

SEP 3 1982

DOCKET NO.: 70-2955
APPLICANT: Edlow International Company
FACILITY: Warehouse, East St. Louis, Illinois
SUBJECT: SAFETY EVALUATION REPORT - REVIEW OF LICENSE APPLICATION
DATED MARCH 11, 1982 AND SUPPLEMENT DATED JUNE 21, 1982
FOR STORAGE OF URANIUM HEXAFLUORIDE IN 30-INCH CYLINDERS

I. Background

Edlow International Company (Edlow) by application dated March 11, 1982, requested authorization to receive, possess and store up to 1,500,000 kilograms of special nuclear material (SNM) as uranium enriched up to 5.0 w/o in the U-235 isotope. The SNM, in the form of uranium hexafluoride (UF₆) contained in Type 30A and 30B cylinders (see Figures 1-4), will be stored in a warehouse located on an industrial site in East St. Louis, Illinois. A copy of an aerial photograph of the site is shown in Figure 5.

The site is also the authorized place of use for Source Material License No. SMC-1377, Docket No. 40-8760 issued to Edlow. SMC-1377 authorizes the possession of natural and depleted uranium in the form of UF₆ and tri-urano-octo oxide (U₃O₈).

In order for the Commission to approve the receipt, possession, storage and delivery of SNM in accordance with the Edlow application, the following findings must be made pursuant to 10 CFR 70, Section 70.23(a).

- A. The special nuclear material is to be used in activities licensed by the Commission under Section 103 or 104 of the Act;
- B. The applicant is qualified by reason of training and experience to use the material for the purpose requested in accordance with the regulations in this chapter;
- C. The applicant's proposed equipment and facilities are adequate to protect health and minimize danger to life and property; and
- D. The applicant's proposed procedures to protect health and minimize danger to life or property are adequate.

The following safety evaluation provides the staff's assessment related to the above findings.

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II. Scope of Review

The safety review of Edlow's application for a special nuclear material license included a review of the application dated March 11, 1982 and supplement dated June 21, 1982, to determine that the requirements of 10 CFR Part 70.23(a) were met. The staff also performed a review of the organization, site, storage and handling procedures, radiation and nuclear criticality safety, fire safety, environmental safety, physical security and the impact of accidents on site.

III. Discussion

- A. The special nuclear material is to be used in activities licensed by the Commission under Section 103 or 104 of the Act.

Title 10, Code of Federal Regulations, Part 70 addresses Domestic Licensing of Special Nuclear Material. The authorization requested by the applicant is the possession of enriched uranium for temporary storage prior to transfer to other licensees for further processing. Accordingly, the staff finds that the SNM authorized by this license is to be used in activities licensed by the Commission under Section 103 of the Act.

- B. The applicant is qualified by reason of training and experience to possess the material for the purpose requested in accordance with the regulations in 10 CFR 70.

The Edlow management organization has more than 50 years' cumulative experience in managing the transportation, handling and storage of all types of nuclear materials including high and low enriched uranium.

Edlow's manager of Radiation Safety Programs has a degree in nuclear engineering and 13 years' experience. For the past two years he has been managing two similar source material storage facilities.

Although Edlow is the responsible licensee, the actual operator at the East St. Louis, Illinois facility will be Bee Industries, Inc. (Bee). Critical Bee personnel have been trained by Edlow to perform the activities authorized by this license and currently perform similar duties in conjunction with their responsibilities for the source material stored at the site.

The staff concludes that the applicant is qualified by reason of training and experience to possess the material for the purpose requested.

- C. The applicant's proposed equipment and facilities are adequate to protect health and minimize danger to life and property.

1. Site Description

The proposed site is an 8-acre industrial area located at 3131 St. Clair Avenue, East St. Louis, Illinois, approximately 300 feet from Interstate 64. An artist's sketch of the site (Figure 6)

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shows the outdoor fenced storage area where the source material is located and a warehouse immediately south of the source material storage area. The warehouse is of masonry construction and is the proposed location for storage of the special nuclear material.

Appendix I is documentation from the Army Corps of Engineers which indicates that the site is outside the flood hazard area, as defined by the National Flood Insurance Program.

2. Storage and Handling

The UF₆, a white crystalline solid at ambient temperatures, is contained under vacuum in the 30" diameter metal cylinders. Each cylinder contains 2 1/2 tons of UF₆ and is shipped to the site in protective overpacks which are certified packages approved for use by the Department of Transportation (DOT Spec 21-PF-1). Upon arrival at the site the cylinders are removed from the overpacks and transported to the storage area by a modified forklift which uses a special strong back attachment similar in design to the handling fixture developed by the AEC/DOE for handling these cylinders at the enrichment plants (Figure 7).

Prior to removal to the storage area, each cylinder will be (1) smeared at five locations for contamination (action will be taken immediately to investigate the source of contamination if any smears exceed 22,000 dpm/100cm²), and (2) checked to assure that the valve cover is in place and the seals are in good condition. The serial numbers of each cylinder and seal are also recorded prior to storage.

The cylinder storage area consists of rows of railroad ties resting on a concrete floor. Chock blocks have been attached to the railroad ties to cradle the cylinder. The cylinders form an array one cylinder high with a two-foot aisle maintained between rows.

The types of cylinders to be stored and the handling procedures are described in the June 21, 1982 Supplement to the license and shall be incorporated as a condition of the license. Accordingly, the following condition is recommended:

All cylinders shall be handled in accordance with the "Procedures for Handling Enriched UF₆ 30" Cylinders" submitted in the supplement dated June 21, 1982.

The staff concludes that the applicant's proposed equipment and facilities are adequate to protect health and minimize danger to life and property.

D. The applicant's proposed procedures to protect health and minimize danger to life and property are adequate.

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1. Administrative Procedures and Training

All personnel associated with handling the special nuclear material authorized by this license will be provided with written instructions covering normal administrative and operating procedures. These procedures are outlined in Section 11 of the application and include the following:

- a. Radiation Detection
- b. Geiger Counter Use
- c. Warehouse Operation
- d. Administrative Procedures
- e. Emergency Procedures
- f. Basics of Radiation

The aforementioned procedures will be incorporated as a condition of the license. Accordingly, the following condition is recommended:

The licensee shall follow the procedures described in Section 11, pages 7 through 20, of the application dated March 11, 1982, and the appropriate sections of the supplement dated June 21, 1982.

The paragraph which describes the packaging of radioactive material prior to delivery to a carrier for transport did not address all of the DOT requirements nor the NRC requirements in 10 CFR Part 71. Accordingly, the following condition is recommended:

The statements on shipping in Paragraph III-B, Page 11, of the application dated March 11, 1982 notwithstanding, all radioactive material packaged for shipment shall comply with the requirements of 10 CFR Part 71.

2. Radiation Safety

Since these cylinders will remain sealed while in storage, the principal pathway to man is by way of direct radiation. The dose rates, at 1 meter from the surface of the cylinders, are reported by the licensee to be less than 1 mr/hr. The applicant has estimated that no worker will spend more than 50 hours per year within 1 meter of the SM. Considering the exposure time and the dose rate that an individual would encounter the quarterly dose will be less than 25% of the maximum allowable dose specified in 10 CFR 20. Accordingly, the staff finds that individual personnel dosimeters are not required.

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Internal exposures could occur if a cylinder should arrive with surface contamination or if one should develop a leak while in storage. The former is precluded by smear surveys prior to storage and the latter, if minor, would be detected during audits of the facility. If major leaks occur, the emergency procedures described in the application are adequate to protect the personnel.

Radiation detection procedures are described in Section 9 of the application and will be incorporated as a condition of the license. Accordingly, the following condition is recommended:

The licensee shall follow the radiation detection procedures described in Section 9, page 5, of the application dated March 11, 1982 and appropriate sections of the supplement dated June 21, 1982.

In reviewing the application and its supplement the staff finds that there is no mention of or criteria for the release of potentially contaminated equipment for unrestricted use. To correct the deficiency the following condition is recommended:

The decontamination of facilities and equipment prior to release for unrestricted use shall be in accordance with the attached Annex A, dated July, 1982.

3. Criticality Safety

The applicant, in his application, stated that "a criticality accident is not possible" and then quoted the results of experiments conducted at the Oak Ridge Critical Experiments Facility. The report of these experiments conclude "it is somewhat doubtful if criticality could ever be achieved in any array of the 30" diameter cylinder at the 4.5% U-235 enrichment level." Therefore, the applicant requested an exemption from the provisions of 10 CFR 70.24.

The staff independently evaluated an infinite planar array of 30" cylinders containing uranium enriched up to 5% in the U-235 isotope as dry UF₆ assuming conditions of optimum interspersed moderation and full reflection and found the k_{eff} to be less than 0.95. A cylinder could form a critical mass if there was a large rupture of a cylinder and a simultaneous incursion of water. These conditions are considered incredible considering the type of material, and the precautions taken by the applicant during handling and storage. Accordingly, the staff has determined that the proposed storage of UF₆, as proposed by the applicant, cannot form a critical mass under credible conditions. Therefore, the following exemption is recommended:

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The licensee is exempt from the criticality alarm system provisions of 10 CFR 70.24 insofar as this section applies to materials held under this license.

4. Fire Safety

The warehouse, where the UF₆ will be stored, is a masonry building equipped with an automatic sprinkler system to suppress any fires that may occur. If the sprinkler system is activated, the local fire department would be notified immediately by an offsite alarm.

The possibility of a fire is minimized by restricting the use of explosive or flammable materials within 100 yards of the storage area. No combustible materials will be stored in the warehouse and the warehouse will be inspected daily by on-site personnel to identify and remove any combustible litter.

5. Environmental Safety

As noted in Paragraph III-D-2, the material stored under this license will be sealed under normal conditions. Accordingly, the main concern is from direct ionizing radiation. Considering the low level of radiation being emitted from the source (1 mr/hr), the materials of construction of the warehouse, and the distance to the fence line, the staff has concluded that the impact on the environment is insignificant. Accordingly, pursuant to 10 CFR 51.5(d)(4), no environmental impact statement, negative declaration or environmental impact appraisal need be prepared.

6. Security

The SM₁ storage areas will be locked except when personnel need access to the cylinders. The area is normally manned 40 hours per week, and the storage areas are audited daily by the site personnel. The warehouse is also equipped with alarms on all doors and windows as well as motion detectors that are activated after normal business hours. All alarms are monitored by Police Alert Security Systems. It is the staff's opinion that the security precautions are adequate to safeguard the material, the public and the environment.

7. Accidents

Accidents can be divided into three categories: valve failure, cylinder puncture and cylinder rupture associated with a fire. Since the UF₆ under ambient conditions is a solid, the effect of a valve failure or cylinder puncture is

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considered by the staff to be negligible, except in the immediate vicinity of the cylinder. The applicant has provided a CO₂ fire extinguisher to freeze off any detectable cylinder leak.² Spare valves are provided to replace any leaking valves, and wooden plugs are available to seal a cylinder in case a valve is sheared. Also, a repair kit similar to the one described in the DOE report ORO-651 Rev. 4, "Uranium Hexafluoride Handling Procedures and Container Criteria," will be provided.

A cylinder puncture or rupture with a simultaneous fire could result in the vaporization of large quantities of UF₆ resulting in the formation of uranyl-fluoride (UO₂F₂) and hydrofluoric acid (HF). As discussed in Paragraph III-D², the possibility of a serious fire is mitigated by the fire prevention, detection and suppression systems that the applicant has proposed. The rupture or puncture of a cylinder could occur only during handling of the cylinders. As discussed earlier in paragraph III.C.2, the handling equipment, and procedures minimize the chance of damage during handling. Accordingly, it is the staff's opinion that the probability of the simultaneous rupture or puncture of a cylinder and an associated fire of any magnitude is extremely remote.

The staff concludes that the applicant's proposed procedures to protect health and minimize danger to life and property are adequate.

IV. Conclusions and Recommendations

Based upon the staff's evaluation and discussion with Region III personnel, it has been determined that the proposed activities can be performed without undue risk to the health and safety of the workers or the public and with no adverse impact on the environment. Accordingly, it is recommended that the license be issued subject to the following conditions:

1. All cylinders shall be handled in accordance with the "Procedures for Handling Enriched UF₆ 30 inch Cylinders" submitted in the supplement dated June 21, 1982.
2. The licensee shall follow the procedures described in Section 11, pages 7 through 20, of the application dated March 11, 1982, and the appropriate sections of the supplement dated June 21, 1982.
3. The statements on shipping in Paragraph III-B, Page 11, of the application dated March 11, 1982, notwithstanding, all radioactive material packaged for shipment shall comply with the requirements of 10 CFR Part 71.

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4. The 22,000 dpm/100cm² action level to investigate the source of removable contamination on ²³⁵UF₆ cylinders shall be defined as follows: 22,000 dpm/100cm², Removable alpha, as measured by a radiation detection instrument with the capability of detecting alpha activity.
5. The licensee shall follow the radiation detection procedures described in Section 9, page 5, of the application dated March 11, 1982, and appropriate section of the supplement dated June 21, 1982.
6. The decontamination of facilities and equipment prior to release for unrestricted use shall be in accordance with the attached Annex A dated July, 1982.
7. The licensee is hereby exempted from the provisions of 10 CFR 70.24 insofar as this exemption applies to the materials held under this license.

Original signed by:
Barry L. Serini

B. L. Serini
Uranium Process Licensing Section
Uranium Fuel Licensing Branch
Division of Fuel Cycle and
Material Safety, NMSS

Original Signed By:
W. T. Crow

Approved by: W. T. Crow, Section Leader

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SURNAME ▶	BLSerini/al	GHBidinger	LTyson	WTCrow			
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