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COMBUSTION ENGINEERING

May 1, 1989
LD-89-049

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Rec'd MAY 8 1989 U. S. NUCLEAR REGULATORY COMMISSION NMSS Mail Section

Docket 70-36
License No. SNM-33

Mr. Leland C. Rouse, Chief
Fuel Cycle Safety Branch
Division of Industrial and
Medical Nuclear Safety
Attn: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Log May 89 - 1
Remitter
Check No. 215046
Amount $150 - 1A
Fee Category
Type of Fee AMD
Date Check Rec'd. 5/10/89
Date Completed
By: Owens

Subject: License Amendment Request for Production With New Pellet Lines

Reference: (A) Letter LD-89-031, A. E. Scherer (C-E) to L. C. Rouse (NRC), dated March 22, 1989

(B) Letter LD-89-032, A. E. Scherer (C-E) to L. C. Rouse (NRC), dated March 29, 1989

Dear Mr. Rouse:

In Reference (A), Combustion Engineering submitted a license amendment request for start-up and testing with depleted uranium in the revitalized fuel manufacturing facilities at Hematite, Missouri. That request was followed by Reference (B) which provided the environmental information related to production in the revitalized facilities. This submittal fulfills our intention stated in Reference (A) to provide by May 1, 1989, a license amendment request for pellet production with enriched uranium in the new buildings and equipment. We hope that these timely submittals will allow us to proceed with operation of the new facilities that we discussed at a March 10, 1989, meeting with your staff. Our current schedule calls for start-up testing with depleted uranium to begin about June 15, 1989, and for enriched uranium production to begin about September 1, 1989.

DF03 1/1

The enclosed amendment addresses only the changes and additions in buildings, equipment and processes directly related to the revitalization program. Existing radiological controls and procedures that are

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Combustion Engineering, Inc.

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25488

in place will continue to be employed in the new facilities. Other license changes have been discussed with your staff including, for example, an updated Hematite organization description. They will follow as separate amendment requests.

Forwarded herewith are Enclosure I containing a list of the affected pages, Enclosure II containing the license amendment change pages and Enclosure III, a check in the amount of $150.00 to cover this license amendment request as required by 10 CFR 170.31. Ten (10) copies of Enclosures I and II are included for your use.

If I can be of any assistance on this matter, please do not hesitate to call me or Mr. J. F. Conant of my staff at (203) 285-5002.

Very truly yours,

COMBUSTION ENGINEERING, INC.

A. E. Scherer
Director
Nuclear Licensing

AES:jeb

Enclosures: As stated

cc: G. D. France (NRC-Region III)
M. L. Horn (NRC)
D. A. McCaughey (NRC)

DOCKET NO. 70-36

CONTROL NO. 25488

DATE OF DOC. May 1, 1989

DATE RCVD. May 8, 1988

FCUF ✓ PDR ✓

FCAF ______ LPDR ______

I & E REF. ✓

SAFEGUARDS ✓

FCTC ______ OTHER ______

DATE 5/8/89 INITIAL Stc

Docket No. 70-36
License No. SNM-33

ENCLOSURE I

COMBUSTION ENGINEERING, INC.

HEMATITE NUCLEAR FUEL MANUFACTURING FACILITY

REQUEST FOR LICENSE AMENDMENT

LIST OF AFFECTED PAGES

May 1, 1989

Docket No. 70-36
License No. SNM-33
May 1, 1989

HEMATITE NUCLEAR FUEL MANUFACTURING FACILITY

REQUEST FOR LICENSE AMENDMENT

Combustion Engineering requests that License No. SNM-33 for its Hematite Nuclear Fuel Manufacturing Facility be amended to:

1.) Include the addition of Building No. 253 containing utilities, offices, UO_2 storage and liquid waste solidification.

2.) Provide for utilization of Buildings 253, 254 and 256 as described for receiving, processing, storage and shipping of enriched uranium.

The license pages affected by this amendment request and their respective revision numbers are listed below. The change pages are contained in Enclosure II.

List of Affected Pages

Deleted Page		Added Page	
Page No.	Rev.	Page No.	Rev.
iii	0	iii	1
I.1-3	4	I.1-3	5
I.1-3a	0	I.1-3a	1
I.4-5	3	I.4-5	4
I.4-5a	0	Deleted	
I.4-6	3	I.4-6	4
I.4-6a	1	I.4-6a	2
-	-	I.4-6b	0
I.5-5	1	I.5-5	2
I.5-6	1	I.5-6	2
II.1-5	0	II.1-5	1
II.1-6	0	II.1-6	1
II.1-9	0	II.1-9	1
II.1-12	1	II.1-12	2
II.1-13	2	II.1-13	3
II.1-13a	0	II.1-13a	1
-	-	II.1-13b	0
II.1-16	0	II.1-16	1
II.1-17	2	II.1-17	3
II.2-1	0	II.2-1	1
II.2-2	0	II.2-2	1
II.2-3	0	II.2-3	1
II.2-4	2	II.2-4	3
II.2-6	1	II.2-6	2
II.2-9	3	II.2-9	4
II.8-3	1	II.8-3	2
II.8-6	0	II.8-6	1
-	-	II.8-6a	0
II.8-7	3	II.8-7	4

List of Affected Pages (continued)

Deleted Page		Added Page	
Page No.	Rev.	Page No.	Rev.
II.8-8	2	II.8-8	3
II.8-9	2	II.8-9	3
II.8-10	1	II.8-10	2
II.8-11	1	II.8-11	2
-	-	II.8-11a	0
-	-	II.8-11b	0
-	-	II.8-11c	0
-	-	II.8-11d	0
-	-	II.8-11e	0
-	-	II.8-11f	0
-	-	II.8-11g	0
-	-	II.8-11h	0
-	-	II.8-11i	0
-	-	II.8-11j	0
-	-	II.8-11k	0
-	-	II.8-11l	0
II.8-12	0	II.8-12	1
II.8-13	0	II.8-13	1
-	-	II.8-13a	0
II.8-14	0	II.8-14	1
II.8-15	1	II.8-15	2
II.8-17	2	II.8-17	3
II.8-18	0	II.8-18	1
II.8-19	2	II.8-19	3
II.8-20	2	II.8-20	3
II.8-21	2	II.8-21	3
II.8-22	1	II.8-22	2
II.8-24	2	II.8-24	3
II.8-25	1	II.8-25	2

List of Affected Pages (continued)

Deleted Page		Added Page	
Page No.	Rev.	Page No.	Rev.
II.8-26	0	II.8-26	1
II.8-27	0	II.8-27	1
II.8-28	0	II.8-28	1
II.8-29	1	II.8-29	2
II.8-30	0	II.8-30	1
II.8-31	2	II.8-31	3
II.8-32	0	II.8-32	1
II.9-31	2	II.9-31	3
II.10-1	0	II.10-1	1

Docket No. 70-36

License No. SNM-33

ENCLOSURE II

COMBUSTION ENGINEERING, INC.

HEMATITE NUCLEAR FUEL MANUFACTURING FACILITY

REQUEST FOR LICENSE AMENDMENT

PROPOSED LICENSE AMENDMENT PAGES

May 1, 1989

TABLE OF CONTENTS

PART II SAFETY DEMONSTRATION

Section

1.7 Authorized Activities

Receive, possess, use, and transfer Special Nuclear Material under Part 70 of the Regulations of the Nuclear Regulatory Commission in order to manufacture nuclear reactor fuel utilizing low-enriched uranium (up to 5.0 weight percent in the isotope U-235).

Receive, possess, use, and transfer Source Material under Part 40 of the Regulations of the Nuclear Regulatory Commission. Source materials are used for the same purposes as SNM, and are generally used for the start-up testing of a new process. Sealed cobalt-60 sources are used for instrument calibration and testing. Authorized activities are conducted in the following buildings and facilities on the Hematite site:

Number	Name	Present Utilization
101	Tile Barn	Emergency Center and equipment storage
110	New Office Building	Guard Station and Offices
120	Wood Barn	Equipment storage
-	Oxide Building and Dock	UF6 to UO2 Conversion, UF6 receiving
235	West Vault	Source material storage
240	240-1	Offices and Cafeteria
	240-2	Recycle and Recovery area
	240-3	Incinerator, SNM storage and waste processing
	240-4	Laboratory and Maintenance Shop
252	South Vault	Radioactive waste storage
253	Utility Building	Steam supply, SNM Storage, Operating Supplies, Offices, and Liquid Waste Solidification

Number	Name	Present Utilization
254	254-1	UO2 storage, blending, and pressing
	254-2	UO2 oxidation, reduction, dewaxing, and sintering
	254-3	UO2 grinding and pellet packaging
255	Pellet Plant	Pellet fabrication, storage, and packaging
256	Warehouse	Shipping, Receiving and Storage

4.2.3 Safety Margins for Individual Units (continued)

c) Nuclear safety shall be independent of the degree of moderation between units up to the maximum credible mist density. The maximum mist density will be determined by studying all the sources of water in the vicinity of the single units or arrays. The maximum mist density may be limited by design and/or by administrative controls.

d) Buildings containing fissile materials will not have fire sprinkler systems. Water hoses will not be used to fight fires in Building Nos. 253, 254 or 255.

e) Optimum conditions (limiting case) of water moderation and heterogeneity credible for the system shall be determined in all calculations.

f) The analytical method(s) used for criticality safety analysis and the source of validation of the method(s) shall be specified.

g) Safety margins for individual units and arrays shall be based on accident conditions such as flooding, multiple batching, and fire.

h) No moderators, except for the operator's arms, and small items such as plastic bags, tools, and damp rags for cleaning, will be allowed in the agglomeration hoods in Building 255 while fissile material is in the hood.

i) The R-1, R-2 and R-3 inlet high pressure switches will be calibrated at least once every six months.

j) The following cylindrical tanks in the Recycle/Recovery Area (240-2) will have a barrier to insure no significant moderating material can be brought within one foot of the cylindrical tank surface.

   1. Dissolvers (2)
   2. Centrifuge Feed Vessel
   3. UO_4 Dryer Scrubber Vessel

4.2.3 Safety Margins for Individual Units (continued)

j) (continued)

4. NO_x Scrubber
5. Centrifuge Supernate Recycle
6. UO_4 Precipitate Overflow Vessel

k) The hydrometer on the plant air to the Dry Blenders in the Oxide Building and in Building 254 will be set to alarm at a dewpoint no higher than 0°F and checked on a six month period.

l) The water content will be verified to be less than 0.05 w/o in storage cans in the conveyor storage area on a production lot basis (contents of two dry blenders).

m) The R-2 steam line will have two (redundant) fail-safe shut-off valves, each activated by two independent high and low temperature alarms setpoints on the R-2 reactor. The operability of this system will be ascertained at least once every six months.

n) The moisture content of the UO_2 powder transferred into the blenders in the north end of Building 254 will be verified as being $\leq$1 w/o.

4.2.4 Limits for Safe Individual Units (SIUs)

Table 4.2.4

Safe Individual Unit Limits for $\leq$ 5.0% enriched UO_2 at optimum moderation. All Mass and Volume limits have been adjusted to provide constant spacing areas for the enrichment shown. Heterogeneous limits have been developed with optimum rod sizes taken to allow for pellet chips, etc.

Nominal Enrichment	MASS LIMITS			
	HOMOGENEOUS		HETEROGENEOUS	
	$KgUO_2$	$f^{(1)}$	$KgUO_2$	$f^{(1)}$
- 2.5% U-235	54	.19	50	.26
>2.5 - 3.0% U-235	41	.23	38	.29
>3.0 - 3.2% U-235	36	.23	36	.29
>3.2 - 3.4% U-235	35	.25	33	.29
>3.4 - 3.6% U-235	32	.26	30	.30
>3.6 - 3.8% U-235	28	.26	27	.29
>3.8 - 4.1% U-235	24	.25	24	.27
>4.1 - 4.3% U-235	22	.26	22	.27
>4.3 - 4.5% U-235	20	.27	20	.27
>4.5 - 4.7% U-235	18	.26	18	.27
>4.7 - 5.0% U-235	16	.27	16	.27

4.2.4 Limits for Safe Individual Units (SIUs) (continued)

Enrichment (% U-235)	Homogeneous Limits				
	Vol.(L)	$f^{(1)}$	Cyl Dia (in)	$f^{(1)}$	Slab (in. of Powder)
>Nat.- 3.5	31	0.39	10.7	0.34	4.0
>3.5 - 4.1	25	0.38	9.8	0.33	4.0
>4.1 - 5.0	22	0.22	9.2	0.34	4.0

	Heterogeneous Limits			
	Vol.(L)	$f^{(1)}$	Cyl Dia (in)	$f^{(1)}$
>Nat.- 3.5	22	0.40	9.5	0.36
>3.5 - 4.1	18	0.38	8.9	0.34
>4.1 - 5.0	9	0.38	8.4	0.35

	Heterogeneous Slab Limits		
	Corrugated Trays		Randomly Loaded Boats
	Inches	$f^{(1)}$	inches
>Nat.- 3.5	4.4	0.22	4.0
>3.5 - 4.1	3.9	0.20	4.0
>4.1 - 4.3	3.7	0.20	4.0
>4.3 - 5.0	3.5	0.20	4.0

(1) Fraction of the equivalent unreflected critical spherical volume or mass.

4.2.5 Surface Density Method

The surface density method may be used to evaluate arrays of SIUs where each mass limit has a fraction critical of 0.3, and volume and cylinder limits have a fraction critical of 0.4. Spacing for mass limited Safe Individual Units is such that the contained UO_2 and

TABLE I.5-1 Environmental Monitoring Program

OPERATIONAL EFFLUENTS MONITORING PROGRAM

Sample Medium	No. of Sampling Points	Collection & Analysis Frequency	Sample Type	Type of Analysis	Action Level
Air Effluent	15 Exhaust Stacks	Continuous & analyze weekly	Particulate	Gross alpha	Two week average MPC
Air Effluent	Conversion offgas stack	Continuous & analyze weekly	Gaseous	Fluoride	
Liquid Effluent	Site dam Sewage treatment outfall	Continuous & analyze weekly	Composite	Gross alpha & beta	Above MPC

OPERATIONAL ENVIRONMENTAL MONITORING PROGRAM

Sample Medium	No. of Sampling Points	Collection & Analysis Frequency	Sample Type	Type of Analysis
Air	2 onsite remote	Continuous & analyze quarterly	Particulate	Gross Alpha
Surface Water	Joachim Creek above and below site creek outfall.	Monthly	Grab	Gross Alpha & beta
	Joachim and site creek confluence	Quarterly	Grab	Gross Alpha & beta
Ground Water	Plant well	Monthly	Grab	Gross Alpha & beta
	Offsite well (Hematite)	Quarterly	Grab	Gross Alpha & beta
	3 monitoring wells for evaporation ponds.	Monthly	Grab	Gross Alpha & beta
Soil	4 locations surrounding plant	Quarterly	Grab	Gross Alpha & beta
Vegetation	4 locations surrounding plant	Quarterly	Grab	Gross Alpha & beta & Fluoride

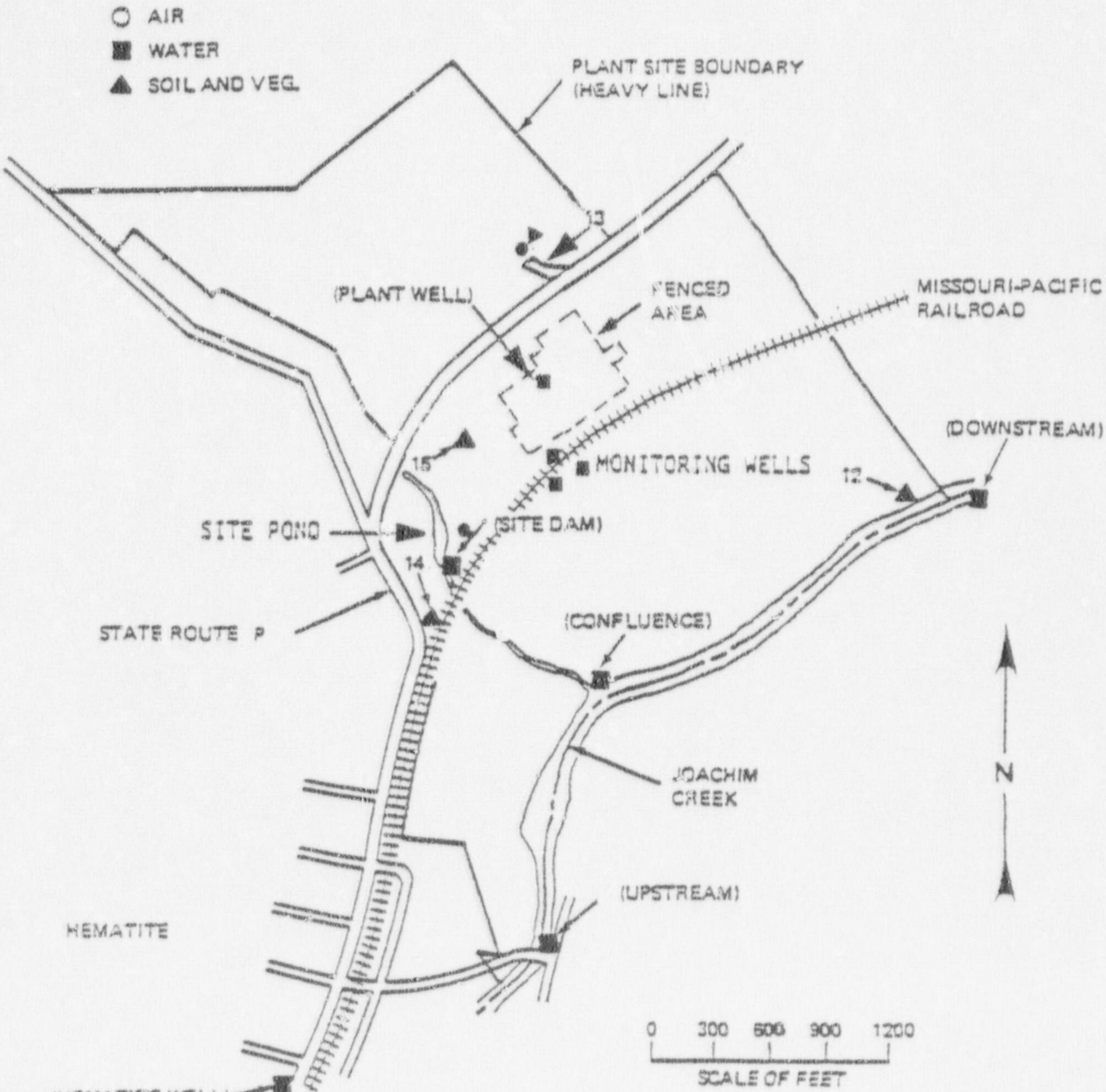


Figure I.5-1 Location of Monitoring Sites Around Hematite Facility

1.2 Operating Objective and Process Summary

Combustion Engineering's Hematite, Missouri, plant produces low enriched (up to 5.0% U-235) ceramic fuel for light water reactors. Uranium hexafluoride feed is initially received from the DOE enrichment plants and converted to uranium dioxide powder, using a dry fluidized bed conversion process. The UO_2 powder is either shipped offsite for further processing or it is fabricated into ceramic fuel pellets on site and then shipped.

UF_6 is received as a solid in 2.5 ton cylinders. These cylinders are heated in steam chests to vaporize the UF_6, which then enters the first fluidized bed reactor. Here it is reacted with dry steam to form uranyl fluoride (UO_2F_2) and hydrogen fluoride gas.

The gaseous HF and excess steam exit the reactor through porous metal filters; the UO_2F_2 particles move to a second and third reactor where they are pyrohydrolyzed in a reducing atmosphere of "cracked" ammonia or hydrogen to remove any residual fluoride and reduce the UO_2F_2 to UO_2. Offgases from these reactors are also filtered through porous metal filters and then routed with offgases from the first reactor to scrubbers filled with calcium carbonate to remove most of the HF prior to discharge to the atmosphere.

UO_2 from the third reactor is cooled and pneumatically transferred to storage silos or to hoppers. The powder is withdrawn from the storage silos or hoppers into a fluid energy mill, where recycle material may also be added. It is then transferred to blenders and withdrawn for shipment or for use in one of the two pelletizing buildings.

1.2 Operating Objective and Process Summary (continued)

For pelletizing, blended powder is agglomerated using either an organic binder and a suitable solvent or a dry powder slugging press. The agglomerated powder or slugs are then granulated to insure a consistent press feed and pressed into pellets. "Green" pellets are processed through a dewaxing furnace to remove the additives and then passed through a sintering furnace where they densify and achieve the desired characteristics. The sintered pellets are sized using a centerless grinder, dried, inspected and packaged for shipment.

Support operations for the conversion and pelletizing process include material recycle, scrap recovery, cylinder heel recovery, quality control laboratory, maintenance, waste consolidation and disposal, and effluent processing.

1.3 Site Description

1.3.1 Location of Plant

The C-E Hematite site is located in Jefferson County, Missouri, approximately 35 miles south of the City of St. Louis. Figure II.1-1 indicates the location of Jefferson County within the state of Missouri. Figure II.1-2 illustrates an expanded section of the area within a 5-mile radius of the site and shows the location of small towns and settlements within this area. The plant is located on Highway P about 3/4 mile northeast of the unincorporated town of Hematite. Figure II.1-3 shows the site boundaries with respect to the town of Hematite.

1.3.4 Hydrology (continued)

that the annual mean flow is about 132 cubic feet per second (cfs). The seasonal mean flows are: spring - 330 cfs, summer - 12 cfs, fall - 16 cfs, winter - 169 cfs.

Wells drilled into bedrock aquifers in the Joachim Creek watershed may encounter confined or artesian groundwater. In general, groundwater movement is southeasterly towards Joachim Creek. Yields of wells vary, depending on what rock units are penetrated. Wells finished in St. Peter Sandstone through Lower Gasconade Dolomite have yields of more than 100 gallons per minute, while wells finished in Cambrian age sediments open to Ordovician age sediments have yields up to as much as 500 gallons per minute. Wells drilled in any of these areas could expect to encounter water with acceptable dissolved solids (less than 500 ppm) in or above the aquifer indicated. Water used at the site is supplied by a well located on the property. Daily average water usage for site operations amounts to about 15,000 gallons per day. Withdrawal of this volume of water has no adverse effect on the water table as it represents a very small portion of the available supply, for example: a spring on the property, a few hundred feet from the well, naturally flows at the average rate of 350,000 gallons per day.

Floods which might occur at the site will produce different flood levels depending upon the flow rate of Joachim Creek. While the historical records (maximum observed level of 431 feet msl) as well as the analysis by U.S. Corps of Engineers (100-year flood level at 434.7 ft. msl) show that a site flood is not likely it still is considered remotely possible. If a flood of larger magnitude (greater than 435 feet msl) were to occur, water at the plant site would rise but there is not expected to be any significant water velocity associated with the flooding. The reason for the minimal water velocity is that the railroad track, which is located between

1.3.6 Seismological (continued)

quakes of Epicentral Intensity XII Modified Mercalli scale (M.M) which took place on December 6, 1811 and January 23 and February 7, 1812, near New Madrid. During recent years, there have been two quakes recorded in the New Madrid area. In 1962 a quake measuring V (M.M) was recorded and one with a magnitude of 4-1/2 was recorded in 1963. A quake reported as "the strongest in years" occurred near Caruthersville, Missouri, 150 miles southeast of Hematite, on December 3, 1980.

1.4 Locations of Buildings on Site

Figure II.1.4 shows the location of and identifies the buildings and facilities on the Hematite site. A general description of the major buildings follows:

The Oxide Plant (Powder Production Area) is a four-level building, 31' x 36', with a concrete floor, corrugated plas-steel siding, and a metal roof. This building is an addendum to the original Building 255 and opens directly into the pelletizing facility. The Oxide Building is approximately 50' in height.

Adjoining the Oxide Plant is a 31' x 55' dock area which also has a concrete floor and a metal roof, metal walls and overhead doors.

Building 240, the Recycle/Recovery Areas and Laboratory, is 83' x 215' and is 16' high. The building has concrete flooring, exterior concrete block walls with windows, and a concrete-on-metal roof. About 6,000 square feet of the area is utilized for uranium recycle and recovery operations with the remainder of the building used for office area, clothing change and locker rooms, showers, maintenance shop, laboratory space, the site laundry, and utilities.

1.4 Locations of Buildings on Site (continued)

The Quality Control Laboratory is located in the southwest corner of Building 240. An area of approximately 2,500 square feet it utilized for testing of the chemical and physical properties of uranium oxide, powders, pellets and other materials.

Building 253 adjoins Buildings 254 and 256 on the east and Building 240 on the west. It measures approximately 77 feet wide by 133 feet long by 17 feet high and is constructed similarly to Building 240. It has a concrete slab floor, concrete block walls and metal supporting roofing.

Filtrate solidification is performed in the south end of Building 253. The center area contains the steam boiler, storage for chemicals and maintenance items and storage for SNM. The powder is stored in pails and in wheeled recycle hoppers. A facility with filtered ventilation is provided for transfer of powder from pails to the hoppers and blending in the hoppers. The bi-level north end of Building 253 contains offices and a change room.

Building 254 contains two parallel pellet production lines which are comprised of milling, blending, pressing, sintering, grinding, and packaging operations. Additional equipment has been installed to recycle green and hard scrap.

Building 254 is surrounded on four sides. It adjoins the building 255 on the east side, the warehouse building 256 on the south side, the womens' locker room on the north side, and the storage/utilities/office building 253 on the west side.

1.4 (cuntinued)

The building measures 83 feet wide by 161 feet long. The roof is 23 feet high on the south end and stepped to 36 feet high on the north end. Building 254 is constructed with a free standing steel frame supported on shallow poured concrete spread footings, a concrete slab floor on grade and concrete block walls laterally tied to the steel frame. The block walls are shared where building 254 adjoins other buildings. Metal curtain walls with insulation are used on the exposed exterior walls of the high north end and on the high portions that rise above the block walls shared with adjoining buildings. Roofing is rigid insulating board over metal decking supported on prefabricated trusses carried on the steel building frame.

Building 255 measures 83' x 161' and is 17' high. This building has concrete flooring, concrete block walls, and a concrete-on-metal roof. Pellet production occupies a portion of this building--an area approximately 83' wide by 83' long. The remainder of this building area is used for offices, storage, work-break area, UO2 product storage in sealed containers, and the supply room.

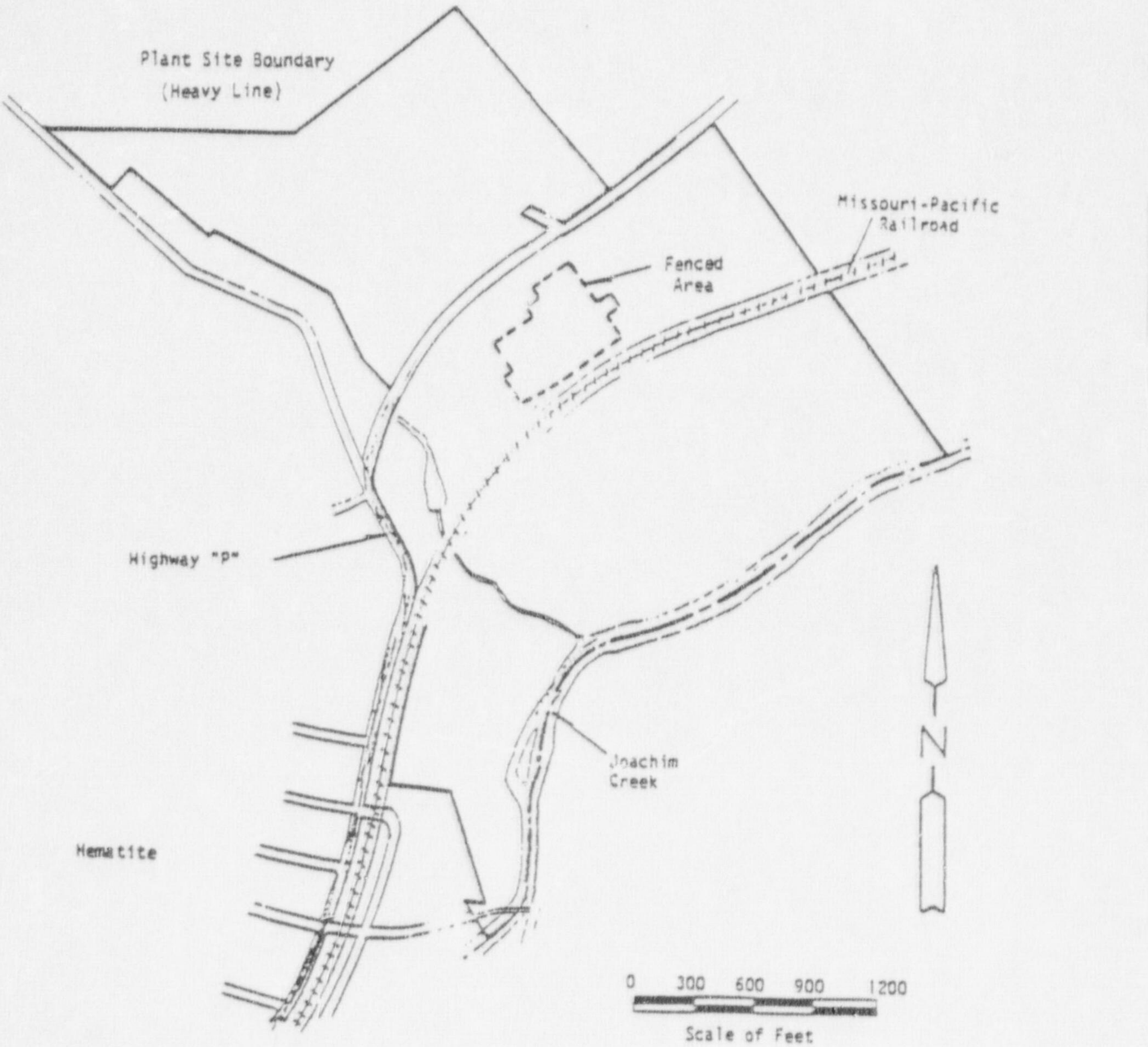
The warehouse building 256 extends westward along the south end of pelletizing building 255 and the south end of pelletizing building 254. This warehouse measures approximately 151 feet by 50 wide. It is constructed of concrete slab floor on grade with concrete block walls and roofing of rigid insulating board over metal decking supported on prefabricated steel trusses. The warehouse serves as a storage and shipping facility for finished pellets and as a receiving warehouse for site supplies. Truck access to the warehouse is via a roadway corridor that runs from the main gate to the warehouse.

1.5 License History

License SNM-33 was transferred to Combustion Engineering from Gulf United Nuclear on August 21, 1974. It has since been renewed on March 31, 1977 and December 30, 1983 for 5-year periods.

Figure II.1-3

Site Boundaries and Location
With Respect to the Town of Hematite



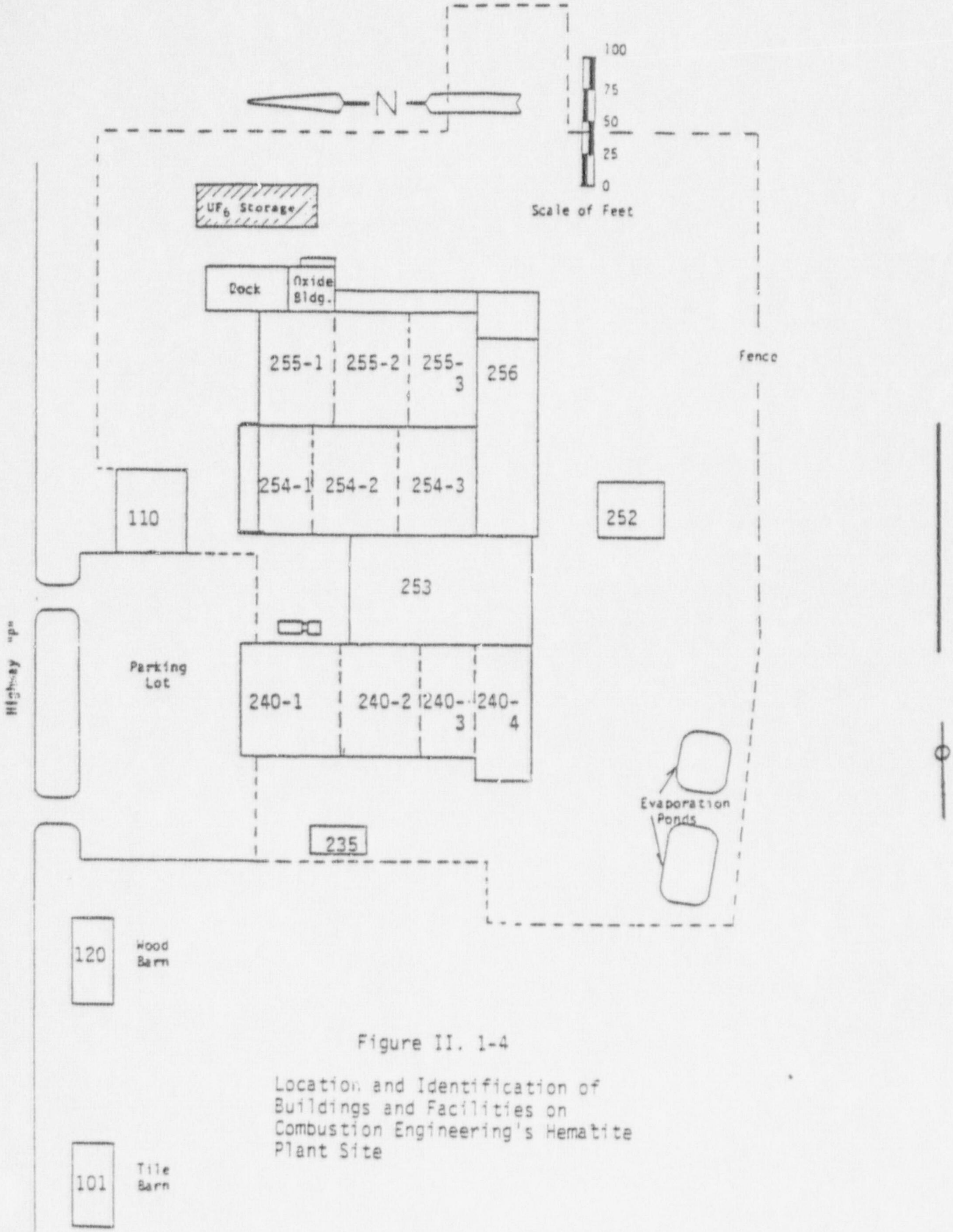


Figure II. 1-4

Location and Identification of Buildings and Facilities on Combustion Engineering's Hematite Plant Site

2.0 FACILITY DESCRIPTION

2.1 Plant Layout

Section II.1.4 gives a general description of the construction and uses of the major buildings on the Hematite site.

Details of process equipment layout are given in Chapter II.8.0.

2.2 Utilities

Electrical power to the Hematite Plant is provided by the Union Electric Company via a substation located approximately 100 yards northeast of Building 255, adjacent to Highway P.

The substation transformer steps down the voltage to 12.5 KV and from there is distributed to three stepdown transformers located on the site.

The 3-phase output of each stepdown transformer is then connected to metal clad switchgear for distribution to associated buildings.

Transformer Location	Input Voltage	Output Voltage	KVA Rating
Oxide Plant	12.5 KV	480 v	500 KVA
East of Bldg. 110	12.5 KV	480 v	1500 KVA
Bldg. 240	12.5 KV	230 v	500 KVA
Bldg. 255	480 v	208 v	500 KVA

Additional smaller stepdown transformers (480v/230v/120V) provide power for lighting and general convenience.

2.2 Utilities (continued)

Two natural gas-powered emergency generators provide backup emergency power to maintain critical loads such as emergency air, water, steam, instrumentation, alarms, etc. This natural gas supply is non-interruptable.

One unit is located on the 4th floor level of the Oxide Building and produces 3-phase, 120/208 volts, and 7.5 KW.

The other unit is located in the Utilities Room in Building 240 and produces 3-phase, 120/220 volts, and 75 KW.

Both emergency generators feed their own respective distribution boards and are switched from normal power to generator (emergency) power by "Onan" automatic line transfer switches.

Generator startup and transfer takes approximately 25 seconds for the unit located in Building 240. Startup and transfer of the unit located in the Oxide Building takes about 5 seconds.

Both units are startup tested on a weekly basis.

Emergency Generators	Primary Loads
Oxide Building Unit	1. Instrumentation 2. Alarms 3. Emergency Lighting 4. Oxide Roof Exhaust
Building 240 Unit	1. Well Pump 2. Nuclear Alarms 3. Burner Blower-Boiler 4. Feed Water Pump-Boiler 5. Feed Water Control Panel-Boiler 6. Roof Exhaust Above Generator 7. Air Compressor 8. Emergency Lighting (Bldgs. 253,254) 9. Telephones

2.2 Utilities (continued)

Water used on the C-E Hematite site is supplied by a well located within the fenced manufacturing area. On the average day, 15,000 gallons are withdrawn from this well.

Water is stored in a 5,000 gallon tank and distributed as needed within the plant, primarily for process water. A circulating water cooling system, including a forced convection evaporative cooling tower, provides equipment cooling.

Water from this site well is analyzed for contamination on a monthly basis. An alternate source of water is the site spring.

All systems using the potable water supply utilize an air break to prevent inadvertent contamination.

2.3 Heating, Ventilation, and Air Conditioning

The Oxide Building is heated by a natural gas-fired heater located on the roof of Building 255. Buildings 255 and 240 are heated by steam supplied by the site boiler located in the south end of Building 253. This boiler is natural gas-fired from an interruptable supply. Fuel oil is stored in an underground tank for use during periods of interruption of natural gas service. Buildings 253 and 254 are heated by natural gas fired heaters located on their roofs. Only the offices, Laboratory, and Maintenance Shop are air conditioned.

Ventilation air from the Oxide Building, from Buildings 253, 254 and 255 and from the Recycle/Recovery Areas in Building 240 is passed through absolute filters prior to release to the atmosphere, except for the pellet furnace room air exhausts in Building 255.

2.3 Heating, Ventilation, and Air Conditioning (continued)

The Oxide Building also has an unfiltered room air exhaust which is operated only infrequently during periods of hot weather, at times when release of contamination is unlikely, and is monitored when used. A continuous air monitor, located on the 4th floor, will alarm should a release occur.

All exhaust stacks are continuously monitored when in operation.

Exhaust stacks have the following flow rates:

Stack Identification	Flow Rate (CFM)
Oxide Main Exhaust	9,773
Oxide Powder Unloading	4,909
Oxide Roof Exhaust	7,068
Bldg. 253 Recycle Loading	1,500
Bldg. 254 Pressing area (2)	12,000 ea.
Bldg. 254 Sintering and grinding (2)	12,000 ea.
Bldg. 254 Pellet Packaging (1)	12,000
Bldg. 255 Roof Exhaust	9,032
Bldg. 255 West Manifold	12,020
Bldg. 255 East Manifold	9,773
Bldg. 240 Dry Recycle	3,657
Bldg. 240 Wet Recovery	5,807
Bldg. 240 Incinerator	3,800

2.4 Waste Handling

2.4.1 Liquid Wastes

Cleanup and mop water are evaporated to recovery the uranium, Process water from wet recovery is evaporated for concentration

2.4.2 Solid Wastes (continued)

A gas-fired incinerator has been installed to reduce the volume of combustible contaminated wastes for shipment to licensed burial. This incinerator also supplements the oxidation/reduction furnaces used to reduce wastes containing recoverable quantities of uranium. The incinerator is equipped with a wet scrubber system to clean offgases prior to discharge.

Calcium fluoride and limestone from the conversion process dry scrubbers are used as fill materials on site. These materials, referred to as spent limestone, do not contain detectable contamination and are not considered to be radiological solid waste. (Less than 100 dpm per 100 cm^2 of rock surface). Contaminated limestone is held within the controlled area.

Non-radioactive solid waste is disposed of by a commercial waste disposal firm. Old items of non-contaminated equipment may be disposed of to commercial scrap dealers.

2.5 Chemical Storage

Chemicals will be stored in accordance with all pertinent federal and state regulations. Chemicals currently used are:

Ammonia - approximately 620,000 pounds used per year as a reducing gas in the production of UO_2 powder, pellets, and in preparation of material for recycle.

Potassium Hydroxide - approximately 3,500 pounds used per year. Mixed with process water and used as wet scrubber liquor to remove hydrofluoric acid from the recycle pyrohydrolysis process effluent.

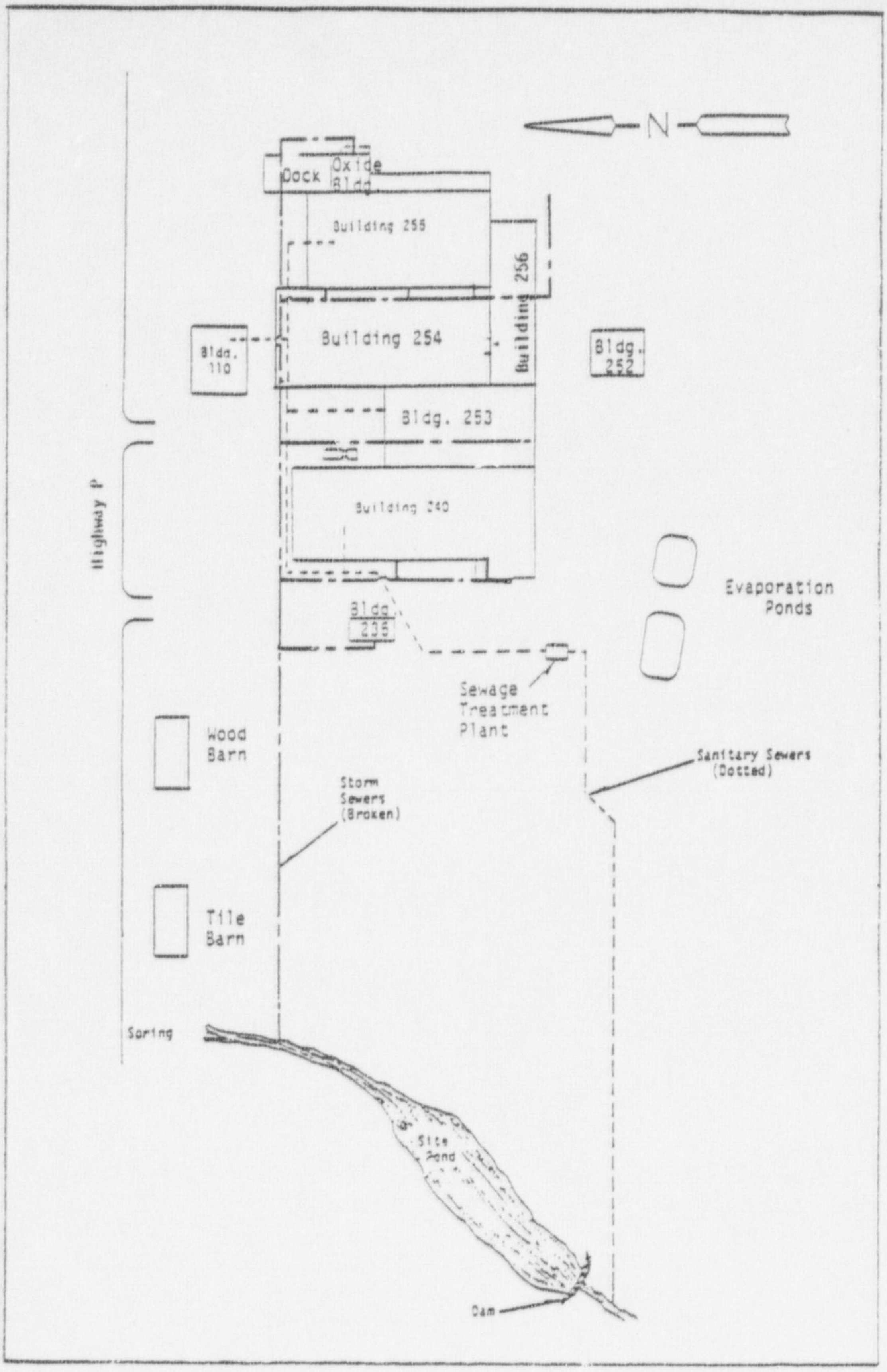


Figure II.2.2 Sanitary and Industrial Waste Line Flows

8.1.1 Receive and Store UF_6 (continued)

on the Oxide Building dock.

As required, a UF_6 cylinder is removed from it's shipping package or storage and connected to the conversion equipment.

The UF_6 storage area is separated from the dock by more than 12 feet.

The individual UF_6 cylinders filled with 5.0 wt % U235 are a safe moderation controlled subcrit. On the storage pad they are spaced one foot apart in a planar array. This assures a nuclearly safe storage.

8.1.2 UF_6 Conversion Process

Vaporization of the UF_6 by heating the UF_6 cylinder in a steam chamber is the first step of this process. There are two chambers but only one cylinder is on line at a time. When one cylinder is almost empty, the second cylinder starts on line. A valving arrangement prevents the two cylinders from being interconnected.

The heating of cylinders and the vaporization takes place at the Oxide Building dock area. This area is enclosed by a metal frame building with metal roof, metal walls and overhead doors. Should a UF_6 leak occur to the air, a monitor on the wall activates an alarm and turns off the roof vent in the dock area and the Oxide Building and pellet plant makeup air blowers.

A condensate line drains the steam chambers through an air gap to take steam condensate to the drain. The drain line contains a conductivity cell and an automatic shut-off valve.

8.1.3 In-Process Storage

The UO_2 product from the cooler is in the form of granules. The granules are transferred for in-process storage to either long 12 inch diameter silos or to a long 14 inch diameter blender vessel. UO_2 granules are transferred to the silos when the production run requires milled powder to be shipped as powder or fabricated into pellets in Building 255. The processes in Building 255 are described in Section 8.2. Alternatively, the granules are transferred to the 14 inch diameter blender vessel No. 4, loaded by gravity into bulk storage hoppers and wheeled to Building 254 for pelletizing. The process in Building 254 is described in Section 8.3.

Transfer lines connecting individual pieces of equipment in the Oxide Building are two inches in diameter or less. This is a dry operation and is nuclearly safe for enrichments not exceeding 5% as per TID-7028. Silos are spaced on four foot centers, forming an inline array. The Nuclear Safety Evaluation is provided in Section II.9.0.

8.2 Building 255 Powder Preparation and Pellet Fabrication

8.2.1 Milling

UO_2 granules stored in the silos in the Oxide Building flow by gravity to the mill. Process milling equipment consists of 10-inch diameter hoppers which taper to three inch discharge openings to the mill. Scrap recycle charge containers are five gallon pails (19 liters) which attach to tapered hoppers, which discharge to the mill. This also is a dry operation with the exception that the recycle material may contain up to five weight percent moisture.

Milling equipment in the Oxide Building is spaced at least four feet edge-to-edge from other SNM bearing equipment. The Nuclear Safety Evaluation is provided in Section II.9.1.

8.2.2 Building 255 Blending

The four blenders located in the Oxide Building are 14 inches in diameter. Blenders No. 1 and No. 2 are employed for blending powder intended for further processing in Building 255. Blender No. 4 is employed for holding and transferring granules into hoppers intended for further processing in Building 254. Blender No. 3 is not used. At any one time, the silos and blender vessels in the oxide building are employed for processing UO_2 either for Building 255 or for Building 254. Thus, at least two of the blender vessels are always empty.

The blending operation involves no hydrogeneous material. The atmosphere is continuously monitored for humidity and an increase in moisture will cause an alarm and subsequent cessation of the blending operation. The Nuclear Safety Evaluation is provided in Section II.9.5.

8.2.2 Blending (continued)

The blenders in the Oxide Building are arranged on six foot centers forming an inline array and are located at least four feet from other SNM-bearing equipment.

8.2.3 Building 255 Packaging and Storage

Milled and blended UO_2 powder that is intended for transport offsite is withdrawn from the blenders in the Oxide Building. Dry UO_2 product is transferred into stainless steel cans (9.75" Ø x 11" long) in the powder packaging hoods. A 10 mil poly bag may be used as an inner liner. If used, it is sealed at the top with tape. The can lid is a friction-fit type which is sealed on the outside with tape. This precludes any in-leakage of moisture from atmospheric humidity (the powder is not hygroscopic) or flooding. Thus, the UO_2 product is kept dry (typically < .05% moisture) and moderation control is assured under all conditions. Section II.9.7 describes all moderation controls in detail.

The sealed cans of dry UO_2 product are then transferred to one of the roller conveyors on the north side of Building 255 as shown in Drawing D-5007-2001, Sheet 9 of 9. The entire building is above the 100 year flood level as determined by the U.S. Army Corps of Engineers in the Special Study for Joachim Creek, dated March, 1980. Even if flooding were possible, the 30 kg weight of the cans containing high density UO_2 would prevent them from floating and being moved. Building 255 is not sprinklered and firefighting would be done by dry chemical means. Thus, criticality safety is assured through moderation control ($\leq$ 5.0% enriched UO_2 cannot be made critical without moderation).

8.2.4 Building 255 Agglomeration and Granulation

UO_2 from the conversion process may also be withdrawn in five gallon pails to be agglomerated and granulated to provide feed for pellet pressing in Building 255.

After pressing, pellets are dewaxed, sintered, ground and inspected. They are then packaged for shipment. Process flow is shown in Figure II.8.1.

UO_2 powder from the blenders is transferred to a V-blender having a total volume of 25.7 liters. Binders and other materials are added in predetermined quantities. The agglomerated material is discharged to a vibratory conveyor and then dropped to a steam heated vibratory conveyor. The dry material is then dropped to a 15 liter granulator. This agglomerated press feed is then transferred into metal buckets (11" Ø x 13" long) equipped with metal lids (which are tightly closed with a locking clamp-ring) for storage. The criticality evaluation of the V-blender assumes the V-blender to be a sphere with a volume of 25.7 liters. The volume of an unreflected sphere having optimal internal moderation is 50 liters (ARH-600 volume II Figure III.B.3-4); applying the 1.3 safety factor yields a volume of 38.5 liters. Since the 25.7 liter representation of the V-blender is less than 38.5 liters, the V-blender is a safe configuration. The absence of a reflector will be controlled by allowing only limited moderating material in the hood (see 4.2.3, Safety Margins for Individual Units, Item b).

The granulator is a safe volume as shown in Table 4.2.4.

8.2.5 Building 255 Powder Storage and Press Feed Storage

The agglomerated press feed in the metal buckets sealed with a locking ring clamp, is stored on a 1/4 inch thick steel mezzanine located above the product storage conveyors. This mezzanine is 8 1/2 feet above the concrete floor and the buckets are stored in a 13 x 13 array on 24-inch centers. Metal rings are used to maintain this spacing.

The following assumptions were incorporated in the calculational model of the powder storage and the mezzanine press feed storage areas:

1. The containers on the lower level were modelled as 9.75 inch diameter by 11 inch high cylindrical containers containing 35 kg of UO_2 with .05 w/o water. The steel structures of the cans were not modelled, as well as the 0.01" polyethylene bag which may be containing the UO_2 in the can.
2. The lower level contained no external mist.
3. The containers on the upper level were modelled as 11 inch diameter by 13 inch high cylindrical containers containing 41.0 kg of UO_2 with 2.0 w/o water. The steel structures of the cans were not modelled.
4. The upper level assumed a .05 g/cc external mist.
5. The lower level assumed the cans were stacked as shown in Drawing D-5007-2001 in the +/- x direction (horizontally) and that the cans were touching in the +/- z direction (depth) and infinite in length.
6. The upper level assumed a separation distance of 2 feet between centers in the x direction and 1.7 feet (2.0 feet actual) between centers in the z direction and infinite in length.
7. The system was reflected in the +/- x and z directions. The K-eff obtained for the system is 0.65867 +/- 0.00862.

8.2.6 Building 255 Pressing

Granulated material, contained in 5-gallon pails, is considered to be homogeneous for criticality safety evaluations. The 5-gallon pails of blended material are attached to the press-feed hopper mounted above each press. From this hopper, the material is gravity-fed to the press. The pressed pellets are randomly loaded into boats or placed on corrugated trays.

Pellets, when randomly loaded, pack to an average density of 5.95 gm/cc, with a one sigma variation of 0.264, as determined from a series of 14 measurements. Thus, at a 95% confidence level, the volume of H_2O to volume of UO_2 ratio does not exceed 1.0 and from Fig. 1.E.16 of UKAEA Handbook ASHB1, the critical slab thickness is 6.2 inches. Dividing by the safety margin of 1.2 results in a slab thickness of 5.2 inches.

8.2.7 Building 255 Dewaxing and Sintering

Pressed pellets are dewaxed and then sintered to achieve the specified ceramic properties. Pellets are loaded onto trays or are randomly loaded into sintering boats to a maximum safe slab height. The boats or trays are charged through the controlled atmosphere furnaces.

8.2.8 Building 255 Grinding

Sintered pellets are transferred to the grinder feed system and ground under a stream of coolant. The coolant is recirculated at a uranium concentration of considerably less than one gram per liter. The infeed, grinder and the outfeed pellet configurations are limited to a safe slab thickness.

8.2.8 Building 255 Grinding (continued)

Grinder sludge is removed by a centrifuge and stored in mass limited SIUs. This material is dried in an oven and stored awaiting final disposition.

A complete enclosure is provided around the grinder to preclude dusting of UO_2. This enclosure is maintained at a slight negative pressure with respect to the room.

The centrifuge is limited to a safe volume of less than 10 liters and is provided with a spacing area of 4.0 ft.^{2}. Water from the centrifuge collects in a 19 liter sump and is pumped back to the grinder. The centrifuge sump is provided with a spacing area of 8.0 ft^2. The centrifuge is cleaned periodically as required to permit continued operation.

Properly sized pellets are transferred on a conveyor to trays which are then moved to the inspection area. The pellets move in a safe slab configuration during inspection operations. After inspection, the pellets are stored in a safe slab and then packaged for shipment. The safe slab limit here is that applicable to corrugated trays.

8.2.9 Building 255 Packaging

The pellets awaiting packaging will form a safe slab with a thickness less than the safe thickness shown in Table I.4.2.4.

The pellets are packaged in the licensed shipping containers in accordance with the applicable certificate of compliance.

8.3 Building 254 Powder Preparation and Pellet Fabrication

8.3.1 Building 254 Milling

UO_2 granules from a production run intended for pelletizing in Building 254 flow by gravity from the 14 inch diameter blender vessel No. 4 in the Oxide Building into bulk storage hoppers. The hoppers move by wheeled transporter through Building 255 into Building 254. There are up to 54 hoppers. Nuclear criticality criteria are satisfied with any placement arrangement of loaded hoppers at the north end of Building 254 (see Section 8.3.4.3).

During milling, a hopper is lifted above the virgin oxide unload hood, the UO_2 granules flow by gravity through a vibrator feeder to the mill (micronizer) and the milled powder is pneumatically transferred by negative pressure to the blender. Scrap recycle material may also be introduced at the mill. Scrap recycle hoppers containing recycle UO_2 are stored in the bulk recycle storage room of Building 253. They are wheeled to Building 254, lifted above a recycle unload hood and unloaded through a vibratory feeder to the mill.

There are two parallel pellet lines in Building 254. Each has one virgin oxide unload hood, one recycle unload hood, one mill and three blenders.

8.3.2 Building 254 Blending

The blenders are 48 inches in diameter and hold up to 3000 kg of UO_2 powder. The blending operation involves no hydrogeneous materials. Scrap recycle is measured for moisture before the recycle hoppers are filled in Building 253. Moisture in scrap recycle is limited to a maximum 1.0 w/o. The plant air employed for blending is continuously monitored for humidity and an increase in moisture will cause an alarm and subsequent cessation of the blending operation. The blenders are nuclearly safe with any arrangement of loaded storage hoppers and adjacent blender loading, based on analyses assuming moderation control. (See Section 8.3.4.3.)

8.3.3 Building 254 Agglomeration, Granulation and Pressing

Blended UO_2 powder is pneumatically transferred by negative pressure from the blender up to a receiver from which it drops through a series of process steps ending at the pellet press. The steps may provide addition of poreformer, addition of lubricant, addition of press fines, mixing, agglomeration by chemical additions or by dry powder slugging and granulation. The granulated powder flows freely for the final pellet pressing operation. Each pellet line in Building 254 includes these powder preparation steps.

Granulated powder flows by gravity to the multiple die rotary press. There are two presses in Building 254, one for each pellet line. Green pellets from the press are randomly loaded into boats for the furnaces. Safety analyses of the boat configuration are provided in Section II.8.2.6.

8.3.4 Nuclear Safety Evaluation for In-Process Storage, Milling and Pellet Fabrication

The UO_2 granules processed in Building 254 are stored during processing in bulk storage hoppers that are filled in the Oxide Building, transported through the north corridor of Building 255 and stored in the vicinity of the blenders in Building 254. The safety evaluation addresses three stages of the process: 1) filling, 2) transporting, and 3) storage. Storage evaluation is combined with the overall analysis of the front-end of the pelletizing line, i.e., milling through pressing.

8.3.4.1 Filling of Bulk Storage Hoppers

The bulk storage hoppers are wheeled into the oxide conversion room one at a time on the transporter, filled from blender No. 4, and wheeled to Building 254. The filling process is analyzed by a KENO analysis of the oxide room. In this mode of operation of the oxide room, the three reactors and UO_2 cooler are functional; a piping change at the outlet of the UO_2 cooler is made to bypass the two silos, which are empty, and to feed blender No. 4; the remaining three blenders are empty.

The following conservative assumptions are used in the calculational model of the UF_6 to UO_2 conversion equipment analysis:

a) Reactors R-1 and R-2 are assumed to be filled in the 10" portion (i.e., no overfill) with dry UO_2 at 2.5 g/cc density of powder and 5.0 w/o U^{235}. All structures consisting of .375" steel wall, 7.75" of 37.5 lbs/ft^3 firebrick insulation and 0.25" steel casing are included in the model. The reactor details are shown in Figures II.9-1 and II.9-2.

b) The R-3 reactor is assumed to be filled in both the 10" and 12" portions (i.e., overfilled) with wet UO_2 at 2.5 g/cc powder density and 5.0 w/o U^{235}. The UO_2 - water mixture is equivalent to a UO_2 volume fraction of 0.23 and a water volume fraction of 0.77. All structures consisting of .375" steel wall, 7.75" firebrick insulation and .25" steel casing are included in the model.

c) The cooler is assumed to contain UO_2 with the same volume fractions of UO_2 and water, and is surrounded by 1/2" of water. The steel structure is not modelled.

d) The silos are assumed to be empty. The .125" steel walls are modelled.

e) UO_2 blenders Nos. 1, 2 and 3 are empty and No. 4 contains UO_2 with 5.0 w/o water. The .125" steel walls are modelled.

f) The UF_6 scrubber is assumed to contain dry UO_2 with no external structures modelled.

g) The R-1 hopper is assumed to be filled with dry UO_2 and surrounded by 1" of water. Steel structures are not modelled.

h) An external mist of 0.001 g/cc is assumed.

i) A bulk storage hopper containing 1000 Kg of 5 w/o UO_2 with 1 w/o H_2O is modelled below blender No. 4.

The KENO-IV code with Hansen-Roach cross-sections is used to determine the criticality of the system. With the above conservative assumptions, the K_{eff} is 0.9744 $\pm$0.0032.

8.3.4.2 Transporting of the Loaded Bulk Storage Hopper Through Building 255.

The east-west corridor between the north wall of building 255 and the virgin powder can storage conveyors is 110 inches wide. Eight and one half feet above the corridor floor on a one-quarter inch thick steel mezzanine floor are the storage rings for positioning the sealed agglomerated feed buckets on 24 inch centers. The number of storage positions is 48. To assess the criticality safety of the combined arrays of: (1)

conveyors loaded with virgin powder cans, (2) 48 agglomerated press feed buckets, and (3) bulk storage hoppers stored and/or in transit through the north corridor, a KENO-IV calculation with Hansen-Roach cross sections is employed with the following assumptions.

a. The overall array is represented by a semi-infinite array of 24 inch square unit cells having an agglomerated press feed bucket at the mezzanine floor level, a modified bulk storage hopper on the main floor, 12 inch thick concrete floor, and a 12 inch thick water region at ceiling height (18 feet).
b. The agglomerated press feed bucket (11 inch diameter by 13 inch height) is centered in the unit cell on the mezzanine floor and contains 41 kg of UO_2 with 5 w/o U-235 and 5 w/o water.
c. The modified bulk storage hopper simulates the axial distribution of UO_2 in the real hopper by employing tapered and non-tapered regions positioned at appropriate heights above the concrete floor. The UO_2 contains 5 w/o U-235 and 1 w/o water.
d. No structural materials are represented in this model; the only materials present are water, UO_2, and concrete.
e. The virgin powder array containing 5 w/o U-235 and 0.05 w/o water is replaced in this analysis by the "slab" of modified bulk storage hoppers which contain more UO_2 and UO_2 of a higher k_∞ per unit floor area.

The KENO-IV multiplication factor is 0.884 $\pm$0.004. Based on this analysis, it is concluded that no criticality problem exists in the north corridor of Building 255 during transport of a loaded bulk storage hopper through the corridor to building 255 even if the corridor is filled with loaded bulk storage hoppers.

8.3.4.3 Bulk Storage Hoppers and Front-End of Pelletizing Line

To assess the criticality safety of the front-end of the pelletizing line in combination with filled bulk storage hoppers located on the ground floor of the north end of Building 254 between the southern edge of the second floor and the north wall, KENO analyses are carried out using Hansen-Roach cross sections. Fixed equipment, i.e., hopper unloaders, micronizer, blenders and the vertical stacks of UO_2 process equipment from the vacuum receivers on the third floor down to the rotary presses on the ground floor are represented in a conservative manner in KENO as are the filled bulk storage hoppers. These analyses are supplemented by other KENO calculations for various arrays of filled bulk storage hoppers. The multiplication factors are well below 0.95 for the set of conservative nominal conditions and are acceptable for more adverse conditions.

A summary of the assumptions employed in the KENO model follows.

a) Drawings D-5018-2001 (sheets 1 through 5) are used for dimensions of Building 254 and the locations of the fixed equipment at the front-end of the pelletizing lines. Drawings D-5018-8005 and D-5018-8011 are used to model the bulk storage hopper and the blenders, respectively. See Figures II.8.3-2 and II.8.3-3.

b) The elements employed are UO_2, water, concrete, poreformer, and lubricant; no credit is taken for scattering or parasitic absorptions by structural materials in the building or equipment.

c) The floor, north, west and east walls of Building 254 are taken to be 12 inches of ordinary concrete; the ceiling (35.5 feet) and heat wall are represented as 12 inches of full density water.

d) Fifty-four filled (29.375" I.D.) bulk storage hoppers (four are on the unloaders) and six (47.25" I.D.) blenders are arranged as illustrated in Figure 8.3-1; bulk storage hoppers are used instead of the recycle hoppers on the recycle hopper unloaders. The two filled pneumatic transport lines are conservatively represented as a 15 inch cylinder extending from floor to ceiling at the micronizer location. The vertical array of equipment from the vacuum receiver on the third floor down to the rotary press on the ground floor is also represented as a right cylinder of 15 inch diameter extending from floor to ceiling at the rotary press location.

e) All UO_2 regions contain UO_2 having a density of 3.5 g/cc, an enrichment of 5 w/o U-235 and 1 w/o water. In addition, two and one half times the maximum amount of poreformer and lubricant are present in the UO_2 cylinder representing the vertical pelletizing array. Each bulk storage hopper contains 1000 Kg UO_2 and each blender is assumed to contain 4200 Kg UO_2.

f) A significant fraction of the bulk storage hoppers are clustered closer to the blenders than practical from an orderly access point of view so as to maximize the interaction between hoppers and blenders.

The multiplication factor for the above set of conservative nominal conditions was 0.542 ±0.003.

KENO calculations are carried out for infinite and finite arrays of bulk storage hoppers to examine possible limitations on storage configurations. The following assumptions are employed in the KENO models.

a) Figure 8.3-2 shows the KENO model for an individual hopper. No structural materials are included.

b) Hoppers are spaced on 30 inch centers.

c) Each hopper is assumed to contain 1000 Kg UO_2. The UO_2 is taken to be of 3.5 g/cc density, 5.0 w/o U-235, and 1 w/o water.

d) The model employs a one foot thick ordinary concrete floor and a 12 inch water region at ceiling height (35.5 feet).

Results of the KENO calculations are as follows.

a) An infinite planar array - k = 0.833 ±0.004

b) An infinite planar array with hoppers overfilled to 1378 Kg UO_2 - k = 0.867 ±0.004

c) A 7 x 7 array of bulk storage hoppers at 1000 Kg / hopper - k = 0.686 ±0.004

d) Isolated hopper surrounded by a one foot radial water reflector - k = 0.571 ±0.003

Based on these analyses, it is concluded that an overfill condition, should it occur, has only a small effect on the multiplication factor in a large array of hoppers on 30 inch centers. It is also concluded that a realistic size array of filled bulk storage hoppers loaded with UO_2 of 5 w/o enrichment and 1 w/o water is highly subcritical when the hoppers are in physical contact within the array.

8.3.5 Building 254 Dewaxing and Sintering

The boats of randomly loaded pellets pass through two furnace steps; dewaxing to burn off additives and sintering. A controlled atmosphere is maintained in the furnaces. The boats meet the requirements of I.4.2.4 for slab limits.

8.3.6 Building 254 Grinding

The wet grinding process, grinder sludge control and criticality control are similar to that described for Building 255 in Section 8.2.8. Finished pellet inspection may include an alternate optical measurement of pellet dimensions.

8.3.7 Building 254 Packaging

Pellets are arranged onto corrugated trays that are stacked in a lifting cradle. The cradle is weighed and then lowered into a shipping container through a transfer port that separates Building 254 from the clean warehouse Building 256. The pellets are packaged in licensed shipping containers in accordance with the applicable certificate of compliance.

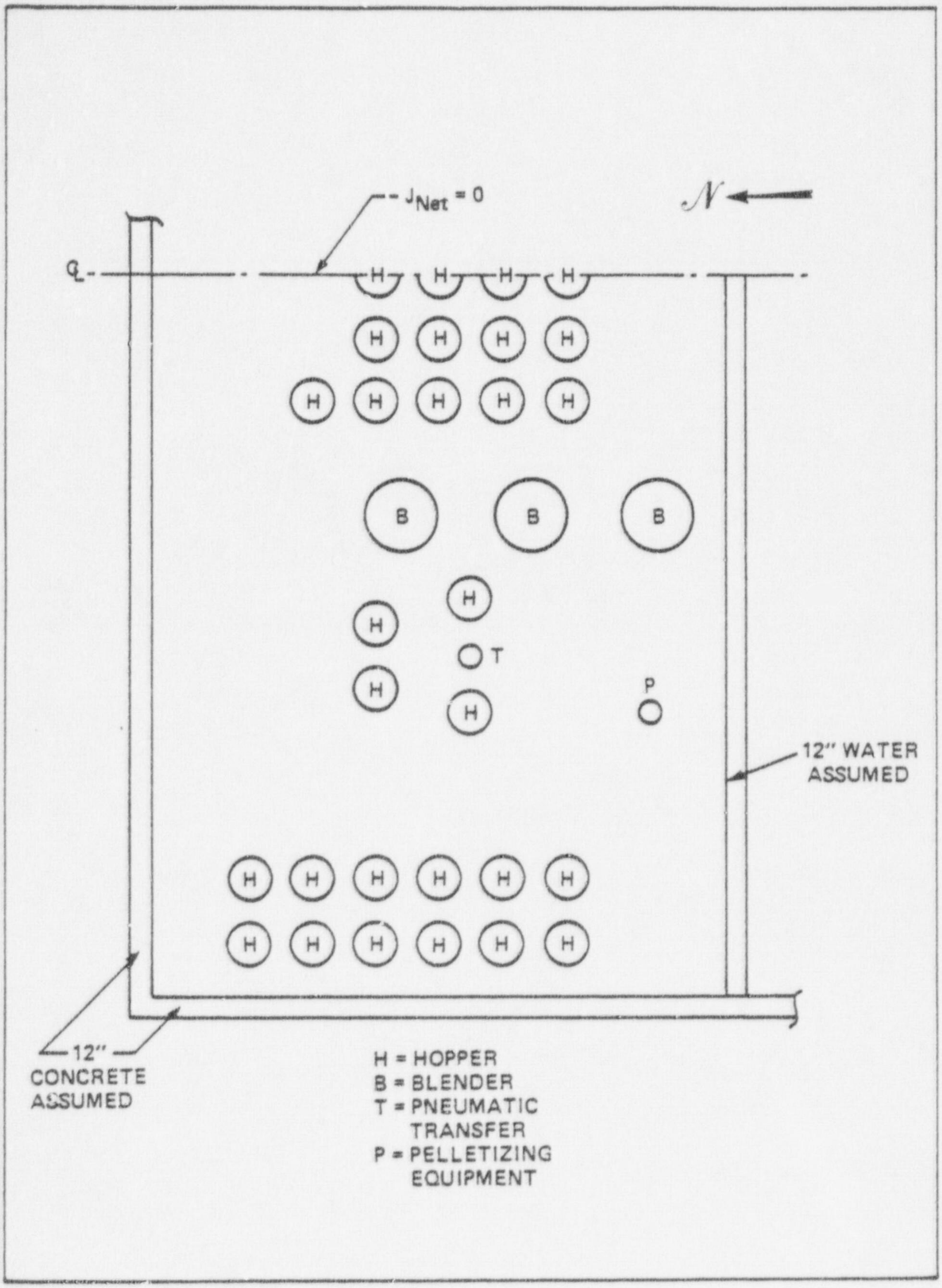


Figure II.8.3-1 KENO Model for Front-End of Pellet Line (Northwest Corner of Building 254)

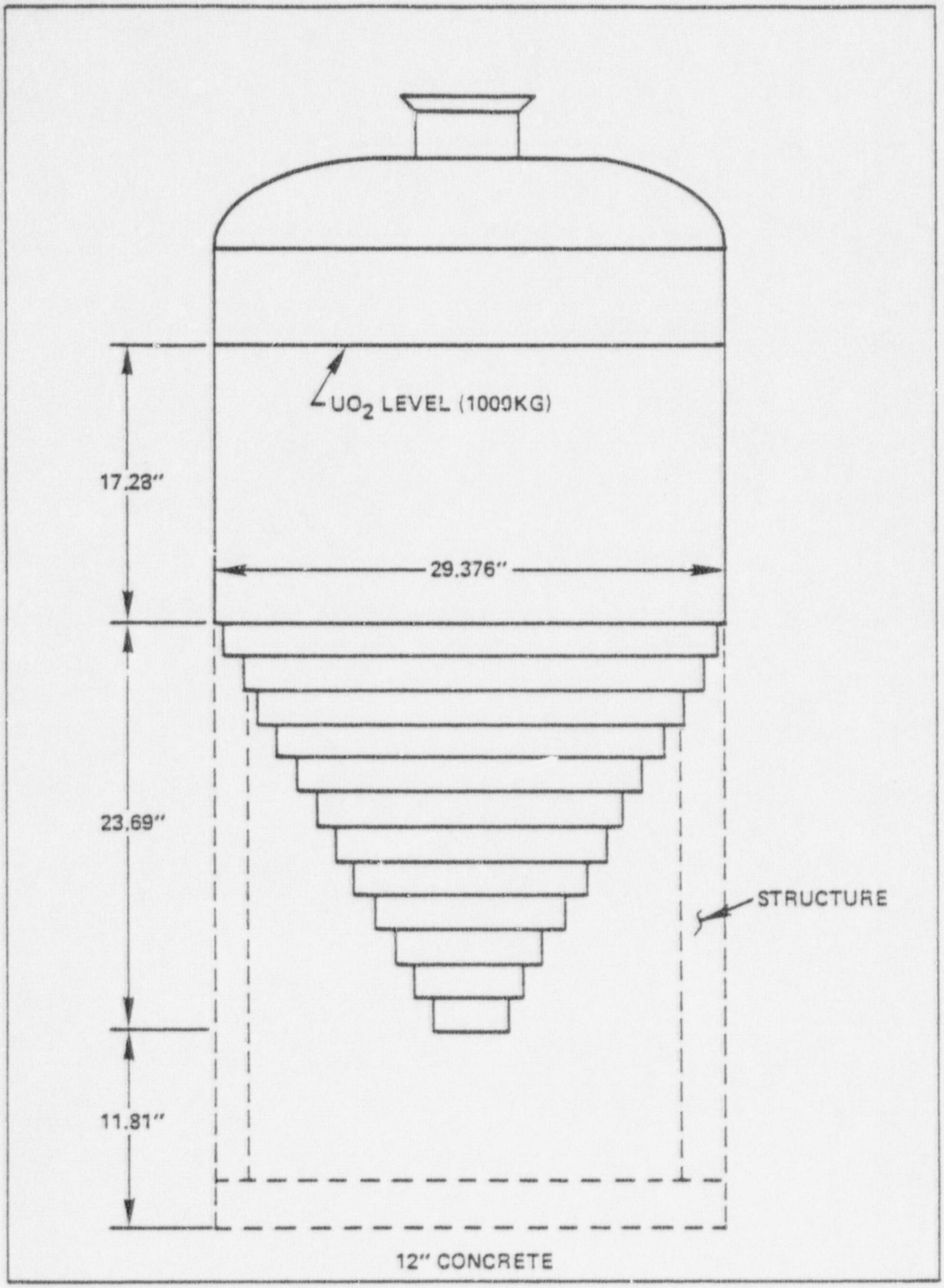


Figure II.8.3-2 KENO Model for Bulk Storage Hopper

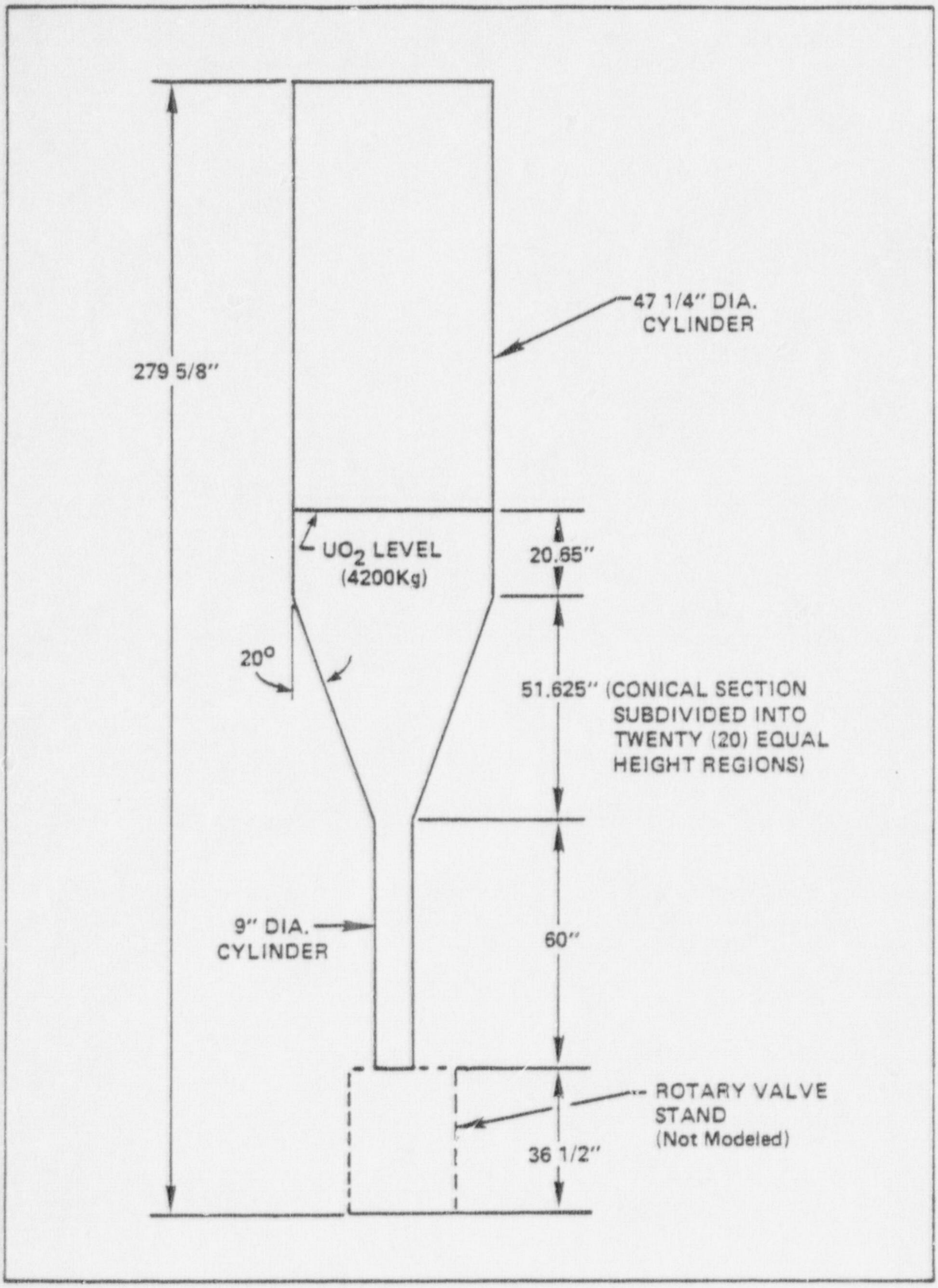


Figure II.8.3-3 KENO Model for Oxide Blender

8.4 Support Operations for Oxide Conversion

8.4.1 Filter Clean Out Hood

This is an Oxide Building hood used to clean process filters. A filter housing is attached to the top of the hood. The assembly (less than 12 inches in diameter) is lowered into the hood and material falls to the bottom where it is collected in a 5-gallon receiver attached to the bottom. This hood is located on at least 4 foot centers from other SNM bearing equipment.

8.4.2 Trench and Sump

A trench and sump are provided for Oxide Building floor cleanup operations. It is located N-S along the center of the building. The trench is 6 inches X 6 inches X 18 feet wide with a 9 inch diameter X 1.5 foot deep sump located in the center. Clean-up water is pumped out of the sump and trench to 5-gallon pails for disposition determination. There will be no more than two containers of sump water in the area stored a minimum of one foot apart. Because of the low uranium concentrations, a mass SIU is conservatively utilized.

8.4.3 Vacuum Sweepers

Vacuum sweepers used for equipment cleanup are provided for at each Oxide Building level. They will be five (5) gallons or less in capacity, and have an absolute filter on the discharge. No more than two vacuum sweepers will be in use on a level at any one time. Each is effectively one mass SIU.

8.4.4 Weigh and Sample Hood

Two such hoods exist; one each on the ground and third levels of the Oxide Building.

These hoods will be normally used to work with samples. These samples will be in 1 gallon or smaller containers. When necessary, two containers not exceeding 5-gallons in capacity may be in this hood and will be separated by one foot edge-to-edge. However, all other SNM bearing containers will be removed when working with 5-gallon pails.

8.5 Recycle Operations

All clean scrap is accumulated for reprocessing and recycle with the feed material. Clean scrap containing erbia is also recycled. Scrap may be milled to yield desired particle size best suited for reprocessing, oxidized and reduced to assure removal of volatile additives and to achieve the desired ceramic properties of the resulting recycle UO_2, and blended to assure uniformity. Generally, clean scrap from the pellet lines in Building 254 is processed within Building 254 and added to the current production run or stored in pails in Building 253. Clean scrap from other buildings is processed in Building 240 (Section 8.8). The following equipment is included in these operations:

a. Oxidation and reduction and pyrohydrolysis furnaces.
b. Milling equipment
c. Boildown equipment
d. General purpose hoods
e. Filter knockdown hoods
f. Storage facilities

Furnace operation for Building 240 is described in Section II.8.8.2. The scrap recycle furnace operation in Building 254 employs a continuous furnace process instead of the batch process. All operations carried out in hoods have sufficient ventilation to assure a face velocity of 100 fpm. These operations are controlled by use of mass or volume limits in accordance with Table I.4.2.4. Positive spacing fixtures are used to assure spacing whenever more than one SIU is allowed in any given hood or furnace reactor box.

8.6 UF_6 Heel Removal

The 2-1/2 ton cylinders are cold-trapped into an 8A cylinder to reduce the UF_6 heel prior to their return to the enrichment facility for refilling.

8.6.1 UF_6 Cylinder Washing

Prior to their 5-year recertification, 2-1/2 ton cylinders may be washed to remove the UF_6 heel. This will only be performed when the uranium content of the heel does not exceed 12 kilograms of uranium. Such determination will be made by weight difference on the empty cylinder. This quantity of uranium is one-half the safe mass limit as shown in Table I.4.2.4.

Cylinders are washed by introducing 4 gallons of water, rolling on the cylinder roller, and pumping the resulting solution into a 5-gallon pail. This pail is transferred to approved storage. The above steps are repeated until the heel is removed. The following specific procedures apply:

a) No cylinder containing a heel greater than 12 kilograms of uranium will be released for washing, as determined by weighing on the calibrated UF_6 cylinder scales.

b) The cylinders will be washed successively with four gallons of water until the uranium concentration in the wash solution is <5 gm U/ℓ. Each batch will be returned to its container until sampled. Washing will cease if water cannot be removed.

c) The wash water will be sampled and on this basis wash water from only two cylinders consolidated into a precipitation tank and diluted. Each run will thus be limited to a safe mass based on the sample results.

8.6.1 UF_6 Cylinder Washing (continued)

d) The uranium in the wash solution will be precipitated by the addition of Anhydrous Ammonia.

The precipitate will be filtered on a 12" X 12" filter press.

e) Filtrate will be concentrated by evaporation, sampled and alpha and beta counted. It will then be solidified by adding cement and packaged for shipment to licensed burial.

8.7 Analytical Services

Analytical services are provided in several laboratory areas. SNM of any enrichment may be handled in these areas.

The laboratories are divided into sections consistent with the testing techniques employed. There are a general lab area, physical testing areas, office areas and storage.

The material handled includes feed material samples, process control samples, final product samples, and residue samples. Such samples may be liquid or solid.

Analyses are performed using destructive and non-destructive techniques. Unused sample portions are returned to the process streams. Analytical residues are collected, analyzed, and removed from the area for solidification for shipment to a licensed burial site or stored for recovery.

a. General Laboratory

Wet and dry analytical methods are used. The quantity of SNM in this area will be limited to 740 grams of U-235. However, for enrichments in excess of 5.0%, a limit of 350 gm U-235 applies.

8.8 Scrap Recovery

8.8.1 System Description

The Scrap Recovery Process is designed for wet recovery and blending of scrap materials containing uranium having a maximum enrichment of 5.0%. Clean dry scrap recycle (Section II.8.5) and UF_6 cylinder wash precipitation (Section II.8.6.1d) operations are also conducted in the Recycle/Recovery Area (240-2). Except as specified, all units of equipment conform to the limits specified for safe mass, volume or cylinder diameter, and are spaced to conform with spacing requirements for SIUs. The uranium bearing units and their associated spacings are shown on Drawing D-f5009-2012, Rev. 5, and the equipment layout is shown on Drawing D-5009-2010, Rev. 4. Material flow diagrams are shown on the following Drawings:

D-5009-1011 Rev. 2 240-2 R/R Equipment Flow Diagram
D-5009-1007 Rev. 1 240-2 R/R Process Flow
B-5009-1008 Rev. 2 240-2 R/R Wet Recovery System
B-5009-1009 Rev. 1 240-2 R/R UF_6 Cylinder Wash

8.8.2 Oxidation and Reduction

Wet recovery operations will be performed on all types of scrap materials such as contaminated uranium compounds, clean-up residues and combustible materials with recoverable uranium content. Most of these materials require oxidation and reduction prior to introduction into the Wet Recovery System, and are loaded into furnace trays in the muffle box hood. This hood is operated on a mass limit depending on whether it is a heterogeneous or homogeneous material being processed.

8.8.2 Oxidation and Reduction (continued)

Additional nuclear safety provisions for assuring that the mass limits are not exceeded are:

a. Material to be processed is weighed on the scrap recycle scales. These scales are included in the Accountability Measurement Control Program and receive frequent checks for accuracy.

b. The total batch weight of raw scrap is assumed to be pure UO_2 in determining the safe batch weight.

c. Each container transferred to 240-2 for processing has a tag showing the enrichment, physical description, and the container gross, tare and net weights.

d. The identity and weight is checked by the operator prior to loading into the furnace trays. Any discrepancy noted must be resolved before loading into the trays.

e. Safe batch limits for material with unverified enrichment will be based on the highest enrichment in process or in storage for recovery.

As the trays are filled, they are placed into a muffle box, with six trays loaded into the front, and six into the rear of the box. Each group of six trays comprises one mass limit. A physical barrier in the center of the box assures the required separation. Sealed boxes are furnaced and then cooled.

8.8.2 Oxidation and Reduction (continued)

Cooled boxes are unloaded in the muffle box hood, and the material processed through such steps as granulation, magnetic separation, sampling weighing, and blending, as appropriate. Each of these operations is performed under a safe mass limit.

Material thus prepared is now ready for introduction into the first step of the Wet Recovery System.

8.8.3 Dissolution

A preweighed charge of homogeneous material is introduced into a 9 3/4" diameter x 16" long vessel which is located in the slurry feed hood. This hood is limited to one safe mass. The material is slurried with water and transferred to a dissolver. The dissolver is 9 3/4" diameter x 21" long. With the addition of nitric acid, the uranium is dissolved into a solution having a concentration of 50 to 250 grams per liter. Concentrations of uranium in the 300 gram/liter range and higher form slurries which cannot be pumped by the centrifugal transfer pump.

The critical diameter for a fully reflected infinitely long cylinder containing 5.0 wt % U-235 at optimum internal moderation is 10.4 inches. The critical diameter for an unreflected infinite cylinder is 13.7 inches. Therefore, a 9.75 inch diameter cylinder even at optimum internal moderation is a safe cylinder. The criticality safety is assured by item "j" in Section 4.2.3, Part I.

Non-homogeneous material (e.g., pellets) will not be introduced into the dissolution step.

8.8.3 Dissolution (continued)

Both the slurry and dissolver vessels have assigned spacing areas greater than 5 ft^2 per ft. of length.

8.8.4 Filtration, Storage, and Dilution

After allowing digestion time to insure complete uranium dissolution, the $UO_2(NO_3)_2$ solution may still contain acid insolubles and is pumped through a filter press to remove these solids. The filter press is 6" x 8" x 8-1/2" and has an active volume of less than the allowable safe volume for non-homogeneous material.

After filtration, the solution is pumped into two safe diameter (6" diameter by 5' long) Pyrex clarity check vessels. If any evidence of suspended solids remaining in the solution is observed, it will be recirculated through the filter until a clear solution is obtained prior to release to the holding tank. The holding tank has a maximum capacity of 1285 gallons, and is also used for dilution and blending.

The holding tank is poisoned with Raschig rings in accordance with ANSI Standard N16.4-1979. Two Raschig ring sample tubes are provided to enable inspection for accumulation of solids and to provide samples for testing the physical and chemical properties of the rings. These inspections and tests will be conducted in accordance with the ANSI Standard.

8.8.4 Filtration, Storage, and Dilution (continued)

The acid insoluble filter and the clarity check vessels are assigned exclusion areas conforming with surface density spacing requirements. These exclusion areas are shown on Dwg D-5009-2012, Rev. 5. There are no sumps nor floor drains in the 240-2 area to which process material could flow from leaks or rupture of the equipment.

8.8.5 UO_4 Precipitation

Diluted $UO_2(NO_3)_2$ solution is transferred to a horizontal trough precipitator (8 3/8" x 12 5/8" x 10' long). An overflow is located at a height of 9 inches. Any overflow from this trough is collected in a (9 3/4" diameter x 39" long) unreflected overflow vessel. Criticality safety is assured by limiting reflector (see item "j" section 4.2.3).

The critical diameter for a fully reflected cylinder containing 5.0% wt % U-235 at optimum moderation is 10.4 inches. The critical diameter for an unreflected cylinder is 13.7 inches. The trough precipitator is essentially unreflected. Further, the leakage for a rectangular tank is greater than for an equivalent cross section area cylinder. The rectangular tank is equivalent to a 9.39 inch cylinder when corrected for leakage. Applying the 1.1 safety factor to the 10.4 inch fully reflected critical diameter cylinder of 10.4 inches results in 9.45 inch safe cylinder which is larger than the 9.39 inch equivalent cylinder representation of the trough precipitator.

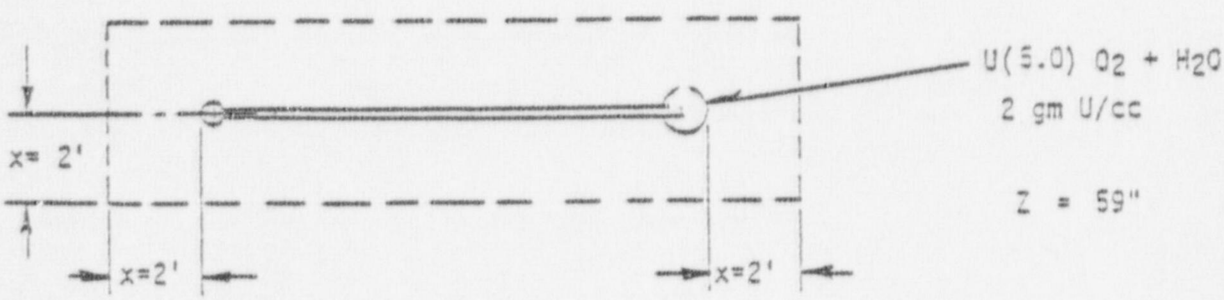
The pH of the solution is adjusted with ammonium hydroxide from the ammonium hydroxide makeup system. This system consists of a sealed tank with a vent to the atmosphere. Additional makeup solutions are introduced from tank 4-2 to precipitate the uranium as UO_4. After aging and the final pH adjustment is completed, the UO_4 slurry is discharged to a 9 3/4" diameter x 33" long centrifuge feed vessel.

8.8.6 UO_4 Separation

The precipitated slurry is transferred from the centrifuge feed vessel into a centrifuge which has a maximum volume of 7.63 liters. The cake is discharged, by gravity, from the centrifuge into a steam heated screw conveyor dryer.

The dryer has a total cross sectional area of 75.17 in^2 (this includes the internal screw conveyor) The actual net internal volume available for uranium is 107.62 liters, based on the manufacturer's design data, and allowing for the volume displaced by the internal screw mechanism. The centrifuge is located in line with the dryer, and has an internal volume of 7.63 liters.

The UO_4 centrifuge-dryer-pail complex, as sketched below, has been evaluated in a 1000 x 1000 array to establish safe spacing requirements. The evaluation was made using KENO with Hansen-Roach cross sections. The geometrical model used in the KENO calculations is shown in Figure II.8-2.



Reflector assumptions used were a 16" thick concrete slab below and a 4: thick concrete slab above the complex.

8.8.6 UO_4 Separation (continued)

The KENO calculation gave k_{eff}=0.8966 ± .0099 at an optimum UO_2 density of 2.0 gm/cc.

The following conservative assumptions were incorporated in the calculation:

1. The powder was assumed to be UO_2 at 5.0 wt % U^{235} instead of the actual UO_4. The powder density was assumed to be 2.0 g/cc. The UO_2 was assumed to be optimally moderated.
2. All steel structural materials were neglected. The dryer driving screw was replaced by full density water.
3. The system was assumed to be fully reflected by water.
4. The net internal volume of the Holo-Flite processor was 107.62 liters. The UO_2 was assumed distributed uniformly around the dryer driving screw, which was modelled as a central cylinder occupying the remaining volume.

Accordingly, a minimum spacing of x - 2.0' will be provided for the centrifuge-dryer pail combination unit, given a total exclusion area of 72 ft^2 for this unit. This spacing is more than adequate, as the KENO model used was conservative. After drying, the UO_4 is transferred to safe volume containers in the dryer discharge hood. This hood is limited to one such container. These containers are moved to approved storage spaces to await additional processing. Centrifuge supernate is discharged to a 9 3/4" diameter x 39" long overflow and filter recycle unreflected vessel (see item "j" section 4.2.3). It is then pumped through a filter press for further clarification.

This filter press is limited to a safe volume and is assigned exclusion area spacing of greater than 9 ft^2. Solids from this press are treated in the same manner as solids from the centrifuge.

8.8.6 UO_4 Separation (continued)

The filtrate is pumped through the UO_4 polish filter for additional clarification before being pumped into one of two filtrate hold tanks. These 580 gallon hold tanks are filled with Raschig Rings in accordance with ANSI Standard N16.4-1979. These tanks are similar to the one described in Section 8.8.4 Inspections and tests previously described in Section 8.8.4 are also performed on these tanks and their Raschig Rings.

The filtrate is mixed prior to sampling for uranium concentration and transfer to the filtrate treatment and furnace scrubber hold tank. The filtrate is mixed, neutralized and sampled for uranium concentration before discharge to the evaporation tanks.

The alternate method of UO_4 separation will be utilization of the UO_4 filter press as the primary filter and the UO_4 polish filter for the final filtration.

8.8.7 Filtrate Treatment

In the event of filtrates containing recoverable quantities of uranium, the filtrate is pumped back into the UO_4 precipitator and the uranium is precipitated with ammonium hydroxide from the NH_4OH makeup. The impure ADU slurry is pumped into the centrifuge or the filter press for separation.

8.8.8 Miscellaneous Operations

Several hoods and locations are provided for analytical, utility, and blending operations. All operations are mass limited, and any hoods with multiple mass limits are provided with physical spacers to assure adequate spacings. Mass limited storage locations are also provided throughout the area.

8.6.9 Utility and Support

Several utility or support tanks or vessels are located in the 240-2 R/R process area. These tanks or vessels are:

1) Raw water feed
2) 45% KOH feed
3) D.I. water storage
4) H_2O_2 and NH_4OH make up
5) NH_4OH make up
6) Nitric acid bulk storage

All of these vessels will be totally enclosed with a vent if required. Accidental introduction of uranium into these tanks and vessels is not considered credible.

8.8.10 Furnace Scrubbers

The gaseous emission from the muffle boxes in furnaces are passed through packed bed scrubbers with a counter-current flow of KOH solution. KOH is utilized to neutralize hydrofluoric acid in the offgases. The scrubber solution is sampled on a routine basis and analyzed for uranium to assure that the uranium concentration does not exceed 1 gm U/liter. The pH of the scrubber solution is monitored to

8.8.10 Furnace Scrubber (continued)

assure that an excess of KOH is present. Spent scrubber solution is pumped out of the scrubbers into the filtrate treatment and furnace scrubber hold tank. The scrubbers are then replenished with KOH solution to maintain a constant liquid level. The scrubbers are inspected annually for accumulation of solids. No accumulation has been observed.

Analyses of the scrubber solution for uranium content have averaged 0.03 to 0.04 gm U/liter, with a maximum value of 0.7 gm U/liter.

Thus, the nuclear safety of the furnace scrubbers and hold tank system is based on the following factors:

1) No physical mechanisms exist that would allow significant quantities of uranium to concentrate in the furnace scrubber solution.

2) Furnaces are operated on a safe batch limit (see Section II. 8.8.2). Residence time per furnace load is 14 to 24 hours. Any increase in uranium concentration in the scrubber solution would thus occur very slowly.

3) Frequent replacement of scrubber liquor precludes concentrations exceeding 1 gm U/liter from being reached in the scrubber solution.

4) Scrubber liquor is sampled weekly. The scrubber will be drained and flushed if a sample exceeds 1.0 gm U/liter.

8.8.11 UO_4 Dryer Scrubber

Gaseous emissions from the UO_4 dryer are scrubbed in the UO_4 dryer scrubber. The gases are passed through a 9-3/4" diameter spray tower to reduce the uranium emission to an acceptable release level. Water is used as the scrubbing liquid. The recirculating liquid is continuously filtered and then is pumped into one of two 9-3/4" diameter UO_4 dryer scrubber hold tanks. It is analyzed for uranium concentration prior to being pumped to the filtrate treatment and furnace scrubber hold tank.

8.8.12 NO_x Scrubber

Oxides of nitrogen released from the dissolution vessels are absorbed in the NO_x scrubber. The 9-3/4" diameter NO_x scrubber is a packed tower with a countercurrent flow of recirculating water as the absorption liquid. The scrubber was designed to operate for maximum absorption efficiency. Compression of the gases is performed by a water sealed compressor. The scrubber liquid is used as feed in the D.I. water/dilute nitric acid feed vessel.

8.8.13 Exclusion Areas

Vessels and other items of equipment requiring exclusion areas have the limits of these areas clearly marked on the floor. SIUs in transit are not permitted to enter an exclusion area. This rule is covered in operator training and operating procedures.

8.9 <u>Waste Incineration</u>

The incinerator/scrubber system is used to reduce the volume of low level uranium contaminated waste with a maximum enrichment of 5.0% U-235. The system consists of a gas-fired incinerator, an air-cooled heat exchanger, an ejector-venturi scrubber and a packed tower scrubber. The engineering flow diagram is shown in Drawing D-5009-1020. The system is located in area 240-3. The equipment layout is shown in Drawing D-5009-2015.

Low level wastes are dispositioned for incineration after gamma counting. The wastes are logged in on the Incinerator/Scrubber Continuous Inventory Sheet and then subdivided into incinerator charges in the filter cut-up hood. Individual charges are packaged in plastic or paper bags.

The typical incinerator charge contains about 10 kilograms of combustible waste and only a few grams of U-235. The small size of the incinerator makes it necessary to vacuum out the ash long before the safe mass is reached. Operating procedures require removal of the ash when it reaches a depth of 3 to 4 inches (less than a safe slab configuration). No significant ash accumulation has been observed in the secondary combustion chamber. Operating procedures, however, require inspection of the secondary chamber each time the ash is removed from the primary chamber. The probability of moderation by water flooding is essentially zero.

8.9 <u>Waste Incineration</u> (continued)

The above considerations, including basing the mass limit on the highest licensed enrichment, negate the effect of any charge measurement or enrichment uncertainty.

Prior to introduction of the charge into the incinerator, the ejector-venturi scrubber recycle tank and the packed tower scrubber are filled to the operating level with D.I. water and recycle circulation in each system is initiated.

Cooling air for the heat exchanger is started to cool the flue gas prior to scrubbing. Uncontaminated cooling air is discharged to the atmosphere in warm weather and to the 240-3 area during cold weather.

The incinerator is preheated and the charge introduced into the primary combustion chamber.

As the charge is incinerated, flue gases are cooled by the heat exchanger and then enter the ejector-venturi scrubber. Recycle water in this scrubber removes the majority of the fly ash.

Scrubbed gases are then passed through a packed tower scrubber to remove any residual particulates before the effluent gases are discharged into the 240-2 wet recovery ventilation stack after the HEPA filter. This stack is continuously sampled.

8.9 Waste Incineration (continued)

Charging of the incinerator is terminated when the inventory sheet shows that a total of 800 grams U^{235} (16 kg at 5.0 w/o U^{235}) has been introduced into the system, or when the ash nears a safe slab depth, as stated above.

Ash will be removed from the incinerator via the vacuum collection hood, analyzed for total uranium and dispositioned for burial or wet recovery.

The ejector-venturi scrubber recycle tank is drained after each safe mass charge is incinerated and therefore cannot exceed a safe mass for 5.0% enrichment.

T packed tower scrubber is very similar to the scrubber used with the furnaces in area 240-2. Thus, the same control procedures are used. The scrubber liquor is sampled weekly and analyzed for uranium concentration. The scrubber will be drained and flushed if the uranium concentration exceeds 1 gram per liter.

The heat exchanger, ejector-venturi separator box, and the packed tower scrubber are inspected at least annually for accumulation of uranium compounds.

No significant accumulation has been observed in over seven years of operation.

Pressure indicators are located before and after each stage of the system. Operating procedures require frequent checks of these indicators to assure that the entire system remains under negative pressure.

8.9 Waste Incineration (continued)

The gas firing system is provided with standard fire safety controls.

Both burners have thermocouple controlled valves which close in the event the flame goes out. The valves will not open if the pilot light is out. Gas supply is cut off automatically if there is an electric power failure.

There are no liquid discharges to the environs from the system. The used scrubber solution is evaporated to recover the solids content.

Nuclear Safety (continued)

d. Dry Blenders (Reference: NDEO-1137) (continued)

4) Water could be introduced through the plant air system. However, the following failures would be required:

Failure of the dryer
Failure of the alarm
Failure of water separator with the automatic blowdown. The automatic blowdown on the blender air receiver would have to fail. This applies only to the blend air system.

5) Water could be introduced through the roof mounted vacuum transfer system blower. This requires physical damage to the blower or accessories followed by forced introduction of water.

e. Agglomerators

This equipment is safe if optimally water moderated and unreflected. It is in a hood and is elevated off the floor, making flooding impossible.

f. Granulators

This equipment is safe if optimally water moderated and completely water reflected.

10.0 DRAWINGS

The following drawings are included by reference.

D-5007-2001	Sheets 1 through 4 and 6 through 8	Oxide Building Equipment Design
D-5007-2001	Sheet 9	Building 255 Equipment Layout
D-5008-2003	Agglomeration Station Plan and Elevation	
D-5020-2019	240-4 Equipment Layout	
D-5009-1007	Recycle/Recovery Process Flow	
B-5009-1008	240-2 Wet Recovery System	
B-5009-1009	UF_6 Cylinder Wash	
D-5009-1011	Recycle Recovery Equipment Flow Diagram	
D-5009-2012	240-2 Surface Density Exclusion Areas	
D-5009-2010	240-2 Equipment Layout	
D-5009-2015	240-3 Equipment Layout	
D-5009-1020	Incinerator/Scrubber Flow Diagram	
D-5020-2043	Hematite Plant Expansion	
D-5018-2001	Sheets 1 through 5, Pellet Plant (Building 254) Equipment Layout	
D-5018-8005	Bulk Storage Hopper	
D-5018-8011	Oxide Blender	
NFM-E-4627	Floor Layout for Hematite Shipping	

Docket No. 70-36
License No. SNM-33

ENCLOSURE III

COMBUSTION ENGINEERING, INC.

HEMATITE NUCLEAR FUEL MANUFACTURING FACILITY

REQUEST FOR LICENSE AMENDMENT

CHECK FOR APPLICATION FEE

May 1, 1989