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Integrated Thermal Treatment System Study— Phase 1 Results

Appendix B – Flow Sheets and Material Balances

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PROCESS INPUT

PROCESS OUTPUT

ROTARY KILN AIR FOR COMBUSTION (BASELINE SYSTEM)	① TOTAL INPUT WASTE	② METALLIC WASTE (SURFACE CONTAMINATION)	③ METALLIC WASTE (ENTRAINED CONTAMINATION)	④ LEAD METAL	⑤ INCINERABLE WASTE	⑥ AQUEOUS WASTE	⑦ SPECIAL WASTE	⑧ MERCURY CONTAMINATED WASTE	⑨ OFFGAS	⑩ INCINERATION ASH	⑪ SLUDGE	⑫ TREATED SPECIAL WASTE	⑬ AMALGAMATED WASTE	⑭ TREATED METALLIC WASTE (RECYCLE)	⑮ TREATED METALLIC WASTE (RECYCLE)	⑯ TREATED LEAD (RECYCLE)	⑰ STABILIZED WASTE	⑱ STABILIZED WASTE	⑲ TREATED/PACKAGED SOLID WASTE
FLOW RATE (LB/HR)	2,400	88	3	26	2,000	80	153	50	RANGE (5,291-17,123)	RANGE (1,026-1,616)	380	153	52	91	3	25	RANGE (1,508-2,290)	RANGE (116-390)	RANGE (1,848-2,766)

FIGURE B1-1. ROTARY KILN: PFD FOR OVERALL SYSTEM (SYSTEMS A-1 THROUGH A-7)

NOTE: EMPTY BINS AND DRUMS FLOW RATE WERE NOT CONSIDERED IN THE MASS-BALANCE CALCULATIONS. HOWEVER, THE METAL MELTING AND DECONTAMINATION SUBSYSTEM HAVE BEEN SIZED LARGE ENOUGH TO HANDLE EXCESS CAPACITIES.

RECEIVING AND PREPARATION SUBSYSTEM	1 CONTAINERS (BOXES, BINS, DRUMS)	2 AQUEOUS WASTE	3 SORTING REQUIRED CONTAINERS	4 UNSORTED WASTE (INTACT DRUMS)	5 LEAD CONTAMINATED METAL WASTE	6 NON-COMBUSTIBLE SOLID WASTE	7 COMBUSTIBLE SOLID WASTE	8 AQUEOUS WASTE FROM CONTAINERS	9 SPECIAL WASTE	10 EMPTY BINS AND DRUMS	11 CORRODED CONTAINERS	12 ORGANIC LIQUIDS	13 AQUEOUS WASTE	14 MERCURY CONTAMINATED SOLIDS	15 METALS WITH SURFACE CONTAMINATION	16 METALS WITH ENTRAINED CONTAMINATION
FLOW RATE (LB/HR)	2,245	155	1,090	1,155	26	440	330	NEGLECTIBLE	153	SEE NOTE	SEE NOTE	75	80	50	88	3

FIGURE B1-2. ROTARY KILN: PFD FOR RECEIVING AND PREPARATION SUBSYSTEM (SYSTEM A-1)

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NOTES:

1. SYSTEM A-1 EMPLOYS AIR FOR COMBUSTION. SYSTEM A-2 EMPLOYS OXYGEN.
2. SECONDARY WASTE INPUT FROM VARIOUS SUBSYSTEMS NOT SHOWN.
3. ADDITIVE SOIL = 50% OF INERT MATERIAL IN FEED.
4. INFILTRATION AIR INCLUDED WITH INPUT AIR UNLESS NOTED.

INCINERATION SUBSYSTEM	① SORTED NON-COMBUSTIBLE SOLID WASTE	② SORTED COMBUSTIBLE SOLID WASTE	③ ORGANIC LIQUIDS	④ UNSORTED WASTE (INTACT DRUMS)	⑤ AIR OXYGEN	⑥ NATURAL GAS	⑦ SCC OFFGAS	⑧ BOTTOM ASH/SOLIDS	⑨ ADDITIVE SOIL	⑩ INFILTRATION AIR	⑪ COOLING WATER SPRAY
FLOW RATE (LB/HR) (SYSTEM A-1)	440	330	75	1155	15.450	364	16.788	1.699	573	-	-
FLOW RATE (LB/HR) (SYSTEM A-2)	440	330	75	1155	2.812	447	5.291	1.616	573	447	1.397
INCINERATION AIR POLLUTION CONTROL SUBSYSTEM	① SCC OFFGAS	② QUENCH WATER	③ COOLED OFFGAS	④ FILTERED OFFGAS	⑤ FLY ASH	⑥ CAUSTIC SOLUTION (20% NaOH)	⑦ SCRUBBER LIQUOR	⑧ SCRUBBER/ COOLER WATER	⑨ TREATED OFFGAS		
FLOW RATE (LB/HR) (SYSTEM A-1)	16.788	7.846	24.634	24.515	119	310	9.403	9.403	17.836		
FLOW RATE (LB/HR) (SYSTEM A-2)	5.291	3.298	8.590	8.487	102	310	4.716	4.716	5.697		

FIGURE: B1-3. ROTARY KILN: PFD FOR INCINERATION (SYSTEMS A-1 AND A-2) AND DRY AND WET AIR POLLUTION CONTROL SUBSYSTEMS (SYSTEM A-1 AND A-2)

LEAD RECOVERY SUBSYSTEM	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪		
FLOW RATE (LB/HR)	100	80	20	80	110	110	71	18	2				
MERCURY AMALGAMATION SUBSYSTEM	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬
FLOW RATE (LB/HR)	100	95	5	22	35	83	5	78	194	10	21	60	58

FIGURE B1-4. ROTARY KILN: PFD FOR MERCURY AMALGAMATION AND LEAD RECOVERY SUBSYSTEMS (SYSTEM A-1)

NOTES:

1. ASSUME MINIMAL METAL LOSS DUE TO ABRASIVE BLASTING.
2. ASSUME 5% OF BLASTING WATER IS DUMPED.
3. INPUT (4) IS AN INITIAL FILL OF 2,250 LBS OF WATER.
4. MASS FLOW RATES ARE SHOWN FOR 100 LBS/HR OF INPUT. THE ACTUAL FEED RATE IS SHOWN IN THE PFD FOR THE OVERALL SYSTEM.

SECONDARY STABILIZATION SUBSYSTEM	1	2	3	4	5	6	7	8	9	10
	METALLIC DEBRIS	SURFACE CONTAMINATED METALLIC DEBRIS	GRIT OR CO ₂	WATER (SEE NOTE 3)	WATER/ SLUDGE	DECONTAMINATED METAL	FILTERED BLAST WATER	CONTAMINATED BLAST WATER	EMPTY BINS AND DRUMS	DECONTAMINATED EMPTY BINS AND DRUMS
FLOW RATE (LB/HR)	100	100	1	2250	112	100	2139	2251	91	91

FIGURE B1-5. ROTARY KILN: PFD FOR METAL DECONTAMINATION SUBSYSTEM (SYSTEM A-1)

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AQUEOUS WASTE TREATMENT SUBSYSTEM FLOW RATE (LB/HR)	① HIGH TOTAL ORGANIC CARBON	② LOW TOTAL DISSOLVED SOLID LIQUIDS	③ HIGH TOTAL DISSOLVED SOLID LIQUIDS	④ MERCURY CONTAINING LIQUIDS	⑤ ORGANICS	⑥ AQUEOUS WASTE	⑦ NEUTRALIZED LIQUIDS	⑧ AQUEOUS WASTE (LOW DISSOLVED SOLIDS)	⑨ DISTILLATE TO CARBON FILTER	⑩ AQUEOUS WASTE TO ION EXCHANGER	⑪ AQUEOUS WASTE TO CARBON FILTER	⑫ TREATED WATER	⑬ TREATED WATER	⑭ RECOVERED ORGANICS	⑮ SPENT RESINS	⑯ CLARIFIED WASTE	⑰ SPENT CARBON	⑱ TREATED OFFGAS	⑲ CONCENTRATED LIQUIDS	⑳ SLUDGE	㉑ SLUDGE	㉒ SCRUBBER LIQUOR	㉓ CONCENTRATED LIQUIDS	㉔ CONCENTRATED LIQUIDS
AQUEOUS WASTES 1% TOC	100	0	0	0	0.2	99.8	0.0	0.0	5.4	61.9	31.0	97.5	35.5	0.8	3.0	0.0	3.0	0.3	0.3	0.0	6.0	0.0	0.3	0.0
AQUEOUS WASTES 100 PPM TDS, 10,000 PPM TSS	0	100	0	0	0.0	0.0	16.0	84.0	6.5	61.2	30.6	98.3	37.0	0.1	3.0	14.7	3.0	0.4	0.4	1.3	5.9	0.0	0.4	0.0
AQUEOUS WASTES 10,000 PPM TDS, 1,000 PPM TSS	0	0	100	0	0.0	0.0	0.0	0.0	12.2	57.1	28.5	97.7	40.6	0.1	3.0	92.0	3.0	0.7	0.7	8.0	5.5	0.0	0.7	0.0
AQUEOUS WASTES 200 PPM Hg, 1,000 PPM TSS	0	0	0	100	0.0	0.0	0.0	0.0	12.2	57.1	28.5	97.7	40.6	0.1	3.0	92.0	3.0	0.7	0.7	8.0	5.5	0.0	0.7	0.0
SCRUBBER SALTS	0	0	0	0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	89.9	89.9	0.1	3.0	0.0	3.0	0.0	10.0	0.0	0.0	100.0	0.0	10.0

NOTES:
1. MASS FLOW RATES ARE SHOWN FOR 100 LBS/HR OF INPUT. THE ACTUAL FEED RATE IS SHOWN IN THE PFD FOR THE OVERALL SYSTEM.
2. SECONDARY WASTE INPUT FROM VARIOUS SUBSYSTEMS ARE NEGLIGIBLE AND NOT SHOWN IN THIS DIAGRAM.

FIGURE B1-7. ROTARY KILN: PFD FOR AQUEOUS WASTE TREATMENT SUBSYSTEM (SYSTEM A-1)

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NOTE:

1. CALCULATIONS ASSUME NO REACTION OF OXYGEN WITH THE MELT.
2. MASS FLOW RATES ARE SHOWN FOR 100 LBS/HR OF INPUT. THE ACTUAL FEED RATE IS SHOWN IN THE PFD FOR THE OVERALL SYSTEM.

PRIMARY STABILIZATION SUBSYSTEM	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	ASH	OFFGAS	MOLTEN SLAG	STABILIZED WASTE	BED MEDIA	OFFGAS	SPENT BED MEDIA	FLUX	OXYGEN	WATER	FLY ASH	FUEL	TREATED OFFGAS	AIR
FLOW RATE (LB/HR)	100	13	100.5	100.5	NEG.	13	NEG.	0.5	13	6	NEG.	1	21	1

FIGURE B1-8. ROTARY KILN: PFD FOR PRIMARY STABILIZATION SUBSYSTEM (SYSTEM A-1)

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NOTES:

1. PROCESS (1) MASS BALANCE CALCULATIONS ASSUME ZERO INPUT FROM NODE 3.
2. PROCESS (2) MASS BALANCE CALCULATIONS ASSUME ZERO INPUT FROM NODE 1.
3. CALCULATIONS ASSUME THAT ALL SALTS WILL BE DRIED AND ENCAPSULATED WITH POLYMER.
4. CALCULATIONS ASSUME THAT ALL BULK WASTE (SUCH AS SPENT HEPA FILTERS) WILL BE ENCAPSULATED IN CEMENT GROUT.
5. MASS FLOW RATES ARE SHOWN FOR 100 LBS/HR OF INPUT. THE ACTUAL FEED RATE IS SHOWN IN THE PFD FOR THE OVERALL SYSTEM.

SECONDARY STABILIZATION SUBSYSTEM	① CONCENTRATOR BOTTOM SLUDGE (20% WEIGHT)	② POLYMER	③ DRIED SOLIDS	④ STABILIZED WASTE	⑤ DRUMMED WASTE	⑥ DISTILLATE WATER	⑦ DRIED SOLIDS	⑧ RINSE WATER	⑨ RINSATE	⑩ GROUT	⑪ STABILIZED WASTE
CONCENTRATOR SLUDGE (LB/HR) (SEE NOTE 1)	100	20	-	40	40	80	-	30	30	-	40
COMPACTED SOLID OR HEPA FILTER (LB/HR) (SEE NOTE 2)	-	-	100	200	300	-	100	30	30	200	300

FIGURE B1-9: ROTARY KILN: PFD FOR SECONDARY STABILIZATION SUBSYSTEM (SYSTEMS A-1 AND A-5)

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NOTE: MASS FLOW RATES ARE SHOWN FOR 100 LBS/HR OF INPUT.
THE ACTUAL FEED RATE IS SHOWN IN THE PFD FOR THE
OVERALL SYSTEM.

WET AIR POLLUTION CONTROL SUBSYSTEM	① HOT OFFGAS	② WATER	③ TREATED OFFGAS	④ MAKE-UP CAUSTIC SOLUTION (20% NaOH)	⑤ SCRUBBED GAS	⑥ SALT SLURRY
FLOW RATE (LB/HR)	100	115	146	1.5	106	111

FIGURE B1-11. ROTARY KILN: PFD FOR WET AIR POLLUTION CONTROL SUBSYSTEM (SYSTEM A-3)

NOTES:

1. 90% OF RECOVERED LIME IS RECYCLED.
10% OF RECOVERED LIME IS SENT TO
SECONDARY STABILIZATION.
2. THE BLEED STREAM INCLUDES THE N_2
FROM THE INFILTRATION AIR + UNUSED O_2
3. ADDITIVE SOIL = 50% OF THE FEED
TO PRIMARY STABILIZATION

INCINERATION SUBSYSTEM	① NON-COMBUSTIBLE SOLID WASTE	② COMBUSTIBLE SOLID WASTE	③ ORGANIC LIQUIDS	④ UNSORTED WASTE (INTACT DRUMS)	⑤ AIR OXYGEN	⑥ NATURAL GAS	⑦ SCC OFFGAS	⑧ ASH/SOLIDS	⑨ ADDITIVE SOIL	⑩ INFILTRATION AIR	⑪ COOLING WATER SPRAY		
FLOW RATE (LB/HR)	440	330	75	1.155	2.818 447	125	5.29*	1.616	573	447	1.397		
INCINERATION AIR POLLUTION CONTROL SUBSYSTEM	① SCC OFFGAS	② COOLED OFFGAS	③ QUENCH WATER	④ FLYASH	⑤ FILTERED OFFGAS	⑥ MAKE-UP LIME	⑦ SCRUBBED OFFGAS	⑧ SALT/ CaCO ₃ / CaO	⑨ TREATED OFFGAS	⑩ SPENT LIME/ SALT	⑪ RECYCLE LIME (SEE NOTE 1)	⑫ WASTE WATER	
FLOW RATE (LB/HR)	5.291	8.590	3.290	102	8.487	30	6.619	2.163	3.095	106	265	5.241	

FIGURE B1-12. ROTARY KILN: PFD FOR DRY AND WET AIR POLLUTION CONTROL SUBSYSTEM WITH CO₂ RETENTION (SYSTEM A-4)

NOTE:

1. ASSUME 10% SALT DUMP TO STABILIZATION
2. ASSUME 7% OF SOLID INPUT WASTE IS METALLIC MATERIAL WHICH IS SEPARATED
3. ADDITIVE SOIL = 50% OF THE FEED TO PRIMARY STABILIZATION.

INCINERATION SUBSYSTEM	① NON-COMBUSTIBLE SOLID WASTE	② COMBUSTIBLE SOLID WASTE	③ ORGANIC LIQUIDS	④ UNSORTED WASTE (INTACT DRUMS)	⑤ AIR	⑥ NATURAL GAS	⑦ SCC OFFGAS	⑧ ASH/SOLIDS	⑨ ADDITIVE SOIL	⑩ METAL (SEE NOTE 2)	SALT RECOVERY SUBSYSTEM	① SCRUBBER LIQUOR BLOWDOWN	② HCL	③ NaOH	④ WATER	⑤ DRIED SALTS (SEE NOTE 1)	⑥ RECOVERED SALTS (SEE NOTE 1)
FLOW RATE (LB/HR)	440	330	75	1,155	15,793	370	17,123	1,403	503	140	FLOW RATE (LB/HR)	9,581	47	52	9,505	8	68
INCINERATION AIR POLLUTION CONTROL SUBSYSTEM	① SCC OFFGAS	② QUENCH WATER	③ COOLED OFFGAS	④ FILTERED OFFGAS	⑤ FLYASH	⑥ CAUSTIC SOLUTION	⑦ QUENCH SCRUBBER LIQUID	⑧ SCRUBBER LIQUOR BLOWDOWN	⑨ SCRUBBER/COOLER WATER	⑩ TREATED OFFGAS							
FLOW RATE (LB/HR)	17,123	7,993	25,116	25,011	105	310	9,581	9,581	2,452	18,193							

FIGURE B1-13. ROTARY KILN: PFD FOR DRY AND WET AIR POLLUTION CONTROL SUBSYSTEM WITH SALT RECOVERY (SYSTEM A-6)

— PRIMARY MATERIAL FLOW
 - - - SECONDARY MATERIAL FLOW

NOTE: OXYGEN IS USED FOR ALTERNATIVE A-2

① LIFT HOIST (CA)	② SHREDDER INLET (SI)	③ SHREDDER (SI)	④ SHREDDER OUTLET AIRLOCK AND LOADING FLANGE (ND)	⑤ PORTABLE WASTE HOPPER (ND)	⑥ TRANSFER DOLLY (CA)	⑦ BAGHOUSE (CA)	⑧ GANTRY ROBOT (SI)	⑨ WASTE SAMPLER DEVICE (SI)	⑩ PNEUMATIC TUBE CONVEYOR (SI)	⑪ UNLOADING AIRLOCK AND FLANGE (ND)	⑫ WASTE FEEDER (CA)
⑬ INTAKE HOPPER (SI)	⑭ IEB FEEDER (CA)	⑮ IEB SLO DAY TANK (CA)	⑯ ROTARY KILN INCINERATOR (SI)	⑰ ROTARY KILN SEAL (SI)	⑱ SECONDARY COMBUSTION CHAMBER (CA)	⑲ ASH UNLOADING AIRLOCK AND FLANGE (SI)	⑳ PORTABLE ASH HOPPER (ND)	㉑ ASH COOLER (SI)	㉒ COMBUSTION AIR SUPPLY FAN (CA)	㉓ FUEL BURNER (CA)	

CA - COMMERCIALY AVAILABLE
 ND - NEEDS DEVELOPMENT
 SI - SYSTEM INTEGRATION NEEDED

FIGURE B1-15. ROTARY KILN: FAD FOR INCINERATION SUBSYSTEM (SYSTEMS A-1 AND A-2)

①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯
QUENCHER (CA)	DRY FILTER (SI)	ACTIVATED CARBON (MERCURY REM FILTER) (SI)	BACKFLUSHABLE STAINLESS STEEL HEPA FILTERS (ND)	HYDROSONIC SCRUBBER (CA)	PACKED TOWER SCRUBBER (CA)	PUMP (CA)	CONTINUOUS AIR MONITOR (ND)	HEAT EXCHANGER (CA)	HEAT EXCHANGER (CA)	PHASE SEPARATOR (CA)	NAOH DAY TANK (CA)	REHEATER (CA)	MIST ELIMINATOR (CA)	DE NOX REACTOR (SI)	FAN (CA)

CA - COMMERCIALY AVAILABLE
 ND - NEEDS DEVELOPMENT
 SI - SYSTEM INTEGRATION NEEDED

CMS - COOLING MEDIUM SUPPLY
 CMR - COOLING MEDIUM RETURN
 HMS - HEATING MEDIUM SUPPLY
 HMR - HEATING MEDIUM RETURN

FIGURE B1-16. SYSTEM A, BASELINE: FAD FOR AIR POLLUTION CONTROL SUBSYSTEM (SYSTEM A-1)

(1)	SHREDDER (CA)	(12)	CONTINUOUS AIR MONITOR (ND)	(19)	MERCURY PUMP (CA)	(22)	STEEL SHOT BIN (CA)
(2)	ROTARY FEEDER ARLOCK (SU)	(13)	HEPA FILTER (SU)	(20)	PEBBLE MILL MIXER (SU)	(21)	AMALGAM PACKAGING (CA)
(3)	PORTABLE BIN (ND)	(14)	O BLOWER (CA)	(17)	ELEMENTAL MERCURY STORAGE TANK (CA)	(10)	DRY FILTER (SU)
(4)	RETORT (SU)	(15)	NITRIC ACID STORAGE TANK (CA)	(16)	NITRIC ACID TRANSFER PUMP (CA)	(9)	QUENCHER (CA)
(5)	MERCURY CONDENSER (SU)	(16)	NITRIC ACID TRANSFER PUMP (CA)	(18)	MERCURY PUMP (CA)	(8)	COMBUSTION CHAMBER (CA)
(6)	MERCURY SEPARATOR (SU)	(17)	ELEMENTAL MERCURY STORAGE TANK (CA)	(19)	POWDERED COPPER BIN (CA)	(7)	VACUUM PUMP (SU)
(7)	VACUUM PUMP (SU)	(18)	MERCURY PUMP (CA)	(20)	PEBBLE MILL MIXER (SU)	(6)	MERCURY SEPARATOR (SU)
(8)	COMBUSTION CHAMBER (CA)	(19)	POWDERED COPPER BIN (CA)	(21)	AMALGAM PACKAGING (CA)	(5)	MERCURY CONDENSER (SU)
(9)	QUENCHER (CA)	(20)	PEBBLE MILL MIXER (SU)	(22)	STEEL SHOT BIN (CA)	(4)	RETORT (SU)
(10)	DRY FILTER (SU)	(21)	AMALGAM PACKAGING (CA)			(3)	PORTABLE BIN (ND)
(11)	ACTIVATED CARBON FILTER (CA)					(2)	ROTARY FEEDER ARLOCK (SU)

CA - COMMERCIALY AVAILABLE
 ND - NEEDS DEVELOPMENT
 SU - SYSTEM INTEGRATION NEEDED

FIGURE B1-17. ROTARY KILN: FAD FOR MERCURY AMALGAMATION SUBSYSTEM (SYSTEM A-1)

①	②	③	④	⑤	⑥	⑦	⑧	⑨
CANTRY ROBOT CRANE (SI)	TRANSFER CART (CA)	SIZE REDUCTION TOOL (SI)	DECONTAMINATION BOOTH (CA)	SPRAY/SLUDGE PUMP (CA)	FILTER (CA)	GRIT OR CO ₂ STORAGE TANK (CA)	EXHAUST FAN (CA)	HEPA FILTER UNIT (CA)

CA - COMMERCIALLY AVAILABLE
 ND - NEEDS DEVELOPMENT
 SI - SYSTEM INTEGRATION NEEDED

FIGURE B1-18. ROTARY KILN: FAD FOR METAL DECONTAMINATION SUBSYSTEM (SYSTEM A-1)

①	②	③	④	⑤	⑥	⑦	⑧	⑨
GANTRY ROBOT CRANE (SI)	TRANSFER CART (CA)	ASSAY AND INSPECT (SI)	SIZE REDUCTION TOOL (SI)	HINGED HOOD (SI)	SECONDARY COMBUSTION CHAMBER (CA)	COOLING UNIT (CA)	CANISTER WASHING AND CAPPING (SI)	EXHAUST FAN (CA)
⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱
HEPA FILTER (CA)	MELTER (SI)	QUENCHER (CA)	DRY FILTER (CA)	ACTIVATED CARBON FILTER (CA)	HEPA FILTER (SI)	INDUCED DRAFT FAN (CA)	CONTINUOUS AIR MONITOR (ND)	CANISTER (CA)

CA = COMMERCIALLY AVAILABLE
 ND = NEEDS DEVELOPMENT
 SI = SYSTEM INTEGRATION NEEDED

FIGURE B1-19. ROTARY KILN: FAD FOR METAL MELTING SUBSYSTEM (SYSTEM A-1)

①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑	㉒
HIGH TOC BATCH TANK (CA)	LOW TDS BATCH TANK (CA)	HIGH TDS/HEAVY METALS BATCH TANK (CA)	MERCURY WASTE BATCH TANK (CA)	HIGH TOC TRANSFER PUMP (CA)	GROSS ORGANIC REMOVAL UNIT (CA)	AQUEOUS PHASE TRANSFER PUMP (CA)	SUSPENDED SOLIDS FILTER (CA)	LOW TDS TRANSFER PUMP (CA)	HIGH TDS TRANSFER PUMP (CA)	MERCURY WASTE TRANSFER PUMP (CA)	NEUTRALIZER (ND)*	REACTOR (ND)*	SETTLING TANK (ND)*	SLUDGE TRANSFER PUMP (CA)	CLARIFIED AQUEOUS PHASE TRANSFER PUMP (CA)	EVAPORATOR (CA)	COLUMN (CA)	CONDENSER (CA)	VAPOR PHASE CARBON (CA)	VACUUM PUMP (CA)	CONDENSED WATER TRANSFER PUMP (CA)
㉓	㉔	㉕	㉖	㉗	㉘	㉙	㉚	㉛	㉜	㉝	㉞	㉟	㊱	㊲	㊳	㊴	㊵	㊶	㊷	㊸	㊹
CONDENSED WATER TRANSFER PUMP (CA)	BATCH STILL (CA)	BATCH STILL COLUMN (CA)	BATCH STILL CONDENSER (CA)	VAPOR PHASE CARBON (CA)	REBOILER (CA)	BATCH STILL TRANSFER PUMP (CA)	LIQUID PHASE CARBON (CA)	PEROXIDE STORAGE TANK (CA)	PEROXIDE TRANSFER PUMP (CA)	UV/PEROXIDE UNIT (CA)	ION EXCHANGE UNIT (ND)*	ACID STORAGE TANK (CA)	ACID TRANSFER PUMP (CA)	BASE STORAGE TANK (CA)	BASE TRANSFER PUMP (CA)	SULFIDE STORAGE TANK (CA)	SULFIDE TRANSFER PUMP (CA)	POLYMER STORAGE TANK (CA)	POLYMER TRANSFER PUMP (CA)	TREATED WATER STORAGE TANK (CA)	TREATED WATER TRANSFER PUMP (CA)

FIGURE B1-20. ROTARY KILN FAD FOR AQUEOUS WASTE TREATMENT SUBSYSTEM (SYSTEM A-1)

CA - COMMERCIALY AVAILABLE
 ND - NEEDS DEVELOPMENT
 * NEEDS DEVELOPMENT FOR MERCURY REMOVAL

FILENAME FAD B120.DGN DATE 5/10/94

①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱
FORKLIFT (CA)	DRUM AIRLOCK (SI)	DRYER (CA)	HEATER UNIT FOR DRYER (CA)	TRANSFER DOLLY (CA)	POLYMER STORAGE SILO & FEED (CA)	WEIGH STATION (CA)	BLENDER (CA)	FEEDER (CA)	EXTRUDER (CA)	DRUM COOLING ENCLOSURE (CA)	FORCED DRAFT VENTILATION FAN (CA)	DRUM CAPPING & WASHING UNIT (CA)	AIRLOCK/ LOADING FLANGE (SI)	FAN (CA)	CARBON FILTER (CA)	HEPA FILTER (CA)	INTAKE AIRLOCK (SI)

CA = COMMERCIALLY AVAILABLE
 ND = NEEDS DEVELOPMENT
 SI = SYSTEM INTEGRATION NEEDED

FIGURE B1-22. ROTARY KILN: FAD FOR SECONDARY STABILIZATION SUBSYSTEM (SYSTEMS A-1 AND A-5)

①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪
GANTRY ROBOT CRANE (SI)	TRANSFER CART (CA)	ASSAY AND INSPECT (SI)	SIZE REDUCTION TOOL (ND)	DECONTAMINATION BOOTH (CA)	SPRAY/SLUDGE PUMP (CA)	FILTER (CA)	GRIT STORAGE TANK (CA)	EXHAUST FAN (CA)	HEPA FILTER (SI)	MELTER (SI)
⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑	㉒
HINGED HOOD (SI)	SECONDARY COMBUSTION CHAMBER (CA)	COOLING UNIT (CA)	STORAGE BIN WASHING STATION (CA)	QUENCHER (CA)	DRY FILTER (CA)	ACTIVATED CARBON FILTER (CA)	HEPA FILTER (CA)	CONTINUOUS AIR MONITOR (ND)	BLOWER (CA)	CANISTER (CA)

CA = COMMERCIALY AVAILABLE
 ND = NEEDS DEVELOPMENT
 SI = SYSTEM INTEGRATION NEEDED

FIGURE B1-23. ROTARY KILN: FAD FOR LEAD RECOVERY SUBSYSTEM (SYSTEM A-1)

①	②	③	④	⑤	⑥	⑦	⑧	⑨
ROLL-UP DOOR (CA)	VENTILATION BARRIER (CA)	BRIDGE CRANE (CA)	ROTATING LOAD BLOCK (CA)	ROLLER CONVEYOR (CA)	REAL-TIME RADIOGRAPHY (ND)	PASSIVE ACTIVE NEUTRON (ND)	SEGMENTED GAMMA SPECTROSCOPY (ND)	SELF-GUIDED VEHICLE (SI)

ND - NEEDS DEVELOPMENT
CA - COMMERCIALY AVAILABLE
SI - SYSTEM INTEGRATION NEEDED

FIGURE B1-24. ROTARY KILN: FAD FOR CERTIFY AND SHIP SUBSYSTEM (SYSTEM A-1)

CMS - COOLING MEDIUM SUPPLY
 CMR - COOLING MEDIUM RETURN
 HMS - HEATING MEDIUM SUPPLY
 HMR - HEATING MEDIUM RETURN

①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫
HYDROSONIC SCRUBBER (CA)	PACKED TOWER SCRUBBER (CA)	PHASE SEPARATOR (CA)	PUMP (CA)	HEAT EXCHANGER (CA)	HEAT EXCHANGER (CA)	MIST ELIMINATOR (CA)	NaOH DAY TANK (CA)	REHEATER (CA)	WET ELECTRO- STATIC FILTER (CA)	DE-NOX REACTOR (CA)	CONTINUOUS AIR MONITORING (ND)

CA - COMMERCIALY AVAILABLE
 ND - NEEDS DEVELOPMENT

FIGURE B1-25. ROTARY KILN: FAD FOR WET AIR POLLUTION CONTROL SUBSYSTEM (SYSTEM A-3)

FIGURE B1-26. ROTARY KILN: FAD FOR DRY AIR POLLUTION CONTROL SUBSYSTEM WITH CO₂ RETENTION (SYSTEM A-4)

FIGURE B1-27. ROTARY KILN: PLAN VIEW OF OVERALL SYSTEM (SYSTEMS A-1 THROUGH A-6)
SCALE : 1"=40'-0"

FIGURE B1-28. ROTARY KILN: PERSPECTIVE VIEW OF OVERALL SYSTEM (SYSTEMS A-1 THROUGH A-6)
NOT TO SCALE

EQUIPMENT LIST

- ① DECONTAMINATION ENCLOSURE
- ② BRIDGE CRANE AND LOAD GRAPPLER
- ③ SELF-GUIDED VEHICLE

FIGURE B1-29. ROTARY KILN: PLAN VIEW OF RECEIVING AND UNLOADING AREA OF THE RECEIVING AND PREPARATION SUBSYSTEM (SYSTEM A-1).

SCALE : $\frac{1}{16}$ " = 1' - 0"

FILE NAME: WRU2D.DGN PLOT DATE: 5/11/94

FIGURE B1-30. ROTARY KILN: PERSPECTIVE VIEW OF RECEIVING AND UNLOADING AREA OF THE RECEIVING AND PREPARATION SUBSYSTEM (SYSTEM A-1)
NOT TO SCALE

FILENAME: WROU2D USN PLOT DATE: 5/11/94

EQUIPMENT LIST

- ① SELF-GUIDED VEHICLE
- ② DECAP DEVICE
- ③ SORT HOPPER (TYP 4)
- ④ ROTATING SORT TABLE
- ⑤ SPECIAL WASTE SORT BOX
- ⑥ DUMP HOPPER
- ⑦ GANTRY ROBOT
- ⑧ ROLLER CONVEYOR
- ⑨ REMOTE MANIPULATOR
- ⑩ MASTER SLAVE MANIPULATOR
- ⑪ SIZE REDUCTION UNIT
- ⑫ SPECIAL WASTE MANIPULATOR
- ⑬ DECAP ENCLOSURE
- ⑭ MANIPULATOR TOOL TABLE

FIGURE B1-32. ROTARY KILN: PERSPECTIVE VIEW OF THE DECAP, SORT, AND DUMP CELL OF THE RECEIVING AND PREPARATION SUBSYSTEM (SYSTEM A-1)

NOT TO SCALE

FILENAME: RAP20.DGN PLOT DATE: 5/11/94

EQUIPMENT LIST

- ① PORTABLE WASTE HOPPERS
- ② SHREDDER
- ③ WASTE STREAM SAMPLER
- ④ WASTE FEEDER
- ⑤ INTAKE HOPPER
- ⑥ SOIL FEED CONVEYOR
- ⑦ ROTARY KILN INCINERATOR
- ⑧ ASH COOLING CHAMBER

- ⑨ PORTABLE ASH HOPPER
- ⑩ SECONDARY COMBUSTION CHAMBER
- ⑪ QUENCH CHAMBER
- ⑫ DRY FILTER BAGHOUSE
- ⑬ CARBON FILTERS
- ⑭ HEPA FILTERS
- ⑮ HYDROSONIC SCRUBBER
- ⑯ PACKED TOWER MIST ELIMINATOR

- ⑰ HEAT EXCHANGERS
- ⑱ DENOX CATALYTIC REACTOR
- ⑲ FAN AND STACK
- ⑳ OVERHEAD CRANE
- ㉑ WASTE CONTAINER HOIST
- ㉒ DUST COLLECTOR

FIGURE B1-33. ROTARY KILN: PLAN VIEW OF INCINERATION AND AIR POLLUTION CONTROL SUBSYSTEMS (SYSTEM A-1)
SCALE : 1"=20'-0"

NOTE: WALLS NOT SHOWN FOR CLARITY

EQUIPMENT LIST

- ① PORTABLE WASTE HOPPERS
- ② SHREDDER
- ③ WASTE STREAM SAMPLER
- ④ WASTE FEEDER
- ⑤ INTAKE HOPPER
- ⑥ SOIL FEED CONVEYOR
- ⑦ ROTARY KILN INCINERATOR
- ⑧ ASH COOLING CHAMBER
- ⑨ PORTABLE ASH HOPPER (HIDDEN)
- ⑩ SECONDARY COMBUSTION CHAMBER
- ⑪ QUENCH CHAMBER
- ⑫ DRY FILTER BAGHOUSE
- ⑬ CARBON FILTERS
- ⑭ HEPA FILTERS
- ⑮ HYDROSONIC SCRUBBER
- ⑯ PACKED TOWER MIST ELIMINATOR
- ⑰ HEAT EXCHANGERS
- ⑱ DENOX CATALYTIC REACTOR
- ⑲ FAN AND STACK
- ⑳ OVERHEAD CRANE
- ㉑ WASTE CONTAINER HOIST
- ㉒ DUST COLLECTOR

FIGURE B1-34. ROTARY KILN: PERSPECTIVE VIEW OF INCINERATION AND AIR POLLUTION CONTROL SUBSYSTEMS (SYSTEM A-1)
NOT TO SCALE

FILENAME: 111-20-304 PLOT DATE: 6/08/94

EQUIPMENT LIST

- ① FEED HOPPER AND SHREDDER
- ② ELECTRIC RETORT
- ③ CONDENSER
- ④ SEPARATOR
- ⑤ VACUUM PUMP
- ⑥ OFFGAS COMBUSTION CHAMBER
- ⑦ QUENCH COLUMN
- ⑧ FILTER BAGHOUSE
- ⑨ ACTIVATED CARBON ADSORBERS
- ⑩ HEPA FILTERS
- ⑪ FAN AND STACK
- ⑫ LIQUID MERCURY TANK
- ⑬ SOLIDS MIXER (PEBBLE MILL)
- ⑭ NITRIC ACID TANK
- ⑮ STEEL SHOT BIN
- ⑯ COPPER BIN
- ⑰ SCREW FEEDER
- ⑱ GANTRY ROBOT

FIGURE B1-35. ROTARY KILN: PLAN VIEW OF MERCURY AMALGAMATION SUBSYSTEM (SYSTEM A-1)
SCALE : $\frac{1}{8}" = 1' - 0"$

FILENAME: MAN20.DGN PLOT DATE: 7/07/94

NOTE: WALLS NOT SHOWN FOR CLARITY

EQUIPMENT LIST

- ① FEED HOPPER AND SHREDDER
- ② ELECTRIC RETORT
- ③ CONDENSER
- ④ SEPARATOR
- ⑤ VACUUM PUMP
- ⑥ OFFGAS COMBUSTION CHAMBER
- ⑦ QUENCH COLUMN
- ⑧ FILTER BAGHOUSE
- ⑨ ACTIVATED CARBON ADSORBERS
- ⑩ HEPA FILTERS
- ⑪ FAN AND STACK

- ⑫ LIQUID MERCURY TANK
- ⑬ SOLIDS MIXER (PEBBLE MILL)
- ⑭ NITRIC ACID TANK
- ⑮ STEEL SHOT BIN
- ⑯ COPPER BIN
- ⑰ SCREW FEEDER
- ⑱ GANTRY ROBOT

FIGURE B1-36. ROTARY KILN: PERSPECTIVE VIEW OF MERCURY AMALGAMATION SUBSYSTEM (SYSTEM A-1)
NOT TO SCALE

FILE NAME: MANO.DGN PLOT DATE: 5/11/94

EQUIPMENT LIST

- ① POWERED ROLLER CONVEYOR
- ② BARREL DECAPPING
- ③ AUTOMATIC DRUM DUMPER
- ④ DRUM PUSHER
- ⑤ SORT TABLE GLOVE BOX
- ⑥ DECONTAMINATION BOOTH
- ⑦ CLEAN METALS SORT TABLE
- ⑧ INGOT INSPECT SORT TABLE
- ⑨ BARREL CAPPING
- ⑩ ASSAY/INSPECT STATION
- ⑪ BARREL DECON STATION
- ⑫ BATTERY SORT/SIZING TABLE
- ⑬ SHREDDER
- ⑭ MIXER
- ⑮ MONORAIL
- ⑯ OVERHEAD CRANE
- ⑰ FURNACE W/HOOD
- ⑱ LEAD CASTING MACHINE
- ⑲ SECONDARY COMBUSTOR
- ⑳ QUENCHER
- ㉑ DRY FILTER
- ㉒ CARBON FILTER
- ㉓ HEPA FILTER

FIGURE B1-37. ROTARY KILN: PLAN VIEW OF LEAD RECOVERY SUBSYSTEM (SYSTEM A-1)
SCALE: 1/8"=1'-0"

FILENAME: RLED20.DGN PLOT DATE: 5/11/94

NOTE. WALLS NOT SHOWN FOR CLARITY

EQUIPMENT LIST

- ① POWERED ROLLER CONVEYOR
- ② BARREL DECAPPING
- ③ AUTOMATIC DRUM DUMPER
- ④ DRUM PUSHER
- ⑤ SORT TABLE GLOVE BOX
- ⑥ DECONTAMINATION BOOTH
- ⑦ CLEAN METALS SORT TABLE
- ⑧ INGOT INSPECT SORT TABLE
- ⑨ BARREL CAPPING
- ⑩ ASSAY AND INSPECT STATION
- ⑪ BARREL DECON STATION
- ⑫ BATTERY SORT & SIZING TABLE
- ⑬ SHREDDER
- ⑭ MIXER
- ⑮ MONORAIL
- ⑯ OVERHEAD CRANE
- ⑰ FURNACE WITH HOOD
- ⑱ LEAD CASTING MACHINE
- ⑲ SECONDARY COMBUSTION CHAMBER
- ⑳ QUENCHER
- ㉑ DRY FILTER
- ㉒ CARBON FILTER
- ㉓ HEPA FILTER

FIGURE B1-38. ROTARY KILN: PERSPECTIVE VIEW OF LEAD RECOVERY SUBSYSTEM (SYSTEM A-1)
NOT TO SCALE

EQUIPMENT LIST

- ① SIZE REDUCTION TABLE
- ② DECONTAMINATION BOOTH
- ③ INSPECT AND PACKAGE TABLE
- ④ GANTRY ROBOT
- ⑤ REMOTE CONTROL VEHICLE

FIGURE B1-39. ROTARY KILN: PLAN VIEW OF METAL DECONTAMINATION SUBSYSTEM (SYSTEM A-1)
 SCALE : 1/8" = 1' - 0"

EQUIPMENT LIST

- ① SIZE REDUCTION TABLE
- ② DECONTAMINATION BOOTH
- ③ INSPECT AND PACKAGE TABLE
- ④ GANTRY ROBOT
- ⑤ REMOTE CONTROL VEHICLE

NOTE: WALLS NOT SHOWN FOR CLARITY

FIGURE B1-40. ROTARY KILN: PERSPECTIVE VIEW OF METAL DECONTAMINATION SUBSYSTEM (SYSTEM A-1)
NOT TO SCALE

EQUIPMENT LIST

① SIZE REDUCTION TABLE	⑨ ACTIVATED CARBON ADSORBERS
② SIZED METAL FEED HOPPER	⑩ HEPA FILTERS
③ MELTER	⑪ FAN AND STACK
④ CASTING AND COOLING CHAMBER	⑫ CAPPING AND WASHING
⑤ ROLLER CONVEYOR	⑬ INSPECT AND ASSAY
⑥ AFTERBURNER	⑭ OVERHEAD CRANE
⑦ QUENCH COLUMN	⑮ GANTRY ROBOT
⑧ FILTER BAGHOUSE	⑯ REMOTE MANIPULATORS AND CUTTING TOOLS

FIGURE B1-41. ROTARY KILN: PLAN VIEW OF METAL MELTING SUBSYSTEM (SYSTEM A-1)
SCALE : 1"= 10'-0"

FILENAME: MAE20.DGN PLOT DATE 01/08/94

FIGURE B1-42. ROTARY KILN: PERSPECTIVE VIEW OF METAL MELTING SUBSYSTEM (SYSTEM A-1)
NOT TO SCALE

EQUIPMENT LIST

- ① BATCH TANKS WITH AGITATOR (TYP 4)
- ② OIL AND WATER SEPARATOR
- ③ SOLIDS FILTER
- ④ NEUTRALIZER TANK WITH AGITATOR
- ⑤ REACTOR TANK WITH AGITATOR
- ⑥ SETTLING TANK
- ⑦ EVAPORATOR UNIT
- ⑧ CONDENSER
- ⑨ CONDENSED WATER TANK
- ⑩ VAPOR PHASE CARBON FILTER
- ⑪ VACUUM PUMP
- ⑫ BATCH STILL
- ⑬ STILL CONDENSER
- ⑭ VAPOR PHASE CARBON FILTER
- ⑮ ION EXCHANGE UNIT
- ⑯ UV AND PEROXIDE UNIT
- ⑰ CARBON FILTER DRUMS

FIGURE B1-43. ROTARY KILN: PLAN VIEW OF AQUEOUS WASTE TREATMENT SUBSYSTEM (SYSTEM A-1)
SCALE : 1/8"=1'-0"

EQUIPMENT LIST

- ① BATCH TANKS WITH AGITATOR (TYP 4)
- ② OIL AND WATER SEPARATOR
- ③ SOLIDS FILTER
- ④ NEUTRALIZER TANK WITH AGITATOR
- ⑤ REACTOR TANK WITH AGITATOR
- ⑥ SETTLING TANK
- ⑦ EVAPORATOR UNIT
- ⑧ CONDENSER
- ⑨ CONDENSED WATER TANK
- ⑩ VAPOR PHASE CARBON FILTER
- ⑪ VACUUM PUMP
- ⑫ BATCH STILL
- ⑬ STILL CONDENSER
- ⑭ VAPOR PHASE CARBON FILTER
- ⑮ ION EXCHANGE UNIT
- ⑯ UV AND PEROXIDE UNIT
- ⑰ CARBON FILTER DRUMS

NOTE: WALLS NOT SHOWN FOR CLARITY

FIGURE B1-44. ROTARY KILN: PERSPECTIVE VIEW OF AQUEOUS WASTE TREATMENT SUBSYSTEM (SYSTEM A-1)

NOT TO SCALE

EQUIPMENT LIST

- ① SAMPLING SYSTEM
- ② WASTE FEEDER
- ③ MELTER
- ④ PARTICULATE FILTER
- ⑤ AFTERBURNER
- ⑥ QUENCH COLUMN
- ⑦ FILTER BAGHOUSE
- ⑧ ACTIVATED CARBON FILTERS
- ⑨ HEPA FILTERS
- ⑩ FAN AND STACK
- ⑪ COOLING CHAMBER
- ⑫ CANISTER DECON
- ⑬ INSPECT AND ASSAY
- ⑭ OVERHEAD CRANE

FIGURE B1-46. ROTARY KILN: PERSPECTIVE VIEW OF PRIMARY STABILIZATION SUBSYSTEM (SYSTEM A-1)
NOT TO SCALE

EQUIPMENT LIST

① DRYER AND HEATER	⑥ EXTRUDER
② DRIED WASTE HOPPER	⑦ CARBON FILTERS
③ POLYMER HOPPER	⑧ DRUM CAP. WASH. ASSAY
④ DRUM WEIGHT BATCHER	⑨ DUST COLLECTOR
⑤ BLENDER	⑩ GANTRY ROBOT

FIGURE B1-47. ROTARY KILN: PLAN VIEW OF SECONDARY STABILIZATION SUBSYSTEM (SYSTEMS A-1 AND A-5)
SCALE : $\frac{1}{8}" = 1' - 0"$

NOTE: WALLS NOT SHOWN FOR CLARITY

EQUIPMENT LIST

- ① DRYER AND HEATER
- ② DRIED WASTE HOPPER
- ③ POLYMER HOPPER
- ④ DRUM WEIGHT BATCHER
- ⑤ BLENDER
- ⑥ EXTRUDER
- ⑦ CARBON FILTERS
- ⑧ DRUM CAP, WASH & ASSAY
- ⑨ DUST COLLECTOR
- ⑩ GANTRY ROBOT

FIGURE B1-48. ROTARY KILN: PERSPECTIVE VIEW OF SECONDARY STABILIZATION SUBSYSTEM (SYSTEMS A-1 AND A-5)
NOT TO SCALE

FIGURE B1-49. ROTARY KILN: PLAN VIEW OF CERTIFY AND SHIP SUBSYSTEM (SYSTEM A-1)
SCALE : $\frac{1}{16}$ " = 1' - 0"

EQUIPMENT LIST

- ① ASSAY AND INSPECT STATION
- ② BRIDGE CRANE AND LOAD GRAPPLER
- ③ SELF-GUIDED VEHICLE

NOTES:

1. ALL INPUT SOLID WASTE MUST BE SORTED AND CATEGORIZED AS EITHER COMBUSTIBLE OR NON-COMBUSTIBLE SOLIDS.

2. ADDITIVE SOIL = 50% OF THE FEED TO PRIMARY STABILIZATION.

PRIMARY STABILIZATION SUBSYSTEM	① VITRIFIER SLAG	② PACKAGED SLAG											
FLOW RATE (LB/HR)	1,532	1,532											
INCINERATION SUBSYSTEM	① SORTED COMBUSTIBLE WASTE	② SORTED NON- COMBUSTIBLE WASTE	③ OXYGEN	④ SCC OFFGAS	⑤ INFILTRATION AIR	⑥ PYROLYZER SOLIDS	⑦ ADDITIVE SOIL (SEE NOTE 3)	⑧ VITRIFIER SLAG	⑨ ORGANIC LIQUIDS	⑩ VITRIFIER OXYGEN	⑪ VITRIFIER OFFGAS	⑫ SCC COOLING WATER	⑬ VITRIFIER AIR INPUT
FLOW RATE (LB/HR)	393	1,532	1,095	3,520	224	31	573	1,532	75	345	1,117	992	168
INCINERATION AIR POLLUTION CONTROL SUBSYSTEM	① SCC OFFGAS	② QUENCH WATER	③ COOLED OFFGAS	④ FILTERED OFFGAS	⑤ FLYASH	⑥ CAUSTIC SOLUTION	⑦ QUENCH SCRUBBER LIQUID	⑧ SCRUBBER LIQUOR	⑨ TREATED OFFGAS	⑩ SCRUBBER/ COOLER WATER			
FLOW RATE (LB/HR)	3,520	2,274	5,794	5,608	186	310	3,612	3,612	3,776	1,468			

FIGURE B2-2. PYROLYSIS: PFD FOR INCINERATION, AIR POLLUTION CONTROL AND PRIMARY STABILIZATION SUBSYSTEMS (SYSTEM B-1)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LIFT HOST (CA)	SHREDDER INLET AIRLOCK (CA)	SHREDDER (CA)	SHREDDER OUTLET AIRLOCK/LOADING FLANGE (SI)	PORTABLE WASTE HOPPER (ND)	TRANSFER DOLLY (SI)	BAG HOUSE (CA)	GANTRY ROBOT (SI)	WASTE SAMPLER DEVICE (ND)	PNEUMATIC TUBE CONVEYOR (SI)	UNLOADING AIRLOCK/ FLANGE (SI)	WASTE FEEDER (CA)	INTAKE HOPPER (ND)	IEB FEEDER (CA)	IEB SILO/ DAY TANK (CA)
16	17	18	19	20	21	22	23	24	25	26	27	28	29	
DRYER/ BLENDER (CA)	MELTER (SI)	INDIRECTLY HEATED SECONDARY COMBUSTION CHAMBER (SI)	DISCHARGE SLUICE (CA)	ASH DISCHARGE SLUICE (CA)	WASTE INTAKE AIRLOCK/ LOADING FLANGE (SI)	INDIRECTLY HEATED PYROLYZER (SI)	HEATING JACKET (SI)	SLAG DISCHARGE VALVE (SI)	SLAG CANISTER (SI)	TRANSFER DOLLY (CA)	SLAG COOLING CHAMBER (CA)	SEAL (ND)	CANISTER CHAMBER DECON (SI)	

CA - COMMERCIALY AVAILABLE
ND - NEEDS DEVELOPMENT
SI - SYSTEMS INTEGRATION NEEDED

FIGURE B2-3. PYROLYSIS: FAD FOR INCINERATOR, AIR POLLUTION CONTROL AND PRIMARY STABILIZATION SUBSYSTEMS (SYSTEM B-1)

FIGURE B2-4. PYROLYSIS: PLAN VIEW OF INCINERATION, AIR POLLUTION CONTROL AND PRIMARY STABILIZATION SUBSYSTEMS (SYSTEM B-1)
 SCALE : $\frac{1}{16}$ " = 1' - 0"

NOTE: WALLS NOT SHOWN FOR CLARITY

EQUIPMENT LIST

- ① SHREDDER
- ② PORTABLE WASTE HOPPER
- ③ DRYER AND BLENDER
- ④ MELTER
- ⑤ SECONDARY COMBUSTION CHAMBER
- ⑥ QUENCH COLUMN
- ⑦ DRY FILTER
- ⑧ ACTIVATED CARBON FILTER
- ⑨ HEPA FILTER
- ⑩ HYDROSONIC SCRUBBER
- ⑪ HEAT EXCHANGER
- ⑫ PACKED-TOWER SCRUBBER
- ⑬ MIST ELIMINATOR
- ⑭ REHEATER
- ⑮ DE-NOX REACTOR
- ⑯ INDIRECTLY HEATED PYROLYZER
- ⑰ CANISTER CHAMBER DECON
- ⑱ SLAG COOLING CHAMBER
- ⑲ DUST COLLECTION
- ⑳ SAMPLE CUTTER

FIGURE B2-5. PYROLYSIS: PERSPECTIVE VIEW OF INCINERATION,
AIR POLLUTION CONTROL AND PRIMARY STABILIZATION SUBSYSTEMS (SYSTEM B-1)
NOT TO SCALE

ROTARY KILN AIR COMBUSTION GAS (BASELINE SYSTEM)	1 INPUT WASTE	2 METALLIC WASTE (SURFACE CONTAMINATION)	3 METALLIC WASTE (ENTRAINED CONTAMINATION)	4 LEAD METAL	5 INCINERABLE WASTE	6 AQUEOUS WASTE	7 SPECIAL WASTE	8 MERCURY CONTAMINATED WASTE	9 OFFGAS	10 INCINERATION ASH	11 SLUDGE	12 TREATED SPECIAL WASTE	13 AMALGAMATED WASTE	14 TREATED METALLIC WASTE (RECYCLE)	15 TREATED LEAD (RECYCLE)	16 METAL INGOTS	17 STABILIZED WASTE	18 STABILIZED WASTE	19 PACKAGED/TREATED SOLID WASTE
FLOW RATE (LB/HR)	2,400	88	3	26	2,000	80	153	50	7,159	1,722	380	153	50	91	26	3	1,722	152	2,197

* ASSUME ONLY 20% SOLIDS FROM EVAPORATOR.

FIGURE B3-1. PLASMA FURNACE: PFD FOR OVERALL SYSTEM (SYSTEM C-1)

FILENAME: 0527F31.DGN PLOT DATE: 5/11/94

FIGURE B3-4. PLASMA FURNACE: PLAN VIEW OF INCINERATION, AIR POLLUTION CONTROL AND PRIMARY STABILIZATION SUBSYSTEMS (SYSTEM C-1)

SCALE : $\frac{1}{16}$ " = 1'-0"

FILENAME: 112-20.UCM PLOT DATE: 5/12/94

NOTE: WALLS NOT SHOWN FOR CLARITY

EQUIPMENT LIST

- ① SHREDDER
- ② PORTABLE WASTE HOPPER
- ③ DRUM FEED
- ④ ROTATING REACTOR
- ⑤ SLAG/GAS SEPARATOR
- ⑥ PLASMA TORCH
- ⑦ SECONDARY COMBUSTION CHAMBER
- ⑧ QUENCH COLUMN
- ⑨ DRY FILTER
- ⑩ ACTIVATED CARBON FILTER
- ⑪ HEPA FILTER
- ⑫ HYDROSONIC SCRUBBER
- ⑬ PACKED-TOWER SCRUBBER
- ⑭ HEAT EXCHANGER
- ⑮ MIST ELIMINATOR
- ⑯ REHEATER
- ⑰ DE-NOX REACTOR
- ⑱ INSPECT
- ⑲ CAPPING AND DECONTAMINATION
- ⑳ SLAG COOLING CHAMBER
- ㉑ SOIL CONVEYOR
- ㉒ SAMPLE CUTTER
- ㉓ DUST COLLECTION

FIGURE B3-5. PLASMA FURNACE: PERSPECTIVE VIEW OF INCINERATION, AIR POLLUTION CONTROL AND PRIMARY STABILIZATION SUBSYSTEMS (SYSTEM C-1)

NOT TO SCALE

FILE NAME: jcrad35.dgn PLOT DATE: 5/11/94

NOTES:

1. 10% OF LIME IS DUMPED TO STABILIZATION.
2. 90% OF LIME IS RECYCLED.
3. ADDITIVE SOIL = 50% OF THE FEED TO PRIMARY STABILIZATION.

INCINERATION SUBSYSTEM	① COMBUSTIBLE WASTE	② NON-COMBUSTIBLE WASTE	③ ADDITIVE SOIL (SEE NOTE 3)	④ AIR/OXYGEN	⑤ NATURAL GAS	⑥ SCC OFFGAS	⑦ BOTTOM ASH/SOLIDS	⑧ BOTTOM ASH/SOLIDS	⑨ ORGANIC LIQUIDS	⑩ INFILTRATION AIR	⑪ COOLING WATER SPRAY			
FLOW RATE (LB/HR)	393	1,532	573	392	1,476	39	4,289	31	1,632	75	224	1,441		
INCINERATION AIR POLLUTION CONTROL SUBSYSTEM	① SCC OFFGAS	② QUENCH WATER	③ COOLED OFFGAS	④ FILTERED OFFGAS	⑤ FLYASH	⑥ MAKEUP LIME	⑦ GAS WITH CO2 REMOVED	⑧ CaCO ₃ /CaO /SALT	⑨ SPENT/SALT LIME	⑩ CO ₂	⑪ WASTE WATER	⑫ RELEASED DELAYED OFFGAS	⑬ RECYCLED LIME	
FLOW RATE (LB/HR)	4,289	2,822	7,111	7,025	86	100	6,186	1,155	100	838	4,808	2,217	217	

FIGURE B4-2. SYSTEM D. FIXED HEARTH WITH CO₂ RETENTION: PFD FOR INCINERATION AND AIR POLLUTION CONTROL SUBSYSTEMS (SYSTEM D-1)

1	2	3	4	5	6	7	8	9	10	11	12	13
LIFT HOIST (CA)	SHREDDER INLET AIRLOCK (CA)	SHREDDER (CA)	SHREDDER OUTLET AIRLOCK/LOADING FLANGE (SI)	PORTABLE WASTE HOPPER (NO)	TRANSFER DOLLY (CA)	BAG HOUSE (CA)	GANTRY ROBOT (SI)	WASTE SAMPLER DEVICE (SI)	PNEUMATIC TUBE CONVEYOR (SI)	UNLOADING AIRLOCK FLANGE (SI)	WASTE FEEDER (CA)	INTAKE HOPPER (SI)
14	15	16	17	18	19	20	21	22	23	24	25	
KB FEEDER (CA)	KB SILO DAY TANK (CA)	DRYER/BLENDER (CA)	ASH HOPPER (SI)	SECONDARY COMBUSTION CHAMBER (CA)	DISCHARGE SLUICE (CA)	ASH DISCHARGE SLUICE (CA)	WASTE INTAKE SLUICE (SI)	FIXED HEARTH INCINERATOR (CA)	BURNER (CA)	LOADING FLANGE AIRLOCK (SI)	TRANSFER DOLLY (CA)	

— PRIMARY MATERIAL FLOW
 - - - SECONDARY MATERIAL FLOW
 CA - COMMERCIALY AVAILABLE
 NO - NEEDS DEVELOPMENT
 SI - SYSTEMS INTEGRATION NEEDED

FIGURE B4-3. SYSTEM D, FIXED HEARTH WITH CO₂ RETENTION: FAD FOR INCINERATION AND AIR POLLUTION CONTROL SUBSYSTEMS (SYSTEM D-1)

DMS - CO2 NO. 1000 SUPPLY
 LMS - CO2 NO. 1000 RETURN
 HMR - HEATING MEDIUM SUPPLY
 HMR - HEATING MEDIUM RETURN

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
INDUCED DRAFT FAN (CA)	DRY FILTER (SI)	ACTIVATED CARBON MERCURY RETAINER (SI)	HEPA FILTER (CA)	FLUORIZED BED CO ₂ ABSORBER (SI)	C-CLONE SEPARATOR (CA)	CERAMIC DRY GAS FILTER (CA)	CERAMIC DRY GAS FILTER (CA)	ROTARY KLEN CALCHER (CA)	KLEN SEAL (SI)	LIME STORAGE (CA)	FEED PLENUM (CA)	DISCHARGE APPLIANCE (SI)	HOPPER (CA)	HOPPER (CA)	PNEUMATIC LIME CONVEYER (CA)	WATER CONDENSER (SI)
18	19	20	21	22	23	24	25	26	27	28	29					
CO ₂ COMPRESSOR (CA)	GAS COMPRESSOR (CA)	DELAY VESSEL (SI)	HEPA FILTERS (CA)	OFF-GAS MONITOR (SI)	GAS SAMPLER (SI)	GAS COOLER (CA)	LIME SLURRY TANK (CA)	LIME PUMP (CA)	HEAT EXCHANGER (PRE-HEATER) (CA)							

CA - COMMON TO ALL
 SI - SYSTEMS INTERACTION REQUIRED

FIGURE B4-4. FIXED HEARTH WITH CO₂ RETENTION: FAD FOR AIR POLLUTION CONTROL SUBSYSTEM (SYSTEM D-1)

EQUIPMENT LIST

- ① SHREDDER
- ② PORTABLE WASTE HOPPER
- ③ DRYER AND BLENDER
- ④ QUENCH COLUMN
- ⑤ DRY FILTER
- ⑥ ACTIVATED CARBON FILTER
- ⑦ HEPA FILTER
- ⑧ SAMPLE CUTTER

- ⑨ ROTARY CALCINER (CO DESORBER)
- ⑩ FLUIDIZED BED CO₂ ABSORBER
- ⑪ CYCLONE SEPARATOR
- ⑫ BAGHOUSE
- ⑬ WATER CONDENSER
- ⑭ CO₂ COMPRESSOR
- ⑮ CALCINED LIME HOPPER
- ⑯ DELAY VESSEL
- ⑰ HEPA FILTER
- ⑱ GAS COOLER
- ⑲ GAS COMPRESSOR
- ⑳ MAKE-UP LIME HOPPER
- ㉑ GAS-TO-GAS HEAT EXCHANGER
- ㉒ HEAT EXCHANGER
- ㉓ FIXED HEARTH INCINERATOR
- ㉔ DUST COLLECTION

FIGURE B4-5. FIXED HEARTH WITH CO₂ RETENTION: PLAN VIEW OF INCINERATION AND AIR POLLUTION CONTROL SUBSYSTEMS (SYSTEM D-1)
SCALE: 1/16" = 1'-0"

EQUIPMENT LIST

- ① SHREDDER
- ② PORTABLE WASTE CONTAINER
- ③ DRYER AND BLENDER
- ④ QUENCH COLUMN
- ⑤ DRY FILTER
- ⑥ ACTIVATED CARBON FILTER
- ⑦ HEPA FILTER
- ⑧ SAMPLE CUTTER
- ⑨ ROTARY CALCINER (CO_2 DESORBER)
- ⑩ FLUIDIZED BED CO_2 ABSORBER
- * ⑪ CYCLONE SEPARATOR
- ⑫ BAGHOUSE
- ⑬ WATER CONDENSER
- ⑭ CO_2 COMPRESSOR
- * ⑮ CALCINED LIME HOPPER
- ⑯ DELAY VESSEL
- * ⑰ HEPA FILTER
- ⑱ GAS COOLER
- ⑲ GAS COMPRESSOR
- * ⑳ MAKE-UP LIME HOPPER
- ㉑ GAS-TO-GAS HEAT EXCHANGER
- ㉒ HEAT EXCHANGER
- ㉓ FIXED HEARTH INCINERATOR
- ㉔ DUST COLLECTOR
- * NOT SHOWN IN THIS VIEW

FIGURE B4-6. FIXED HEARTH WITH CO_2 RETENTION: PERSPECTIVE VIEW OF INCINERATION AND AIR POLLUTION CONTROL SUBSYSTEMS (SYSTEM D-1)

NOT TO SCALE

NOTES:

1. ASSUME COMBUSTIBLE WASTE HAS 7% INERTS.
2. ASSUME GROUT TO WASTE RATES: 2 TO 1
3. ADDITIVE SOIL = 50% OF THE FEED TO PRIMARY STABILIZATION.

THERMAL DESORPTION SUBSYSTEM	① NON-COMBUSTIBLE WASTE	② TREATED OFFGAS	③ VOCs	④ DEBRIS TO GROUTING	⑤ ORGANIC LIQUID	INCINERATION SUBSYSTEM		① ORGANIC LIQUIDS	② COMBUSTIBLE WASTE	③ ADDITIVE SOIL (SEE NOTE 3)	④ AIR	⑤ NATURAL GAS	⑥ SCC OFFGAS	⑦ ASH/SOLIDS		
FLOW RATE (LB/HR)	1.532	NEGLIGIBLE	209	1.323	209			75	393	16	9.201	160	10.010	46		
INCINERATION AIR POLLUTION CONTROL SUBSYSTEM	① SCC OFFGAS	② QUENCH WATER	③ SCRUBBER/COOLER WATER	④ COOLED OFFGAS	⑤ FILTERED OFFGAS	⑥ FLYASH	⑦ CAUSTIC SOLUTION (20% NaOH)	⑧ QUENCH SCRUBBER LIQUID	⑨ SCRUBBER LIQUOR	⑩ TREATED OFFGAS	GROUT SUBSYSTEM		① DEBRIS	② GROUT	③ GROUTED WASTE	④ WATER
FLOW RATE (LB/HR)	10.010	4.678	1.697	14.688	14.684	4	245	5.990	5.990	10.638			1.323	2.646	3.969	

FIGURE B5-2. THERMAL DESORPTION: PFD FOR INCINERATION, THERMAL DESORBER AND AIR POLLUTION CONTROL SUBSYSTEMS (SYSTEM E-1)

FILENAME: D27152.DWG PLOT DATE: 03/05/94

FIGURE B5-3. THERMAL DESORPTION: FAD FOR INCINERATION, THERMAL DESORBER AND AIR POLLUTION CONTROL SUBSYSTEMS (SYSTEM E-1)

— PRIMARY MATERIAL FLOW
 - - - SECONDARY MATERIAL FLOW

① HOPPER INTAKE AIRLOCK (SI)	② INTAKE PLENUM (SI)	③ DEBRIS FEEDER (CA)	④ THERMAL DESORBER (CA)	⑤ DEBRIS DISCHARGE SLUICE (CA)	⑥ DISCHARGE AIRLOCK (SI)	⑦ HOPPER INTAKE AIRLOCK (SI)	⑧ DEBRIS FEEDER (CA)	⑨ PLUG MILL (SI)	⑩ DISCHARGE VALVE & FLANGE (SI)
⑪ GROUT TANK (CA)	⑫ GROUT FEEDER (CA)	⑬ PRIMARY CONDENSER (SI)	⑭ SECONDARY CONDENSER (SI)	⑮ TRANSFER DOLLY (CA)	⑯ TRANSFER DOLLY (CA)	⑰ CAPPING & WASHING (SI)	⑱ ORGANIC LIQUID TANK (CA)	⑲ TRANSFER PUMP (CA)	⑳ PORTABLE WASTE HOPPER (ND)

CA - COMMERCIALY AVAILABLE
 ND - NEEDS DEVELOPMENT
 SI - SYSTEMS INTEGRATION NEEDED

FIGURE B5-3. THERMAL DESORPTION: FAD FOR INCINERATION, THERMAL DESORBER AND AIR POLLUTION CONTROL SUBSYSTEMS (SYSTEM E-1)

EQUIPMENT LIST

- ① SHREDDER
- ② PORTABLE WASTE HOPPER
- ③ ROTARY KILN INCINERATOR
- ④ SECONDARY COMBUSTION CHAMBER
- ⑤ PUG MILL
- ⑥ CAPPING
- ⑦ WASHING
- ⑧ QUENCH COLUMN
- ⑨ DRY FILTER
- ⑩ ACTIVATED CARBON FILTER
- ⑪ HEPA FILTER
- ⑫ HYDROSONIC SCRUBBER
- ⑬ PACKED-TOWER SCRUBBER AND MIST ELIMINATOR
- ⑭ HEAT EXCHANGER
- ⑮ DE-NOX REACTOR
- ⑯ STACK
- ⑰ ORGANIC LIQUID TANK
- ⑱ SECONDARY CONDENSER
- ⑲ PRIMARY CONDENSER
- ⑳ THERMAL DESORBER
- ㉑ DUST COLLECTION
- ㉒ SAMPLE CUTTER

FIGURE B5-4. THERMAL DESORPTION: PLAN VIEW OF INCINERATION, THERMAL DESORBER AND AIR POLLUTION CONTROL SUBSYSTEMS (SYSTEM E-1)

SCALE : $\frac{1}{16}$ " = 1' - 0"

FILENAME: 11520.DGN PLOT DATE 03-08-93

NOTE: WALLS NOT SHOWN FOR CLARITY

EQUIPMENT LIST

- ① SHREDDER
- ② PORTABLE WASTE HOPPER
- ③ ROTARY KILN INCINERATOR
- ④ SECONDARY COMBUSTION CHAMBER
- ⑤ PUG MILL
- ⑥ CAPPING
- ⑦ WASHING
- ⑧ QUENCH COLUMN
- ⑨ DRY FILTER
- ⑩ ACTIVATED CARBON FILTER
- ⑪ HEPA FILTER
- ⑫ HYDROSONIC SCRUBBER
- ⑬ PACKED-TOWER SCRUBBER AND MIST ELIMINATOR
- ⑭ HEAT EXCHANGER
- ⑮ DENOX REACTOR
- ⑯ STACK
- ⑰ ORGANIC LIQUID TANK
- ⑱ SECONDARY CONDENSER
- ⑲ PRIMARY CONDENSER
- ⑳ THERMAL DESORBER
- ㉑ DUST COLLECTION
- ㉒ SAMPLE CUTTER

FIGURE B5-5. THERMAL DESORPTION: PLAN VIEW OF INCINERATION, THERMAL DESORBER AND AIR POLLUTION CONTROL SUBSYSTEMS (SYSTEM E-1)

SCALE: NONE

**DATE
FILMED**

10/24/94

END