factor to the analytical results and calculating the mean and standard deviation of the mean.

Each population will be subdivided into sub-populations based on the lot code sequence (Material Type and Source Code) and their physical characteristics. As previously discussed, each waste phase may be further subdivided if distinct layer effects are observed. Characterization of containerized materials on a sub-population basis should provide more effective controls to ensure that NTS receives low-level radioactive wastes only. Sub-populations exhibiting contaminant concentrations above the respective RTL will be managed as potential hazardous waste unless additional characterization refutes this claim.

Step 5: Development of Logic Statement

Analytical data are submitted to Site Media Sampling for statistical analyses (in accordance with EPA SW-846) and reporting to assist Waste Characterization in the RCRA determination process. The statistical report provides tabulated analytical data used in the statistical analyses and the analyte-specific TCLP regulatory threshold level (RTL), mean, standard error of the mean, confidence interval (80% two-sided), and coefficient of variance (COV) generated by statistical analyses. For decisions that require comparison with the analyte-specific RTL, only the upper limit of the 80% confidence interval (a 90% one-sided confidence interval) is evaluated. A summary of the statistical analysis methodology, in accordance with the FEMP Waste Characterization Plan, is as follows:

The inferential calculations used to form the 90% (one-sided) confidence limit are based on the assumption that the population is approximately normally distributed. Two primary criteria for determining whether a population is normally distributed based on review of a sample set are:

1) Visual inspection of the data (i.e., a graph or plot of the data) and/or

2) Mathematical comparison of the values for the sample mean ($\bar{x}$) and the standard error of the mean ($s\bar{x}$) to produce the COV

For ASL B data where the constituent concentration is expressed as "less than" the detection limit (DL), a value of 1/2 the DL is used as an input for statistical treatment. For ASLs C, D, and E, estimated values (i.e., expressed with a data qualifier of "J") the reported value is used. However, these data are only considered valid when the reported DL or estimated value is below the regulatory limit with which data are to be compared. This approach minimizes error in decision making (as opposed to using a value of zero or the actual DL in the decision making).

Duplicate and split sample analyses are an integral part of SW-846 quality assurance protocol and are used to measure sampling performance in terms of precision (reproducability) and/or comparability. A sample and its duplicate or split are designed to be equivalent (i.e., sampled and analyzed in precisely the same manner), therefore any distinction between a sample and its duplicate or split is arbitrary. For purposes of statistical treatment of data, the average value of the duplicate or split analyses for each constituent for a given sample is used for calculating statistics.

If any given sample result exceeds its respective RTL, then the FEMP will conduct an inspection of the supporting analytical QC data and analytical notes to verify that the reported value is valid in accordance with FEMP SSOP-1004, "FEMP Data Validation Procedure". If the reported value is not valid, the FEMP will document this finding, treat the result as missing or unusable data, and resample and reanalyze if warranted. If the reported value is valid, then the FEMP may

resample and reanalyze the affected waste materials for the given suspect analyte(s).

If the analyte-specific 90% confidence limit exceeds the RTL, then the FEMP will conduct an inspection of the analytical data to determine its validity. If the data is not valid, then the FEMP may resample and reanalyze the waste materials. If the data is valid, then the FEMP will determine the normality of the data distribution. If the COV value is less than 1.25 (i.e., $sx/\bar{x}$ is <1.25), the data may be assumed to be approximately normally distributed. If this test indicates that the data are not normally distributed, then the following steps are taken in accordance with established guidance at the FEMP:

1) Process knowledge (PK) and the Sampling and Analysis (S&A) effort are revisited to determine if the apparent distribution may be an artifact of S&A. Resampling may be necessary if this is deemed to be the case.

2) If the data correlate to an apparent stratification of the sub-waste stream and this correlation is substantiated by PK, then the waste may be evaluated as a stratified sub-waste stream.

3) If the data are determined to meet an alternate distribution profile, a data transformation and subsequent statistical evaluation may be performed (e.g., log-normal transformation followed by anti-log transformation of the 90% confidence limit).

4) If the transformation does not normalize the data, non-parametric approaches may be utilized to form the required 90% confidence limit.

5) Alternatively, additional samples may be collected to expand the number of data points representing the waste. This additional data provides a broader base with which to evaluate assumptions of normality.

If the normalized data indicate that the analyte-specific 90% confidence limit exceeds its respective RTL, then the FEMP will make a qualitative determination of its leachability. If the analyte has a high potential for leachability, the FEMP may submit samples for TCLP extraction and analysis.

By taking the approach described in the "Prototype Sampling and Analysis Plan for Containerized Waste at the FEMP", the FEMP is attempting to satisfy regulatory requirements with the most cost- and time-effective strategy. As stated previously, PK/previous analytical data/visual inspection reviews will allow for the development of a target list of analytes. In addition, the FEMP will use total screening methods for organics and inorganics/metals to evaluate if additional analyses (TCLP or TAL) are warranted. Additional testing, if

warranted, will only be conducted for suspect analytes (i.e., exceed respective RTL).

Containerized waste material sampling and analysis is required to satisfy the following data needs:

1) Determine the regulatory status of the waste materials (at a 90% confidence level) and ensure compliance with NVO-325 (Rev. 1) requirements

2) Determine the appropriate level of health and safety requirements for protection of site workers during waste disposal, treatment, or storage

3) Determine the waste characteristics to evaluate the proper disposal, treatment, or storage option

4) Assess risks to human health or the environment if wastes must be stored at the FEMP

The intended data users are Waste Characterization and Waste Storage and Disposition. Other potential data users are CRU1, CRU2, CRU3, CRU4, and CRU5 for treatability studies and CERCLA RI/FS activities, and Materials Control and Accountability (MC&A) for inventory and proper storage of radiologically-contaminated and/or RCRA materials.

Step 6: Establish Constraints on Uncertainty

An example of a false positive error that would affect the decision is uranium interference during metals analysis using inductively coupled plasma-atomic emission spectroscopy (ICPES). Previous experiences have indicated positive hits for certain metallic constituents, that were associated with errors in counting due to detection of uranium activity energies. Other examples of false positive errors include potential cross-contamination of sample equipment and inherent variabilities associated with statistical analyses of the data set.

An example of a false negative error that would affect the decision process, would be to determine that the waste is not RCRA or hazardous, when in reality they should be. Factors that could lead to such an error is the inherent variability associated with laboratory and statistical analyses, or persons with insufficient training or experience that may be involved in the decision process.

False negative errors represent a greater impact than false positive errors. An error (no matter how small or great in magnitude) in the decision to call the waste material non-RCRA, when in actuality the material is RCRA hazardous, could result in termination of the FEMP's disposal permit from NTS. This would result in subjecting NTS to scrutiny and pressures from the Nevada Department of Environment Protection (NDEP), the agency assigned to regulate NTS disposal activities. At the FEMP, such an error would result in an increased strain of providing storage of these materials at approved RCRA facilities, and possibly extensive fines or penalties administered by OEPA for violation of Consent Decree requirements and milestones. In terms of environmental protection and human health and safety, increasing magnitude of the error may result in greater potential for environmental damage or adverse human health effects.

In terms of a false positive error, the magnitude of the error would have minimal impact on environmental protection or human health and safety. The major consequence of calling the waste material RCRA hazardous, when in actuality it is non-RCRA, would be the increased strain of providing storage space at an approved RCRA facility at the FEMP. Although the FEMP may not be in violation of Consent Decree requirements, there would be an impact to the credibility of the FEMP waste characterization and waste management programs.

False negative errors in the decision to call material non-RCRA when in actuality it is RCRA hazardous and ship such material to NTS are <u>never acceptable</u>. In terms of political/social and economic consequences with OEPA and health/ecological risks, such errors may be almost never to sometimes acceptable. False positive errors may be sometimes acceptable since they have a lesser magnitude of impact than false negative errors. However, these errors should be minimized whenever possible.

In order to maintain a 90% confidence level in the data generated under the prototype sampling and analysis format, the following probabilities are acceptable:

False positive rate, alpha, of 10% or 0.10 (1 - alpha = 90% or 0.90)
False negative rate, beta, of 5% or 0.05 (1 - beta = 95% or 0.95)

The region of indifference for false positive errors can range from 10% to 100% with little or no impact on the decision. As the false positive rate increases, the most conservative approach is to assume that the errors are consistent throughout the sub-population or population, and that the material is RCRA hazardous until subsequent data can be presented (i.e., correction of causes of error) to refute the decision.

The region of indifference for false negative errors is greater than 10%. Basically, if the false negative rate exceeds 10%, the most conservative approach is to identify the material as RCRA hazardous until subsequent data can be presented to refute the decision.

In practical terms, false negative and false positive errors may be minimized by selecting a representative portion of data releases for investigation/ evaluation of waste/QC sample data calculations, analytical procedures, instrument histories, etc. (i.e., data validation). If the reported values can be considered valid at a 90% confidence level or better, the FEMP can assume that the population of data values are correct. In addition, the FEMP could utilize split sample analyses to identify possible data reporting errors. If the split sample results are in agreement on a consistent basis, then the FEMP can assume that population data are valid.

If the false positive or false negative rates exceed 10%, the FEMP will take the most conservative approach of identifying the waste materials as RCRA hazardous to avoid unintentional shipment of RCRA materials to NTS.

Step 7: Optimize Design for Obtaining Data

In general, containerized wastes at the FEMP were previously generated as a result of uranium metal production processes, equipment decontamination, sump-cleanout, by-product storage, etc. Containerized wastes are currently being generated as a result of temporary storage of materials disturbed by CERCLA RI/FS studies, removal actions, construction/demolition activities, and daily FEMP operations.

Contaminants of concern vary across the FEMP site and within each OU as well. Contaminants of concern for the OUs are as follows:

- OU-1 - radionuclides, trace metals, asbestos, volatile organics
- OU-2 - radionuclides, trace metals
- OU-3 - radionuclides, trace metals, volatile organics, semi-volatile organics, pesticides, PCBs, asbestos, acids, fuel oils, and lubricating oils.
- OU-4 - radionuclides and trace metals
- OU-5 - all contaminants of concern in OUs 1 through 4

Contaminant distributions within each sub-population are expected to vary between the solid and liquid phases. The difference in the distribution of contaminants is primarily related to differences in the waste generation processes. A majority of the solid or sludge materials were deposited during uranium metal production processes; while, the liquid materials represent stormwater runoff collection or sanitary-sewer effluent collection.

In general, the sampling approach for containerized wastes at the FEMP is dependent on the characteristics of the sub-waste stream as determined by PK/previous analytical data/visual inspection reviews. Simple random sampling methods are used for sub-waste streams which contain single-phased (i.e., either solid or liquid) and relatively homogenous waste materials. Stratified random sampling methods are used for sub-waste streams that have been segregated into multiple container groups (lots) based upon differences in: the physical characteristics (i.e., phase and degree of homogeneity) of the waste materials, the origin (time and location) of waste materials and their generation processes, or the distribution and concentration of contaminants.

Random sample point locations will be generated using computer algorithms designed based upon guidance criteria provided in EPA/230-02-89-042, Methods for Evaluating the Attainment of Cleanup Standards, Vol. I, Soils and Solid Media. Sample locations for stratified random sampling can be determined using the following methods: 1) select random sample locations as previously described and collect a sample from each stratum or media type (i.e. liquid and sludge), or 2) calculate random sample locations for each stratum or media type independently. A major assumption of using this methodology is that each stratum or media type is evenly dispersed throughout the surface impoundment.

Typically, the number of samples required equals 10% of the number of drums in a sub-waste stream. However, for sub-waste streams containing more than 100 drums, collecting samples for analyses at a rate of 10% may not be economically feasible or practical. Therefore, the FEMP intends to use the 10% method for sub-waste streams with < 100 drums and the cube root method for sub-waste streams with > 100 drums. Using this approach, the number of samples required for waste characterization is as follows:

Number of Drums	Min. # of Samples for Analysis	Number of Samples for Completeness*
1 to 20	2	3
21 to 100	10%	12.5%
101 to 1000	10	13
1001 to 10000	22	28

* - Total number of samples required to maintain 90% completeness using a conservative R-value of 0.20 (20%).

For white metal box, Sea/Land^R, or Top Load container sampling, the proposed number of samples required shall be equal to 10% of the containers in the sub-waste stream, as follows:

Number of Boxes	Min. # of Boxes to be Sampled	Number of Samples for Completeness*
1	1	3
2 to 20	2	5
21 to 30	3	8
16 to 40	4	10
41 to 50	5	13
over 50	10%	25%

* - Total number of samples required to maintain 90% completeness using a conservative R-value of 0.20 (20%). This number includes collecting two random samples from each white metal box, Sea/Land^R, or Top Load container sampled.

For sub-waste streams that have been characterized by process knowledge but do not meet one of the conditions in Section 1.5 of this SAP, the number of required confirmatory samples per sub-waste stream is as follows:

Number of Containers	Min. # of Samples for Analysis	Number of Samples for Completeness*
1 to 10	2	3
11 to 100	3	4
101 to 1000	4	5
over 1001	5	6

* - Total number of samples required to maintain 90% completeness using a conservative R-value of 0.20 (20%). If the containers are white metal, Sea/Land[R], or Top Load boxes, the required number of samples in this table is doubled.

Parametric analysis, or EPA SW-846 Equation 8, is the preferred method to select the required number of samples required to satisfy the NVO-325 90% confidence level requirement. However, EPA SW-846 Equation 8 requires previous analytical data to determine the mean and associated standard deviation for the analyte with the most restrictive regulatory threshold level. EPA SW-846 Equation 8 may be used as a tertiary method, in situations where the upper limit of a 90% confidence level approximates or exceeds the regulatory threshold value for a given analyte, to determine if additional sample collection and analysis is warranted.

Visual inspection, photoionization detection (PID) and alpha and/or beta/gamma detection field screening analyses at ASL A. Laboratory analyses at ASL B initially, additional data uses may require ASL C or D.

Representativeness, or the collection of samples that are unbiased and exhibit average properties of the population sampled, is achieved by segregating the waste materials into sub-waste streams. A sub-waste stream is generally comprised of a group of materials labeled with the same Material Type and Source Code. Material Type and Source Code identifiers are provided in each PSAP, in Sections A.5 and A.6, respectively.

Sampling accuracy is achieved through randomized sampling of the waste materials within a given sub-waste stream. Randomized sampling minimizes bias in the sample selection process by giving each portion of the waste materials an equal probability of being sampled.

Sampling precision is achieved by increasing the number of samples to be collected, increasing the actual volume of the samples, or dividing a population into appropriate strata prior to sampling. Additional samples may be collected when the uniformity of the waste is not known and when sample collection is difficult. In general, the volume of sample material collected at the FEMP exceeds the minimum amount needed for analytical sample preparation and analysis. Lastly, when a sub-waste stream is suspected or known to contain separate physical phases (i.e., solids and liquids), the number of samples required is calculated for each waste phase. During sample collection activities, a sample is collected from each waste phase from the randomly selected sample points.

Method detection limits for solid- and liquid-phased samples, in accordance with EPA SW-846, are provided in Table G-1 of the SCQ (Vol. II).

As previously mentioned, additional samples may be collected when appropriate. To satisfy SCQ completeness requirements of 90%, the number of samples required to be collected will be calculated in accordance with methods described in

EPA/230-02-89-042, Feb. 1989, Methods for Evaluating the Attainment of Cleanup Standards, Vol. I, Soils and Solid Media. The following equation will be used to determine the number of samples to satisfy the SCQ 90% completeness level requirement:

$$\#\ \text{of Samples}_{(90\%\ \text{comp})} = \frac{\text{Minimum number of samples required}}{(1 - R)}$$

where,

R = 0.20 (20%), the expected percent of missing or unusable data (i.e., sample holding times exceeded, improper preservation of samples, sample container breakage during shipment to laboratory, etc.)

An R-value of 0.20 (20%) was selected to take the most conservative approach for minimization or elimination of the potential need for resampling activities.

Lastly, laboratories contracted to provide analytical services are required to comply with all provisions in the SCQ. Therefore, data sets from differing laboratory facilities should be comparable since the same analytical method and method detection limit is required.

Required analytical methods are as follows:

Analytical Parameter	EPA SW-846 Test Method(s)
Organics (Gas Chromatography)	8010, 8020
Organics (Gas Chromatography/ Mass Spectroscopy)	8270
Inorganics/Metals (Atomic Absorption Spectroscopy)	40 CFR 261, App. III SW-846 Parts 7.3.3.2 and 7.3.4.3
Inorganics/Metals (Inductively Coupled Plasma/ Atomic Emission Spectroscopy)	6010

RCRA Analyses	
Ignitability	1010
Reactivity	40 CFR 261.23
	Parts 7.3.3.2 and 7.3.4.3
Corrosivity	9040 (NVO-325)
	1110 (SCQ)
Toxicity Characteristic	1311
LDR Solvents	TCLP (F001-F005)
LDR Halogenated Org.	9020
Cyanides	9010/9012 (NVO-325)
	335.2/335.3 (SCQ)
Sulfides	9030
Other NVO-325 (Rev. 1) Analyses	
Free Liquids	9095
PCBs	8080 (No SCQ Reference)

DQO Logic Statement and Summary Form NTW-002

1.A. Task/Description: Physical, chemical, and radiological characterization of containerized waste materials. OU #: OUs 1 - 5

1.B. Project Phase: (Circle the appropriate selection.)

RI FS RD RA R,A OTHER (specify) Waste Characterization/Management

1.C. DQO No.: NTW-002 DQO Reference No.: _____

---

2. Media Characterization: (Circle the appropriate selection.)

Air Biological Groundwater Sediment Soil

Waste Waste water Surface water Other (specify) _____

---

3. Data Use with Analytical Support Level (A-E): (Circle the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization A B C D E Risk Assessment A B C D E
Evaluation of Alternatives A B C D E Engineering Design A B C D E
Monitoring during remediation activities A B C D E
Other A B C D E (Explain) Waste Characterization

4.A. Drivers:
1) NVO-325 Rev. 1, "Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements"
2) Consent Decree with Ohio Environmental Protection Agency
3) Amended Consent Agreement with USEPA
4) DOE Order 5820.2A, "Radioactive Waste Management"

4.B.Objective:
1) Generate and maintain data of sufficient quality to identify the regulatory status of and safely manage containerized waste materials.
2) Determine appropriate waste disposition options, including treatment and disposal.

---

5. Site Information (Description): The FEMP, formerly FMPC, is a DOE facility located 27 kilometers northwest of Cincinnati, Ohio. The FMPC operated from 1951 to 1989, by processing uranium ore and feed materials for the production of low-enriched uranium metal products. Subsequent to 1989, the site name and mission changed towards implementation of environmental restoration initiatives to address environmental impacts associated with FMPC operational and FEMP remediation activities.

DQO Number: NTW-002

In 1989, a large, but finite inventory of materials associated with the uranium metal production process were retained. In addition, a variety of the FEMP's restoration, facility support, and maintenance functions are currently generating or will continue to generate waste materials. These wastes require characterization to ensure safe, compliant, and appropriate management in support of environmental restoration and waste management goals at the FEMP and supporting programs and facilities.

6.A. Data Types with appropriate Analytical Support Level Equipment Selection and QAPjP Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the QAPjP Section.)

1. pH	X	2. Uranium/Thorium	X	3. BTX	
Temperature		Full Radiologic		TPH	
Specific Conductance		Metals	X	Oil/Grease	
Dissolved Oxygen		Cyanide	X		
		Silica			
4. Cations		5. VOA/SVOA	X	6. PFLT	X
Anions		ABN		LDR	X
TOC		Pesticides		Flash Point	X
TCLP	X	PCB	X	F-Listed Solvents	X
CEC					
COD					

6.B. Equipment Selection and QAPjP Reference:

Equipment Selection		Refer to QAPjP Section
ASL A		QAPjP Section:
ASL B	SW-846 Methodology, GC/MS, AAS	QAPjP Section: Appendix G
ASL C	CLP Methodology	QAPjP Section: Appendix G
ASL D	CLP Methodology	QAPjP Section: Appendix G
ASL E		QAPjP Section:

DQO Number: NTW-002

7.A. Sampling Methods: (Circle the appropriate selection.)

Biased Composite Environmental Grab Grid

Intrusive Non-Intrusive Phased Source

Other (specify): Simple or stratified random sampling methods

7.B. Sample Work Plan Reference: (List the samples required. Reference the work plan or sampling plan guiding the sampling activity, as appropriate.)

Background samples: Prototype SAP for Containerized Wastes at the FEMP

7.C. Sample Collection Reference: (Please provide a specific reference to the QAPjP Section and subsection guiding sampling collection procedures.)

Sample Collection Reference: Sections K.5.5.4 - K.5.5.6, and K.8 of the FEMP SCQ

---

8. Quality Assurance/Control Samples: (Place an "X" to the right of the appropriate selection(s).)

8.A. Field Quality Assurance Samples:

Trip Blanks X
Field Blanks X
Equipment Rinsate Samples X
Preservative Blanks __
Other (specify) __ _____

Container Blanks __
Duplicate Samples X
Split Samples __
Performance Evaluation Samples __

8.B. Laboratory Quality Control Samples:

Method Blank __
Matrix Spike __

Matrix Duplicate/Replicate (Matrix Spike Duplicates) __
Surrogate Spikes __

Other (specify) X Per Appendix G of the FEMP SCQ

---

9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.

As a quality assurance measure, NVO-325 Rev. 1 requires that all personnel involved in the waste characterization, determination, certification and transfer processes have sufficient training to meet the project objectives. Therefore, the data quality and validity may be greatly affected by personnel designing and implementing the requested scope of work for these projects.

Appendix D FEMP Miscellaneous Forms

Fernald Environmental Management Project
MATERIAL EVALUATION FORM (MEF)

Evaluation Section

A. WASTE STREAM IDENTIFICATION

1. MEF #: Revision No.:	2. Date Completed:	3. Provide 15 digit Lot Marking if available or Material Type and Source Code:
4. Evaluator:	5. Phone No.:	6. Badge No./Co. Name:

B. MATERIAL REGULATORY STATUS

Regulated:	Material Specific Regulation:	Regulated:	Material Specific Regulation:
__ yes __ no	TSCA PCBs	__ yes __ no	Low Level Radioactive Waste (LLRW).
__ yes __ no	CAA Asbestos NESHAPs	__ yes __ no	Transuranic Waste (TRU).
__ yes __ no	State of Ohio Infectious waste	__ yes __ no	NonRadioactive waste***.
(See Form REG in material evaluation file)		(See Form RAD in material evaluation file)	
__ yes __ no	RCRA Solid Waste (See Form Series SW)	***Concurrence, Radiological Assessment	Date
__ yes __ no	RCRA Hazardous Waste (See Form Series HW)	Re-evaluation Date: _____	
Hazardous Waste Code(s): _____		NOTE: WASTE STREAM MUST BE RE-EVALUATED BY FME IF IT IS GENERATED AFTER THE RE-EVALUATION DATE LISTED ABOVE OR WHEN THERE IS A CHANGE IN THE STREAM/GENERATING PROCESS.	

C. MATERIAL MANAGEMENT:

1. Waste Form Criteria: __ yes __ no Health & Safety Addendum Attached. (Note if marked yes do not manage this material without attached H&S Addendum. __ yes __ no Material contains free liquids. __ yes __ no LLRW meets NVO-325 Waste Acceptance Criteria (See Form NTS in material evaluation file)	2. Container Specification:	3. Reactivity Group Code:
4. DOT Shipping Description:	5. DOT Labels:	6. DOT Identification No.: ☐ UN ☐ NA _____ (Suffix) 7. DOT Hazard Class:

D. DISTRIBUTION

___ Generator _____	___ RCRA Program Manager D. A. Nixon MSF 84
___ MC&A H. J. Kaus MSF 28	___ Site Media Sampling M. F. Ramirez MSF 18
___ Facilities and Warehousing R. S. Perkins MSF 63	___ IRSAT R. L. Koehler MSF 21
___ Sample Disposition (if sampled) _____	___ Waste Reduct Prog. J. T. Wiggins MSF 16
Distributed by:	Date:

FORM EVAL: REVISION 1.0; 11/30/92 WCPFORM\EVAL.FRM

Material Evaluation Form (Part 1)

FORM MEPOFF (04/02/92)

MATERIAL EVALUATION FORM
Off-Site Generator Section

A. GENERATOR/WASTE STREAM IDENTIFICATION:

1. MEF #: Revision No.: _____	2. Date Submitted:	3. FEMP Generator SRC ID:
4. Generator Name:	5. Generator USEPA ID:	6. Generator State ID:
7. Facility Address:	8. Technical Contact Name:	10. Technical Contact Phone Number(s):
	9. Technical Contact Title:	

B. GENERATION INFORMATION:

1. Provide best descriptive name for material:

2. Describe how the material is generated:

[Documentation attached: ○ additional narrative; ○ SOP; ○ Manufacturing Spec; ○ MSDS; ○ AEDO Log excerpt; ○ release report; ○ other: _____]

3. Waste Quantity: Number of Containers: _____ [☐ estimate; ☐ actual] Container Type: _____ Total weight and volume: _____ [☐ estimate; ☐ actual]

C. GROSS CHARACTERISTICS

1. Describe Color/Appearance:

2. Physical State:
☐ Liquid ☐ Solid debris/rubble
☐ Semi-solid/sludge ☐ Dry solid residue
☐ dry powder/dusty residue ☐ Other, specify:

3. Contains Free Liquids: based on:
☐ yes ☐ visual
☐ no ○ PFLT results attached
☐ unknown

[NOTE: Do Not Smell the Material]

4. Note Any Incidental Odor:

5. Describe Phase/Layers:
☐ single phase ☐ two-layers ☐ multi-layered

6. pH (specify range or 'unknown'): _____ [☐ estimate; ○ analytical results attached]

7. Flash Point (specify range or 'unknown'): _____ [☐ estimate; ○ analytical results attached]

D. MATERIAL COMPOSITION

1. Components: Min - Max: Basis for Identifying:
_____ ____ - ____ % _____
_____ ____ - ____ % _____
_____ ____ - ____ % _____
_____ ____ - ____ % _____
MAXIMUM must meet or exceed 100 %
[☐ based on knowledge of the material; ○ analytical data attached]

2. Does the material contain any of the following:
☐ asbestos ☐ polychlorinated biphenyls (PCBs)
☐ cyanides ☐ sulfides
☐ RCRA metals, circle if suspected:
(arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, thallium)
☐ based on knowledge of the material
○ analytical data attached

3. Radionuclide Contamination:
☐ material is not contaminated with radionuclides
☐ material contains incidental radionuclide contamination
☐ radionuclide bearing material/residue
Radionuclides of Concern if any:
☐ uranium
☐ thorium
☐ transuranics (TRU)
[☐ based on knowledge of the material; ○ analytical data attached] ☐ Other: _____

4. Identify any additional characteristics:
☐ water reactive ☐ explosive
☐ pyrophoric ☐ shock sensitive
☐ oxidizer ☐ other _____

Material Evaluation Form (Part 2)

FEMP REQUEST FOR SAMPLING & ANALYSIS/FIELD ACTIVITIES

PROJECT INFORMATION:

Requestor:	Phone:	Project Name:	MEF #:
PE/PM:	Phone:	Project/WO #:	SMS Request #:
Field Contact:	Phone:	Charge #:	Date Submitted:
Sample Plan Prepared By:	Phone:		Requested Completion Date:

SAMPLING PURPOSE:

__ RCRA Waste Characterization __ Waste Confirmation __ CERCLA __ Statistical Summary
__ RCRA Closure __ Treatability Study __ Visual Inspection __ Other

WASTE CONFIGURATION (at time of sampling):

__ Containerized (circle container type)

drum/pail - 5, 10, 20, 30, 55, 85, 110 gallon
White Metal Box, Wood Box, ISO Container (Sea/Land)

__ inventory information attached

__ tank/sump
__ pile
__ building/structure
__ surface impoundment
__ waste in process unit
__ landfill/soils in place
__ location/diagram/dimensions of unit attached

WASTE DESCRIPTION (list marking/drum number(s), matrix, consistency, suspected contaminants, percent (volume) of total waste):

PARAMETERS FOR ANALYSIS:

(List sample matrix(ces) and identify parameters for each)	Analysis Group (See Reverse) 1	2	3	4	5	6	7	8	9
1)									
2)									
3)									
4)									
5)									

DATA QUALITY OBJECTIVE REQUIRED (to be completed by requestor) if completed fill in DQO # _____ and attach, (see SCQ, vol. II, Appendix C.) - Check Analytical Support Level (ASL) below

(ASL A) FIELD SCREENING ____	(ASL) B SW-846 ____	(ASL C) CLP SOW ____	(ASL D) CONFIRMATIONAL ____	(ASL E) NON-STANDARD ____	OTHER ____

SAMPLING APPROACH:

__ Simple Random __ Stratified Random __ Systematic Random
__ Grid __ Grab __ Other

ADDITIONAL INSTRUCTIONS:

CONCURRENCE:

Waste Characterization: _____ Requestor: _____

Cost Account Manager (CAM): _____

FORM SAMPREQ;Revision 5; 12/27/93SMS\FORM\SAMPREQ.FRM

Request for Sampling and Analysis (Part 1)

FEMP REQUEST FOR SAMPLING & ANALYSIS\FIELD ACTIVITIES

PARAMETERS FOR ANALYSIS

GROUP 1 - TC Metals

__ Totals __ TCLP

__ arsenic
__ barium
__ cadmium
__ chromium
__ lead
__ mercury
__ selenium
__ silver

GROUP 2 - TC Pesticides

__ Totals __ TCLP

__ Endrin
__ Lindane
__ Methoxychlor
__ Toxaphene
__ 2,4-D
__ 2,4,5-TP Silvex
__ Chlordane
__ Heptachlor

GROUP 3 - TC VOAs

__ Totals __TCLP

__ benzene
__ carbon tetrachloride
__ chlorobenzene
__ chloroform
__ 1,2-dichloroethane
__ 1,1-dichloroethylene
__ methyl ethyl ketone
__ tetrachloroethylene
__ trichloroethylene
__ vinyl chloride

GROUP 4 - TC Semi-VOAs

__ Totals __ TCLP

__ o-cresol
__ m-cresol
__ p-cresol
__ cresol
__ dichlorobenzene
__ 2,4-dinitrotoluene
__ hexachlorobenzene
__ hexachlorobutadiene
__ hexachloroethane
__ nitrobenzene
__ pentachlorophenol
__ pyridine
__ 2,4,5-trichlorophenol
__ 2,4,6-trichlorophenol

GROUP 5 - F001 - F005 Solvent Constituents

__ acetone
__ benzene
__ carbon disulfide
__ carbon tetrachloride
__ chlorinated fluorocarbon
__ chlorobenzene
__ chloroethane
__ chloromethane
__ 1,1-dichloroethane
__ trans-1,2-dichloroethane
__ o-dichlorobenzene
__ 2-ethoxyethanol
__ ethyl acetate
__ ethyl benzene
__ ethyl ether
__ isobutanol
__ methanol
__ methyl isobutyl ketone (MIBK)
__ methyl ethyl ketone (MEK)
__ methylene chloride
__ nitrobenzene
__ 2-nitropropane
__ pyridine
__ tetrachloroethylene
__ toluene
__ 1,1,1-trichloroethane
__ 1,1,1-trichloro-1,2,2-trifluoroethane
__ trichlorofluoromethane
__ vinyl chloride
__ xylenes

GROUP 6 - Rad

__ Cs 137
__ Np 237
__ Pu 238
__ Pu 239/240
__ Ra 226
__ Ra 228
__ Ru 106
__ Sr 90
__ Tc 99
__ Th Total
__ Th 228
__ Th 230
__ Th 232
__ U Total
__ U 234
__ U 235/236
__ U 238
__ Gross alpha/beta

GROUP 7 - Phys/Chem

__ Paint Filter Liquid Test (PFLT)
__ pH (if PFLT fails and filtrate is aqueous)
__ corrosivity toward steel (if PFLT fails and filtrate is aqueous)
__ flash point (if PFLT fails)
__ asbestos (__TEM, __EM, __PLM)
__ HSL
__ full __ extended __ abbrev.

GROUP 8 - ASTM Methods

__ commingling waste (ASTM D 5058)
__ cyanides in waste (ASTM D 5049)
__ sulfides in waste (ASTM D 4978)
__ pH of waste (ASTM D 4980)
__ physical description (ASTM D 4979)
__ oxidizers in waste (ASTM D 4981)
__ particle grain size (ASTM)

GROUP 9 - LDR

__ total organic carbon (TOC)
__ total suspended solids (TSS)
__ total organic halides (TOX)
__ PCBs
__ nickel
__ thallium

SMSFORM SAMPREQ; Revision 5; 12/27/93

Request for Sampling and Analysis (Part 2)

000390

FERMCO

001-03

FIELD LOGBOOK INDEX

DATE

PG ___ of ___

TIME START TIME FINISH

FERNALD ENVIRONMENTAL RESTORATION MANAGEMENT CORPORATION
7400 Willey Road
Fernald, OH 45030

PROJECT NAME

SAMPLE PLAN NO

LOCATION

PROJECT FIELD CONTACT(S)

PROCESS PRODUCING WASTE
Uranium Metals Production

PURPOSE OF SAMPLING
Site Media Sampling

FIELD LOGBOOK RECORDER

SWMACA FORM NUMBER

NORTH OR UP

FIELD SKETCH

FIELD NOTES

SAMPLER'S NAME (Print) SAMPLER'S SIGNATURE

SAMPLER'S NAME (Print) SAMPLER'S SIGNATURE

SAMPLER'S NAME (Print) SAMPLER'S SIGNATURE

SAMPLER'S NAME (Print) SAMPLER'S SIGNATURE

Field Logbook (Part 1)

001-04

FERMCO

FIELD LOGBOOK INDEX

DATE | TIME START | TIME FINISH | PG ___ of ___ | SWMACR FORM NUMBER

SAMPLE PLAN NUMBER | FIELD LOG RECORDER

CUSTOMER NUMBER	SAMPLE POINT	TYPE CODE	MATERIAL CODE	COLLECTION METHOD	SAMPLE DEPTH	TIME	CONTAINER TYPE	NUMBER VOLUME	ANL CODE	PRES. CODE	UNIT CODE

TYPE CODES: S=Sample Re=Resample D=Duplicate F=Field Blank T=Trip Blank Rs=Rinsate EB=Equipment Blank

FIELD SCREENING INSTRUMENT TYPE	SERIAL NUMBER	CALIBRATION DATE	CALIBRATION METHOD	CALIBRATION READING

Field Logbook (Part 2)

FERNALD SITE
SITE SERVICES ANALYTICAL
SITE-WIDE ANALYSIS REQUEST/CUSTODY RECORD

Form Number ____ - ____ - ____ - ____

Page ____ of

PROJECT	FOR SAMPLE RELATED PROBLEMS, CONTACT:
☐ PLAN NO.: OR ☐ PROJECT NO.:	ORGANIZATION:
PROJECT MANAGER/ENGINEER:	NAME: PHONE:
SAMPLER: PHONE:	SAMPLER REMARKS:
CHARGE NUMBER: LOT MARKING CODE:	
SAMPLER SIGNATURE(S):	
SEND RESULTS TO:	

CHECK FOR: ☐ S R LAB ☐ BIO LAB ☐ WTP LAB

SAMPLE SOURCE, DESCRIPTION/IDENTIFICATION, ANALYSIS REQUIRED

	SAMPLE NUMBER	CUSTOMER NUMBER	SAMPLE POINT	MATRIX CODE	COLLECTED DATE	COLLECTED TIME	CONTAINER/ VOLUME	COMPOSITE	GRAB	NO. OF CONTAINERS	ANALYTES CODE - (UNITS CODE)												REMARKS
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							

ITEM/REASON	RELINQUISHED BY	RECEIVED BY	DATE	TIME	ITEM/REASON	RELINQUISHED BY	RECEIVED BY	DATE	TIME

NO.	DISTRIBUTION OF COPIES
1	LABORATORY
2	REQUESTER
3	SAMPLER

FEMPC 00 2001 (7/10/91)

Sitewide Analysis Request/Custody Record

SAMPLE ID: XXXXXXXXXX

(barcode goes here)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
SAMPLE ID : XXXXXXXXXX
(barcode goes here)

DATE SAMPLED _____ TIME SAMPLED _____

MATERIAL NAME / SAMPLE TYPE
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
PRESERVATIVES
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CONTAINER TYPE XXXXXXXXXXXXXXXX GROSS WEIGHT _____

COLLECTORS INITLS _____ TARE WEIGHT _____

CNT: _____

COC #: _____

SAMPLE ID: XXXXXXXXXX

(barcode goes here)

Label A

TEMP SAMPLE ID _____ X-REF SAMPLE ID _____

DATE SAMPLED _____ TIME SAMPLED _____

MATL NAME _____

SAMPLE TYPE _____

CONTAINER TYPE XXXXXXXXXXXXXXXXX GROSS WEIGHT _____

COLLECTORS INITLS _____ TARE WEIGHT _____

PRESERV: _____

CNT: _____

COC #: _____

Label B

Sample Label

LAB SAMPLE
DO NOT TAMPER

DATE _____

INITIALS _____

Custody Seal

SURVEILLANCE PLAN AND CHECKLIST FOR FIELD PERFORMANCE AUDIT

Page 1 of 2

ORGANIZATION _____
PROJECT _____
LOCATION _____

Surveillance No. _____
DATE _____

SURVEILLANCE REQUIREMENT	YES	NO	COMMENTS
PROJECT RESPONSIBILITIES			
Was the PSP prepared?			
Was a briefing held for project participants?			
Were additional instructions given to project participants?			
SAMPLE COLLECTION			
Is there a written list of sampling locations and descriptions?			
Are samples collected as stated in the PSP?			
Are samples collected in the type of containers specified in the PSP?			
Is sample equipment available, calibrated, and in proper working order?			
Are samples preserved as specified in the PSP?			
Are the number, frequency, and type of samples collected as specified in the PSP?			

Example Surveillance Plan/Checklist for Field Performance Audit (Page 1)

SURVEILLANCE PLAN AND CHECKLIST FOR FIELD PERFORMANCE AUDIT

Page 2 of 2

ORGANIZATION _____
PROJECT _____
LOCATION _____

Surveillance No. _____
DATE _____

SURVEILLANCE REQUIREMENT	YES	NO	COMMENTS
SAMPLE COLLECTION - cont.			
Are quality assurance checks performed as specified in the PSP?			
DOCUMENT CONTROL			
Have any accountable documents been lost?			
Have any accountable documents been voided?			
Have any accountable documents been disposed of?			
Are the samples identified as specified in the PSP?			
Are blank and duplicate samples properly identified?			
Are samples listed on a chain-of-custody record?			
Is chain-of-custody documented and maintained?			

Evaluator Signature: _____ Date: _____

Example Surveillance Plan/Checklist for Field Performance Audit (Page 2)

VR No. _____

VARIANCE REQUEST

Page _ of _

Date _____

VARIANCE (Include Justification)

Variance:

Justification:

REQUESTED BY: _____ **Date:** _____

APPROVED BY: _____ **Date:** _____

Project Manager

_____

Quality Assurance

_____

SCQ Implementation

APPLICABLE DOCUMENT(S) AND SECTION NUMBER(S)

Variance Request Form

Appendix E Glossary

Characterization (EPA 600/R-92/033): The determination of the physical, chemical, radiological, and biological properties of a pure substance, compound, or mixture to the extent necessary to support informed decision making.

Confidence Coefficient (EPA 600/R-92/033): The probability statement that accompanies a confidence interval and is equal to unity minus the associated type I error rate (false positive rate). A confidence coefficient of 0.90 implies that 90% of the intervals resulting from repeated sampling of a population will include the unknown (true) population parameter.

Confidence Interval (EPA 600/R-92/033): The numerical interval constructed around a point estimate of a population parameter, combined with the probability statement (the confidence coefficient) linking the interval to the population's true parameter value.

Disposal (EPA 600/R-92/033): The systematic and orderly placement, storage, distribution, or transformation of wastes.

Disposal (NVO-325, Rev. 1): The emplacement of low-level wastes or radioactive mixed wastes in a manner which is considered permanent in that routine recovery is not provided for.

Facility - RCRA (EPA 40 CFR 260.10): All contiguous land, and structures, other appurtenances and improvements on the land used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units (e.g., one or more landfills, surface impoundments, or combinations of them).

Facility - Waste (EPA 40 CFR 260.10): All contiguous land, and structures, other appurtenances and improvements on the land used for treating, storing, or disposing of waste. A facility may consist of several treatment, storage, or disposal operational units (e.g., one or more landfills, surface impoundments, or combinations of them).

Hazardous Waste (DOT 49 CFR 171.8): Any material that is subject to the Hazardous Waste Manifest Requirements of the Environmental Protection Agency specified in 40 CFR Part 262.

Hazardous Waste (DOE EH-231-003/0191): A solid waste that must be treated, stored, or transported, and disposed of in accordance with applicable requirements under Subtitle C of RCRA.

Low-Level Waste (NVO-325, Rev. 1): All radioactive waste not classified as high-level waste, spent nuclear fuel, transuranic waste, uranium mill tailings, mixed waste, or 11e(2) by-product material as defined in DOE Order 5820.2a. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentrations of transuranics is less than 100 nanocuries (nCi/g).

Mixed Waste (NVO-325, Rev. 1): Waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the RCRA, respectively. Mixed waste must meet the Land Disposal Restrictions (LDR) as listed in 40 CFR 268.

Operable Unit (EPA 40 CFR 300.6) A discrete part of the entire response action that decreases a release, threat of release, or pathway of exposure.

Radioactive Waste (NVO-325 Rev. 1): Solid, liquid, or gaseous material that contains radioactive nuclides regulated under the Atomic Energy Act of 1954, as amended, and of negligible economic value considering costs of recovery.

Radioactive Waste (DOE 5480.2): Solid or fluid materials of no value containing radioactivity; discarded items such as clothing, containers, equipment, rubble, residues, or soils contaminated with radioactivity; or soils, rubble, equipment or other items containing induced radioactivity such that the levels exceed safe limits for unconditional release.

Solid Waste (NVO-325, Rev. 1): Waste material that is an essentially dry, solid form. The waste stream may include well-drained containers or liquids which have been entrapped or otherwise solidified so that they will retain their solid form without the presence of free liquids during handling, transportation, storage, or disposal. Viscous material is determined to be a solid by testing in accordance with American Society for testing Materials Standard D 4359, "Standard Test Method for Determining Whether a Material is a Liquid or a Solid."

Solid Waste (EPA 40 CFR 260.10, 261.2): Garbage, refuse, and other discarded solid materials, including solid waste materials resulting from industrial, commercial, and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluent, dissolved materials in irrigation return flows, or other common water pollutants. It generally does not include mining, agricultural, and industrial solid wastes; hazardous wastes; sludges; construction and demolition wastes; and infectious wastes.

Sub-Waste Stream: A group of containers that contain similar material based on process knowledge and are labeled with the same Material Type and Source Code as part of the FEMP's Lot Marking System Number.

Waste Stream (NVO-325 Rev. 1): The categorization of waste defined by the ability or method of characterization and certification. Examples are (1) by matrix; e.g., compactible trash, metal, wood, sludge, filter cakes, glass; and (2) by process; e.g., controlled experiments, decommissioning activities as described in DOE Order 5820.2A, Section V.

Appendix F List of Supporting Documents

EM-EXM-91-018 (Rev. 1), "Site Media Sampling Extraction Methodology for Obtaining Soil Samples from Metal Overpack Containers," Oct. 1991.

EP-SMS-001 (Rev. 0), "Field Logbook Procedure", Dec. 1993.

EP-SMS-002 (Rev. 0), "Field Quality Control Procedure", Dec. 1993.

EP-SMS-003 (Rev. 0), "Equipment Decontamination Procedure," Dec. 1993.

EP-SMS-004 (Rev. 0), "Conduct and Coordination of Field Operations," Dec 1993.

EPA/230-02-89-042, Methods for Evaluating the Attainment of Cleanup Standards, Vol. I, Soils and Solid Media, Feb. 1989.

EPA/600/R-92/033, Characterizing Heterogeneous Wastes: Methods and Recommendations, Feb. 1993.

EPA SW-846, Test Methods for Evaluating Solid Wastes, Volume II, Field Manual, Physical/Chemical Methods.

FEMP SCQ, Fernald Environmental Management Project Sitewide CERCLA Quality Assurance Project Plan, Sept. 1992

FEMP-SOP 20-C-805, "Sampling Drummed Waste for Hazard Identification," Apr. 1992.

FEMP-SSOP-0018, "Processing the Sitewide Analysis Request/Custody Record for Sample Control," May 1992.

FEMP-SSOP-1004, "FEMP Data Validation Procedure", Draft, Nov. 1993.

FEMP Waste Characterization Plan (draft version)

NVO-325 (Rev. 1), Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements, June 1992.

Signature Page

The following individual(s) have reviewed and understand the requirements presented in this SAP:

Name (Printed)	Signature	Badge #	Date

Signature Page

The following individual(s) have reviewed and understand the requirements presented in this SAP:

Name (Printed)	Signature	Badge #	Date