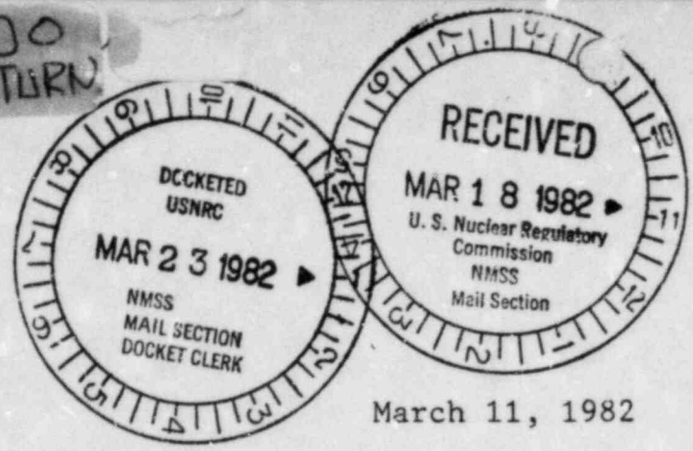
PDR-DO
NOT RETURN



70-2955
Institution Code:
14695
Pkg Code
21210

Edlow International Company
1100 17th Street, N.W. Suite 404
Washington, D.C. 20036 U.S.A.
(202) 833-8237
WUI 64387, RCA 248540

March 11, 1982

Uranium Fuel Licensing Branch
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
attn. Mr. R.G. Page

Subject: Application for Special Nuclear Material License

Dear Sir:

Enclosed please find our application for a license for storage of uranium hexaflouride enriched to 5 weight percent maximum. Also enclosed is our check for the application fee.

We certify that all information contained in this application is true and correct to the best of our knowledge and belief.

If you need any further information, please let us know. Thank you for your prompt attention in this matter.

Sincerely,

EDLOW INTERNATIONAL COMPANY

Jack Edlow
President

JE/ajs

Enclosures: Our application (34 pp.) - 10 copies
Our check for $460.00

Applicant... 4506 $460 NJ
Check No.
Amount, Fee
Type of Fee APPLICATION
Date Check Rec'd 3/15/82
Received by BROWN
per DLW

RECEIVED BY/FILED
Date 3/15/82
Ltr Mat PG 3 N.L.
By Brown
Orig To
Action Due 3/17/82

20403

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Application For Special Nuclear Material License

Pursuant to the regulations in Title 10, Chapter 1, Code of Federal Regulations, Part 70, application is hereby made for a new license to receive, possess, and deliver special nuclear material for the activity described below:

1. Name of Applicant:

   Edlow International Company

2. Principal Business Address:

   Suite 404
   1100 17th Street, N.W.
   Washington, D.C. 20036

3. Address Where Special Nuclear Material Will be Possessed:

   3131 St. Clair Avenue
   East St. Louis, Illinois 62202

4. Person To Be Contacted Concerning This Application:

   Bruce W. Podhurst
   (202)833-8237

5. Purpose For Which Special Material Will Be Used:

   This license is for storage only of special nuclear material in the form of UF6. There will be no processing of the material. It will be stored at the storage facility prior to delivery to fabricators for the fabrication into nuclear fuel.

6. Form and Quantity of Special Nuclear Material To Be Stored Under This License:

   Chemical form - uranium hexafluoride
   Physical form - solid (67.6% U)
   enrichment - less than 5.00 weight percent U235
   maximum amount at any time - 1,500,000 kilograms U as UF6

7. The special nuclear material will not be processed in any way, only stored temporarily, at this location. While material will be received, possessed, transferred, or delivered against the license, Edlow will not use the material in or for a nuclear process. The maximum quantity of material that would be on hand at any time is 1,500,000 kilograms of uranium.

   The uranium hexafluoride will be stored in Department of Transportation specification 7A cylinders models 48X, 48A, 48Y, 48F, 30A and 30B. Attachments 1 through 8 are descriptions and specifications for these cylinders which were taken from ORO-651-Rev. 4 "Uranium Hexafluoride: Handling Procedures and Container Criteria".

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5237

The special nuclear material will be stored at 3131 St. Clair Avenue, East St. Louis, Illinois which is an 8 acre industrial site. Operations are conducted on the site between 8:00 a.m. and 4:30 p.m. Monday through Friday. Source material is stored on this site under license SMC-1377. The property is surrounded by an 8 foot high chain link fence topped by 3 strands of barbed wire. The one gate in this fence is closed and alarmed after operating hours.

The special nuclear material will be stored in a secure area inside this perimeter fence in the northeast portion of the property, as shown on attachment 9. This storage area is surrounded by another chain link fence, eight feet high and topped with 3 strands of barbed wire. The entrance gate to this secured area is locked at all times to prevent entrance by anyone except when access is required for handling the material, inspections, or for administrative purposes. Natural uranium hexafluoride and yellowcake are currently stored in this area. An electronic security system protects all four sides and the gate of the storage area. This system is monitored by a local organization, Police Alert Security Systems, whose dispatcher has a direct line to the East St. Louis Police Department. Based on past experience, the police should respond to an alarm in under five minutes.

The special nuclear material may also be stored inside a 30,000 square foot masonry warehouse building on the site. The building will be locked and protected by electronic alarms after normal business hours when warehouse personnel are not presently on site. Electronic motion detectors, door switches, and fire detectors are monitored by the same organization that monitors the system protecting the outside storage compound.

The enriched uranium stored inside the warehouse building will be kept in rooms that will be locked at all times except when access to the cylinders is required for handling, inspections, or administrative purposes.

Shipping, receiving, handling, and surveillance of the material will be provided by Bee Industries, Inc. of Washington Park, Illinois who will be acting as contractor to the Edlow International Company. James Ellis, President of Bee Industries, and Lee Wynn, Foreman, will have day to day supervisory responsibility for the material.

Exposure of personnel will be minimized through the use of time-distance techniques. Low enrichment uranium hexafluoride cylinders have radiation readings of less than 1.0 at 1 meter from the cylinder surface. Any material stored outside will be located a minimum of 1 meter from the storage area perimeter fence. The storage area itself is located a minimum of 10 feet inside the site perimeter fence.

The outside area is located in a portion of the property that has no traffic flow. There will be no reason for anyone to go near the storage area except when working with the stored material. Additionally, since the material will just be delivered and then stored, the amount of time anyone would be required to spend working around the area would be negligible. Personnel have been

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WASHINGTON, D.C. 20036
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instructed that they should not loiter near the storage area. It is unlikely that anyone working with the material would spend more than 50 hours per year within 1 meter of the stored material.

Workers' exposure to material stored inside will be minimized by the fact that it will be kept in locked rooms away from personnel.

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8. Supervisory Personnel

Bruce Podhurst	Manager, Fuel Cycle Services
Diane Harmon	Vice President
Jack Edlow	President
Samuel Edlow	Chairman

Bruce Podhurst - graduated with Bachelor of Science degree in Nuclear Engineering from Rensselaer Polytechnic Institute in 1968. Course work included studies on radiation detection equipment and the nature of nuclear material and radiation. Has spent the past 13 years working in the area of nuclear fuels for the Babcock & Wilcox Company, the Rochester Gas and Electric Corporation, and the Edlow International Company. He has been responsible for managing the operation of Edlow's two source material storage facilities for the past two years. Mr. Podhurst will be the person with primary responsibility for the radiation safety program.

Diane Harmon - has worked for ten years at Edlow International managing transportation, handling, and storage of all types of nuclear materials, including source materials. Established storage site in Virginia where Edlow International has been storing source material since 1976 under license by the NRC.

Jack Edlow - has worked for 14 years managing transportation of all types of nuclear materials. Is particularly experienced in UF6 and U308 shipments. Has participated in clean-up operations of source material spills, both U308 and UF6.

Samuel Edlow - has been involved in the manufacture, design, licensing, handling and shipping of spent fuel and other nuclear material packages for over 20 years. Has participated in clean-up operations of source material spills, both U308 and UF6.

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SUITE 404 1100 17TH ST., N.W.
WASHINGTON, D.C. 20036
TELEPHONE (202) 833-[redacted]

8237

9. Radiation Detection

As there will be no processing of material but only storage, danger to life or property will be minimized and health protected primarily by preventing access to the material through the use of the techniques noted in 7.

Ten Eberline TLD's containing LiF chips will be used for environmental monitoring of radiation resulting from outside storage. Badges will be placed on each of the four sides of the perimeter fences, one badge will be placed within the site 50 feet from the storage compound, and one badge will be kept in an office on the site to provide background readings.

An Eberline model E120 Geiger counter reading in mR/hr. and cpm will be used by personnel having responsibility for handling and inspection of the material. This counter is equipped with an HP270 probe, an energy compensated component for detecting gamma radiation and an HP190 end window probe for detecting beta contamination.

Once per calendar quarter the perimeter of the storage area fence will be surveyed with both probes to assure that there is no contamination in the area. This procedure will also be performed after any handling of material takes place. Bee Industries personnel will also visually inspect the material daily during normal operations.

Standard Eberline Instrument Corporation TLD's will be used for environmental monitoring. The TLD's will be processed quarterly by Eberline Instrument Corporation and the readings sent to the Edlow International Company. A description of these TLD's is included as attachments 10 and 11.

Prior to each use of the Geiger counter the operability of the beta and gamma probes will be verified through the use of technetium and cesium sources respectively. The E120 Geiger counter and HP270 probe will be returned to the Eberline Instrument Corporation for recalibration every 6 months. Specifications for this equipment are included as attachments 10 and 11.

An additional eight TLD's will be used for environmental monitoring in the interior of the warehouse building when uranium is being stored within. The building interior will also be surveyed once per calendar quarter and after handling of material for contamination when enriched uranium is stored within the building.

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SUITE 404 1100 17TH ST., N.W.
WASHINGTON, D.C. 20036
TELEPHONE (202) 833-[illegible]

10. Safety Procedures

The enriched UF6 will be stored outside in a storage area surfaced with crushed rock or inside a sprinklered masonry building. In either case, it will be kept a minimum of 100 yards from any explosive or flammable materials storage area. This will minimize the possibility of non-nuclear accidents such as fires or explosions.

To minimize the possibility of accidents during handling operations a forklift with a minimum of six tons lifting capacity will be used to move the UF6 cylinders. A special strongback attachment of the type used by the Department of Energy at Oak Ridge will be attached to the forklift and used for moving cylinders. This device is shown in attachment 12. Cylinders will not be stacked for storage and two foot aisles will be maintained between rows of cylinders. All cylinders in storage will be sealed and will have valve protectors in place.

Prior to receipt of the initial delivery of special nuclear material at the facility written procedures will be supplied to Bee Industries detailing exactly how the cylinders are to be physically handled. An employee of Edlow International familiar with special nuclear material container handling will be present during the handling of the initial delivery to verify that the handling procedures are being properly interpreted and followed.

All regulations listed in 10CFR19 will be complied with. Posting of notices to workers required under 10CFR19.11 will be in the general office at storage site.

All requirments specified in 10CFR20 will be complied with. The storage area will be conspicuously posted as required under 10CFR20.203 with radioactive materials signs in the storage areas. Each cylinder received for storage will be monitored by Bee Industries personnel when received for excessive surface contamination.

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8237

11. Procedures

James Ellis, President of Bee Industries, Inc. and two other Bee Industries supervisory workers have been instructed in the use of the radiation survey equipment, the nature of radioactive material, and all other items required in 10CFR19.12. Any Bee personnel responsible for handling the special nuclear material will also be instructed in the nature of the material and criticality. They will be furnished with written instructions covering normal administrative and operating procedures. The procedures to be furnished to Bee Industries are as follows:

I. RADIATION DETECTION PROCEDURES

A. Thermoluminescence Dosimeters

1. Place one each in the middle of the four sides of the storage area fence, the four sides of the property boundary fence, and one near the northeast corner of the building. One detector should be kept in the warehouse office away from sources of radiation for a background check. There should be two TLD's placed in each of the four storage areas in the warehouse whenever special nuclear material is stored inside the building.
2. The physical location of the detectors will be noted by Bee on a form supplied by Edlow. A copy of this form will be sent to Edlow each time detectors are emplaced.
3. Bee will ship detectors quarterly for reading per Edlow's instructions. Bee will emplace new detectors as they are received quarterly, noting locations.

B. Geiger Counter

1. Edlow personnel will instruct at least two Bee supervisory people in the use of Geiger counter equipped with beta and gamma probes.
2. The Geiger Counter with gamma probe will be used monthly on a perimeter survey of the storage area to check for excessive radiation levels. A perimeter survey will also be performed after completion of material handling. Bee will note survey readings on forms provided by Edlow and send to Edlow for filing. Bee will notify Edlow by phone of readings. Levels in excess of 1.5 mR/hr. at the fence will be considered excessive. The reason for the high level will be determined and action will be taken to reduce the level. Instructions for any actions will be given by Edlow personnel.
3. When UF6 cylinders are received for storage Bee will use the beta probe to check for excessive contamination before removing cylinders from trailers. If excessive contamination is found they will:
   a) immediately notify Edlow by phone who will then notify the NRC and carrier as required by 10CFR20.205. Bee will provide Edlow with information on location and extent of contamination.
   b) remove cylinder from trailer and segregate in storage area away from fence. Personnel handling these cylinders shall wear gloves which shall be discarded in a 55 gallon waste drum when handling is complete.
   c) await instructions from Edlow concerning contaminated cylinder. Edlow will contact shipper and NRC Region III to determine source, type and extent contamination and best method to deal with it so as to minimize risk and exposure. Bee personnel should avoid contaminated cylinder after it is placed in storage. When all informa-

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SUITE 404 1100 17TH ST., N.W.
WASHINGTON, D.C. 20036
TELEPHONE (202) 833-[redacted]
5237

tion has been evaluated a response which may, in serious cases, require the use of a professional organization to handle decontamination will be determined.

4. Bee will take radiation level readings with the gamma probe at a distance of 1, 2 and 10 meters from the material after all handling is completed. These will be noted on logs kept by Bee.
5. The Geiger counter and gamma probes will be sent per Edlow's instructions every six months for recalibration.

C. Personnel Records
1. A log of all Bee workers who work with the material shall be kept by Bee. This log will show worker name, age, date, amount of time spent at fence and location, amount of time spent in the storage area, and proximity to the material.
2. Records as to date, job, and amount of time spent handling the material will be kept for each worker involved in those operations.
3. A record of all readings taken and personnel logs will be kept by Bee. Copies will be sent to Edlow. Records will be kept by Bee until specifically authorized in writing by Edlow that retention is no longer required. Edlow will retain these for a minimum of five years.

D. Smears
1. Use smears provided by Edlow.
2. Wear gloves while taking smears.
3. Vigorously rub one side of smear over a 4 inch by 4 inch area.
4. Place window of HP 190 probe on side of smear rubbed on cylinder. Record reading.
5. Save smears in envelope which identifies cylinder number and date done.
6. Readings should be noted on a separate form and filed. A copy should be sent to Edlow.
7. Check radiation levels:
   a) Use HP-270 probe. Set switch on 1.
   b) Read dial in mR/hr. Readings can be repeated by pressing the "Reset" button.

EDLOW INTERNATIONAL COMPANY
SUITE 404 1100 17TH ST., N.W.
WASHINGTON, D.C. 20036

II. INSTRUCTIONS FOR GEIGER COUNTER USE

1. The "Geiger Counter Technical Manual" for this equipment has been provided. All personnel who will be using the counter should read this document prior to utilizing the equipment.
2. Check battery by turning switch to "BATT". Needle should read in the "Battery OK" range. If it does not, replace batteries.
3. Turn switch to .1. Let counter warm-up for at least 5 seconds. Check probes with CS-7A (CS-137) and CS-13 (TC99) sources. The HP-270 gamma probe should be checked by holding the end of the probe next to the CS-7A source. A dial reading of approximately 5000 cpm (500 cmp actual) should be obtained. The HP-190 probe should be checked by holding the end of the probe on the CS-13 source. A dial reading of approximately 5500 cpm (550 cpm actual) should be obtained. Edlow should be notified if counter is not working properly and Eberline Instrument Corporation's service department (tel. 505-471-3232) should be contacted to troubleshoot the equipment problem.
4. Cylinders should not be unloaded unless there is a working Geiger counter available for checking contamination.
5. The window on the HP-270 probe should be kept closed at all times.
6. Check cylinders for contamination:
   a) Use HP-190 probe. Set switch on 1.
   b) Take smears.
   c) Take reading from smear by placing end of probe on side of smear rubbed on cylinder. This reading, in CPM, is noted as "READ TOT".
   d) Place two sheets of paper over smear. Take reading. This reading, betas in CPM, is noted as "READ BT".
   e) Subtract "READ BT" from "READ TOT". This number, "READAL" in CPM, is the alpha reading.
   f) The alpha efficiency is 50% of 2π emission rate. Therefore, devide "READAL" by .5 and multiply by 2π to find alpha disintegrations per minute. The beta efficiency is 30% of 2π emission rate. Divide "READ BT" by .3 and multiply by 2π to find beta disintegrations per minute. Sum the alpha and beta disintegrations per minute to find the total contamination level. This calculation is not necessary if "READ TOT" is less than 3000 CPM.
7. Check radiation levels:
   a) Use HP-270 probe. Set switch on 1.
   b) Read dial in mR/hr. Readings can be repeated by pressing the "Reset" button.

III. OPERATING AND ADMINISTRATIVE PROCEDURES - WAREHOUSE

A. Receiving

1. Edlow notifies Bee in writing of upcoming shipment promptly after receiving the one month notice from customer.
2. Edlow notifies Bee by phone promptly after receiving the one week notice from customer.
3. Edlow notifies Bee by phone immediately after receiving the notice from customer one day prior to shipment.
4. Bee arranges for crane and/or fork lift trucks as needed for the shipment to be received the same day.
5. Edlow notifies Bee immediately by phone after shipper notifies Edlow that the shipment has departed. Edlow provides Bee with carrier name, container identification numbers, and estimated time of arrival.
6. Bee assures that handling and lifting equipment will be available for unloading the shipment.
7. Bee arranges delivery with the carrier when carrier arrives in St. Louis area and contacts Bee.
8. Only individuals instructed as required under 10CFR19.12 will be allowed to handle cylinders. Only workers properly instructed and checked out on the use of the Geiger counter will be allowed to take radiation readings.
9. The amount of time spent handling and inspecting material should be minimized as far as possible.
10. Bee checks cylinders for contamination with the Geiger counter equipped with beta probe while still on truck. This is done by taking smears at five locations; two near the valve cover, one each on the bottom of the cylinder at front and back, and one on the top front of the cylinder, and then checking contamination levels using the HP-190 placed on the smears. Bee will inform Edlow immediately by phone if contamination excess of 22000 disintegrations per minute is found in a 100 cm. square area (3.93 inches by 3.93 inches). Bee notes results on forms provided by Edlow and retains in its files and sends a copy to Edlow.
11. Bee verifies serial numbers, seal numbers, and condition and signs bills of lading.
12. Bee will place cylinders in storage using a fork lift outfitted with a cylinder handling device. It will assure that the cylinders are not moved over cylinders already in storage.
13. Bee notifies Edlow by phone when material arrives and then again after it is placed in storage.
14. Bee notifies Edlow if there are any discrepencies with with serial or seal numbers immediately by phone.
15. Bee promptly sends Edlow a copy of the bill of lading and the report of the contamination checking.
16. Bee prepares a handling report containing name and age of all personnel involved in handling, their job function, and the amount of time spent handling the material.
17. Bee retains all documents and records until disposal is authorized by Edlow.

B. Shipping

1. Edlow notifies Bee in writing of upcoming shipment promptly after receiving the one month notice from the customer.
2. Edlow notifies Bee by phone promptly after receiving the one week notice from customer.
3. Edlow notifies Bee by phone immediately after receiving the notice from customer one day prior to shipment.
4. Bee arranges for lifting and handling equipment as needed.
5. Bee loads shipment using the receiving handling procedures, takes radiation readings to obtain transport index, and fills out a handling report. Bee also assures that all required labels and placards are in place. Transport index is the radiation level obtained using the gamma probe at 1 meter from the container. Bee will not allow a shipment to depart without instructions from Edlow if a transport index greater than 5.0 is found.
6. Bee notifies Edlow by phone after shipment has departed. Bee dispatches documents supplied by Edlow with shipment.
7. Bee sends Edlow a copy of the bill of lading and the handling report.

C. Operations

1. Bee files the following documents in the office. Bee posts the NRC-3 form and notice that the following documents are on file in the office. Postings and filings shall remain until the warehouse is no longer operating.
   a) 10CFR19
   b) 10CFR20
   c) special material license
   d) operating procedures
   e) notice of any violations

   The storage area will be posted for "radiation" as required under 10CFR20.
2. Bee performs a daily visual inspection of the material. Records of who does this and the time spent, will be kept by Bee on forms provided by Edlow.
3. Bee performs a monthly check with the Geiger counter around the storage area perimeter checking the radiation levels and checking for contamination. Bee records on forms provided by Edlow the names of people doing the survey and how much time is spent doing it. Bee sends a copy of this form to Edlow.

EDLOW INTERNATIONAL COMPANY
SUITE 404 1100 17TH ST., N.W.
WASHINGTON, D.C. 20036

IV. OPERATING AND ADMINISTRATION PROCEDURES

A. Responsibility

1. It is the responsibility of Jack Edlow, President, and Bruce Podhurst, Manager, Fuel Cycle Services to assure that the storage facility is operated properly and safely and in accordance with all procedures, governmental regulations and license conditions.

B. Receiving

1. Customer notifies Edlow in writing at least one month in advance of quantity and date of planned shipment to warehouse. Edlow then notifies Bee in writing of this information.
2. Customer updates notice on shipment to Edlow by phone one week prior to the shipment. Edlow promptly notifies Bee by phone of this information.
3. Edlow instructs customer to have shipper:
   a) notify Edlow when shipment departs
   b) supply Edlow with name of carrier
   c) provide the estimated time of arrival
   d) provide cylinder identification numbers
   e) place on the bill of lading the requirement that the delivering carrier call Bee upon arrival in the St. Louis area for delivery instructions, noting that the warehouse will only accept deliveries from 8:00 a.m. to 2:00 p.m. on normal business days.
4. Customer notifies Edlow by phone one day prior to shipment of all details of transport. Edlow immediately notifies Bee by phone of this information.
5. Shipper notifies Edlow after shipment departs of items 3.a) through 3.d). Edlow immediately gives Bee this information by phone.
6. Bee notifies Edlow when shipment arrives.
7. Bee notifies Edlow after shipment is placed in storage.
8. Edlow immediately notifies NRC and carrier as required in 10CFR20.205 if excessive contamination is found on the cylinders. Edlow also contacts shipper to determine source and type of contamination and best method of dealing with it. Edlow notifies Bee of how to procede with handling the excessive contamination.
9. Edlow fills out 741 form and distributes after notification from Bee that shipment has arrived in proper condition.
10. Edlow sends customer warehouse receipt.
11. Edlow will maintain all records and documents for a minimum of five years.

C. Shipping

1. Customer gives Edlow details in writing of upcoming shipment from warehouse at least one month in advance of desired shipping date. Edlow notifies Bee promptly in writing.
2. Customer updates notice on shipment to Edlow by phone one week prior to the shipment. Edlow promptly notifies Bee by phone of this information.
3. Edlow sends Bee a Notice of Upcoming Shipment.
4. Edlow prepares the 741 forms and Bill of Lading and sends them to Bee prior to the shipment.
5. Customer notifies Edlow by phone one day prior to shipment of all details of transport. Edlow immediately notifies Bee by phone of this information.

6. Edlow receives notice from Bee that shipment has been dispatched.
7. Edlow receives bill of lading and handling report from Bee and retains.
8. Edlow sends customer notice that shipment was made.

D. Operations
1. Edlow receives Bee's report of daily inspections and files the reports.
2. Edlow receives Bee's report of monthly radiation survey.
3. Edlow arranges with Chem-Nuclear Systems, Inc. for the pickup and disposal of waste drums whenever a full drum of waste is accumulated.

E. Audits
1. Edlow will review all logs, reports, and documents submitted by Bee prior to filing. Bee will be questioned on any unusual items or discrepencies or violation of procedures and any necessary action will be taken.
2. Edlow personnel will visit the storage facility at least once per quarter to take an inventory of material in storage. During this time Bee's adherence to procedures and its records will be checked. Bee will also be examined for adherence to the requirements of 10CFR19 and 10CFR20. The included audit check list will be used to provide a framework for the audit.
3. Edlow personnel will be present during the initial receiving of material for storage. They will monitor Bee's performance and adherence to procedures. They will assure that Bee personnel understand the procedures and the operation of the radiation detection equipment on which they have previously been trained, and provide any assistance necessary to assure that the initial operations are handled correctly.
4. Edlow personnel will conduct two unscheduled audits of Bee's operations per year.
5. Any problems uncovered during regular or unscheduled inspections of Bee will be discussed with and noted to Bee in writing along with the required corrective action promptly. Bee will notify Edlow when corrective action has been taken. Bee will be audited during the next inspection to assure that the deficiencies have been corrected.

AUDIT CHECKLIST

YES NO

1. Storage area
   a) Radiation Posting
   b) NRC-3 form posted
   c) Document notice posted
   d) Fence locked
   e) Two 55 gallon drums
   f) TLD's emplaced properly:

2. Office
   a) NRC-3 form posted
   b) Document notice posted
   c) 10CFR19 filed
   d) 10CFR20 filed
   e) License filed
   f) Notice of violations posted
   g) Notice of violations filed
   h) Operating procedures filed
      1) Operating and Admin. Procedures - Bee
      2) Operating and Admin. Procedures - Edlow
      3) Emergency Procedures for Bee Industries
      4) Radiation Detection Procedures for Bee Industries
      5) Instructions for Geiger Counter use
   i) Geiger Counter Technical Manual filed
   j) Check sources
      1) CS-7A
      2) CS-13
   k) Geiger Counter
      1) E-120
      2) HP-270
      3) HP-190
3. Anti-contamination equipment
   a) Two respirators
   b) five cartridges
   c) Shoe covers
   d) Gloves
   e) Coveralls
   f) Plastic bags
   g) Duct tape
   h) Black tape
4. Cylinder emergency repair kit
5. Receiving
   a) Smears filed properly - cylinder # i)
      ii)
      iii)
      iv)
   b) Trained worker used Geiger Counter
   c) Properly instructed workers handled material
   d) Handling records correct

EDLOW INTERNATIONAL COMPANY
SUITE 404 1100 17TH ST., N.W.
WASHINGTON, D.C. 20036

	YES	NO
6. Inventory and Inspection Report		
a) Reports filed		
b) Trained worker used Geiger Counter		
c) Proper containers in storage		
7. Worker Logs		
a) Daily work log filed		
b) Worker record filed		
c) a) and b) are consistent		

EDLOW INTERNATIONAL COMPANY
SUITE 404 1100 17TH ST., N.W.
WASHINGTON, D.C. 20036

V. EMERGENCY PROCEDURES FOR SPECIAL NUCLEAR MATERIAL STORAGE

A. Emergency in which there is fire or the threat of fire -

a) notice should be given immediately to the East St. Louis fire department, telephone (618-274-0934), noting that the items involved are uranium hexafluoride. The fire department has been informed by EIC of the material to be stored.

b) notice should then be given to Edlow International Company, telephone (202-833-8237). for nights, weekends, and holidays alternate telephone contacts are Jack Edlow (301) 229-4992, Diane Harmon (703) 379-2799, Samuel Edlow (202) 363-4634, or Bruce Podhurst (703) 751-2629. One of the above will promptly go to the storage site to take charge of the situation.

c) all efforts should be made to keep fire from the material.

B. Emergency in which fire is not an immediate threat -

1. Contact should be made immediately for Edlow International Company, telephone (202) 833-8237. For nights, weekends and holidays, alternate telephone contacts are Jack Edlow (301) 229-4992, Diane Harmon (703) 379-2799, Samuel Edlow (202) 363-4634 or Bruce Podhurst (703) 751-2629. Instructions will then be given by Edlow staff as to what steps should next be taken. One of the above will promptly go to the storage to take charge of the situation, if warranted.

2. Leaking uranium hexafluoride cylinder -

a) Bee personnel should not enter or stay in a visible cloud of material leaking. Leaking UF6 will form a white cloud.

b) Edlow International should be immediately notified by phone. Bee should not procede with any actions until it receives instructions from Edlow. Edlow may authorize Bee to take actions to minimize the spread of contamination prior to the arrival of Edlow personnel on site.

c) Jack Edlow, Diane Harmon, Samuel Edlow, or Bruce Podhurst will go to the storage site to supervise operations relating to the handling and cleanup of the leak and to assure that any actions taken prior to their arrival on site were performed safely and correctly. If not, corrective action will be taken.

d) during cleanup and repair operations personnel must don and wear respirators and protective clothing as in 2 above.

e) the hole or source of the leak will most likely have been self-sealed by escaping hydrolized UF6. If not, the leak will be frozen off with a carbon dioxide fire extinguisher.

f) temporarily patch hole or crack with duct tape. A metal patch will be provided for shipping which will be applied per instructions to be supplied at that time by Edlow.

g) leaking valves should be replaced with a spare according to instructions to be provided by Edlow. Edlow personnel will be on site and supervise any valve replacement operation.

h) if the valve is sheared totally off, the hole should be plugged using a wooden plug.

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SUITE 404 1100 17TH ST., N.W.
WASHINGTON, D.C. 20036

i) a repair kit for repairing cylinders similar to the one described in Figure 22 of ORO-651 Rev. 4, "Uranium Hexafluoride: Handling Procedures and Container Criteria" will be provided by Edlow and kept by Bee to facilitate any repairs necessary.

j) anti-contamination clothing should not be taken outside storage area after it has been worn during cleanup operations. It should be discarded in a waste drum inside the storage area.

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VI. BASICS OF RADIATION

I. Introduction - 5 minutes
A. Objectives
   1. Provide information on radiation
   2. Provide information on hazard
   3. Provide introduction to health physics
B. 10CFR19 - Notices, Instructions and Reports to Workers; Inspection
   1. Posting of notices - 30 minutes
      a) 10CFR19 and 10CFR20
      b) license
      c) operating procedures
      d) NRC-3 "Notice to Employees"
      e) notice of violations
   2. Responsibilities - 30 minutes
      a) workers instructed in how to minimize exposure
      b) workers instructed in health protection problems of radiation
      c) workers instructed to observe Commission regulations and licenses
      d) workers instructed in emergency response
      e) workers instructed to report problems causing potential violations to licensee
   3. Reports - 10 minutes
      a) not required as doses unlikely to exceed the 5% for under 18 year olds or 25% for those over 18 years old of the 1.25 rems per quarter specified in 20.101 and 20.401.
   4. NRC - 10 minutes
      a) NRC can inspect at all reasonable times
      b) NRC can consult privately with workers
      c) workers can request inspection if believes there are violations
C. Hazards
   1. Types - 30 minutes
      a) chemical - UF6 is corrosive and can burn lungs, eyes, skin. UF6 forms HF+ U02F2 particles (white cloud) in air.
      b) toxic - UF6 can damage kidneys if ingested in large amounts. Other damage to lung and kidneys from small amounts is repairable or temporary.
      c) radiation - transport index of 5 for UF6, (mR/hr. at 1 meter).
   2. Risk - 30 minutes
      a) UF6 is solid under 147 F
      b) UF6 in DOT type 7A 5/8 inch thick steel cylinders
      c) UF6 leaks self-sealing from produced UO_2F_2
   3. Risk Reduction - 40 minutes
      a) packaging
      b) handling - forklift or crane
      c) storage - fenced, stay away from fence if possible
      d) time - distance procedures (minimize time, maintain distance)
      e) emergency procedures and kits
      f) store away from flammables and explosives

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II. Radiation
A. Sources - 15 minutes
   1. Natural - cosmic rays, minerals, water
   2. Man-made elements above uranium, fission products, sources
   3. Medical/dental
   4. Average yearly doses
      a) radiation from background - 100 to 200 mR
      b) radiation from medical/dental - 10 to 30 mR/x ray
      c) other sources - flying at .5 mR/hr., TV, etc.
      d) radiation worker allowed 5000 mR
      e) general public allowed 500 mR
      f) levels at facility less than 1 mR/hr.
B. Definitions - 15 minutes
   1. Radiation - energy
   2. Contamination - particles of material giving off radioactivity
   3. Roentgen - amount of gamma radiation that loses in air 78 ergs/gram
   4. Rem (roentgen equivalent man) - radiation absorbed by man which will produce the same biological effects as 1 roentgen of x or gamma radiation
   5. Curie - 3.7×10^{10} disintergrations per second
C. Types - 15 minutes
   1. Alpha - helium - will not penetrate paper, skin
   2. Beta - electron - will not penetrate steel
   3. Gamma - x ray, photons - decreased by lead, concrete
   4. Neutron
D. Biological Effects - 15 minutes
   1. Cell damage
      a) permanent
      b) temporary
   2. Dose rate/Dose
   3. Area exposed - quarterly allowable - hands 18 3/4 R, skin 7½
III. Dosimetry
A. Dosimeters - 30 minutes
   1. TLD's - read quarterly
   2. Geiger Counters - CPM and mR/hr. readings
   3. Film Badges
B. 10CFR20 - 30 minutes
   1. Quarterly doses
      a) whole body - 1.25 R
      b) skin - 7.5 R
      c) extremities - 18.75 R
      d) whole body can go to 3R in quarter
   2. General
      a) personnel monitoring not required as this is not radiation area as level is less than 5 mR/hr., 100 mR dose in 7 days.
      b) area is unrestricted as level is less than 2 mR/hr., 100 mR dose in 7 days.
   3. Posting
      a) See I.B.1
      b) 20.203 - Caution Radioactive Materials for Enriched U.

IV. Contamination

A. Hazards - 30 minutes
   1. External
   2. Internal

B. Detection - 60 minutes
   1. Senses ineffective usually
   2. Smears
   3. Detectors, use of Geiger counter and TLD's

C. Protection - 60 minutes
   1. Decontamination
   2. Respirator
   3. Clothing
   4. Bagging

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12. Criticality

Section 10CFR70.24 covers the need for criticality monitors at special nuclear materials facilities. Edlow Internatinal does not intend to use criticality monitors as, due to the type of material to be stored, a criticality accident is not possible.

There has been a long history of storage of low enriched uranium hexafluoride in 30 inch diameter cylinders. Criticality considerations for these cyinders were analyzed by the Union Carbide Corporation Nuclear Division at the Oak Ridge Gaseous Diffusion Plant in report K-1686, "Protective Shipping Packages For 30-inch-Diameter UF6 Cylinders", April 13, 1967.

Criticality calculations were made for various cylinder wall thicknesses for an infinite length cylinder array using the ANISN computer code. Results of these calculations were verified in experiments conducted at the Oak Ridge Critical Experiments Facility of the Oak Ridge National Laboratory.

Figure 3 of the report shows the infinite multiplication factor for various enrichments with different cylinder wall thicknesses. At a .4 inch thickness which corresponds to a type 30A cylinder, the multiplication factor is .8 for 4.5 weight percent uranium and only slightly higher for 5.0 weight percent uranium. It would be lower with type 30B cylinders where the wall thickness is .5 inches of steel. The report goes on to state on page 25 in the section titled, "Criticality of Arrays" that "it is somewhat doubtful if criticality could ever be achieved in any array of the 30-inch-diameter UF6 cylinders at the 4.5% 235 U enrichment level."

Edlow intends to store the cylinders with a minimum separation of one foot on the sides and ends. The cylinders will sit on railroad ties.

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13. Security

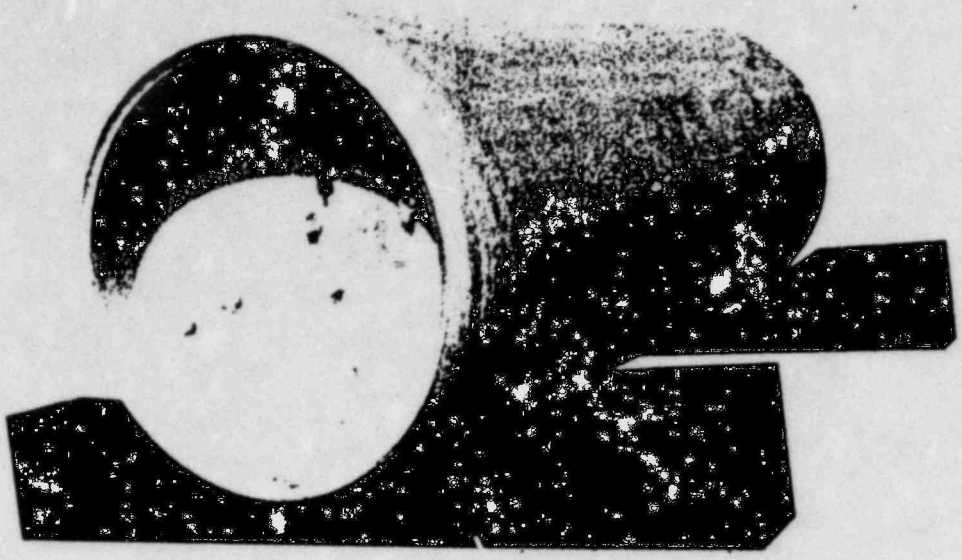
Security as required by 10CFR73.67f will be provided. Special nuclear material stored in the warehouse building will be placed in rooms which will be kept locked at all times, except when the personnel need access to the cylinders.

Motion detectors will be activated in areas in the warehouse where cylinders are stored when personnel are not working in those areas. After business hours alarms on all doors and windows in the warehouse, as well as the motion detectors will be activated. As noted before, these systems will be monitored by Police Alert Security Systems.

Special nuclear material stored outdoors in a fenced compound will be protected by two electronic systems. First, the compound fence will be protected by shock sensors which are continuously activated. Second, microwave detectors will be activated after business hours to protect the outside perimeter of the site fence. This system will create an eight foot high beam from ground level to the top of the fence with a width of four feet which will detect an intruder breaking the beam.

ATTACHMENT 1

UF_6 CYLINDER MODEL 30A*



GENERAL DATA

Other Descriptive Terminology Used - 2-1/2-ton UF_6, 1-ton chlorine

ENGINEERING DRAWING REFERENCE	GOODYEAR ATOMIC CORPORATION, DRAWING CX-761-M2027
Nominal Diameter	30 in.
Nominal Length	81 in.
Wall Thickness	13/32 in.
Head Thickness	3/4 in.
Nominal Tare Weight	1,400 lb (635 kg)
Maximum Net Weight	4,950 lb (2,245 kg)
Nominal Gross Weight	6,350 lb (2,880 kg)
Minimum Volume	25.65 ft^3 (726 liters)
Basic Material of Construction	Steel
Service Pressure	192 psig (approximately)
Hydrostatic Test Pressure	500 psig
Isotopic Content Limit	5.0% U-235 max with moderation control

Valve Used - 1-in Valve.

*OBSOLETE – SUBSTITUTE MODEL 30B

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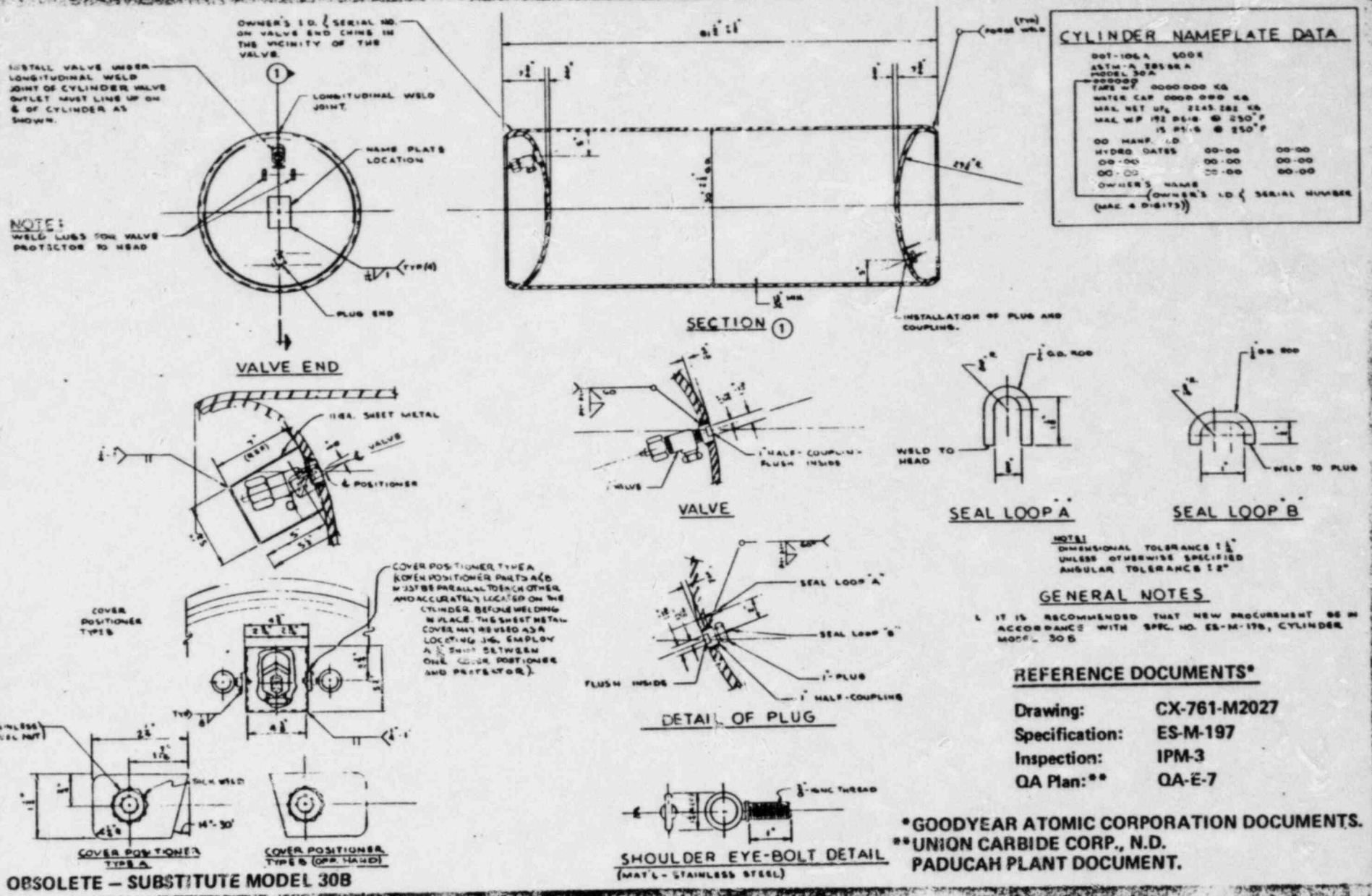

UF$_6$ CYLINDER MODEL 30A

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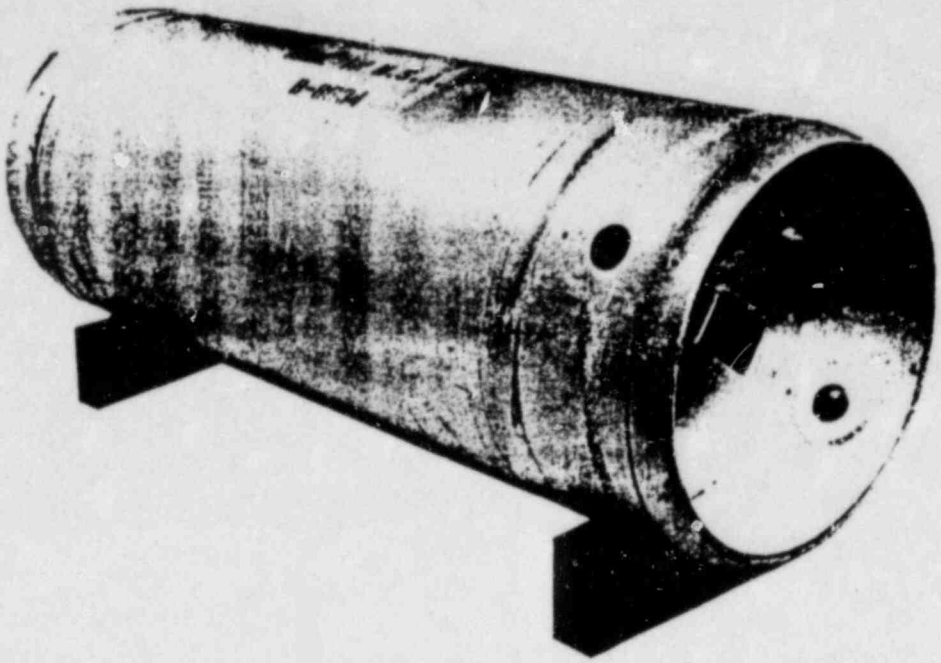
ATTACHMENT 3

UF_6 CYLINDER MODEL 30B



GENERAL DATA

Other Descriptive Terminology Used - 2-1/2-ton

ENGINEERING DRAWING REFERENCE	GOODYEAR ATOMIC CORPORATION DRAWING: CX-761-M2028
Nominal Diameter	30 in.
Nominal Length	81 in.
Wall Thickness	1/2 in.
Nominal Tare Weight	1,400 lb (635 kg)
Maximum Net Weight	5,020 lb (2,277 kg)
Nominal Gross Weight	6,420 lb (2,912 kg)
Minimum Volume	26 ft^3 (736 liters)
Basic Material of Construction	Steel
Service Pressure	200 psig
Hydrostatic Test Pressure	400 psig
Isotopic Content Limit	5.0% U-235 max with moderation control

Valve Used - 1-in Valve.

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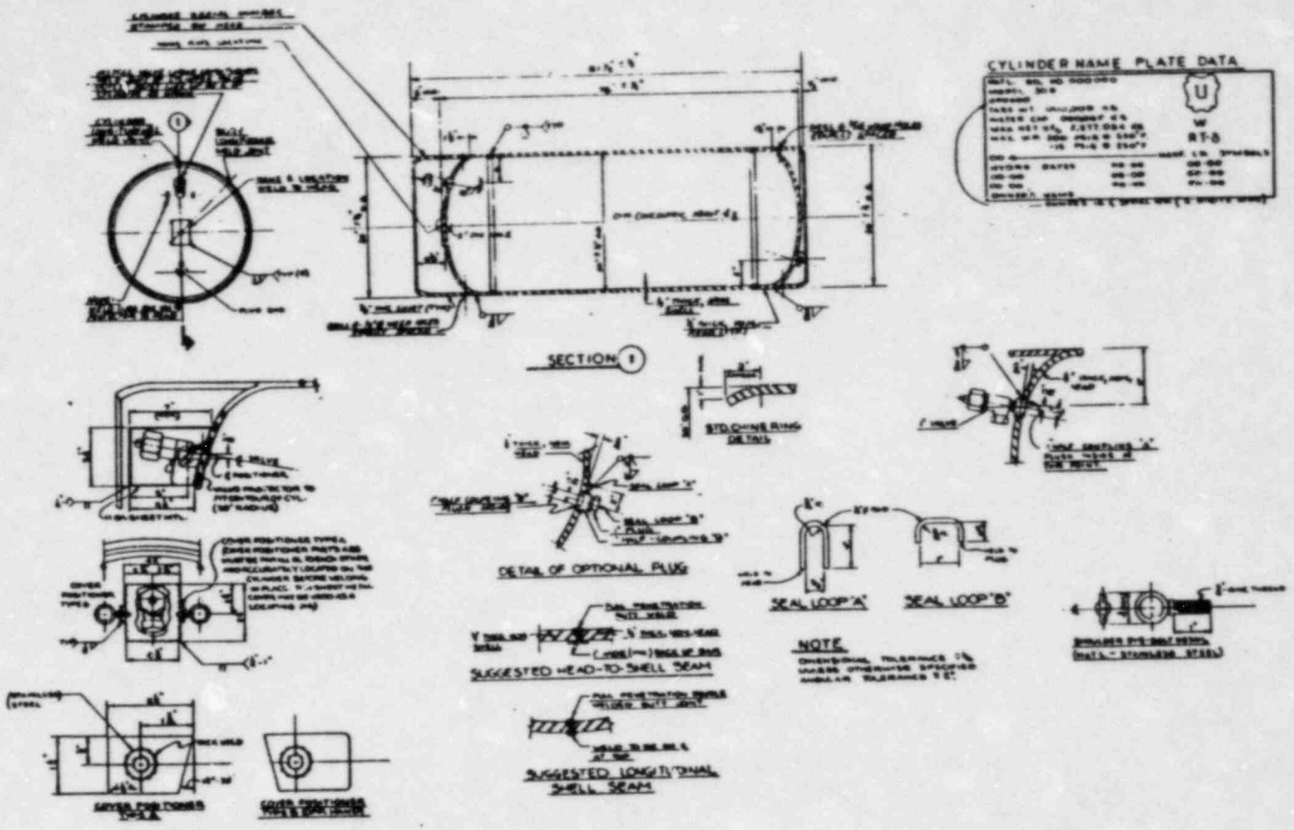

REFERENCE DOCUMENTS*

Drawing:	**CX-761-M2028**
Specification:	**ES-M-198**
Inspection:	**IPM-3**
QA Plan:**	**QA-E-7**

***GOODYEAR ATOMIC CORPORATION DOCUMENTS.**
****UNION CARBIDE CORP., N.D. PADUCAH PLANT.**

UF_6 CYLINDER MODEL 30B

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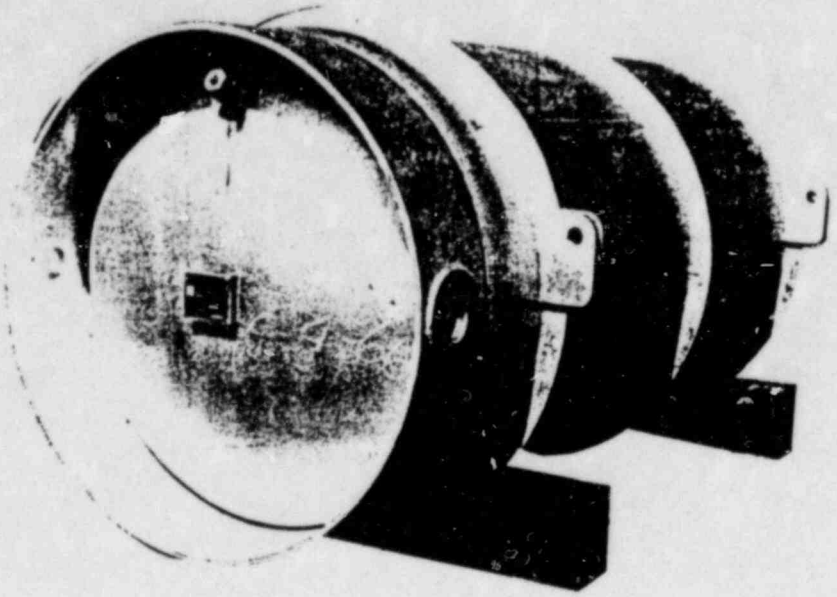
ATTACHMENT 5

UF_6 CYLINDER MODEL 48X



GENERAL DATA

Other Descriptive Terminology Used - 10-ton

ENGINEERING DRAWING REFERENCE	UNION CARBIDE CORPORATION PGDP E-S-12292-B
Nominal Diameter	48 in.
Nominal Length	121 in.
Wall Thickness	5/8 in.
Nominal Tare Weight	4,500 lb (2,041 kg)
Maximum Net Weight	21,030 lb (9,539 kg)
Nominal Gross Weight	25,530 lb (11,580 kg)
Minimum Volume	[illegible] ft³ (3,084 m³)
Basic Material of Construction	[illegible]
Service Pressure	200 [illegible]
Hydrostatic Test Pressure	400 psig
Isotopic Content Limit	4.5% U-235 max with moderation control

Valve Used - 1-in Valve.

NOTE: Previously built 48A cylinders are similar in design, but do not have certified volumes; refer to Table 3 for fill limits and other data applicable to this cylinder.

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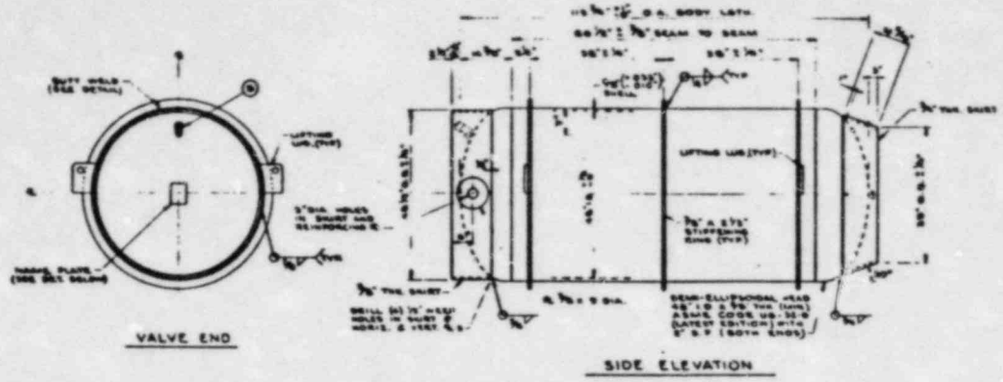
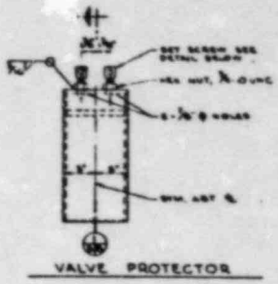
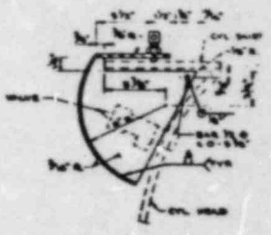
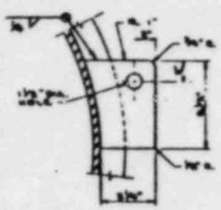
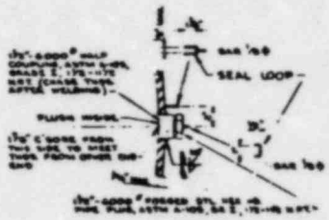
WASHINGTON, D.C. 20036

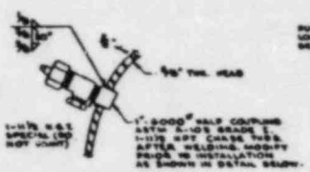


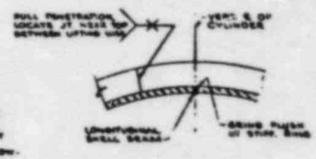


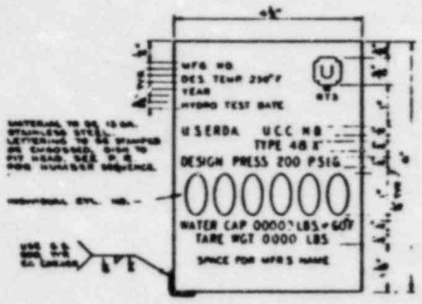


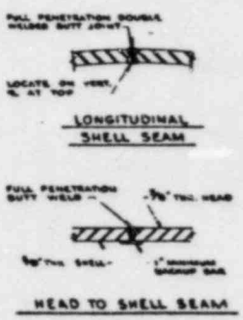


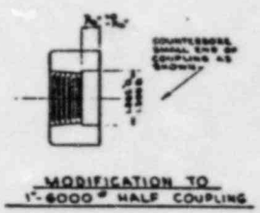












REFERENCE DOCUMENTS *

Drawing:	**E-S-12292-B**
Specification:	**JSP-554-R-O**
Inspection:	**ME&I-11C**
QA Plan:*	**QA-E-7**

***UNION CARBIDE CORP., N.D. PADUCAH PLANT DOCUMENT.**

UF_6 CYLINDER MODEL 48X

ATTACHMENT 6

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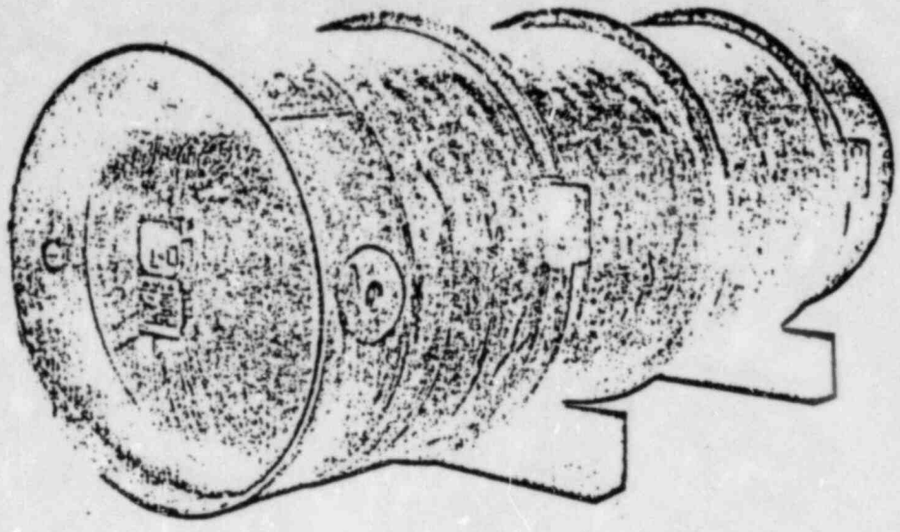
ATTACHMENT 7

UF_6 CYLINDER MODEL 48Y



GENERAL DATA

Other Descriptive Terminology Used - 14-ton

ENGINEERING DRAWING REFERENCE	UNION CARBIDE CORPORATION, PGDP: E-S-12292-C
Nominal Diameter	48 in.
Nominal Length	150 in.
Wall Thickness	5/8 in.
Nominal Tare Weight	5,200 lb (2,359 kg)
Maximum Net Weight	27,560 lb (12,501 kg)
Nominal Gross Weight	32,760 lb (14,860 kg)
Minimum Volume	142.7 ft^3 (4.04 m^3)
Basic Material of Construction	Steel
Service Pressure	200 psig
Hydrostatic Test Pressure	400 psig
Isotopic Content Limit	4.5% U-235 max with moderation control

Valve Used - 1-in. Valve.

NOTE: Previously built 48F cylinders are similar in design, but do not have certified volumes; refer to table 3 for fill limits and other data applicable to this cylinder.

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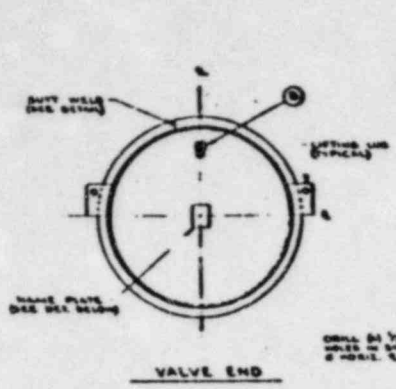
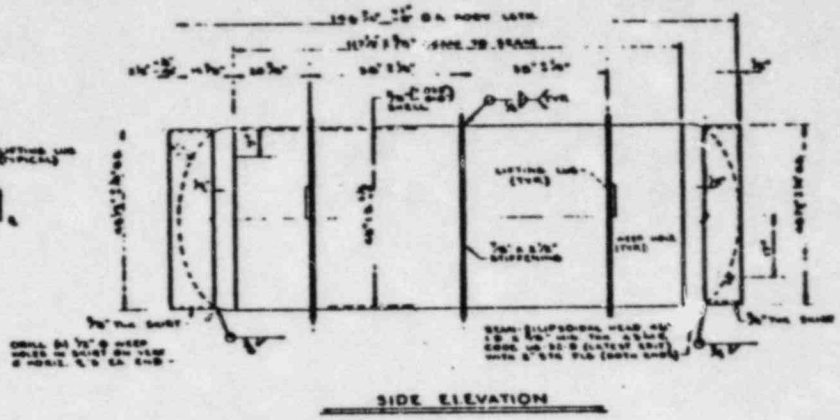
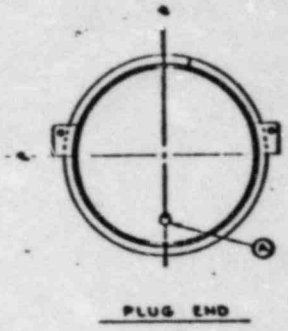


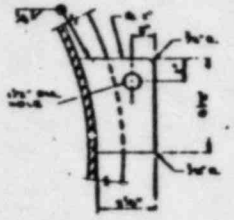
VALVE END



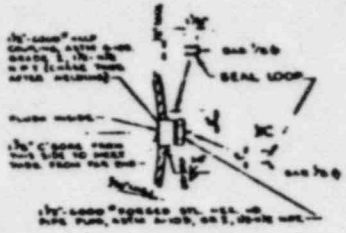
SIDE ELEVATION



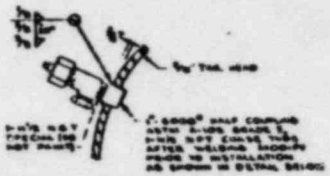
PLUG END



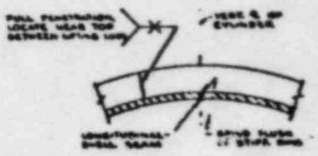
LIFTING LUG



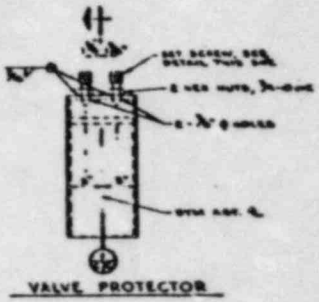
PLUG Ⓐ



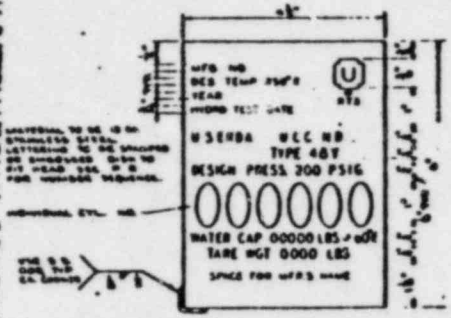
VALVE Ⓑ



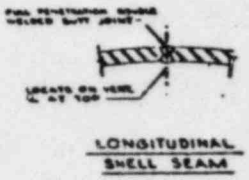
JOINT WELD IN STIFFENING RING



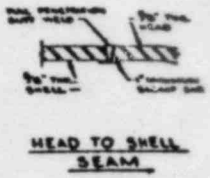
VALVE PROTECTOR



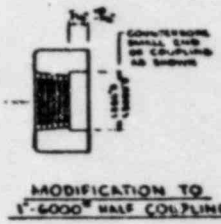
NAME PLATE



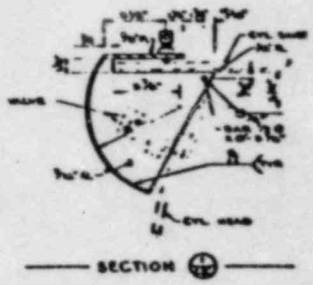
LONGITUDINAL SHELL SEAM



HEAD TO SHELL SEAM



MODIFICATION TO 1"-6000# HALF COUPLING



SECTION Ⓓ

SET SCREW DETAIL

REFERENCE DOCUMENTS*

Drawing:	E-S-12292-C
Specification:	JSP-555
Inspection:	ME&I-11C
QA Plan:	QA E-7

*UNION CARBIDE CORP., N.D. PADUCAH PLANT DOCUMENTS.

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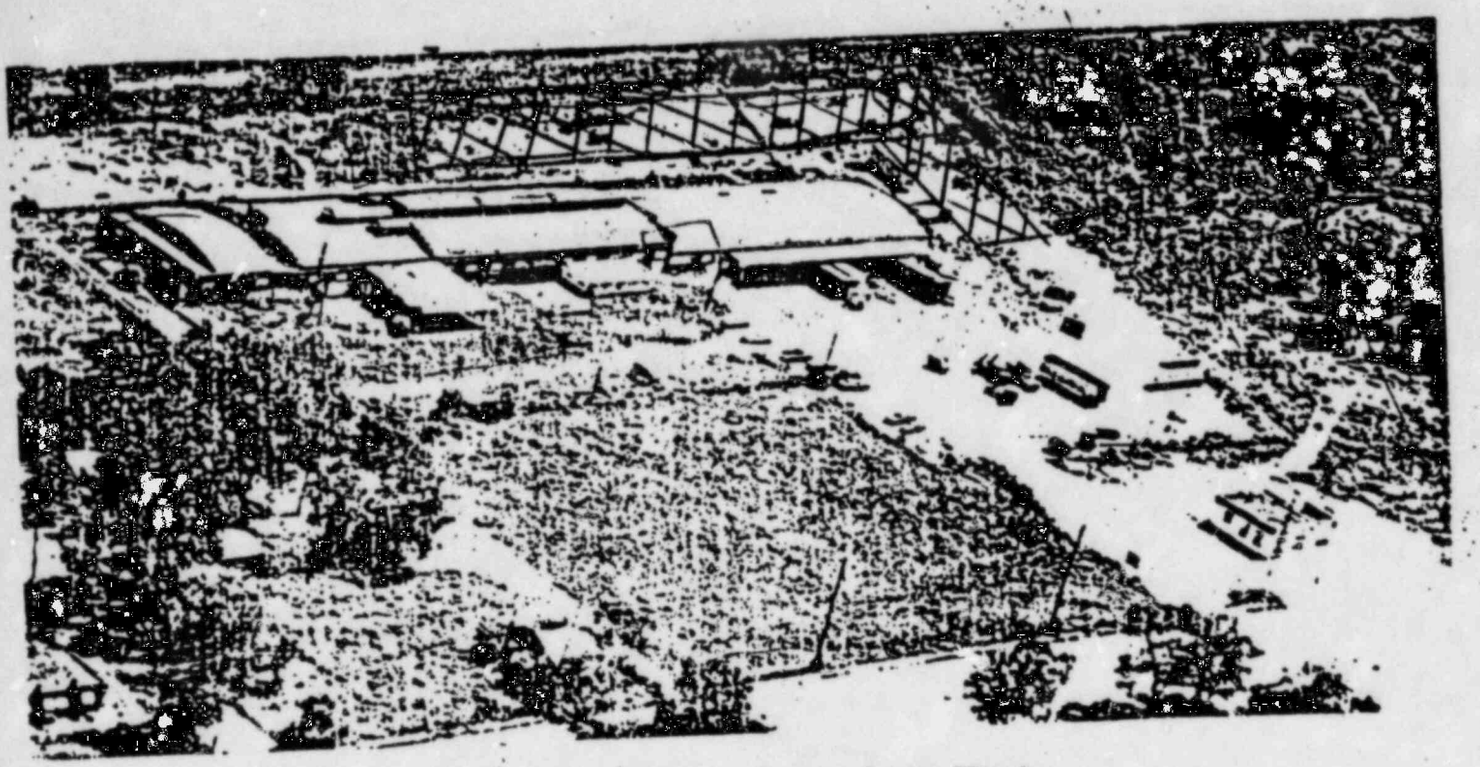
ATTACHMENT 8

UF_6 CYLINDER MODEL 48Y

ATTACHMENT 9



3131 St. Clair Avenue, East St. Louis, Illinois
(Just east of 25th Street interchange)

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FOR PERSONNEL & ENVIRONMENTAL MONITORING

Thermoluminescence dosimetry (TLD) has emerged in recent years as a clearly acceptable alternative to film badges. This technique is based on the ability of certain materials to absorb and store radiation energy, releasing the stored energy in the form of light when the material is heated. Many of the disadvantages of film badges are eliminated by TLD. Lithium fluoride is the most popular TLD material for the following reasons:

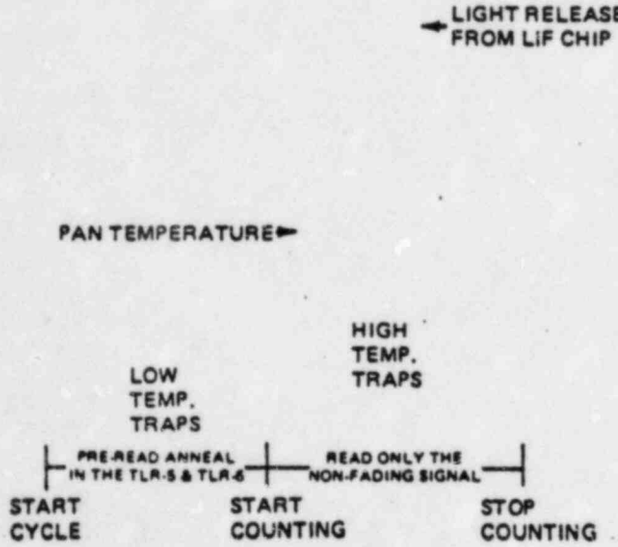
1. The rad response of this material is similar to that of soft tissue, eliminating the need for a complex set of filters.
2. The useful range for gamma (γ) and x-ray is 1 mR to 1000 R, the entire range of interest in radiation protection. The response is linear with exposure over this range eliminating the need for calibration curves.
3. The material is commercially available in small solid dosimeters, especially useful in this application.
4. With proper annealing and reading, badge exchange frequency can be quarterly for personnel who are unlikely to exceed the quarterly occupational dose limits.
5. Angular dependence is almost completely eliminated with the Eberline badge design.
6. Effects of light, heat, humidity and time on the response are not significant with the Eberline method of dosimeter annealing and readout.

After a decade of providing film badge service (1960 to 1970) and another decade of TLD service (1967 to 1977), Eberline is convinced that TLD offers the best available technique for personnel dosimetry.

The Eberline two-step method of readout completely eliminates fading of response for use periods up to one year.

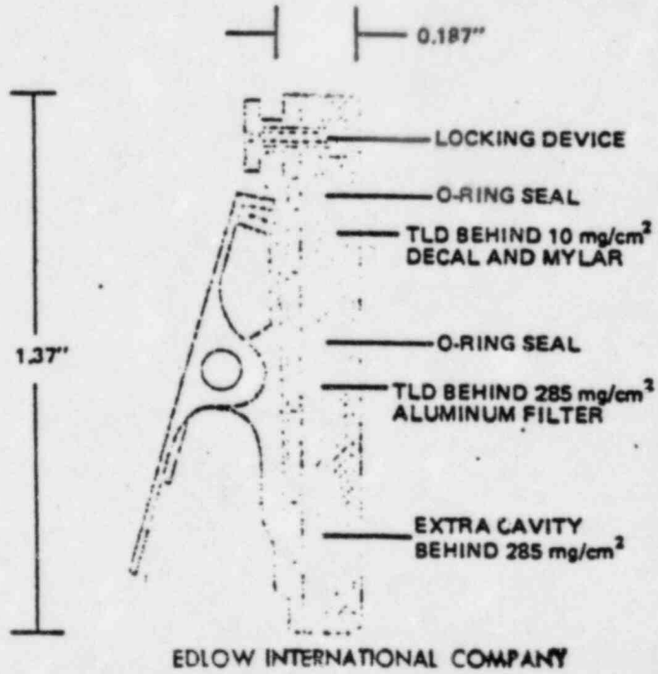
TLR-5 AND TLR-6 [illegible]

Identical to the personnel badge, except that the clip is replaced with an elastic band. This badge design is also suitable for attaching to a photo identification badge.



A variety of TLD holders is available, including the following:

Eberline provides a TLD badge with shielding to measure both the "shallow" and "deep" dose equivalents from beta, gamma, neutron and x-ray radiation.



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A single TLD chip supplied in a small, black polyethylene bag, which is 10 mg/cm^2 thick, mounted on an elastic finger band. This badge is used to measure extremity dose from beta (β), γ or x-ray.

Each badge consists of five LiF chips selected for uniform response, in a plastic holder. The plastic provides adequate protection from weather for this badge to be used out-of-doors

Eberline provides a neutron service based on the technique of Geiger and Doles (Proceedings of the Ninth Midyear Topical Symposium of the Health Physics Society, pages 845-849, February 1976). This technique is used to: (1) identify standard LiF dosimeters that have been exposed to neutrons, (2) calculate neutron and γ components of a mixed irradiation, and (3) estimate the dose from neutrons in situations where the spectrum of neutrons remains relatively constant. This method is based on the fact that natural lithium fluoride responds differently to neutrons than to γ, β or x-rays, with more of the stored energy attributable to neutrons being released at a higher temperature (325°C). The neutron response is dependent on the ratio of thermal neutrons to intermediate or fast neutrons. In a facility where this ratio is relatively constant, the technique may be used to estimate neutron dose. In a facility where the ratio is highly variable, the technique may be used to identify persons who should routinely use one of the other methods of neutron dosimetry. When requested by the customer, badges for neutron readout are issued with a red decal. Badges that are not identified in advance as neutron badges can still be read out for neutrons if they are so marked at the time of return to Eberline. The neutron component is reported in counts, with the customer converting counts to mrem based on calibration under typical conditions of neutron moderation at that facility. This calibration is done with a neutron rem-counter and Eberline TLD badges mounted on a one-gallon jug of water. The customer applies the mrem/count conversion factor that was determined for his facility. This neutron dose is then added to the dose record maintained by Eberline for that individual. The doses (penetrating and skin) from x-ray, γ and β also are reported by Eberline for each badge.

Frequency of exchange: When personnel seldom approach the 1250 mrem quarterly dose limit, a quarterly exchange is adequate. If the limit could be exceeded, monthly exchange is recommended. Environmental badges should be exchanged quarterly.

Exchange procedure: So simple—Eberline will ship a complete new TLD badge prior to each exchange date and customer returns the used badge for reading and reporting. Shipping container and return shipping labels are provided with each shipment of badges.

Eberline TLD service meets performance requirements of standards developed by the Health Physics Society and the American National Standards Institute and Regulatory Guides of the Nuclear Regulatory Commission. Additional assurance is gained through audits conducted internally and by Eberline customers, and through an extensive and continuing dosimetry performance testing program.

One element of the Eberline program consists of a group of reference dosimeters, closely selected for uniform response, used to indicate the consistency in the annealing and reading process. Another is the weekly readout of in-house quality control badges, exposed by the QA Manager. Since they are representative of the current supply provided to customers, the results obtained from these badges indicate the consistency and accuracy of the total dosimetry program.

Badges representative of the current supply, and routinely processed in the same manner as those shipped to customers, are sent monthly to an independent agency for additional performance testing. Sources used include ^{226}Ra, ^{137}Cs and ^{60}Co γ radiation; x-rays of various energies down to 15 keV; β from ^{90}SrY; and neutrons from ^{252}Cf. Results of this testing are consistent with the Health Physics Society Standards Committee proposed standard "Criteria for Testing Personnel Dosimetry Performance". When this standard has been fully implemented, Eberline will supply to each customer evidence that the Eberline service meets these performance criteria for each type service provided to that customer.

The Eberline TLD report has been approved for use in lieu of NRC Form 5. A special form is provided to record information on start-up, additions and deletions.

Routine reports are normally mailed within one or two working days after receipt of badges and always within five working days. Emergency reports, if required, are made by telephone the same day the badges are received. Additional reports supplied at year-end as required by NRC include a statistical listing of number of persons in various dose ranges and a dose summary, listing the quarterly dose to each person.

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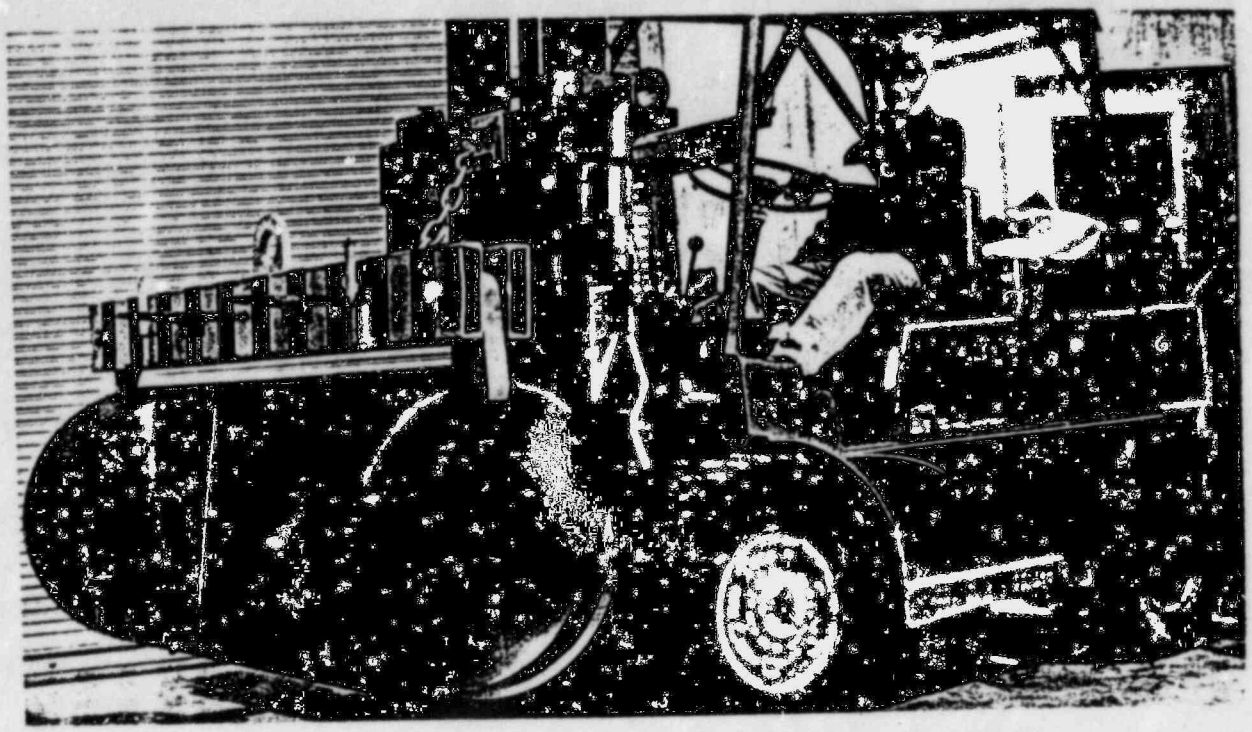

Figure 13
STIFF BACK FOR CYLINDER MODELS 30A AND 30B

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