Enclosure III to
LD-89-081

COMBUSTION ENGINEERING, INC.

WINDSOR FUEL MANUFACTURING FACILITY

LICENSE APPLICATION AMENDMENT CHANGE PAGES

DOCKET NO. 70-1100

LICENSE NO. SNM-1067

JULY 27, 1989

* 1.7 Exemptions and Special Authorizations

* 1.7.1 Transfer of SNM Between Buildings
* Transfers of special nuclear material between buildings at the
* Windsor facility (see Section 1.6) shall not require the issuance of applicable NRC transfer documents, but shall be transferred in accordance with the provisions of this license, and shall be handled as a departmental transfer and shall be controlled by the
* Fundamental Nuclear Material Control Plan (FNMCP) referenced in Section 9.0 of this application.
*
* 1.7.2 Release of Materials & Equipment for Unrestricted Use (does not
* include the abandonment of buildings)
* The release of equipment and material from the plant to offsite for
* unrestricted use or from contaminated to clean areas onsite shall be
* in accordance with "Guidelines for Decontamination of Facilities and
* Equipment Prior to Releases for Unrestricted Use or Termination of
* License for By-Product, Source, or Special Nuclear Material," USNRC,
* Annex B, August 1987. This information is provided in Section 3.3
* of Part I.

* 1.7.3 Leak Testing Sealed Source Containing Alpha Emitter
* Leak testing of all encapsulated sources containing an alpha
* emitter shall be conducted in accordance with the requirements
* set forth in Part I, of Section 3.4.

* 1.7.4 Criticality Monitoring Systems
* Buildings 1, 1A, 2, 2A, 3, 3A, 16 and 18 are exempt from the
* requirement for a criticality monitoring system as specified in
* 10CFR70.24(a). The above buildings are not required to have a
* criticality monitoring systems because the amount of uranium-235
* retained in these buildings is limited to <700 grams.

* Uranium-235 Processing and Fuel Fabrication". The alpha counting equipment is checked daily to verify background and efficiency.

*3.2.5 Internal Exposure

The room air in all areas where unclad licensed material is handled, processed, or where operations could result in worker exposure to the intake of quantities of uranium exceeding those
* specified in 10 CFR 20.103, shall be continuously sampled when ever
* work is performed in the area. Air sampling shall be accomplished
* using fixed position air sampling stations and/or lapel air samplers.
* Lapel air samplers shall be used by individuals who work with or
* handle unclad licensed material in powder form. For these workers,
* lapel air sample results will be used for the basic evaluation of
* the workers internal exposure. In lieu of lapel air samplers, the
* results from the fixed position breathing zone air samplers may be
* used for the basic evaluation of the internal exposure of
* individuals working with unclad licensed material in pellet form if
* the representativeness of the fixed position samplers has been
* validated. The average results from the fixed position air samplers
* shall be used for the basic evaluation of all other individuals in
* the area. All samples from lapel and fixed position air sampling
* shall be analyzed after each working shift.

* During the normal operating period, if a lapel air sampler or a
* fixed position air sampling station indicates the airborne
* concentration of radioactivity for that work area exceeds the MPC as
specified in Table I Column I of 10 CFR 20, Appendix B, an investigation as to the cause shall be conducted. Any necessary corrective actions to

* prevent recurrence shall be taken and documented. Fixed position
* air samplers shall have a minimum flow of 10 lpm. Lapel air
* samplers shall have a minimum flow of 1.4 lpm.

* The fixed position air sampling stations shall be
* strategically located throughout the shop and run continuously when
* ever work is being performed. Fixed position air sampling stations
* provide air samples which are representative of airborne
* contaminates in the working areas in order to evaluate workers
* internal exposure and to monitor the adequacy of ventilation in the
* area.

* The representativeness of the fixed position air sampling stations
* shall be evaluated at least once every 12 months after initial
* validation.

* Whenever an individual's seven (7) consecutive day assigned internal
* exposure exceeds 32 MPC hours they shall be closely monitored to
* preclude their exceeding 520 MPC hours in a calendar quarter.

* 3.3 Release of Materials and Equipment, US NRC Annex B (August 1987)

* The information in this section pertains to the decontamination of
* facilities and equipment prior to release for unrestricted use or
* termination of licenses for by-product, source or special nuclear
* material. The following information is a verbatim copy of USNRC
* Annex B dated August 1987.

* The instructions in this guide, in conjunction with Table 1, specify
* the radionuclides and radiation exposure rate limits which should be
* used in decontamination and survey of surfaces or premises and
* equipment prior to abandonment or release for unrestricted use. The
* limits in Table 1 do not apply to premises, equipment, or scrap
* containing induced radioactivity for which the radiological
* considerations pertinent to their use may be different. The release
* of such facilities or items from regulatory control is considered on
* a case-by-case basis.

* 1. The licensee shall make a reasonable effort to eliminate
* residual contamination.

* 2. Radioactivity on equipment or surfaces shall not be covered by
* paint, plating, or other covering material unless contamination
* levels, as determined by a survey and documented, are below the
* limits specified in Table 1 prior to the application of the

4.2.6 Interaction Criteria - Activities involving SNM may be conducted in single or two level areas of the facility. All SIU units shall have a separation of at least one foot, edge to edge.

Spacing for mass unit activities carried out in the single level portions of the facility shall be such that the contained UO2 and moderator if "smeared" over the allowed spacing areas would not exceed 50% of the critical water-reflected infinite slab surface density assuming optimum water moderation for minimum mass per unit area. Co-planar slabs specified in Table 4.2.5 require no additional spacing if on the same plane. Non-co-planar slabs must be separated by a 12-inch minimum horizontal spacing.

Portions of the facility contain two levels, each of which may be used for SNM. Mass limits on each level shall be spaced such that the contained UO2 and moderator, if "smeared" over the allowed spacing areas would not exceed 25% of the critical water-reflected infinite slab surface density assuming optimum water moderation for minimum mass per unit area.

4.3.1 All incoming UO2 powder shall be stored in 9.75" diameter x 11" long stainless steel cans. All powder shall be sampled before being placed in the virgin powder storage area to demonstrate on a 95/95 confidence level that the moisture content of powder lots is less
* than 5.0 wt.%. The center-to-center spacing of the virgin powder
* cans in the virgin powder storage area shall be no less than 21.75
* inches in the horizontal direction and no less than 22.5 inches in
* the vertical direction. In addition, all damaged packages where containment is breached shall be sampled. The area in and around the virgin powder storage area shall be kept free of combustibles.

4.3.2 The fire door on the virgin powder prep storage area shall close automatically on activation of the fire alarm or upon electrical power failure. The automatic closing feature of the door on the virgin powder storage area shall be verified quarterly and records of its performance shall be maintained.

4.3.3 A maximum of three 9.75" diameter x 11" long stainless steel powder containers and one 5 gallon powder container or two 9.75" diameter x 11" long stainless steel powder containers and two 5 gallon powder
* containers shall be allowed in the batch makeup hood.

4.3.4 The one 5-gallon pail being filled from the three other containers in the batch Make Up Hood shall be limited to 35 Kg UO2 and shall be sealed with a water tight cover prior to being stored on the conveyor.

4.3.5 The blender hoods shall be restricted to 35 Kg UO2 per hood. This does not include the UO_2 in the transfer tube which was assumed to be full of UO_2 in the analysis.

4.3.6 The wiper blade, powder plenum, and the drying belt at the Powder Preparation Station shall be inspected once per week to assure that the wiper blade is functioning properly and that no fuel is accumulating in the plenum below the belt. The depth of the powder on the drying belt is limited mechanically to 1/2" thickness. The drying belt shall be completely enclosed. The powder accumulation under the drying belt shall be less than 1/2".

* Records of these inspections shall be maintained.

4.3.7 In the Concrete Block Storage Area, A maximum of 35.0 Kgs UO2 may be contained in 5-gallon or smaller containers. Each storage position shall be limited to one container. A one foot exclusion zone shall be maintained in front of the Concrete Block Storage Area. *

4.3.8 UO2 pellet thickness on each of the Pellet Storage Shelves shall meet the slab limit specified in Table 4.2.5. The shelves shall be covered from above by a sheet metal top. A one foot exclusion zone shall be maintained in front of the Pellet Storage Shelves. * *

4.3.9 Storage of sintered pellets shall be limited to the slab limit specified in Table 4.2.5.

*4.3.10 Touching fuel rods in horizontal storage shall be close packed in a hexagonal lattice and shall meet the slab limit specified in Table 4.2.5.

4.3.11 A maximum of 32 fuel rods shall be allowed in each autoclave.

4.3.12 The boxes on the Double Shelf Rod Storage Racks shall be covered with a tight fitting aluminum cover which overlaps the outside edge of the box by a minimum of one inch. Fuel rods shall be close packed in a hexagonal lattice and shall meet the slab limit specified in Table 4.2.5 within the individual rod boxes. One box may remain uncovered for short periods of time to allow for the addition or removal of rods for inspection purposes provided that personnel are in attendance. Boxes shall be a minimum of 6 inches edge-to-edge both vertically and horizontally. The center-to-center distance between adjacent racks shall be at least 55 inches.

4.3.13 In the Rod Storage Area, fuel rods in each fuel rod storage box shall meet a slab height limit of six (6) inches. Since the Rod Storage Area is dry, the fuel rods may be stored in any array. The entire storage array is covered by a fire resistant roof to assure the exclusion of sprinkler water. Large signs are posted over the storage array that say "Do Not Use Fire Hoses in this Area."

* 4.3.14 The fuel assemblies in the storage positions, when wrapped with
* polyethylene, shall have the bottom ends open to assure
* drainage. Fire fighting in the fuel assembly storage room with fire
* hoses is prohibited. A minimum spacing of 9.75 inches center to
* center shall be maintained between fuel assemblies in a row. A
* minimum center to center distance of 35.0 inches shall be maintained
* between rows of fuel assemblies within the double row racks. A
* minimum center to center distance of 37.0 inches shall be maintained
* between double row racks.

* 4.3.15 Loaded new fuel assembly shipping containers (Model Nos. 927A1 or 927C1) may be stored outdoors in arrays up to three high. Containers shall be stored on pavement or blacktop within an 8 foot high chain link fence.

4.3.16 Waste containers shall be stored in designated areas of the pellet shop, on a concrete pad contiguous to the south wall of the Bldg. #21 warehouse, or in the temporary storage trailer located inside the Building 17/21 security fence. Packages will contain less than 350 grams U235 each which will meet the surface density criteria. Maximum residence time for packages stored on the pad shall be twelve months.

4.3.20 All storage containers of UO_2 5 gallons or less located outside of hoods or in storage spaces shall be covered. Any storage
* containers accidentally internally moderated shall be handled
* as individual mass units. When stored, accidentally internally
* moderated storage containers shall be stored in the concrete
* block storage area.

* 4.3.21 Only one UNC-2901 shipping container on each shipping pallet
* shall be opened at a time for unloading. The contents of the
* open shipping container must be emptied before opening the
* other shipping container on the pallet. The area surrounding
* any pallet with an open shipping container shall be at least 21
* ft^2. Fissile material, other than the contents of the shipping
* containers on the pallet being unloaded, shall be excluded from
* the 21 ft^2 area.

4.3.22 The filled press feed hoppers can only be stored or placed in designated areas. Only one filled press feed hopper can be in transit on the pellet shop main floor and one can be in transit on the press feed mezzanine.

* 4.3.23 The amount of UO_2 contained in equipment in the Scrap Recycle
* System shall be limited to the following:
* Milling Hood - $\leq$35.0 Kgs UO_2
* Screening Hood - $\leq$35.0 Kgs UO_2
* General Purpose Hood - $\leq$16.0 Kgs UO_2 in right side
* $\leq$16.0 Kgs UO_2 in left side
* Mass units separated by at least 1
* foot.

* Filter Knockdown Hood - $\leq$35.0 Kgs UO_2 in upper portion
* $\leq$35.0 Kgs UO_2 in lower portion
* Mass units separated by at least 1 foot.
* Blender - $\leq$35.0 Kgs UO_2
* Micronizer - $\leq$35.0 Kgs UO_2

*4.3.24 The maximum internal volume of the grinder coolant sump shall
* be 24.0 liters. Other fissile material shall be separated from the
* grinder coolant pump by at least 1 foot.

*4.3.25 The maximum internal volume of the centrifuges shall be
* 24.0 liters. Other fissile material shall be separated from the
* centrifuges by at least one foot.

*4.3.26 The maximum diameter of the liquid waste collection cylinder
* shall be 10 inches. Other fissile material shall be separated from
* the liquid waste collection cylinder by at least one foot.

*4.3.27 Hydrogenous materials shall not be stored on pellet storage
* tables or pellet storage racks where nuclear criticality safety
* is based on 4-inch safe slab limits.

*4.3.28 Hydrogenous materials shall not be stored between trays of
* fuel rods on storage racks or shelves where nuclear criticality
* safety is based on 6-inch safe slab limits.

6.0 INDUSTRIAL SAFETY

The Director, Product Development shall be responsible for compliance with all applicable industrial safety (OSHA) regulations for all activities in Product Development covered by License No. SNM-1067. The Supervisor, Health Physics and Safety shall be responsible for compliance in the manufacturing facility.

7.0 DECOMMISSIONING PLAN

* At the end of plant life, Combustion Engineering shall decontaminate
* the facility and site in accordance with the general Decommissioning
* Plan submitted with the renewal application dated May 14, 1982, so
* that these facilities and grounds can be released for unrestricted
* use. The financial commitment assuring funds for decommissioning,
* submitted by letter dated March 23, 1982, is hereby incorporated as
* part of this License. The Decommissioning Plan is included as
* Appendix A to this License.

8.0 RADIOLOGICAL CONTINGENCY PLAN

Combustion Engineering's Radiological Contingency Plan, approved as Amendment No. 35 to SNM-1067 on March 26, 1982, is considered to be part of this license.

* Combustion Engineering shall maintain and execute the response
* measures of the Radiological Contingency Plan and shall maintain
* procedures as necessary to implement the Plan. Combustion
* Engineering shall make no change in the Plan that will decrease the
* response effectiveness of the Plan without prior NRC approval as
* evidenced by a license amendment. Combustion Engineering shall
* furnish the Chief, Fuel Cycle Safety Branch, Division of Industrial

* and Medical Nuclear Safety, NMSS, U.S. Nuclear Regulatory
* Commission, Washington, DC 20555, six (6) copies of changes to the
* plan within six (6) months after the change is made.

* 9.0 FUNDAMENTAL NUCLEAR MATERIAL CONTROL PLAN (FNMCP)

* Combustion Engineering's FNMCP dated November 17, 1987, approved as
* Safeguards Amendment SG-2 issued on December 15, 1987, is considered
* part of this License.

The KENO-IV Code with sixteen group Hansen-Roach cross sections was used to determine the reactivity of the Virgin Powder Storage Area

* under the condition noted above. The spacing between virgin powder
* can was 21.75 and 22.5 inches in the horizontal and vertical
* directions, respectively. A Keff of 0.7781 ± 0.0043 was obtained
* for an infinite system in the horizontal direction. Figure 8.1
* shows the arrangement of virgin powder cans in the virgin powder
* storage area.

* 8.1.3 Batch Make-Up

Powder containers are removed from the virgin powder storage area

* and placed on a conveyor for transfer to the Batch Make-Up Hood.
* Two 9.75 inch diameter x 11 inch long stainless steel powder
* containers shall be placed on fixtures in the left side of hood

and either a powder container or a 5 gallon pail on the right

* side of the hood when an appropriate batch of less than 35 Kg UO2
* is weighed out and put into a 5-gallon pail. The batch weights

and enrichment are recorded on the container. A water tight cover is secured to these batch containers and they are

* then conveyed to the cone change hood. The cover is placed in
* the change hood with a water tight blender feed cone and then
* transferred to the blender hood. The batch make-up operation
* and the cone change are enclosed in ventilated hoods.

Sufficient negative pressure is provided to assure a minimum face velocity of 100 fpm.

* Criticality Safety Analysis

The following conservative assumptions were incorporated in the

* calculational model of the Batch Make-up Hood and Conveyor Change

* Lift areas:

* 1. All steel structural materials were neglected.

* 2. An external mist of .001 g/cc was assumed.

8.2 Scrap Recycle

All clean scrap is accumulated for reprocessing and recycle with the feed material. Scrap may be milled to yield desired particle size best suited for the processing, oxidized and reduced to assure removal of volatile additives and to achieve the desired ceramic properties of the resulting recycle UO2, and blended to assure uniformity. The following equipment is included in the pellet shop annex:

a) Oxidation and reduction furnace
b) Milling equipment - Enclosed Hood
c) General purpose - Open Faced Hood
d) Filter Knockdown Hood - Enclosed Hood
e) Blender - Closed System
f) Micronizer - Enclosed System
* g) Screening - Enclosed Hood

a) Oxidation and Reduction Furnace

This furnace is made up of two individual sections connected together. Product moves through both furnaces on a wire mesh belt. The oxidation section is used to heat sintered scrap in air to convert the UO_2 to U_3O_8. The reduction section is used to convert U_3C_8 to UO_2 in a heated gas atmosphere of H_2 and N_2.

b) Milling Equipment

This is a mechanical impact type grinder which uses a rotor blade assembly to grind UO_2 powder to a finer particle size so that the UO_2 powder can be recycled back into the pellet process. The UO_2 powder is fed through the top of the mill, passes into the milling chamber, passes through a screen and into a pail connected to the

* discharge of the mill. Connected to the discharge section is a
* vacuum cleaner to prevent the air pressure build-up in the
* milling during the chamber operation.

* c) <u>General Purpose Hood</u>
* This is a ventilated hood which is used for miscellaneous work
* involving handling of UO_2 powder or UO_2 contaminated material.

* d) <u>Filter Knockdown Hood</u>
* This is a ventilated glove box hood which is used to remove loose
* UO_2 powder from used absolute filters and prefilters.

* e) <u>Blender</u>
* The blender houses a sealed pail which contains UO_2 powder. The
* sealed pail is tumbled by rotating the pail in a non-concentric
* rotating motion. This action mixed recycle powder into a
* homogeneous type mixture for use in the production pellet line.

* f) <u>Micronizer</u>
* This is an air impacting type of grinder. Fine particles of UO_2
* powder are fed into the micronizer grinding chamber using a
* vibratory type feeder. High pressure air is then introduced into
* the grinding chamber. This action causes UO_2 particles to impact
* other UO_2 particles at high velocity resulting in finer particles.
* The powder fines and air mixture enters a bag house (sock filters)
* where the UO_2 particles are separated from the air. The UO_2 powder
* is collected in a pail while the air is exhausted into the FA-4
* HEPA filter system.

* The criticality safety for the furnace is based upon the slab limit as
* specified in Table 4.2.5. The remaining operations except the general
* purpose hood, are all carried out in closed systems to assure

exclusion of water. These operations are controlled by use of a 35.0 kg

* mass limit in accordance with Table 4.2.5 with spacing provisions taken
* from Table 4.2.6 of Part I of the application. Since the general purpose
* hood is not a completely enclosed, the SIU mass limit is reduced to
* ≤16 kg UO_2 in either side.

Positive spacing fixtures are used to assure spacing wherever more than one SIU is allowed in any given hood or box. A material balance log is maintained at the Milling Hood and Micronizer to provide

* additional assurance that the criticality limit of a 35.0 kg UO_2 mass limit will not be exceeded at these locations.

8.3 Storage and Transfer

8.3.1 Concrete Block Storage Area

A concrete block storage area is provided as shown in Figure B-1.
* This storage area is intended for 5 gallon pails containing a
* maximum of 35.0 kg of UO2 and has a maximum height of 7 feet. The blocks are of solid 10" thick concrete, having a minimum density of 125 lb/ft3. Mortar is used to join the blocks and to secure the structure to the building wall. Steel shelves, of at least 16 ga. thickness are built into the structure with a vertical spacing of at least 16 inches. Each storage position measures 16" wide x 14" deep, and is lined on three sides with 1/4" thick mild steel. The criticality safety analysis
* demonstrates the acceptability of a twelve-inch (12) exclusion area
* at the front of the Concrete Block Storage Area.

* Criticality Safety Analysis

The following conservative assumptions were incorporated in the calculational model of the Concrete Block Storage Areas:

1. All steel structural materials were neglected.
2. An external mist of .001 g/cc was assumed.
3. Each storage position was assumed to be full with a 5-gallon steel bucket containing a homogeneous mixture of 35 kg UO2 at 5.0 wt % U235 and 5 wt % H2O. This mixture was assumed to be uniformly distributed within the bucket.
4. A 0.25" film of water has been assumed on the exterior steel walls of the shelving, the top of the shelves, and the exterior of each bucket.

* 5. A twelve-inch thick water wall was placed at the front of
* the Concrete Block Storage area.

* The KENO-IV code with sixteen group Hansen-Roach cross
* sections was used to determine the reactivity of the Concrete
* Block Storage area under the conditions noted above. A Keff of
* 0.4698 ± 0.0070 was obtained for a infinitely long array of
* storage positions. The dimensional details of the calculational
* model are shown in Figure 8.5.

A further analysis was done assuming the same bucket was completely flooded with water and reflected in front with 12" of water. The resulting Keff is 0.9221 ± 0.0070. This analysis did not include the steel structures, which includes the 1/4" steel on each side and 1/4" steel shelves.

The KENO-IV code with sixteen group Hansen-Roach cross sections was
* used to determine reactivity of the Pellet Storage Area under the
* conditions noted above. A Keff of 0.7468 ± .0049 was obtained for
* an infinite system in the horizontal direction.
* The UO2 loading of the trays was determined by doing a total of 14
* measurements. The pellets pack to an average density of 5.95 gm UO2
* per cc (5.24 gm U per cc, with a 2 sigma variation of 0.264).
* The 16 group cross sections for the pellets were calculated for
* 0.3766" diameter pellets. Dimensional details of the calculational
* model are shown in Figure 8.6.

The Pellet storage area was re-evaluated assuming a 12 inch reflector was in front of the shelves. The following changes were made in the model:

1. Each of three storage shelves were assumed to contain pellet storage trays filled with a homogeneous mixture of UO_2 at 5 wt % U235 with a density of 5.686 g/cc and water at maximum moderation (volume weighted based on a UO_2 density of 10.96 g/cc). The stainless steel trays were represented explicitly but the structural steel of the racks was not included in the model. The pellet trays were stacked to the slab limit of 4" (i.e., 2 trays high, and 6 trays deep on each shelf). The pellet storage shelves have been modelled as a system of infinite length in the horizontal direction.
2. A 12" reflector of water has been assumed in front of the pellet storage area.

The NITAWL and XSDRNPM codes were used to obtain 16-group cross sections from the 123-group GAM-THERMOS library for input to KENO-IV, the 3-dimensional code which was used to determine the reactivity of the pellet storage area under the conditions noted above. A Keff of 0.8814 ± .0046 was obtained.

From Figure 1.E.16 of UKAEA handbook AHSB 1, the critical

* infinite slab thickness for 5.0% enrichment fully reflected is about 8 inches for this degree of moderation. Applying the safety factor of 1.2 yields an allowable slab thickness of about 6.7 inches.

* Accordingly, the Rod Transfer Cart with two 5-1/2" deep boxes is safe as long as the rods are not stacked higher than 6" in each box.

* The only systems containing fissile material that the fuel Rod
* Transfer Carts can approach are other slab limited systems or the
* Fuel Rod Transport Carts described in 8.5.2. A 1 foot separation
* between the two types of fuel rod transport carts is assured by the
* structure of the carts.

8.3.4 Transfer of Material

Material may be transferred on carts which accommodate one mass or slab limited SIU, or may be transferred by hand, one SIU at a time. Carts used for mass limited SIU's <u>shall</u> provide for centering of the unit, and <u>shall</u> measure at

* least 2.6 feet on a side as specified in Table 4.2.6.

Because most spacing areas do not extend beyond the physical boundary of the equipment, spacing between transfer carts and the equipment is of no concern. In cases where the spacing area extends beyond the equipment boundaries, such as the storage facilities, the spacing boundary will be indicated by a colored line. The line may be crossed by carts only when

* they contain no more than one mass or slab limited SIU, and then only to permit an operator to transfer that SIU to an available storage position.

8.4 Pre-Treatment of Low Level Liquid Wastes

In order to effect a reduction in the quantities of UO2 released to the

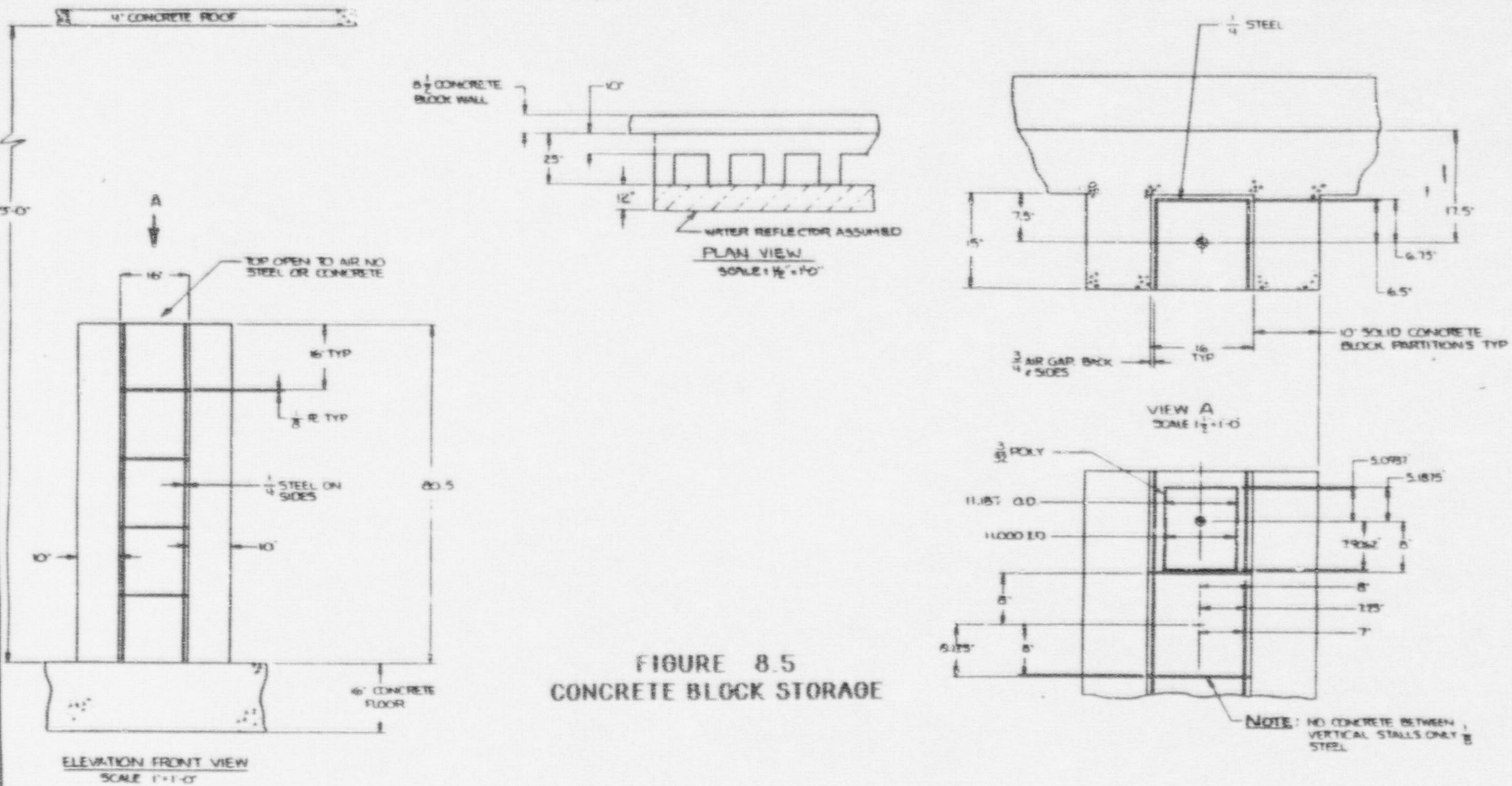

FIGURE 8.5
CONCRETE BLOCK STORAGE

DOCKET No. 70-1100 REV. 04 DATE: 7/27/89
LICENSE No. SNM-1067 PAGE: 11.8-36

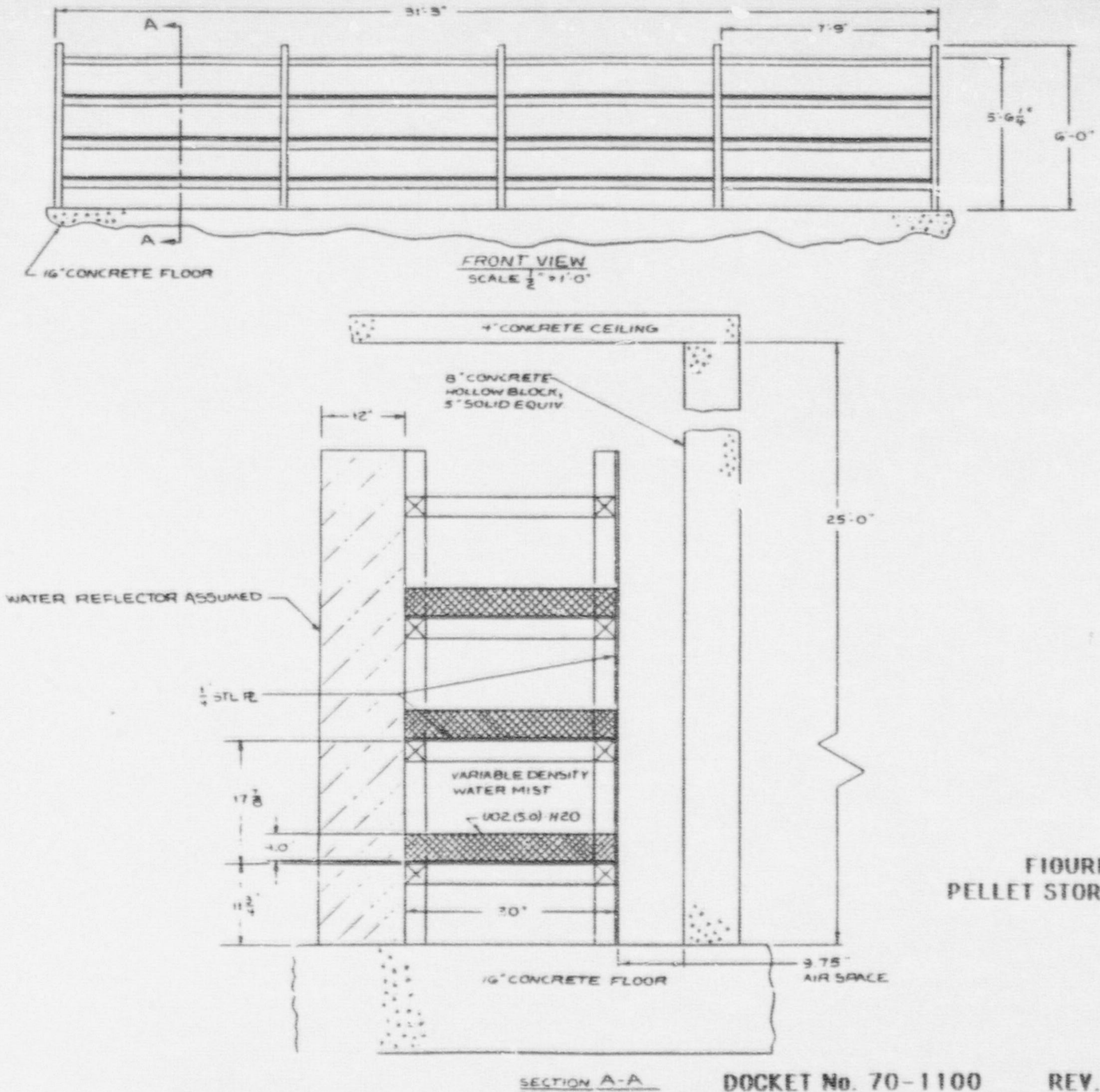

FIGURE 8.6
PELLET STORAGE SHELVES