WANL-TME-621
Rev. 600-0
November 17, 1967

Revision 600-1
March 15, 1968

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Date: 5-3-82

WESTINGHOUSE ELECTRIC CORPORATION

ASTRONUCLEAR CORE OPERATIONS

Cheswick, Pennsylvania

CRITICALITY MANUAL

Classification cancelled for change to
by authority of DOE
by H.P.C. TIC, date SEP 10 1973

SECTION I	Criticality Hazards Control Procedures
SECTION II	Approved Criticality Zones, Building 6 and Outside Storage Areas
SECTION III	Approved Criticality Zones, Buildings 5, 5A, and 5C
SECTION IV	Criticality Instructions

MASTER

Approved By: M. T. Johnson

M. T. Johnson, Manager
NERVA Fuel & Materials

INFORMATION CATEGORY
CONFIDENTIAL RESTRICTED DATA

R.D. Bunn 11-17-67
Authorized Classifier Date

GROUP 1 - Excluded from automatic
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Section I
Revision 600-0
November 17, 1967

ASTRONUCLEAR CORE OPERATIONS
CRITICALITY HAZARDS CONTROL PROCEDURES

SECTION I

INFORMATION CATEGORY

UNCLASSIFIED

R.D. Brown 11-20-67
Authorized Classifier Date

I. INTRODUCTION

To maintain adequate criticality control during the handling and fabrication of enriched uranium bearing materials in the Westinghouse Astronuclear Core Operations (WNCO), a criticality control system has been established which meets the requirements of the Astronuclear Division Procedure 562 and the Astronuclear Laboratory Criticality Hazards Control Guide (WANL-TME-185). This document presents the criticality control procedures specified in the criticality guidance document (TME-185).

The standard procedures will insure criticality hazards control by enforcing defined restrictions on the allowable amount of enriched uranium and the methods for handling it. For clarity, operational areas of WNCO have been divided into work areas, and the work areas subdivided into criticality zones. The basic control area is the criticality zone. The boundaries of these zones are designated by special floor markings where there is no wall or barrier to provide a physical separation. Where walls serve as boundaries of a criticality zone, a strip of the special tape is laid across the entrance or entrances of the walled areas. Both mass and geometry control criteria are used and the applicable rules, limitations, and restrictions are posted in each criticality zone. A description of the criticality zones and their respective limits are given in Sections II and III of this manual. These will be kept current by replacement of the pages affected by approved changes.

A member of Management must be in charge of the Facility when people other than instructed guards are in areas where fuel is available. The line supervisor is responsible for maintaining nuclear safety within his area of responsibility, and he shall establish the techniques required to assure

himself that all criticality hazards control procedures are adhered to. Periodic documented audits will be conducted by personnel designated by the WNCO Plant Manager. If any violations are noted, immediate action will be taken to rectify the situation and a written report submitted to the WNCO Plant Manager.

The Nuclear Safety Engineer or his designated representative will make periodic inspections (approximately weekly) of WNCO. If any violations are noted, he will make an immediate oral report to the responsible supervisor. This will be followed by a written report to the supervisor with carbon copies to the supervisor's line Manager, the WNCO Plant Manager, and the Nuclear Safety Committee. The responsible Manager will then make a written reply within five (5) working days to the Nuclear Safety Engineer defining the corrective action to be taken. If he is unsatisfied with the action taken by WNCO Management, the Nuclear Safety Engineer will immediately advise NERVA Project Management.

Additional control of nuclear safety is accomplished by requiring all uranium bearing material entering or leaving WNCO to be cleared through the Accountability personnel.

The details of this control system are specified in the ensuing sections of this manual.

II. CHANGE PROCEDURE

Changes to this manual must be initiated, reviewed and approved in accordance with WANL Division Procedure 562.

A file of documents supporting changes in this manual will be maintained by the Accountability-Criticality representative.

III. DEFINITIONS

These definitions apply to WNCO.

- A. Facility - A building or a section of a building or complex of buildings in which the handling and processing of uranium materials is conducted.

- B. Work Area - A section or part of a facility where a single type of operation or a related series of operations involving enriched uranium material are performed. For example: Mixing and Extrusion Area, Machine Shop Area, and Inspection Area.
- C. Criticality Zone - A well defined approved zone within a work area where a specific or individual type of operation is performed. Boundaries of criticality zones are physically designated by yellow tape marked "Crit Zone" or by physical barriers (i.e., walls, rails, etc.). Used in conjunction with an appropriate "Crit Zone Limit," they provide a method for administrative control. Aisles and park areas will be marked with plain yellow tape.
- D. Mass Controlled Criticality Zone - A criticality zone within which nuclear safety is maintained solely by limiting the quantity of enriched uranium bearing materials permitted within the zone.
- E. Geometry Controlled Criticality Zone - A criticality zone in which nuclear safety is maintained by restricting the geometry of containers and/or equipment used for enriched uranium materials.
- F. Park or Hold Area - A specified area within a Criticality Zone in which the fixture, transfer cart, etc., used in that zone must be located.
- G. Approved - Approved, as used in this document, means that the referenced item has been reviewed and approved in accordance with WANL Division Procedure 562.
- H. Uranium Material - Any material containing uranium. This includes mixes, element, scrap, etc.
- I. Enriched Uranium - Uranium which is enriched in the Isotope U-235.
- J. Non-Fueled Material - Any materials which physically resemble uranium materials but which contain no uranium.

- K. Fuel Element - A specific shape of graphite material. Unless specified to the contrary, a fuel element contains enriched uranium.
- L. Fuel - This word when used by itself means "enriched material. "
- M. Fuel Beads - Pyrocoated uranium dicarbide particles. Unless specified to the contrary, they contain enriched uranium.

IV. RESPONSIBILITIES

A. Manager, NERVA Fuel and Materials

1. Approve this manual and changes thereto as per WANL Division Procedure 562.

B. Plant Manager of WNCO

1. Assure all operations are covered by approved procedures.
2. Familiarize himself and comply with the latest revision of WANL Division Procedure 562, WANL-TME-185, and WANL-TME-621.
3. Make certain that WNCO supervisors are properly indoctrinated, and they, in turn, indoctrinate their personnel.
4. Enforce discipline for non-compliance of procedures.
5. Approve all requests for changes to the WNCO Criticality Hazards Control Procedures.

C. WNCO Line Management (all levels)

1. Assure all operations are covered by approved procedures and that working copies are available and up-to-date.
2. Assure that all personnel for whom they are responsible are thoroughly indoctrinated and their specific duties relative to criticality hazards control, and that they comply with all criticality hazards control rules. This includes temporary personnel and visitors.

3. Assure that all uranium or uranium materials and non-fuel materials are properly identified and perform identity checks when any question exists.
4. Assure that identification markings appear on all accompanying paperwork for uranium or uranium materials and non-fuel materials.
5. Assure by periodic inspection that the criticality hazards control procedures are effective, that all crit zones have clearly posted limits and markings, and that personnel are complying with the criticality hazards control procedures.
6. Assure that when an emergency such as a fire, explosion, or a water line break occurs in his building or area, immediate and proper action is taken in accordance with established Site Emergency Procedures.
7. Refer all situations not covered by this document to the Nuclear Safety Engineer and the WNCO Manager.
8. Familiarize themselves with and comply with all requirements of WANL-TME-621.
9. Insure that all personnel report to work in a physical and mental condition that does not impair their judgment or ability to effectively perform their duties.

D. Facility Technicians, Machinists, and Inspectors

1. Comply with all criticality hazards control rules as established in this document.
2. Refer all questions or special situations which are not covered by this procedure to his immediate supervisor.
3. Insure that his physical and mental condition while at work does not impair his judgment or ability to effectively perform his duties.

4. If required by assignment, move uranium material and/or identify, package, and store uranium materials in an approved manner and in approved containers, storage devices, and areas.

E. Substation Custodian, Vault Custodians, and Accountability Clerks

1. Comply with all criticality hazards control rules as established in this document.
2. Refer all questions or special situations which are not covered by this procedure to his immediate supervisor.
3. Insure that his physical and mental condition while at work does not impair his judgment or ability to effectively perform his duties.
4. Move and control or direct the movement of fuel beads into the process line.
5. Obtain the required agreement and instructions as to quantity, time, and place of delivery prior to moving or directing the movement of SS materials to another area under the control of another individual.
6. Receive or direct and control the receipt of SS materials from another area.
7. Properly identify, package, or store SS material by approved techniques and in approved storage containers, devices, or areas.

F. Nuclear Safety Engineer

1. Supply criticality calculations for WNCO.
2. Assist line management in assuring compliance with the latest revision of WANL Division Procedure 562, WANL-TME-185, and this manual WANL-TME-621.

V. CRITICALITY HAZARDS CONTROL RULES

A. Material Processing and Storage

1. Enriched Uranium Material - Enriched uranium material or material not positively identified as not being enriched uranium shall only be processed or stored within a criticality zone and with approved criticality limits.
2. Storage Requirement - All enriched uranium materials not in process shall be stored in an approved crit zone in an approved storage container or device.
3. Alteration of Fuel Storage Devices or Areas - No enriched uranium material, storage device, or area shall be altered without the prior approval.
4. Non-Fueled Material - All material which can positively be identified as being non-fueled can be stored without restriction in storage areas clearly marked "Non-Fueled - No Uranium Allowed. " When moved into crit zones, all non-fueled material must be handled as if it were uranium bearing material unless specific crit zone limits allow an intermix of materials and the zone is so posted. If the crit zone is purged of all uranium material and the zone clearly posted "Non-Fueled - No Uranium Allowed" then non-fueled materials can be worked in the crit zone without restriction.
5. Stacking Restriction - No material shall be stacked or stored in other than an approved manner.

6. Approved Containers - Only approved containers shall be used for handling or storing uranium materials, and only approved containers shall be permitted in a crit zone.
7. Governing Criticality Limit - When more than one type of uranium material or unfueled material, is being processed at one time within a work area, the material requiring application of the most restrictive criticality limit shall be the governing limit in that work area.
8. Sections of Fuel Elements - When a fuel element is sectioned other than for routine in-process sampling and/or routine machining, each section containing enriched uranium shall be considered as a whole component (*) and the approved criticality limits for the component shall apply, unless specific criticality limits are available for sections of the enriched uranium material component. In the case of routine samples and pieces of routine machining scrap, the limits for the crit zone in which they are generated and/or handled must include the quantity allowable.
9. Locking of Enriched Uranium Material Storage Areas - Fuel bead storage areas, crit zones A-1 and A-2 and outside storage areas, Work Area I containing radioactive material shall be locked when unattended by Accountability personnel or cognizant supervisors. Vaults, Crit Zones A-5, H-19, and K-6. will be locked to prevent entry of unauthorized personnel in case of fire or flooding. During normal working hours the vault door will be closed, but may remain unlocked. The key or combination to a vault will be available to responsible personnel in the work area and to cognizant supervisors. At any time it is necessary to have persons work in the operational areas who are not regular employees (maintenance workers, etc.) they must be

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(*) A number of fuel element sections may be treated as a single element if:
(a) the pieces are put in a capped aluminum tube (1-inch dia. by 52 inches long)
(b) the sections are placed end to end in a suitable tray or fixture that will hold the sections in a straight and plane position.

instructed not to move any material other than their own and there must be regular employees in attendance in the area. Elements may be left in approved containers and in approved crit zones at any time the operations are stopped provided the facility is locked to prevent other than regular employees and instructed guard patrol from entering.

10. Empty Containers - All approved containers for handling enriched uranium material, when empty, shall be identified "EMPTY" by label or marking pen unless it is immediately obvious by visual determination that containers are empty.

B. Material Identification

1. Enriched Uranium Material - All enriched uranium materials or their containers shall be marked "ENRICHED." Handling containers for all uranium materials except fuel elements must be marked with the quantity of uranium contained.
2. Questionable Identification - When a question or doubt exists concerning material identification, the employee shall immediately contact his immediate supervisor for clarification of the material identification. Until the identity has been established, the material shall be handled as if it were enriched material.
3. Route Cards, Work Requests, and Other Accompanying Paperwork
  - a) All route cards accompanying enriched uranium material shall be identified with the word "ENRICHED. "
  - b) All route cards accompanying non-fuel material shall be identified with the words "NON-FUEL. "
4. Non-Fueled Material - All non-fueled materials or their containers shall be marked "NON-FUELED. "

C. Criticality Zones

1. Identification - All criticality zones are identified by yellow tape marked "Crit Zone" or by physical barriers (i.e., walls, rails, etc.). Exceptions may be taken to the identification of zones with tapes where a piece of equipment (furnace) or section of a piece of equipment (port or shelf) is in itself a criticality zone. Such criticality zones may be identified by a sign on or in the proximity of the piece or section of equipment.

Where walls serve as boundaries of a criticality zone, a strip of yellow tape marked "Crit Zone" must be laid across the entrance or entrances of the walled area. If the fixture, transfer cart, etc., must be kept in a specific area of the zone, then that area will be defined with plain yellow tape. All limits are to be prominently posted at a point that is easily visible to the normal access direction.

2. Establishment and Modification - Criticality zones may not be established or modified without the written approval.
3. Combustible Materials - No combustible materials other than those absolutely necessary for processing purposes shall be in a criticality zone.
4. Liquids - May only be used or stored in crit zones which specifically allow their presence and then only in the quantity approved.

D. Standard Procedures Covering Movement of Fuel Material Between Criticality Zones

Note: Posting of Crit Zone contents is required in all crit zones except for specific controlled storage areas as designated in Section II, Approved Criticality Zones, Building 6 and Outside Storage Areas and Section III, Approved Criticality Zones, Buildings 5, 5A, and 5C.

1. Before fuel material is moved into a Crit Zone, the employe will:
  - a) Determine from the Crit Zone posting the amount of uranium in the zone.
  - b) Verify the "posted" uranium quantity by physical check.
  - c) Determine that the addition of the proposed fuel movement will not exceed the limits for this Crit Zone.
  - d) If the visual check and Crit Zone record are in agreement and the proposed movement is within the Crit Zone limits, the employe will proceed with the fuel movement.
2. The employe will make the fuel movement and change the posted record at the Crit Zone to show the new Crit Zone content. If there is no material in the zone, it shall be posted in a manner that clearly indicates it is empty.
3. Strict compliance with the posted Crit Zone limits must be maintained at all times.
  - a) Periodic documented audits will be made by personnel designated by the WNCO Plant Manager to determine this compliance.
  - b) Any criticality violation noted during these audits will be immediately corrected and a written report submitted to the responsible line Manager and the WNCO Plant Manager.
4. The following methods will be used for physical transfer of fuel:
  - a) Fuel elements in storage trays will be moved either one tray at a time (maximum of 20 elements) by hand carrying, or two trays at a time (maximum of 40 elements) through the use of the approved fuel transfer cart. Single elements (one only) may be hand carried without being placed in a handling or storage device.

- b) Furnace fixtures containing fuel will be moved with their appropriate transfer fixture.
- c) Wet mix fuel material is transferred between Crit Zones in a plastic bag.
- d) Extrusion billets are hand carried.
- e) Fuel beads and finally divided fuel bearing material are hand carried in closed plastic or metal containers.
- f) Effort should be exercised when movements pass in approved aisles to keep the maximum distance between the containers being moved.
- g) No enriched material in transit is to be left unattended in an aisle.

E. Operation When No Enriched Uranium is Used

- 1. When all enriched uranium is purged from all work areas, and confined to the vault or other approved storage area, the requirements of Section V are waived for all portions of the facility except the vault and other approved storage areas which are being used for the enriched uranium storage.

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ASTRONUCLEAR CORE OPERATIONS
APPROVED CRITICALITY ZONES
Building 6 and Outside Storage Areas

SECTION II

INFORMATION CATEGORY

~~Confidential - RD~~

~~RW Brown 11-20-67~~
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SECTION II

<u>Work Area Designation</u>	<u>Description</u>
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3	Loading and Miscellaneous Operations
7	Leach and Coating Furnace
8	Bake Furnace
9	Small Coating Furnace
11	Coating Furnace Area
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20	Fixture Loading, Unloading and Miscellaneous Operations
21	Low Temperature Oven
22	Hold Area
24	Molybdenum Coating Ovens and Key Brazing Furnace
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49	Intra-Building Transfer

BUILDING 6, FIRST FLOOR

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Astronuclear
Laboratory

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BUILDING 6, SECOND FLOOR

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BUILDING 6, INSPECTION AREA

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Astronuclear
Laboratory

CRIT ZONE I-3
50' L x 78' W.

CRIT ZONE I-2

CRIT ZONE I-1

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OUTSIDE STORAGE AREAS

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Section II - Approved Criticality Zones, Building 6 and Outside Storage Areas

The facilities are cleared for fuel element loading up to 600 mg/cc of U-235.

Work Area H - Inspection

Crit Zone H-1, Internal Eddy Current

Limit: 17 elements - not more than 3 elements out of approved trays.

Crit Zone H-2, External Eddy Current Test

Limit: 17 elements - not more than 3 elements out of approved trays.

Crit Zone H-3, Beta Backscatter

Limit: 17 elements - not more than 2 elements out of approved trays.

Crit Zone H-4, Incremental Leak Test

Limit: 17 elements - not more than 2 elements out of approved trays.

AND

One pint of optics cleaning solution

Crit Zone H-5, Dimensional Inspection

Limit: 16 elements - not more than 9 elements out of approved trays.

Crit Zone H-6, Dimensional Inspection

Limit: 16 elements - not more than 9 elements out of approved trays.

Crit Zone H-7, Gamma Count

Limit: 17 elements - not more than 2 elements out of approved trays.

Crit Zone H-8, In-Process Fuel Element Storage, Individual Cubicles Numbered 2000 through 2031 (Special Controlled Storage Area - No Posting Required)

Limit: 64 trays, two trays per cubicle, containing a maximum of 20 fuel elements per tray. Fuel elements will be in approved trays and will be separated by either plastic or rubber spacers. A total of thirty-two cubicles.

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Crit Zone H-9, Combined X-Ray and Developing Room

Limit: 16 fuel elements - not more than eight out of storage tray; or 350 grams of contained uranium samples.

When non-fueled tips are being radiographed, any number may be in the crit zone provided no uranium is in the zone and the zone is posted "Non Fueled - No Uranium Allowed."

Crit Zone H-11, Dimensional Inspection

Limit: 16 elements - not more than 9 elements out of approved trays.

Crit Zone H-12, Dimensional Inspection

Limit: 16 elements - not more than 9 elements out of approved trays.

Crit Zone H-13, Gamma Count

Limit: 17 elements - not more than 2 elements out of approved trays.

Crit Zone H-14, Beta Backscatter

Limit: 17 elements - not more than 2 elements out of approved trays.

Crit Zone H-15, Optical Comparator and Viewing

Limit: 500 grams contained U-235 in the form of fuel element wafers.

Crit Zone H-16, Beta Backscatter

Limit: 17 elements - not more than 2 elements out of approved trays.

Crit Zone H-17, Beta Backscatter

Limit: 17 elements - not more than 2 elements out of approved trays.

Crit Zone H-18, Engineering Review Board Inspection

Limit: 16 elements - not more than 9 elements out of approved trays.

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Crit Zone H-19, Individual Cubicles Numbered 2032 through 2211,
Special Controlled Area - No Posting Required

Cubicles for storing fuel elements. The storage area consists of five shelves separated 24 inches vertically. Individual adjacent cubicles are separated by boral spacers in a horizontal plane. Each shelf has 36 cubicles (total of 180 cubicles). These elements can be stored in all stages of fabrication in approved aluminum storage trays. No tray may be stored in the cubicles containing: (1) aluminum tubes, or (2) fuel elements with unattached (loose) non-fuel tips. Fuel elements with separated non-fuel tips can be stored in cubicles provided the non-fuel tip is securely taped to the fuel element to form a single continuous piece.

- Note: 1. Handling and movement of material within Crit Zone H-19 is accomplished by hand carriage or use of the fuel transfer cart. Each move in the vault is restricted to two trays containing a maximum of 20 fuel elements per tray.
2. Fuel element storage trays must be fully inserted into each cubicle.

Limit: 180 trays, one tray per cubicle, each containing:

1. Maximum of 20 fuel elements, each row separated by three rectangular $3/16$ " thick plastic spacers.

OR

2. Maximum of 20 fuel elements, each row separated by three rectangular ($2-3/4$ " x $4-7/8$ ") closed cell foam rubber spacers.

OR

3. Maximum of 16 fuel elements, each row separated by full length closed cell rubber cushions (Dwg. EDSK-333027-D).

Crit Zone H-20, Beta Backscatter

Limit: Seventeen (17) elements - not more than two elements out of approved trays.

Crit Zone H-21, Beta Backscatter

Limit: Twenty (20) elements (16 elements in a tray plus four standard elements in racks). Allowed out at one time are: not more than two in-process elements from an approved tray and not more than two standard elements from the storage racks.

Crit Zone H-22, Air Impedance

Limit: Sixteen (16) elements - not more than nine elements out of approved trays.

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Crit Zone H-23, Air Leakage

Limit: Seventeen (17) elements - not more than two elements out of approved trays.

Crit Zone H-24, Inspection and Weighing of Fuel Elements

This area is used to inspect, sort, and weigh coated and uncoated fuel elements.

Limit: Thirty-two (32) fuel elements dispersed as follows:

1. Up to 16 fuel elements in an approved aluminum fuel element storage tray on a transfer cart.

AND

Up to 16 fuel elements in an approved aluminum fuel element storage tray and/or placed in a plane array on a table.

OR

2. Up to 16 fuel elements in an approved aluminum fuel element storage tray on a transfer cart.

AND

One approved aluminum fuel element storage tray at the weigh station containing a maximum of 16 fuel elements or a maximum of 16 fuel elements distributed in two trays. Not more than one fuel element permitted out of approved aluminum fuel element storage trays at one time.

OR

3. Two (2) approved aluminum fuel element storage trays containing a maximum of 16 fuel elements per tray on the transfer cart.

Crit Zone H-27, Dimensional Inspection

Limit: Sixteen (16) elements - not more than nine elements out of approved trays.

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Crit Zone H-28, Vacuum Cleaner Storage

Limit: When not in use, the vacuum cleaner is to be stored within this zone. The vacuum cleaner has a one quart plastic collection bottle which is limited to 500 grams contained U 235.

Crit Zone H-29, Gamma Counters

Limit: Sixteen (16) elements in a tray; not more than three (3) elements out of approved trays.

Crit Zone H-30, Darkroom (Microradiography)

Limit: Ten (10) grams contained U 235 in the form of fuel beads.

NOTE 1: A maximum of seven (7) gallons of photographic solutions may be in this zone.

2: This zone contains a sink with running water. At no time will the sink be stoppered when there is fuel in the zone.

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Work Area I - Outside Storage Area

(U)

Crit Zone I-1, Scrap Storage Pad (Special Controlled Area - No Posting Required)

Process scrap, including fuel elements, green (cured) mix, machining dust, leach waste, and leach filters, coating exhaust waste, solvent residues, etc., is stored in birdcage 55-gallon drums (B. of E. Permit 1489 drums, Dwg. 928F245, 5" diameter, ICC 6L drums, Dwg. EDSK 333283) in approved plastic containers. The B. of E. Permit 1489 drum will hold a total of either four polyethylene containers, three bottles, 4-7/8" O.D. by 9" high and one bottle 4-7/8" O.D. by 4-3/4" high or one polyethylene container 4-7/8" O.D. by 31-5/8" high. The ICC 6L drum will hold five bottles, 4-7/8" O.D. by 4-3/4" high or three bottles 4-7/8" O.D. by 9" high or a combination of the two types of bottles provided the bottles do not project above the top of the inner container. Mounted metallography samples, leach waste or leach filters will not be placed in ICC 6L drums. Element sections in polyethylene sleeves may be placed in 5" diameter inner container B. of E. 1489 drums or in the ICC 6L drums. Low-level waste is stored in ICC approved 17-E 55-gallon drums with no birdcage insert. All contaminated low-level uranium waste is stored for disposal including rubber gloves, paper, bags, etc. The uranium content of each low-level drum is estimated from gamma survey data. The scrap drums are stored in a single plane array, one drum high by two drums wide with a minimum aisle of 2-1/2 feet between rows. Maximum capacity of the pad is 720 drums. The entire pad is secured with a controlled access locked gate. Four drums (1 pallet) may be out of the array within the pad.

(U)

Limit: Process Scrap

Note: Not more than one approved container is permitted out of the birdcage drums at one time.

1. 3500 grams contained U-235 per drum as NERVA fuel element scrap resulting from machining, sampling, and rejected or damaged fuel elements.

OR

2. 3500 grams contained U-235 per drum as green (cured) fuel mixture. This material is processed with an equivalent of a cure cycle before storage.

OR

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Crit Zone 1 - 1, (continued)

3. 600 grams of contained U-235 per drum as waste from the leach furnace trap, solidified analytical residue and filtering system. (Stored in accordance with C. I. No. 15.)

OR

4. 350 grams of contained U-235 per drum as low-level waste determined by the gamma survey technique or scrap processing accountability procedures. Drums containing more than 100 grams of contained U-235 will be handled in accordance with C. I. No. 30.

(U)

Crit Zone 1 - 2, Scrap Storage Pad (Special Controlled Area - No Posting Required)

Process scrap, including fuel elements, green (cured) mix, machining dust, leach waste, and leach filters, coating exhaust waste, solvent residues, etc., is stored in birdcage 55-gallon drums (B. of E. Permit 1489 drums, Dwg. 928F245, 5" diameter, ICC 6L drums, Dwg. EDSK 333283) in approved plastic containers. The B. of E. Permit 1489 drum will hold a total of either four polyethylene containers, three bottles, 4-7/8" O. D. by 9" high and one bottle 4-7/8" O. D. by 4-3/4" high or one polyethylene container 4-7/8" O. D. by 3 1/2-5/8" high. The ICC 6L drum will hold five bottles, 4-7/8" O. D. by 4-3/4" high or three bottles 4-7/8" O. D. by 9" high or a combination of the two types of bottles provided the bottles do not project above the top of the inner container. Mounted metallography samples, leach waste or leach filters will not be placed in ICC 6L drums. Element sections in polyethylene sleeves may be placed in 5" diameter inner container B. of E. 1489 drums or in the ICC 6L drums. Low-level waste is stored in ICC approved 17-E 55-gallon drums with no birdcage insert. All contaminated low-level uranium waste is stored for disposal including rubber gloves, paper, bags, etc. The uranium content of each low-level drum is estimated from gamma survey data. The scrap drums are stored in a single plane array, one drum high by two drums wide with a minimum aisle of 2-1/2 feet between rows. Maximum capacity of the pad is 800 drums. The entire pad is secured with a controlled access locked gate. Four drums (1 pallet) may be out of the array within the pad.

Limit: Process Scrap

(U)

Note: Not more than one approved container is permitted out of the birdcage drums at one time.

Crit Zone 1 - 2 (continued)

1. 3500 grams contained U-235 per drum as NERVA fuel element scrap resulting from machining, sampling, and rejected or damaged fuel elements.

OR

2. 3500 grams contained U-235 per drum as green (cured) fuel mixture. This material is processed with an equivalent of a cure cycle before storage.

OR

3. 600 grams of contained U-235 per drum as waste from the leach furnace trap, solidified analytical residue and filtering system. (Stored in accordance with C. I. No. 15.)

OR

4. 350 grams of contained U-235 per drum as low-level waste determined by the gamma survey technique or scrap processing accountability procedures. Drums containing more than 100 grams of contained U-235 will be handled in accordance with C. I. No. 30.

(U)

Crit Zone 1 - 3 Scrap Storage Pad (Special Controlled Area - No Posting Required)

Process scrap, including fuel elements, green (cured) mix, machining dust, leach waste, and leach filters, coating exhaust waste, solvent residues, etc., is stored in birdcage 55-gallon drums (B. of E. Permit 1489 drums, Dwg. 928F245, 5" diameter, and ICC 6L drums, Dwg. EDSK 333283) in approved plastic containers. The B. of E. Permit 1489 drum will hold a total of either four polyethylene containers, three bottles, 4-7/8" O.D. by 9" high and one bottle 4-7/8" O.D. by 4-3/4" high or one polyethylene container 4-7/8" O.D. by 31-5/8 inches high. The ICC 6L drum will hold five bottles, 4-7/8" O.D. by 4-3/4" high or three bottles 4-7/8" O.D. by 9" high or a combination of the two types of bottles provided the bottles do not project above the top of the inner container. Mounted metallography samples, leach waste or leach filters will not be placed in ICC 6L drums. Element sections in polyethylene sleeves may be placed in 5" diameter inner container B. of E. 1489 drums or in the ICC 6L drums. Low-level waste is stored in ICC approved 17-E 55-gallon drums with

Crit Zone 1 - 3 (continued)

no birdcage insert. All contaminated low-level uranium waste is stored for disposal including rubber gloves, paper, bags, etc. The uranium content of each low-level drum is estimated from gamma survey data. The scrap drums are stored in a single plane array, one drum high by two drums wide with a minimum aisle of 2-1/2 feet between rows. Maximum capacity of the pad is 384 drums. The entire pad is secured with a controlled access locked gate. Four drums (1 pallet) may be out of the array within the pad.

(U)

Limit: Process Scrap

Note: Not more than one approved container is permitted out of the birdcage drums at one time.

1. 3500 grams contained U-235 per drum as NERVA fuel element scrap resulting from machining, sampling, and rejected or damaged fuel elements.

OR

2. 3500 grams contained U-235 per drum as green (cured) fuel mixture. This material is processed with an equivalent of a cure cycle before storage.

OR

3. 600 grams of contained U-235 per drum as waste from the leach furnace trap, solidified analytical residue and filtering system. (Stored in accordance with C. I. No. 15.)

OR

4. 350 grams of contained U-235 per drum as low-level waste determined by the gamma survey technique or scrap processing accountability procedures. Drums containing more than 100 grams of contained U-235 will be handled in accordance with C. I. No. 30.

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- (U) Work Area J - Bead Migration Furnace
- (U) Crit Zone J-1, Bead Migration Furnace
- (U) Limit: 100 grams contained U-235 as fuel beads.

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(U) Work Area K - Final Machining Area

(U) Crit Zone K-1, Planer Mill

(U) Limit: 16 fuel elements. (Not more than nine out of their approved storage trays.) Elements may be in machine fixture or fuel storage trays on transfer cart.

Note: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a 1/2-gallon metal can which is limited to 1000 grams contained U 235.

(U) Crit Zone K-2, Surface Plate

(U) Limit: 16 fuel elements and not more than 350 grams of contained U 235 in the form of samples cut from the tray of fuel elements. Not more than nine elements out of the tray at one time on the surface plate.

(U) Crit Zone K-3, Finishing

(U) Limit: 16 fuel elements. (Not more than nine out of their approved storage trays.) Elements may be in machine fixture or fuel storage trays on transfer cart.

(U) Crit Zone K-4, Final Machining

(U) Limit: 16 fuel elements and not more than 350 grams of contained U 235 in the form of samples cut from the tray of 16 fuel elements being machined. (Not more than nine out of their approved storage trays.) Elements may be in machine fixture or fuel storage trays on transfer cart.

Note: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a 1/2-gallon metal can which is limited to 1000 grams contained U 235.

(U) Crit Zone K-5, Final Machining

(U) Limit: 16 fuel elements. (Not more than nine out of their approved storage trays.) Elements may be in machine fixture or fuel storage trays on transfer cart.

Note: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a 1/2-gallon metal can which is limited to 1000 grams contained U 235.

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(CRD) Crit Zone K-6, Fuel Element Storage Vault, Individual Cubicles
Numbered 2212 through 2546 - Special Controlled Storage Area -
No Posting Required

(CRD) Cubicles for storing fuel elements in approved trays. The north wall storage area consists of three assemblies of five shelves (Item 208, Dwg. WT-500184). The shelves, separated 24 inches vertically, are divided into eleven individual cubicles by boral spacers. The three assemblies on the north wall contain 165 individual cubicles. The south wall storage area consists of four assemblies of five shelves. The shelves, separated 24 inches vertically, are divided into nine individual cubicles on three assemblies, and into seven individual cubicles on the fourth assembly by boral spacers. The four assemblies on the south wall contain 170 individual cubicles. A total of 335 cubicles for both the north and south wall storage areas. Fuel elements in approved aluminum storage trays may be stored in all stages of fabrication. The trays will contain a maximum of 20 fuel elements. No tray may be stored in the cubicles containing:

1. Aluminum tubes, or
2. Fuel elements with unattached (loose) non-fuel tips. Fuel elements with separated non-fuel tips can be stored in cubicles provided the non-fuel tip is securely taped to the fuel element to form a single continuous piece.

(CRD) Limit: 335 trays, one tray per cubicle, each containing:

1. Maximum of 20 fuel elements, each row separated by three rectangular 3/16" thick plastic spacers.
- OR
2. Maximum of 20 fuel elements, each row separated by three rectangular (2-3/4" x 4-7/8") closed cell foam rubber spacers.

OR

3. Maximum of 16 fuel elements, each row separated by full length closed cell foam rubber cushions (Dwg. EDSK-333027-D).

Note: 1. Handling and movement of material within Crit Zone K-6 is accomplished by hand carriage or use of the fuel transfer cart. Each move is restricted to two trays containing a maximum of 20 fuel elements per tray.

2. Fuel element storage trays must be fully inserted into the cubicles.

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- (U) Work Area 1 - Accountability Hood
- (U) Crit Zone 1-3, Hood
- (U) This hood is used for weighing and processing all fuel element scrap.
- (U) LIMIT: Two (2) 4-5/8" diameter one-quart bottles containing 500 grams contained U 235 in the form of carbonaceous scrap for accountability processing.
  - OR
  - (U) One (1) 4-5/8" diameter one-half gallon bottle or metal can containing 1000 grams contained U 235 in the form of carbonaceous scrap for accountability processing.
    - OR
    - (U) One leach filter for accountability processing.
      - OR
      - (U) One leach trap residue for accountability processing.
        - OR
        - (U) One coating run residue for accountability processing.
          - OR
          - (U) One Aerotec filter for weighing.
            - OR
            - (U) 350 grams of contained uranium in any form for accountability processing.
              - OR
              - (U) One (1) 4-5/8" diameter bottle with a maximum capacity of one-half gallon containing carbonaceous scrap plus one fueled element in the process of being scrapped. One-half gallon bottle limited to 1000 grams of contained U 235.

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(U) Work Area 3 - Loading and Miscellaneous Operations

(U) Crit Zone 3-1, Inspecting, Weighing and Loading

(U) This area is used to sort, weigh, pack, and unpack fuel elements as part of the Shipping and Receiving function.

(U) Limit: 32 elements dispersed as follows and one-half pint of acetone for cleaning suitcases and aluminum shipping tubes (remove labels and markings).

- a. Up to 16 fuel elements in approved storage tray on a transfer cart.

AND

Up to 16 elements in approved storage tray and/or placed in a plane array on a table or loading fixture table.

OR

- b. Up to 16 fuel elements in approved storage tray on a transfer cart.

AND

One fuel element storage tray at the weigh station containing a maximum of 16 fuel elements or a maximum of 16 fuel elements distributed in two trays. Not more than one element permitted out of approved trays at one time.

OR

- c. Up to 32 fuel elements in approved storage trays on a transfer cart.

AND

One suitcase (Dwg. 976D167 - Short or Dwg. 976D212 - Long) which will contain a maximum of 19 elements in shipping tubes or plastic shipping inserts.

OR

- d. Two fuel element storage trays containing a maximum of 16 fuel elements per tray on the transfer cart.

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(U) Work Area 7 - Leach and Coating Furnaces

(U) Crit Zone 7-1, "L" Furnace

(U) The "L" furnace may be used for either leaching or coating. When connected for one type of operation, the furnace crit zone sign will designate that operation and the alternate operation must not be attempted. The sign will be changed when the trap/filter modification for the operation intended is accomplished.

(U) Limit: (For Coating)

Thirty (30) fuel elements in coating fixture body Drawing EDSK 321015-F, Revision 6. Hole size 1.031 inches.

OR

(U) Thirty-five (35) fuel elements in fixture body Drawing EDSK 321062-F, Revision 1. Hole size 0.873 inches.

OR

(U) Eighteen (18) fuel elements in coating fixture body Drawing EDSK 332940, Revision 9.

(U) Note 1: The 30 and 35 fuel element coating body fixtures are basically eight-inch graphite cylinders containing holes for holding fuel elements. The basic body is fitted with additional graphite fixturing and loaded into and out of the coating furnace as a complete assembly. The 18 fuel element coating fixture is basically an eight-inch hollow graphite cylinder which contains thin plates for supporting the elements at each end. The fixtures will be loaded or unloaded in Crit Zones 20-10, 20-11, or 20-12.

(U) Note 2: Coating furnace traps, Drawing EDSK 320830-F, Revision 3, or EDSK 321118-F, Revision 3, (Refrigerated) will be cleaned after each coating run in accordance with C. I. No. 20.

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(U) Crit Zone 7-1 (continued)

(U) Note 3: When this furnace is used for coating, the leach trap and filter are completely disconnected and the coating traps connected to the internal fixture and the exhaust stack.

(U) Limit: (For Leaching)

(U) Thirty (30) fuel elements in fixture body Drawing EDSK 321015-F, Revision 6. Hole size 1.031 inches.

OR

(U) Thirty-five (35) fuel elements in fixture body Drawing EDSK 321062-F, Revision 1. Hole size 0.873 inches.

OR

(U) Thirty-two (32) fuel elements in two fuel storage trays on a transfer cart. Fuel storage trays will be in the zone only during loading and unloading the furnace.

(U) Note 1: The 30 and 35 fuel element fixtures are basically eight-inch diameter graphite cylinders containing holes for holding fuel elements.

(U) Note 2: The leach furnace trap, Drawing EDSK 320930-D, Revision 2, (water cooled) or EDSK 333058, Revision 1, (refrigerated), and exhaust filter will be cleaned after each run in accordance with C. I. No. 15.

(U) Note 3: When this furnace is used for leaching, the coating traps must be completely disconnected from both the internal fixture and the exhaust stack and the leach trap must be connected to the exhaust by a separate line.

(U) Crit Zone 7-2, "M" Furnace

The "M" furnace may be used for either leaching or coating. When connected for one type of operation, the furnace crit zone sign will designate that operation and the alternate operation must not be attempted. The sign will be changed when the trap/filter modification for the operation intended is accomplished.

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- (U) Crit Zone 7-2 (continued)
- (U) Limit: (For Coating)
- (U) Thirty (30) fuel elements in coating fixture body Drawing EDSK 321015-F, Revision 6. Hole size 1.031 inches.
- OR
- (U) Thirty-five (35) fuel elements in fixture body Drawing EDSK 321062-F, Revision 1. Hole size 0.873 inches.
- OR
- (U) Eighteen (18) fuel elements in coating fixture body Drawing EDSK 332940, Revision 9.
- (U) Note 1: The 30 and 35 fuel element coating body fixtures are basically eight-inch graphite cylinders containing holes for holding fuel elements. The basic body is fitted with additional graphite fixturing and loaded into and out of the coating furnace as a complete assembly. The 18 fuel element coating fixture is basically an eight-inch hollow graphite cylinder which contains thin plates for supporting the elements at each end. The fixtures will be loaded or unloaded in Crit Zones 20-10, 20-11, or 20-12.
- (U) Note 2: Coating furnace traps, Drawing EDSK 320830-F, Revision 3, or EDSK 321118-F, Revision 3 (refrigerated) will be cleaned after each coating run in accordance with C. I. No. 20.
- (U) Note 3: When this furnace is used for coating, the leach trap and filter are completely disconnected and the coating traps connected to the internal fixture and the exhaust stack.
- (U) Limit: (For Leaching)
- (U) Thirty (30) fuel elements in fixture body Drawing EDSK 321015-F, Revision 6. Hole size 1.031 inches.

OR

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(U) Crit Zone 7-2 (continued)

(U) Thirty-five (35) fuel elements in fixture body Drawing
EDSK 321062-F, Revision 1. Hole size 0.873 inches.

OR

(U) Thirty-two (32) fuel elements in two fuel storage trays on
a transfer cart. Fuel storage trays will be in the zone
only during loading and unloading the furnace.

(U) Note 1: The 30 and 35 fuel element fixtures are basically
eight-inch diameter graphite cylinders containing
holes for holding fuel elements.

Note 2: The leach furnace trap, Drawing EDSK 320930-D, Re-
vision 2, (water cooled), or EDSK 333058-D,
Revision 1, (refrigerated), and exhaust filter will
be cleaned after each run in accordance with
C. I. No. 15.

(U) Note 3: When this furnace is used for leaching, the coating
traps must be completely disconnected from both
the internal fixture and the exhaust stack and the
leach trap must be connected to the exhaust by a
separate line.

(U) Crit Zone 7-3, "S" Furnace

The "S" furnace may be used for either leaching or coating. When
connected for one type of operation, the furnace crit zone sign will
designate that operation and the alternate operation must not be
attempted. The sign will be changed when the trap/filter modification
for the operation intended is accomplished.

(U) Limit: (For Coating)

(U) Thirty (30) fuel elements in coating fixture body Drawing
EDSK 321015-F, Revision 6. Hole size 1.031 inches.

OR

(U) Crit Zone 7-3, (continued)

(U) Thirty-five (35) fuel elements in fixture body Drawing
EDSK 321062-F, Revision 1. Hole size 0.873 inches.

OR

(U) Eighteen (18) fuel elements in coating fixture body Drawing
EDSK 332940, Revision 9.

(U) Note 1: The 30 and 35 fuel element coating body fixtures
are basically eight-inch graphite cylinders
containing holes for holding fuel elements. The
basic body is fitted with additional graphite
fixturing and loaded into and out of the coating
furnace as a complete assembly. The 18 fuel
element coating fixture is basically an eight-inch
hollow graphite cylinder which contains thin plates
for supporting the elements at each end. The
fixtures will be loaded or unloaded in Crit Zones
20-10, 20-11, or 20-12.

(U) Note 2: Coating furnace traps, Drawing EDSK 320830-F, Re-
vision 3, or EDSK 321118-F, Revision 3 (refrigerated),
will be cleaned after each coating run in accordance
with C. I. No. 20.

(U) Note 3: When this furnace is used for coating, the leach
trap and filters are completely disconnected and the
coating traps connected to the internal fixture
and the exhaust stack.

(U) Limit: (For Leaching)

Thirty (30) fuel elements in fixture body Drawing EDSK 321015-F,
Revision 6. Hole size 1.031 inches.

OR

Thirty-five (35) fuel elements in fixture body Drawing
EDSK 321062-F, Revision 1. Hole size 0.873 inches.

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- (U) Crit Zone 7-3, (continued)
- (U) Thirty-two (32) fuel elements in two fuel storage trays on a transfer cart. Fuel storage trays will be in the zone only during loading and unloading the furnace.
- (U) Note 1: The 30 and 35 fuel element fixtures are basically eight-inch diameter graphite cylinders containing holes for holding fuel elements.
- (U) Note 2: The leach furnace trap, Drawing EDSK 320930-D, Revision 2, (water cooled), or EDSK 333058, Revision 1, (refrigerated), and exhaust filter will be cleaned after each run in accordance with C. I. No. 15.
- (U) Note 3: When this furnace is used for leaching, the coating traps must be completely disconnected from both the internal fixture and the exhaust stack and the leach trap must be connected to the exhaust by a separate line.

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(U) Work Area 9 - Small Coating Furnace Area

(U) Crit Zone 9-1, "A" Furnace

Limit: 350 grams contained U-235 in fuel element form in fixture EDSK-320950-F, EDSK-320945-D, or NT-500028 or 100 grams of contained U-235 in the form of coated UC₂ particles.

(U) The furnace exhaust contains a coating material trap. If the trap is used, it will be cleaned after each run in accordance with C. I. No. 20.

Crit Zone 9-2, "B" Furnace

(U) Limit: 350 grams contained U-235 in fuel element form in fixture EDSK-320950-F, EDSK-320945-D, or NT-500028 or 100 grams of contained U-235 in the form of coated UC₂ particles.

(U) The furnace exhaust contains a coating material trap. If the trap is used, it will be cleaned after each run in accordance with C. I. No. 20.

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(U) Work Area 11 - Coating Furnace Area

(U) Crit Zone 11-1, "C" Furnace

(U) Limit: Thirty (30) fuel elements in coating fixture body Drawing
No. EDSK 321015-F, Revision 6, (Hole Size 1.031 inches).

OR

Thirty-five (35) fuel elements in coating fixture body Drawing
No. EDSK 321062-F, Revision 1, (Hole Size 0.873 inches).

OR

Eighteen (18) fuel elements in coating fixture body Drawing
No. EDSK 332940, Revision 9.

(U) Note 1: The 30 and 35 fuel element coating body fixtures
are basically eight-inch graphite cylinders
containing holes for holding fuel elements. The
basic body is fitted with additional graphite
fixturing and loaded into and out of the coating
furnace as a complete assembly. The 18 fuel element
coating fixture is basically an eight-inch hollow
graphite cylinder which contains thin plates for
supporting the elements at each end.

(U) Note 2: Coating furnace traps EDSK 320830-F, Revision 3, or
EDSK 321118-F, Revision 3, (refrigerated), will be
cleaned after each coating run in accordance with
C. I. No. 20.

(U) Crit Zone 11-2, "F" Furnace

(U) Limit: Thirty (30) fuel elements in coating fixture body Drawing No.
EDSK 321015-F, Revision 6, (Hole Size 1.031 inches).

OR

Thirty-five (35) fuel elements in coating fixture body Drawing
No. EDSK 321062-F, Revision 1, (Hole Size 0.873 inches).

OR

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Eighteen (18) fuel elements in coating fixture body Drawing No. EDSK 332940, Revision 9.

- (U) Note 1: The 30 and 35 fuel element coating body fixtures are basically eight-inch graphite cylinders containing holes for holding fuel elements. The basic body is fitted with additional graphite fixturing and loaded into and out of the coating furnace as a complete assembly. The 18 fuel element coating fixture is basically an eight-inch hollow graphite cylinder which contains thin plates for supporting the elements at each end.
- (U) Note 2: Coating furnace traps EDSK 320830-F, Revision 3, or EDSK 321118-F, Revision 3, (refrigerated), will be cleaned after each coating run in accordance with C. I. No. 20.
- (U) Crit Zone 11-4, "T" Furnace
- (U) Limit: Thirty (30) fuel elements in coating fixture body Drawing No. EDSK 321015-F, Revision 6 (Hole Size 1.031 inches).
- OR
- Thirty-five (35) fuel elements in coating fixture body Drawing No. EDSK 321062-F, Revision 1, (Hole Size 0.873 inches).
- OR
- Eighteen (18) fuel elements in coating fixture body Drawing No. EDSK 332940, Revision 9.
- (U) Note 1: The 30 and 35 fuel element coating body fixtures are basically eight-inch graphite cylinders containing holes for holding fuel elements. The basic body is fitted with additional graphite fixturing and loaded into and out of the coating furnace as a complete assembly. The 18 fuel element coating fixture is basically an eight-inch hollow graphite cylinder which contains thin plates for supporting the elements at each end.
- Note 2: Coating furnace traps EDSK 320830-F, Revision 3, or EDSK 321118-F, Revision 3, (refrigerated), will be cleaned after each coating run in accordance with C. I. No. 20.

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Work Area 12 - Leaching Furnace Area

Crit Zone 12-1, "D" Furnace

Limit: Thirty (30) fuel elements in fixture body Drawing EDSK 321015-F,
Revision 6. Hole size 1.031 inches.

OR

Thirty-five (35) fuel elements in the furnace fixture body
Drawing EDSK 321062-F, Revision 1. Hole size 0.873 inches.

OR

Thirty-two (32) elements in fuel storage trays on the transfer
cart.

The 30 and 35 fuel element fixtures are basically eight-inch
diameter graphite cylinders containing holes for holding fuel
elements. The leach furnace trap Drawing EDSK 320930-D,
Revision 2, (water cooled), or EDSK 333058-D, Revision 1,
(refrigerated), will be cleaned after each run in accordance
with C. I. No. 15. Fuel storage trays will be in the zone
only during loading and unloading the furnace.

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Work Area 14 - Dumbwaiter

- (U) Crit Zone 14-29, Dumbwaiter - (Special Controlled Area - No Posting Required)
- (U) Limit: Two (2) trays, containing a maximum of 16 fuel elements per tray. Fuel elements will be in approved trays and separated by either plastic or rubber spacers.
- (U) Handling and movement of trays will be by dumbwaiter between the first and second floor and either by hand carriage or cart (Drawing NT 500047) between Crit Zones on the second floor area.

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- (U) Work Area 16 - Machine Filter Storage
- (U) Crit Zone 16-2, Aerotec Filter Storage (Special Controlled Area - No Posting Required)
- (U) Limit: Individual cubicles numbered 300 - 371 in a three high by 38 long array. (A total of 72 cubicles.) Each cubicle is approximately 13 inches square. The lower most shelf is 1-1/2 feet above the upper most portion of the lower storage array (Crit Zone H-8). One Aerotec Filter per cubicle. The maximum allowable weight of machining dust in the filter is 200 grams (equivalent to 75 grams U-235 maximum).

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(U) Work Area 17 - Storage and Shipping

(U) Crit Zone 17-1, Birdcage, Scrap and Fuel Storage (Special Controlled Area - No Posting Required)

(CRD) This Crit Zone is used to store material either prior to unloading or after loading.

(CRD) Storage containers used are:

1. 55-gallon steel drums B. of E. Permit 1489 containing birdcages (Dwgs. 928F245, 5").
2. 55-gallon ICC 6L drums containing birdcages (Dwg. EDSK 333283). Used for process scrap and fuel particles.
3. Oak Ridge DOT Special Permit No. 5246 container (9 elements) or ICC 5097 shipping container (44 elements).
4. 55-gallon ICC 17E drums B. of E. Permit 2016. Used for storing low-level uranium waste.
5. Vendor 55-gallon birdcage type drums.

Fifty-two (52) 55-gallon drums in an array four drums by thirteen drums long, one high, may be placed in the Crit Zone with contents within limits specified below. Oak Ridge DOT Special Permit No. 5246 container may be stored in this area at a substitution ratio of one to one 55-gallon drum. Oak Ridge ICC 5097 shipping container may be stored in this area at a substitution ratio of one to every three 55-gallon drums.

Process scrap and fuel particles are contained in approved containers within the inner container (birdcage) of the 55-gallon drums. Low-level uranium waste is bagged in plastic bags and stored in the ICC 17E drums. Only fuel elements are stored in the Oak Ridge ICC shipping containers.

(U) Limit: Process Scrap

(CRD) 1. 3500 grams contained U-235 drums as NERVA fuel element scrap resulting from machining, sampling, and rejected or damaged fuel elements.

OR

(CRD) 2. 3500 grams contained U-235 per drum as green (cured) fuel mixture.

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Crit Zone 17-1 (continued)

OR

(CRD) 3. 600 grams of contained U 235 per drum as waste from the leach furnace trap and filtering system. (Stored in accordance with C. I. No. 15.)

(CRD) 4. 350 grams of contained U 235 per drum as low-level waste determined by the gamma survey technique or scrap processing accountability procedures. Drums containing more than 100 grams contained U 235 will be handled in accordance with C. I. No. 30.

(U) LIMIT: Fuel Particles

(CRD) 1. 10 kg of contained U 235 per drum as coated fuel particles in unopened vendor containers or approved sealed polyethylene bottles.

(U) LIMIT: Fuel Elements

(CRD) 1. 7500 grams of 93.15% enriched uranium in fuel element form in an Oak Ridge ICC 5097 shipping container. The content of this container is further limited to a maximum of 44 fuel elements.

OR

2880 grams of 93.15% enriched uranium in fuel element form in an Oak Ridge DOT Special Permit No. 5246 shipping container. The content of this container is further limited to a maximum of nine fuel elements.

(U) Crit Zone 17-5, Fuel Element Suitcase Storage (Special Controlled Area - No Posting Required)

(U) Cubicles are provided for the storage of fuel element shipping suitcases containing fuel elements or fuel element samples. The array contains a total of 36 cubicles numbered 1,132 through 1,167. In-process suitcases may be stored in an open condition.

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Crit Zone 17-5 (continued)

(U) LIMIT PER CUBICLE:

1. One suitcase containing a maximum of 19 fuel elements or fuel samples in aluminum shipping tubes.

OR

2. One suitcase containing a maximum of 14 fuel elements in a molded plastic insert assembly.

(U) Crit Zone 17-8, Loading Area (Special Controlled Area - No Posting Required)

(U) LIMIT: 1. Five suitcases each containing a maximum of 19 fuel elements or fuel samples in aluminum shipping tubes.

OR

2. Five suitcases each containing a maximum of 14 fuel elements in a molded plastic insert assembly.
3. Five suitcases each containing a maximum of 12 fuel elements in a styrofoam plastic insert assembly.

(U) Crit Zone 17-11, Loading, Unloading, and Weighing Zone

(CRD) This zone is a work area for loading, unloading, and weighing fuel particles and fuel elements. Only one function, either element processing or fuel bead processing, will be performed at a given time with applicable limits.

(U) LIMIT: Element Processing

(U) 1. Two fuel element storage trays containing a maximum of 16 fuel elements per tray on a transfer cart.

AND

(CRD) Three Oak Ridge DOT Special Permit No. 5246 shipping containers containing a maximum of 2880 grams each of 93.15% enriched uranium in fuel element form. The content of this container is further limited to a maximum of nine fuel elements.

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Crit Zone 17-11, (continued)

OR

(CRD) Three approved 55-gallon birdcage drums containing a maximum of 3500 grams contained U 235 per drum in fuel element form.

OR

One Oak Ridge ICC 5097 shipping container containing a maximum of 7500 grams of 93.15% enriched uranium in fuel element form. The content of this container is further limited to a maximum of 44 fuel elements.

(U) NOTE: Not more than one element is permitted out of the trays or shipping containers within the zone at one time.

(U) LIMIT: Fuel Particle Processing

(U) 1. Eight approved birdcage drums containing a maximum of 10 kg contained U 235 per drum in the form of coated fuel particles.

(U) NOTE: Not more than one vendor or WNCO approved container is permitted out of the birdcage drums at one time.

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- (U) Work Area 20, Fixture Loading, Unloading and Miscellaneous Operations
- (U) Crit Zone 20-2, Loading, Unloading, Weighing, and Checking Area
- (U) Limit: A maximum of 35 fuel elements distributed between one of the following coating body fixtures or 32 elements in two fuel element storage trays on a transfer cart. Not more than two elements are permitted in transit between the fixture and the trays.
- a. Thirty (30) fuel elements in coating fixture body Dwg. No. EDSK 321015-F, Revision 6 (Hole Size 1.031 inches).
- OR
- b. Thirty-five (35) fuel elements in coating fixture body Dwg. No. EDSK 321062-F, Revision 1 (Hole Size 0.873 inches).
- OR
- c. Eighteen (18) fuel elements in coating fixture body Dwg. No. EDSK 332940-F, Revision 9.
- (U) Crit Zone 20-3, Weighing Station
- (U) Limit: Sixteen (16) elements - One fuel element storage tray at weighing station containing a maximum of 16 fuel elements or a maximum of 16 fuel elements distributed in two trays. Not more than one element permitted out of approved trays at one time.
- (U) Crit Zone 20-4, Hold Area
- (U) Limit: Thirty-two (32) elements - Two fuel element storage trays containing a maximum of 16 fuel elements per tray on transfer cart.
- (U) Crit Zone 20-5, Bore Cleaning
- (U) Limit: Sixteen (16) elements - Two fuel element storage trays on a transfer cart at the bore cleaning station containing a maximum of 16 fuel elements distributed in two trays. Not more than one element permitted out of approved trays at one time.
- (U) Note: A dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a one-quart plastic collection bottle with a maximum limit of 500 grams of contained U 235.

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(U) Crit Zone 20-6, Hood

(U) Limit: 1050 grams contained U 235

Three (3) trays, 1-1/2 inches deep by 12-1/2 inches wide by 21 inches long containing Freon MF solvent and residue from one leach trap cleaning operation (C. I. No. 15). (Maximum contained U 235 content - 350 grams per tray.)

Trays are to be placed in a plane array. Stacking of trays is not permitted.

(U) Crit Zone 20-9, Fixturing Hold Area

(U) Limit: A maximum of 35 fuel elements contained in one of the following coating body fixtures:

a. Thirty (30) fuel elements in coating fixture body Drawing No. EDSK 321015-F, Revision 6, (Hole Size 1.031 inches).

OR

b. Thirty-five (35) fuel elements in coating fixture body Drawing No. EDSK 321062-F, Revision 1, (Hole Size 0.873 inches).

OR

c. Eighteen (18) fuel elements in coating fixture body Drawing No. EDSK 332940-F, Revision 9.

(U) Crit Zone 20-10, Loading, Unloading, Weighing, and Checking Area

(U) Limit: A maximum of 35 fuel elements distributed between one of the following coating body fixtures or 32 elements in two fuel element storage trays on a transfer cart. Not more than two elements are permitted in transit between the fixture and the trays.

a. Thirty (30) fuel elements in coating fixture body Drawing No. EDSK 321015-F, Revision 6, (Hole Size 1.031 inches).

OR

b. Thirty-five (35) fuel elements in coating fixture body Drawing No. EDSK 321062-F, Revision 1 (Hole Size 0.873 inches).

OR

c. Eighteen (18) fuel elements in coating fixture body Drawing No. EDSK 332940-F, Revision 9.

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(U) Crit Zone 20-11, Loading and Unloading Area

- (U) Limit: A maximum of 35 fuel elements distributed between one of the following coating body fixtures or 32 elements in 2 fuel element storage trays on a transfer cart. Not more than 2 elements are permitted in transit between the fixture and the trays.
- a. 30 fuel elements in coating fixture body Dwg. No. EDSK 321015-F, Revision 6 (Hole Size 1.031 inches).
  - OR
  - b. 35 fuel elements in coating fixture body Dwg. No. EDSK 321062-F, Revision 1 (Hole Size 0.873 inches).
  - OR
  - c. 18 fuel elements in coating fixture body Dwg. No. EDSK 332940-F, Revision 9.

(U) Crit Zone 20-12, Loading and Unloading Area

- (U) Limit: A maximum of 35 fuel elements distributed between one of the following coating body fixtures or 32 elements in 2 fuel element storage trays on a transfer cart. Not more than 2 elements are permitted in transit between the fixture and the trays.
- a. 30 fuel elements in coating fixture body Dwg. No. EDSK 321015-F, Revision 6 (Hole Size 1.031 inches).
  - OR
  - b. 35 fuel elements in coating fixture body Dwg. No. EDSK 321062-F, Revision 1 (Hole Size 0.873 inches).
  - OR
  - c. 18 fuel elements in coating fixture body Dwg. No. EDSK 332940-F, Revision 9.

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Work Area 21 - Low Temperature Oven

Crit Zone 21-1, Low Temperature Oven

Limit: 1400 grams of contained U-235 in four (4) trays (1-1/2 inches by 12-1/2 inches by 21 inches). Each tray may contain a maximum of 350 grams of contained U-235 from the residue from one leach trap cleaning plus 2 liters of Freon MF, or a leach trap filter (C.I. No. 15).

Trays to be in a plane array and placed on one shelf only. Stacking of trays is not permitted.

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Work Area 22 - Hold Area

Crit Zone 22-1, Leach Furnace Fixture Hold Area

Limit: 35 fuel elements in the furnace fixture (Dwg. EDSK-321062-F, Revision 1).
The fixture is an 8-inch diameter graphite cylinder and will be placed into the leach cooldown assembly (Dwg. EDSK-333218-F).

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(CRD) Work Area 24 - Molybdenum Coating Ovens and Key Brazing Furnaces

Crit Zone 24-1 - "AA" Oven

- (U) Limit: 36 fuel elements in the oven fixture (Dwg. No. E-M-59188) or in fuel storage trays, 16 elements per tray, on transfer carts. The fixture consists of a 44" x 72" aluminum plate machined to receive 36 elements in a flat array.

Elements are to be removed from the oven fixture and/or cart one at a time and then placed in the fixture and/or cart.

Note: The cold trap water bath will be drained per C. I. No. 22, prior to removing the trap for cleaning.

(U) Crit Zone 24-2, "AB" Oven

- (U) Limit: 36 fuel elements in the oven fixture (Dwg. No. E-M-59188) or in fuel storage trays, 16 elements per tray, on transfer carts. The fixture consists of a 44" x 72" aluminum plate machined to receive 36 elements in a flat array.

Elements are to be removed from the oven fixture and/or cart one at a time and then placed in the fixture and/or cart.

Note: The cold trap water bath will be drained per C. I. No. 22 prior to removing the trap for cleaning.

(U) Crit Zone 24-4, "AD" Furnace

- (U) Limit: 12 fuel elements in a plane array on work table or in fuel storage trays on a transfer cart. Fuel elements will be placed into key brazing furnace one at a time.

(U) Crit Zone 24-5, "X" Coating Blow Down and Weighing

- (U) Limit: Thirty-six (36) fuel elements, 16 elements per tray - not more than three out of their approved storage trays at one time. Fuel elements may be in the blowdown unit, on the scale or the work bench. Fuel element storage trays will be located on the transfer cart, the work bench, or on the blowdown unit.

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Crit Zone 24-5 (continued)

Note: The blowdown unit in this crit zone is equipped with a dust collection and filter system which is maintained in accordance with C. I. No. 10. The system includes a one-quart plastic bottle which is limited to 500 grams contained U-235.

(U) Crit Zone 24-6, Fuel Element In-Process Storage, Individual Cubicles Numbered 650 through 653 (Special Controlled Area - No Posting Required)

(U) Limit: 8 trays, two trays per cubicle, containing a maximum of 16 fuel elements per tray. Fuel elements will be in approved trays and will be separated by full length rubber spacers. A total of four cubicles.

(U) Crit Zone 24-7, Hold Area

(U) Limit: 32 elements

- a. Two (2) fuel element storage trays containing a maximum of 16 fuel elements per tray separated by rubber spacers on a transfer cart. Cart will be placed in cart park area.

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Work Area 25, Engineering Development Laboratory

- (U) Crit Zone 25-1, Engineering Development Laboratory
- (U) Limit: 350 grams of contained U-235 in fuel elements or other forms as required for experimentation. Small quantities of water are required for use in the sample polishing equipment as well as process analysis equipment.
- (U) Crit Zone 25-2, Fuel Element Replication Furnace
- (U) Limit: 16 coated fuel elements. Not more than 9 fuel elements out of the fuel element storage tray.

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Work Area 49 - Intra-Building Transfer

- (U) Crit Zone 49-1, Panel Truck Mounted Element Tray Carrier (Special Controlled Area - No Posting Required)

Cubicles for holding fuel elements in fuel element storage trays. The transfer container (Dwg. No. EDSK 321164-D) consists of five adjacent cubicles separated with boral separators. No tray may be stored in the cubicles if the tray contains:

1. Aluminum tubes, or
2. Fuel elements with unattached (loose) non-fuel tips.

Fuel elements with separated non-fuel tips can be placed in cubicles provided the non-fuel tip is securely taped to the fuel element to form a single continuous piece.

- (U) Limit: Five cubicles each containing a maximum of:

1. Maximum of 20 fuel elements, each row separated by three rectangular 3/16" thick plastic spacers.
OR
2. Maximum of 20 fuel elements, each row separated by three rectangular (2-3/4" x 4-7/8") closed cell foam rubber spacers.
OR
3. Maximum of 16 fuel elements, each row separated by full-length closed cell rubber cushions (Dwg. No. EDSK 333027-D).

Note: The panel truck transporter shall be used in accordance with C. I. No. 31.

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Section III
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November 17, 1967

ASTRONUCLEAR CORE OPERATIONS
APPROVED CRITICALITY ZONES

Buildings 5, 5A, and 5C

SECTION III

INFORMATION CATEGORY

~~Confidential - R.D.~~

~~RDB~~ 11-30-67
Authorized Classifier Date

~~Group 1 - Excluded from Automatic
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SECTION III

Work Area
Designation

Description

-	Crit Zone Drawings, Building 5, 5A, and 5C
A	Fuel Bead Storage, Fuel Element Vault
B	Powder Preparation, Mixing, Extrusion, and Curing
C	Machining Area
D	Engineering Development Laboratory
E	Accountability
F	Furnace Area

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BUILDING 5

SECTION III

APPROVED CRITICALITY ZONES, BUILDINGS 5, 5A, and 5C

(CRD) The facilities are cleared for fuel element loading up to 600 mg/cc of U-235.

Work Area A - Fuel Bead Storage, Fuel Element Vault and Accountability Cage

(CRD) Crit Zone A-1, Fuel Bead Storage, Individual Compartments Numbered 1 through 756 (Special Controlled Storage Area - No Posting Required)

Eighty-four vertical bead storage casks (Item 105, Drawing WT-500188, Revision B) are arranged in four rows of twenty-one casks. The casks are spaced on two-foot centers in the North-South direction and on three foot centers in the East-West direction. Each cask consists of nine individual 5-inch diameter cylindrical compartments; five are 7-1/2 inches high, three are 9-1/2 inches high, and one is 6-1/4 inches high. A total of 756 compartments.

(CRD) Limit: 6 kg of contained U-235 in the form of coated UC₂ particles in one approved container per compartment. No more than two one-quart containers or one 1/2-gallon container to be out of the compartments at any one time. Only one cask door is to be open at one time.

AND

One 55-gallon approved birdcage drum containing 10 kg of contained U-235 as coated fuel particles in unopened vendor containers or metal cans. Not more than one vendor or WNCO approved container is permitted out of the birdcage at one time.

(CRD) Crit Zone A-2, Split Bead Storage, Individual Compartments Numbered 757 through 972 (Special Controlled Storage Area - No Posting Required)

Nineteen vertical bead storage casks (four of Item 105, Drawing WT-500188, Revision B, and fifteen of Item 309, Drawing WT-500188, Revision B) are arranged in rows on three-foot centers in the North-South direction and two-foot centers in the East-West direction. Fifteen casks have twelve individual 5-inch diameter cylindrical compartments, 5-1/2 inches high; four casks have nine individual 5-inch diameter cylindrical compartments; five are 7-1/2 inches high; three are 9-1/2 inches high; and one is 6-1/4 inches high. Total of 216 compartments.

Crit Zone A-2 (continued)

- (CRD) Limit: 6 kg of contained U-235 in the form of coated UC₂ particles in one approved container per compartment. No more than two one-quart containers or one 1/2-gallon container to be out of the compartments at any one time. Only one cask door is to be open at one time.

(U) Crit Zone A-3, Hood

This hood is used for splitting coated particles into batch sizes and weighing and processing all types of fuel element scrap.

- Limit: 1. 6 kg contained U-235 as coated particles for splitting. Containers allowed in this zone during splitting are: one vendor container which is discarded and removed from zone when empty, two one-quart containers and one 1/2-gallon container.

OR

When using the Micro-splitter, containers allowed are: three splitting trays and one one-quart container.

OR

2. Two 4-5/8 inch diameter bottles with a maximum capacity of one-half gallon containing carbonaceous scrap for accountability processing.

OR

3. 350 grams of contained uranium in any form for accountability processing.

Crit Zone A-4, Weighing Station

- (U) This zone is used for weighing coated fuel particles.

- Limit: 6 kg contained U-235 as coated particles for weighing. Not more than two one-quart or one 1/2-gallon vendor or approved container in the weighing station at one time.

OR

350 grams of contained uranium in any form for accountability processing.

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(CRD) Crit Zone A-5, Fuel Element Storage Vault, Individual Cubicles Numbered 981 through 1251 - Special Controlled Storage Area - No Posting Required

Cubicles for storing fuel elements in approved trays. The South wall storage area consists of six assemblies of four shelves (Item 401, Drawing WT-500184) and one assembly of five shelves (Item 208, Drawing WT-500184). The shelves, separated 24 inches vertically, are divided into individual cubicles by boral spacers. On the South wall each of the six assemblies contain four shelves of nine cubicles and one assembly contains five shelves of eleven cubicles for a total of 271 individual cubicles. No storage is provided on the North wall at the present time. Fuel elements in approved aluminum storage trays may be stored in all stages of fabrication. The trays will contain a maximum of 20 fuel elements. No tray may be stored in the cubicles containing:

1. Aluminum tubes, or
2. Fuel elements with unattached (loose) non-fuel tips. Fuel elements with separated non-fuel tips can be stored in cubicles provided the non-fuel tip is securely taped to the fuel element to form a single continuous piece.

(CRD) Limit: 271 trays, one tray per cubicle, each containing:

1. Maximum of 20 fuel elements, each row separated by three rectangular 3/16" thick plastic spacers.

OR

2. Maximum of 20 fuel elements, each row separated by three rectangular (2-3/4" x 4-7/8") closed cell foam rubber spacers.

OR

3. Maximum of 16 fuel elements, each row separated by full length closed cell foam rubber cushions (Dwg. EDSK 333027-D).

Note: (1) Handling and movement of material within Crit Zone A-5 is accomplished by hand carriage or use of the fuel transfer cart. Each move is restricted to two trays containing a maximum of 20 fuel elements per tray.

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(2) Fuel element storage trays must be fully inserted into each cubicle.

(U) Crit Zone A-6, Area for Inspection and Sorting of Fuel Elements

(U) Limit: Forty-four (44) fuel elements dispersed as follows:

1. Up to 20 fuel elements in an approved aluminum fuel element storage tray on a transfer cart.

AND

Up to 20 fuel elements in an approved aluminum fuel element storage tray and/or placed in a plane array on a table.

OR

2. Up to 20 fuel elements in an approved aluminum fuel element storage tray on a transfer cart.

AND

One approved aluminum fuel element storage tray at the table containing a maximum of 20 fuel elements or a maximum of 20 fuel elements distributed in two trays. Not more than one fuel element permitted out of approved aluminum fuel element storage trays at one time.

OR

3. Two approved aluminum fuel element storage trays containing a maximum of 20 fuel elements per tray on the transfer cart.

OR

4. One approved Oak Ridge shipping container, with a maximum capacity of 44 fuel elements.

AND

Two approved aluminum fuel element storage trays on a transfer cart being loaded or unloaded from or into the shipping container. Not more than one fuel element permitted out of an approved storage tray or the shipping container at one time.

(CRD) Work Area B - Powder Preparation, Mixing, Extrusion, and Curing

This area is devoted to the extrusion, curing and tipping of fueled and non-fueled elements. Processing includes blending carbon powder and fuel beads in a dry mixture, and then adding a binder to prepare a wet or green mix. This green mix is hand compacted, extruded, chopped, hand compacted, extruded and chopped again and then hand compacted and finally extruded. Fuel elements are extruded onto a tray fixture which when stacked together becomes the cure fixture. The green fuel elements are cured in these fixtures. The quantity of carbon powder, fuel beads, and binder are based on batch formulation calculations made prior to the extrusion.

(U) Crit Zone B-1, Lab Hood

(U) Limit: 2 kg contained U-235 in green mix form or coated fuel particles.

(U) Crit Zone B-2, V Blender Hood No. 1

There is a three-compartment storage rack on the top of the blender hoods for the purpose of placing the fuel particles, the organic binder, and the carbon powder which is used for each extrusion batch. All the raw materials are placed in this rack prior to starting a new batch mix. These raw materials are monitored with a survey meter as a procedure to prevent double batching. When the survey has been completed, the raw materials contained in the rack are mixed together to form a batch mix. The 8-quart blender shall be used for batch loading 0 to 600 mg/cc of U-235 and the 16-quart blender for batch loading of 0 to 500 mg/cc of U-235.

Note: The blender to be used will be specified in writing by the Superintendent of Operations or the WNCO Plant Manager. Only one size blender will be used in any of the four hoods at one time. The other size blender will be removed from the area and stored. See C. I. No. 1 for specific instructions.

(U) Limit: 2 kg contained U-235 in the blender or in the storage cubicle as coated fuel particles for mixing. The maximum allowable quantity of organic binder is 2.5 liters (maximum container volume).

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(U) Crit Zone B-3, V Blender Hood No. 2

There is a three-compartment storage rack on the top of the blender hoods for the purpose of placing the fuel particles, the organic binder and the carbon powder which is used for each extrusion batch. All the raw materials are placed in this rack prior to starting a new batch mix. These raw materials are monitored with a survey meter as a procedure to prevent double batching. When the survey has been completed, the raw materials contained in the rack are mixed together forming a batch mix. The 8-quart blender shall be used for batch loading 0 to 600 mg/cc of U-235 and the 16-quart blender for batch loading of 0 to 500 mg/cc of U-235.

Note: The blender to be used will be specified in writing by the Superintendent of Operations or the WNCO Plant Manager. Only one size blender will be used in any of the four hoods at one time. The other size blender will be removed from the area and stored. See C.I. No. 1 for specific instructions.

(U) Limit: 2 kg contained U-235 in the blender or in the storage cubicle as coated fuel particles for mixing. The maximum allowable quantity of organic binder is 2.5 liters (maximum container volume).

(U) Crit Zone B-4, V Blender Hood No. 3

There is a three-compartment storage rack on the top of the blender hoods for the purpose of placing the fuel particles, the organic binder, and the carbon powder which is used for each extrusion batch. All the raw materials are placed in this rack prior to starting a new batch mix. These raw materials are monitored with a survey meter as a procedure to prevent double batching. When the survey has been completed, the raw materials contained in the rack are mixed together to form a batch mix. The 8-quart blender shall be used for batch loading 0 to 600 mg/cc of U-235 and the 16-quart blender for batch loading of 0 to 500 mg/cc of U-235.

Note: The blender to be used will be specified in writing by the Superintendent of Operations or the WNCO Plant Manager. Only one size blender will be used in any of the four hoods at one time. The other size blender will be removed from the area and stored. See C.I. No. 1 for specific instructions.

(U) Limit: 2 kg contained U-235 in the blender or in the storage cubicle as coated fuel particles for mixing. The maximum allowable quantity of organic binder is 2.5 liters (maximum container volume).

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(U) Crit Zone B-5, V Blender Hood No. 4

There is a three-compartment storage rack on the top of the blender hoods for the purpose of placing the fuel particles, the organic binder, and the carbon powder which is used for each extrusion batch. All the raw materials are placed in this rack prior to starting a new batch mix. These raw materials are monitored with a survey meter as a procedure to prevent double batching. When the survey has been completed, the raw materials contained in the rack are mixed together to form a batch mix. The 8-quart blender shall be used for batch loading 0 to 600 mg/cc of U-235 and the 16-quart blender for batch loading of 0 to 500 mg/cc of U-235.

Note: The blender to be used will be specified in writing by the Superintendent of Operations or the WNCO Plant Manager. Only one size blender will be used in any of the four hoods at one time. The other size blender will be removed from the area and stored. See C. I. No. 1 for specific instructions.

(U) Limit: 2 kg contained U-235 in the blender or in the storage cubicle as coated fuel particles for mixing. The maximum allowable quantity of organic binder is 2.5 liters (maximum container volume).

(U) Crit Zone B-6, Lab Hood

Limit: 2 kg contained U-235 in green mix.

(U) Crit Zone B-7, Lab Hood

(U) Limit: Intensifier Bar

1. 350 grams U-235 in solution (acetone) held in two 4-inch diameter by 16-inch high containers (EDSK-320615-B) placed in a storage rack.

AND

(U) Limit: Tray Storage - 700 grams contained U-235

1. Two (2) trays, 1-1/2 inches deep by 12-1/2 inches wide by 21 inches long containing acetone from mixing and extrusion cleaning (C. I. No. 5). (Maximum contained U-235 content - 350 grams per tray.)

Trays are to be placed in a plane array. Stacking of trays is not permitted.

(U) Crit Zone B-8, Extrusion Press

(U) Limit: One compacted extrusion billet containing a maximum of 2 kg contained U-235.

(U) Crit Zone B-9, Run Out Table, Tilt Fixture, and Cure Fixture Storage Rack

During the extrusion cycle the green mix is hand compacted, extruded, chopped, hand compacted, extruded and chopped again and then hand compacted and finally extruded. The fuel elements are extruded onto trays which have a maximum capacity of nine elements in a plane array. During the extrusion the tray is located on the run-out table of the extrusion press. When nine elements have been extruded, the tray is removed, placed on a tilt fixture for the purpose of turning the element over and examining the bottom surfaces. During this operation, the elements are transferred to an identical tray which is then moved and placed in the cure fixture storage rack.

Five such trays when stacked together constitutes a cure fixture. There are two different types of cure fixtures. One type (long) is used for full length elements and is 62 inches long. The other type (short) is used for development pieces and is approximately 24 inches long.

(U) Limit: 45 extruded elements and/or 2 kg contained U-235 in extrusion recycle material. The distribution of elements will not exceed:

- a. 9 elements in one tray of the cure fixture located on the run-out table. Recycle material may not be stored in this area.
- b. 9 elements in one tray of the cure fixture located on the tilt fixture. The tilt fixture will be placed in a designated park area within the zone while being loaded or unloaded. Recycle material may not be stored in this area.
- c. 45 elements in a cure fixture (long or short). Each cure fixture consists of 5 trays containing 9 elements or a total of 45 elements per fixture. The long cure fixture is approximately 14 inches wide, 7-3/4 inches high by 62 inches long when assembled and the short cure fixture is approximately 14 inches wide, 7-3/4 inches high by 24 inches long when assembled.

(U) Crit Zone B-10, Cure Fixture Storage Rack

(U) Limit: 90 elements

- a. 90 elements in cure fixtures. There are two shelves spaced 18 inches apart in the vertical direction. Each shelf to hold a maximum of 45 elements in long or short cure fixture.

(U) Crit Zone B-11, Cure Fixture Storage Rack

(U) Limit: 90 elements

- a. 90 elements in cure fixtures. There are two shelves spaced 18 inches apart in the vertical direction. Each shelf to hold a maximum of 45 elements in long or short cure fixture.

(U) Crit Zone B-12, Refrigerator

(U) Limit: 2 kg contained U-235 in green mix or extrusion recycle material in approved 1-1/2 inch high pans. No stacking of pans is allowed.

OR

One compacted extrusion billet in a plastic bag.

(U) Crit Zone B-13, Lab Hood, Miscellaneous Operations

(U) Limit: 2 kg contained U-235 in green mix form.

OR

350 grams contained U-235 for any other miscellaneous operations.

(U) Crit Zone B-15, Balance Table

(U) Limit: 350 grams contained U-235 in samples.

- a. Samples to be in process.

(U) Crit Zone B-16, Oven

(U) Limit: 2 kg contained U-235 in green mix for curing. Material must be stored in approved 1-1/2 inch high pans in an approved array. No stacking of pans is allowed.

- (U) Crit Zone B-17, Cure Furnace ("AH" Furnace)
- (U) Limit: 90 elements. Two cure fixtures (long or short) separated with a 12-inch spacer and each fixture containing 45 elements.
- (U) Crit Zone B-18, Cure Furnace ("AG" Furnace)
- (U) Limit: 90 elements. Two cure fixtures (long or short) separated with a 12-inch spacer and each fixture containing 45 elements.
- (U) Crit Zone B-19, Cure Furnace ("N" Furnace)
- (U) Limit: 90 elements. Two cure fixtures (long or short) separated with a 12-inch spacer and each fixture containing 45 elements.
- (U) Crit Zone B-20, Cure Furnace ("G" Furnace)
- (U) Limit: 90 elements. Two cure fixtures (long or short) separated with a 12-inch spacer and each fixture containing 45 elements.
- (U) Crit Zone B-21, Cure Fixture Storage Rack
- (U) Limit: 90 elements
  - a. 90 elements in cure fixtures. There are two shelves spaced 18 inches apart in the vertical direction. Each shelf to hold a maximum of 45 elements in long or short cure fixture.
- (U) Crit Zone B-22, Cure Fixture Storage Rack
- (U) Limit: 90 elements
  - a. 90 elements in cure fixtures. There are two shelves spaced 18 inches apart in the vertical direction. Each shelf to hold a maximum of 45 elements in long or short cure fixture.
- (U) Crit Zone B-23, Hold Area
- (U) Limit: 80 elements
  - a. Four fuel element storage trays containing a maximum of 20 fuel elements per tray on 2 transfer carts. Carts to be parked in designated areas.

(U) Crit Zone B-24, Unloading, Cutting and Weighing

(U) Limit: 45 elements dispersed as follows:

- a. 45 elements in cure furnace fixture (Dwg. 975D784). The fixture (45 elements) may be placed on top of vacuum table or cure fixture rack.
- b. Two fuel element storage trays of 20 fuel elements each on transfer cart.
- c. Two fuel element storage trays at weighing station containing a maximum of 20 fuel elements in one tray or a maximum of 20 fuel elements distributed in two trays.
- d. Up to 20 elements in fuel storage tray and/or placed in a plane array on the top surface of the vacuum table.

AND

Maximum of 500 grams of scrap in a 5-inch diameter by 6-3/4 inch high metal can mounted under the cutoff hood. Not more than one element permitted in hood at one time.

(U) Note: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a 1/2-gallon metal can which is limited to 1000 grams contained U-235.

(U) Crit Zone B-25, Optical Comparator and Viewing

(U) Limit: 500 grams contained U-235 in the form of fuel element wafers.

(U) Crit Zone B-26, Hold Area

(U) Limit: 40 elements

- a. Two fuel element storage trays containing a maximum of 20 fuel elements per tray on transfer cart.

(U) Crit Zone B-27, Proof Testing

(U) Limit: 20 elements

- a. A maximum of 20 elements distributed between three fuel element storage trays in a plane array. Not more than one element permitted out of approved trays at one time.

(CRD) Crit Zone B-28, "AC" Furnace - Tip Brazing

(CRD) Limit: Twenty (20) fuel elements (not more than five out of approved storage tray).

AND

Maximum of four elements worth of non-fuel tips placed in a tray by element in a straight end to end and plane position.

AND

One non-fuel support rod.

AND

Maximum of six (6) flexure test samples. (5-1/2 inches long)

Fuel element storage trays may be located on the work table or on a transfer cart.

(U) Crit Zone B-29, Dimensional Inspection (Surface Plate)

(U) Limit: Twenty (20) fuel elements, not more than 9 out of approved trays.

(U) Crit Zone B-30, Hole Size

(U) Limit: 21 elements - not more than 9 elements out of approved trays.

(U) Crit Zone B-31, Low Temperature Furnace

(U) Limit: 90 elements in an approved graphite furnace fixture. The graphite fixture (Dwg. 928F158, Rev. 2) is an annular cylinder 16-1/2 inches O.D. and 9 inches I.D. containing 90 holes 0.936 inches in diameter.

(U) Crit Zone B-32, Hold Area

(U) Limit: a. 90 elements in the approved graphite furnace fixture (Dwg. 928F158, Rev. 2). This is an annular cylinder 16-1/2 inches O.D. and 9 inches I.D. containing 90 holes 0.936 inches in diameter.

(U) Crit Zone B-33, Fuel Wafer Storage Area

(U) Limit: 500 grams contained U-235 in the form of fuel element wafers.

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(U) Crit Zone B-34, Bow and Twist Inspection

(U) Limit: 18 elements - not more than 9 elements out of approved trays.

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Work Area C - Machining Area

- (U) Note: Each machine in this area includes a dust collection and filter system which is maintained in accordance with C. I. No. 10.
- (U) Crit Zone C-1, Engraver
- (U) Limit: Twenty (20) fuel elements. (Not more than nine out of their approved storage trays.) Elements may be in machine fixture or fuel storage trays on transfer cart. The dust collection and filter system in this zone has a one quart plastic collection bottle with a maximum limit of 500 grams of contained U 235.
- (U) Crit Zone C-2, Engraver
- (U) Limit: Twenty (20) fuel elements. (Not more than nine out of their approved storage trays.) Elements may be in machine fixture or fuel storage trays on transfer cart. The dust collection and filter system in this zone has a one quart plastic collection bottle with a maximum limit of 500 grams of contained U 235.
- (U) Crit Zone C-3, Diamond Mill and Surface Plate
- (U) Limit: Twenty (20) fuel elements. (Not more than nine out of their approved storage trays.) Elements may be in the machine fixture, on the surface plate or in fuel storage trays on a transfer cart and not more than 350 grams of contained U 235 in the form of samples cut from the tray of twenty elements being machined.
- (U) Note: Two (2) Aerotec dust collection units are located in this crit zone. Each has a 1/2 gallon metal collection can which is limited to 1000 grams of contained U 235. Only one can of machining dust or one air filter shall be removed and handled at one time.
- (U) Crit Zone C-5, Cut-Off
- (U) Limit: Twenty (20) fuel elements. Not more than nine elements out of their approved storage tray. Elements may be in machine fixture or fuel storage trays on transfer cart, and not more than 350 grams of contained U 235 in the form of samples cut from the tray of twenty elements being machined.
- Note: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a 1/2-gallon metal can which is limited to 1000 grams contained U 235.

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(U) Crit Zone C-6, Stoning

(U) Limit: 20 fuel elements. Not more than 9 out of their approved storage trays. Elements may be in the machine fixture or fuel storage trays on transfer cart. The dust collection and filter system in this zone has a one-quart plastic collection bottle with a maximum limit of 500 grams of contained U-235.

(U) Crit Zone C-7, Dimensional Inspection

(U) Limit: 20 fuel elements. Not more than 9 elements out of approved trays.

(U) Crit Zone C-8, Stoning

(U) Limit: 20 fuel elements. Not more than 9 out of their approved storage trays. Elements may be in machine fixture or fuel storage trays on transfer cart. The dust collection and filter system in this zone has a one-quart plastic collection bottle with a maximum limit of 500 grams of contained U-235.

(U) Crit Zone C-9, Stoning

(U) Limit: 20 fuel elements. Not more than 9 out of their approved storage trays. Elements may be in machine fixture or fuel storage trays on transfer cart. The dust collection and filter system in this zone has a one-quart plastic collection bottle with a maximum limit of 500 grams of contained U-235.

(U) Crit Zone C-10, Gun Drilling

(U) Limit: 20 fuel elements which may be in the machining fixture or a fuel storage tray on a transfer cart. Not more than one element is permitted out of the approved storage tray at any one time.

Note: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a 1/2 gallon metal can which is limited to 1000 grams contained U-235.

(U) Crit Zone C-11, In-Process Fuel Element Storage, Individual Cubicles Numbered 1577 through 1593 (Special Controlled Storage Area - No Posting Required)

(U) Limit: 32 trays, two trays per cubicle, containing a maximum of 20 fuel elements per tray. Fuel elements will be in approved trays and will be separated by either plastic or rubber spacers. A total of 16 cubicles.

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(U) Crit Zone C-12, Lathe

- (U) Limit: Twenty (20) fuel elements. Not more than nine out of their approved storage trays. Elements may be in machine fixture or fuel storage trays on transfer cart, and not more than 350 grams of contained U 235 in the form of samples cut from the tray of twenty elements being machined.

Note: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a 1/2-gallon metal can which is limited to 1000 grams contained U 235.

(U) Crit Zone C-13, Lathe

- (U) Limit: Twenty (20) fuel elements. Not more than nine out of their approved storage trays. Elements may be in machine fixture or fuel storage trays on transfer cart, and not more than 350 grams of contained U 235 in the form of samples cut from the tray of 20 elements being machined.

Note: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a 1/2-gallon metal can which is limited to 1000 grams contained U 235.

(U) Crit Zone C-14, Lathe

- (U) Limit: Twenty (20) fuel elements. Eighteen (18) elements may be in the two reaming fixtures at one time. Only one element at a time will be in transit between the tray and the reaming fixtures. Elements may be in machine fixture or fuel storage trays on transfer cart.

AND

Not more than 350 grams of contained U 235 in the form of samples cut from the tray of twenty elements being machined.

Note: Two (2) Aerotec dust collection units are located in this crit zone. Each has a 1/2-gallon metal collection can which is limited to 1000 grams of contained U 235. Only one can of machining dust or one air filter shall be removed and handled at one time.

(U) Crit Zone C-15, Lathe

Limit: Twenty (20) fuel elements. Not more than nine out of their approved storage trays. Elements may be in machine fixture or fuel storage trays on transfer cart, and not more than 350 grams of contained U 235 in the form of samples cut from the tray of twenty elements being machined.

Note: The dust collection and filter system in this zone is maintained in accordance with C.I. No. 10. The system includes a 1/2-gallon metal can which is limited to 1000 grams contained U 235.

(U) Crit Zone C-16, Lathe

(U) Limit: 20 fuel elements. Not more than 9 out of their approved storage trays. Elements may be in machine fixture or fuel storage trays on transfer cart, and not more than 350 grams of contained U-235 in the form of samples cut from the tray of 20 elements being machined.

Note: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a 1/2 gallon metal can which is limited to 1000 grams contained U-235.

(U) Crit Zone C-17, Milling Machines

(U) Limit: 20 fuel elements. Not more than 9 out of their approved storage trays. Elements may be in machine fixture or fuel storage trays on transfer cart, and not more than 350 grams of contained U-235 in the form of samples cut from the tray of 20 elements being machined. Machining dust is collected from this machine by a portable vacuum which has a plastic one quart bottle limited to 500 grams of contained U-235.

(U) Crit Zone C-18, Grinder

(U) Limit: 20 fuel elements. Not more than 9 out of their approved storage trays. Elements may be in machine fixture or fuel storage trays on transfer cart, and not more than 350 grams of contained U-235 in the form of samples cut from the tray of 20 elements being machined. Machining dust is collected from this machine by a portable vacuum which has a plastic one quart bottle limited to 500 grams of contained U-235.

(U) Crit Zone C-19, Broach

(U) Limit: 20 fuel elements plus 20 non-fueled pieces approximately four inches long. The non-fueled pieces are to be easily identified as non-fuel and will be stacked at the end of the tray in line with the fuel elements. Elements may be in the machining fixture or in the fuel storage tray on the transfer cart with not more than 9 elements out of their approved storage trays.

(U) Note: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a 1/2 gallon metal can which is limited to 1000 grams contained U-235.

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(U) Crit Zone C-20, Broach

(U) Limit: Twenty (20) fuel elements plus 20 non-fueled pieces approximately four inches long. The non-fueled pieces are to be easily identified as non-fuel and will be stacked at the end of the tray in line with the fuel elements. Elements may be in the machining fixture or in the fuel storage tray on the transfer cart with not more than nine elements out of their approved storage trays.

Note: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a 1/2-gallon metal can which is limited to 1000 grams contained U 235.

Crit Zone C-21, Weigh, Sample and Element Review Area

Limit: Twenty (20) fuel elements distributed as follows:

1. Eighteen (18) elements which may be distributed between two fuel element trays in a plane array. Not more than two elements may be out of approved storage trays at one time.

AND

2. Two aluminum tubes containing the equivalent of two elements in the form of samples.

AND

Not more than 350 grams of contained U 235 in the form of samples for weighing and/or placing in the aluminum tubes.

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Work Area D - Engineering Development Laboratory

Crit Zone D-1, Engineering Development Laboratory

Limit: 350 grams of contained U-235 in fuel elements or other forms as required for experimentation. Small quantities of water are required for use in the sample polishing equipment as well as for process analysis equipment.

Crit Zone D-2, Mechanical Strength Testing

Limit: 350 grams contained U-235 in the form of fuel elements or fuel element sample sections.

Crit Zone D-3, Plasticorder

Limit: 350 grams contained U-235 as plasticorder green mix sample.

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(U) Work Area E - Accountability

(U) Crit Zone E-1, Birdcage, Scrap and Fuel Storage (Special Controlled Area - No Posting Required)

(U) This crit zone is used to store material either prior to unloading or after loading.

(U) Storage containers used are:

1. 55-gallon steel drums B. of E. Permit 1489 containing 5-inch diameter birdcages. (Dwg. 928F245.)
2. 55-gallon ICC 6L drums containing 5-inch diameter birdcages. (Dwg. EDSK 333283.)
3. Oak Ridge ICC 5097 shipping containers. Used for fuel elements.
4. Oak Ridge DOT Special Permit No. 5246. Used for fuel elements.
5. 55-gallon ICC 17E drums B. of E. Permit 2016. Used for storing low-level uranium waste.
6. Vendor 55-gallon birdcage type drums.

Eighteen (18) 55-gallon drums in an array three drums by six drums long, one high, may be placed in the crit zone with contents within limits specified below. Oak Ridge ICC 5097 shipping containers may be stored in this area at a substitution ratio of one to every three 55-gallon drums. One Oak Ridge DOT Special Permit No. 5246 drum is equivalent to one 55-gallon drum.

Process scrap and fuel particles are contained in approved containers within the inner container (birdcage) of the 55-gallon drums. Low-level uranium waste is bagged in plastic bags and stored in the ICC 17E drums. Only fuel elements are stored in the Oak Ridge shipping containers. Mounted metallography samples, leach waste, or leach filters may not be placed in ICC 6L drums.

NOTE: Not more than one inner container or one element is permitted out of the storage container within the zone at any one time.

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(U) LIMIT: Process Scrap

- (U) 1. 3500 grams contained U-235 per drum as NERVA fuel element scrap resulting from machining, sampling, and rejected or damaged fuel elements.

OR

- (U) 2. 3500 grams contained U-235 per drum as green (cured) fuel mixture.

OR

- (U) 3. 600 grams of contained U 235 per drum as waste from the leach furnace trap and filtering system. (Stored in accordance with C. I. No. 15.)

OR

- (U) 4. 350 grams of contained U 235 per drum as low-level waste determined by the gamma survey technique or scrap processing accountability procedures. Drums containing more than 100 grams contained U 235 will be handled in accordance with C. I. No. 30.

(U) LIMIT: Fuel Particles

- (U) 1. 10 kg of contained U 235 per drum as coated fuel particles in unopened vendor containers, approved sealed polyethylene bottles, or approved sealed metal cans.

(CRD) LIMIT: Fuel Elements

1. 7500 grams of 93.15% enriched uranium in fuel element form in Oak Ridge ICC 5097 shipping container. The content of this container is further limited to a maximum of 44 fuel elements.

OR

2. 2880 grams of 93.15% enriched uranium in fuel element form in an Oak Ridge DOT Special Permit No. 5246 shipping container. The content of this container is further limited to a maximum of nine fuel elements.

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(U) Crit Zone E-2, Loading, Unloading, and Weighing Zone

This zone is a work area for loading, unloading, and weighing fuel particles, process scrap, and fuel elements. Only one function; element processing, scrap processing, or fuel bead processing, will be performed at a given time with the applicable limits.

(U) LIMIT: Element Processing

1. Two fuel element storage trays containing a maximum of 20 fuel elements per tray on a transfer cart.

NOTE: Not more than one element is permitted out of the trays or shipping containers within the zone at one time.

AND

(CRD) One Oak Ridge ICC 5097 shipping container containing a maximum of 7500 grams of 93.15% enriched uranium in fuel element form. The content of this container is further limited to a maximum of 44 fuel elements.

OR

Three Oak Ridge DOT Special Permit No. 5246 shipping containers, each containing a maximum of 2880 grams of 93.15% enriched uranium in fuel element form. The content of these containers is further limited to a maximum of nine fuel elements each.

OR

(U) Three approved 55-gallon 5-inch diameter birdcage drums containing a maximum of 3500 grams contained U 235 per drum in fuel element form.

(U) LIMIT: Fuel Particle Processing

1. Three approved 5-inch diameter birdcage drums containing a maximum of 10 kg contained U 235 per drum in the form of coated fuel particles.

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(U) NOTE: Not more than one vendor or WNCO approved container is permitted out of the birdcage drums at one time.

(U) LIMIT: Process Scrap

Three (3) 55-gallon 5-inch diameter birdcage drums (B. of E. Permit 1489 or ICC 6L) for process scrap or three 55-gallon ICC 17E, B. of E. Permit 2016 drums for low level waste. ICC-6L drums will not be used for leach waste, leach filters, or for mounted metallographic specimens.

(U) NOTE: Not more than one approved inner container is permitted out of birdcage containers within the zone at any one time.

(U) 1. 3500 grams contained U 235 per drum as NERVA fuel element scrap resulting from machining, sampling, and rejected or damaged fuel elements.

OR

(U) 2. 3500 grams contained U 235 per drum as green (cured) fuel mixture.

OR

(U) 3. 600 grams of contained U 235 per drum as waste from the leach furnace trap and filtering system. (Stored in accordance with C. I. No. 15.)

OR

(U) 4. 350 grams of contained U 235 per drum as low-level waste determined by the gamma survey technique or scrap processing accountability procedures. Drums containing more than 100 grams contained U-235 will be handled in accordance with C. I. No. 30.

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(U) Crit Zone E-3, Birdcage, Scrap and Fuel Storage (Special
Controlled Area - No Posting Required)

(U) This crit zone is used to store material either prior to unloading or after loading.

(U) Storage containers used are:

1. 55-gallon steel drums B. of E. Permit 1489 containing 5-inch diameter birdcages. (Dwg. 928F245, 5".)
2. 55-gallon ICC 6L drums containing 5-inch diameter birdcages. (Dwg. EDSK 333283.)
3. Oak Ridge ICC 5097 shipping containers. Used for fuel elements.
4. Oak Ridge DOT Special Permit No. 5246. Used for fuel elements.
5. 55-gallon ICC 17E drums B. of E. Permit 2016. Used for storing low-level uranium waste.
6. Vendor 55-gallon birdcage type drums.

Fourteen (14) 55-gallon drums in an array two drums by seven drums long, one high, may be placed in the crit zone with contents within limits specified below. Oak Ridge ICC 5097 shipping containers may be stored in this area at a substitution ratio of one to every three 55-gallon drums. One Oak Ridge DOT Special Permit No. 5246 drum is equivalent to one 55-gallon drum.

Process scrap and fuel particles are contained in approved containers within the inner container (birdcage) of the 55-gallon drums. Low-level uranium waste is bagged in plastic bags and stored in the ICC 17E drums. Only fuel elements are stored in the Oak Ridge ICC shipping containers. Mounted metallography samples, leach waste, or leach filters may not be placed in ICC 6L drums.

NOTE: Not more than one approved inner container or one element is permitted out of the storage containers within the zone at one time.

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(U) LIMIT: Process Scrap

1. 3500 grams contained U 235 per drum as NERVA fuel element scrap resulting from machining, sampling, and rejected or damaged fuel elements.

OR

- (U)
2. 3500 grams contained U 235 per drum as green (cured) fuel mixture.

OR

- (U)
3. 600 grams of contained U 235 per drum as waste from the leach furnace trap and filtering system. (Stored in accordance with C. I. No. 15.)

OR

- (U)
4. 350 grams of contained U 235 per drum as low-level waste determined by the gamma survey technique or scrap processing accountability procedures. Drums containing more than 100 grams contained U 235 will be handled in accordance with C. I. No. 30.

(U) LIMIT: Fuel Particles

- (U)
1. 10 kg of contained U 235 per drum as coated fuel particles in unopened vendor containers, approved sealed polyethylene bottles, or approved sealed metal cans.

(U) LIMIT: Fuel Elements

- (CRD)
1. 7500 grams of 93.15% enriched uranium in fuel element form in an Oak Ridge ICC 5097 shipping container. The content of this container is further limited to a maximum of 44 fuel elements.

OR

- (CRD)
2. 2880 grams of 93.15% enriched uranium in fuel element form in an Oak Ridge DOT Special Permit No. 5246 shipping container. The content of this container is further limited to a maximum of nine fuel elements.

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(U) Crit Zone E-4, Process Dust and Hold Sample Storage, Individual
Compartments Numbered 1602 through 1816. (Special Controlled
Storage Area - No Posting Required)

Thirty (30) vertical storage casks (Item 301, Drawing WT-500188, Revision B) are arranged in six rows of five casks. The casks are spaced on two-foot centers in the north-south direction and on three-foot centers in the east-west direction. Twenty-nine casks have seven individual five-inch diameter cylindrical compartments 9-1/2 inches high and one cask has twelve individual compartments 5-1/2 inches high. There is a total of 215 compartments. The compartments are for the storage of process scrap, dust, hold samples, and fuel beads. Plastic bottles must be contained within metal shells while stored in this zone.

LIMIT PER COMPARTMENT:

NOTE: No more than two one-quart containers or one 1/2-gallon container to be out of the compartments at any one time. Only one cask door is to be open at one time.

1. 1000 grams contained U 235 in scrap or dust form.

OR

2. Any quantity of control samples provided they are in a sealed container which can be put in a compartment.

OR

3. Six (6) kg of contained U 235 in the form of coated UC_2 particles in one approved container per compartment.

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(U) Crit Zone E-5, Fuel Element Suitcase Storage, (Special
Controlled Area - No Posting Required)

(U) Cubicles are provided for the storage of fuel element shipping suitcases containing fuel elements or fuel element samples. The array, per Dwg. WT-500193, contains a total of 48 cubicles numbered 1817 through 1864. In-process suitcases may be stored in an open condition. Not more than one suitcase is permitted out of the array within the zone at any one time. Not more than one element or tube of sections is permitted out of a suitcase at any one time.

(U) LIMIT PER CUBICLE:

(U) 1. One suitcase containing a maximum of 19 fuel elements or any number of element samples so long as they are contained in not more than 19 aluminum shipping tubes.

OR

(U) 2. One suitcase containing a maximum of 14 fuel elements in a molded plastic insert assembly.

Crit Zone E-6, Work Table

(U) This zone is for packaging samples or miscellaneous work not requiring a hood.

LIMIT:

(U) 1. 1000 grams contained U 235 in an approved container.

OR

(U) 2. 350 grams contained U 235 in any form.

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(U) Crit Zone E-7, Birdcage, Scrap and Fuel Storage (Special Controlled Area - No Posting Required)

(U) This crit zone is used to store material either prior to unloading or after loading.

Storage containers used are:

(U) 1. 55-gallon steel drums B. of E. Permit 1489 containing 5-inch diameter birdcages. (Dwg. 928F245.)

(U) 2. 55-gallon ICC 6L drums containing 5-inch birdcages. (Dwg. EDSK 333283.)

(U) 3. Oak Ridge ICC 5097 shipping containers. Used for fuel elements.

(U) 4. Oak Ridge DOT Special Permit No. 5246. Used for fuel elements.

(U) 5. 55-gallon ICC 17E drums B. of E. Permit 2016. Used for storing low-level uranium waste.

(U) 6. Vendor 55-gallon birdcage type drums.

(U) Ten (10) 55-gallon drums in an array one drum by ten drums long, one high, may be placed in the crit zone with contents within limits specified below. Oak Ridge ICC 5097 shipping containers may be stored in this area at a substitution ratio of one to every three 55-gallon drums. One Oak Ridge DOT Special Permit No. 5246 drum is equivalent to one 55-gallon drum.

(U) Process scrap and fuel particles are contained in approved containers within the inner container (birdcage) of the 55-gallon drums. Low-level uranium waste is bagged in plastic bags and stored in the ICC 17E drums. Only fuel elements are stored in the Oak Ridge ICC shipping containers. Mounted metallography samples, leach waste, or leach filters may not be placed in ICC-6L drums.

(U) LIMIT: Process Scrap

(U) 1. 3500 grams contained U 235 per drum as NERVA fuel element scrap resulting from machining, sampling, and rejected or damaged fuel elements.

OR

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- (U) 2. 3500 grams contained U 235 per drum as green (cured) fuel mixture.

OR

- (U) 3. 600 grams of contained U 235 per drum as waste from the leach furnace trap and filtering system. (Stored in accordance with C. I. No. 15.)

OR

- (U) 4. 350 grams of contained U 235 per drum as low-level waste determined by the gamma survey technique or scrap processing accountability procedures. Drums containing more than 100 grams contained U 235 will be handled in accordance with C. I. No. 30.

(U) LIMIT: Fuel Particles

1. Ten (10) kg of contained U 235 per drum as coated fuel particles in unopened vendor containers, approved sealed polyethylene bottles, or approved sealed metal cans.

(CRD) LIMIT: Fuel Elements

1. 7500 grams of 93.15% enriched uranium in fuel element form in an Oak Ridge ICC 5097 shipping container. The content of these containers is further limited to a maximum of 44 fuel elements.

OR

2. 2880 grams of 93.15% enriched uranium in fuel element form in an Oak Ridge DOT Special Permit No. 5246 shipping container. The content of these containers is further limited to a maximum of nine fuel elements.

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Crit Zone E-8, Hood

(U) Limit: Two (2) 4-5/8 inch diameter one-quart bottles containing a maximum of 500 grams each contained U 235 in the form of carbonaceous scrap for accountability processing.

OR

(U) One (1) 4-5/8 inch diameter one-half gallon bottle or metal can containing a maximum of 1000 grams contained U 235 in the form of carbonaceous scrap for accountability processing.

OR

(U) One (1) loaded Aerotec filter containing a maximum of 350 grams contained U 235.

OR

(U) 350 grams of contained uranium in any form for accountability processing.

OR

(U) One (1) 4-5/8 inch diameter bottle with a maximum capacity of one-half gallon containing carbonaceous scrap plus one fueled element in the process of being scrapped. One-half gallon bottle limited to 1000 grams of contained U 235.

Crit Zone E-9, Bead Retainer Sample Storage. (Special Controlled Area - No Posting Required.)

(U) Retainer samples of fuel beads are stored in 1" diameter by 2" high plastic bottles. The bottles are contained in metal trays 1-1/4" wide, 2" high, and 35" in length. The trays are bolted in rows on the back of a metal storage cabinet 36" wide, 21" deep, and 78" high. Total of 16 trays with 4-1/4 inch tray to tray separation.

LIMIT: 50 grams maximum contained U 235 per sample bottle. No more than two sample vials to be out of trays within the zone at any one time.

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(U) Crit Zone E-10, Riffle Splitting Glove Box

(U) This crit zone is used for riffle splitting chemistry samples from carbonaceous uranium materials.

(U) LIMIT: 350 grams of contained U 235 in carbonaceous uranium material.

Crit Zone E-11, Hood

(U) LIMIT: Two (2) 4-5/8 inch diameter one-quart bottles containing a maximum of 500 grams each contained U 235 in the form of carbonaceous scrap for accountability processing.

OR

(U) One (1) 4-5/8 inch diameter one-half gallon bottle or metal can containing 1000 grams contained U 235 in the form of carbonaceous scrap for accountability processing.

OR

(U) One (1) loaded Aerotec filter containing a maximum of 350 grams contained U 235.

OR

(U) 350 grams of contained uranium in any form for accountability processing.

OR

(U) One (1) 4-5/8 inch diameter bottle with a maximum capacity of one-half gallon containing carbonaceous scrap plus one fueled element in the process of being scrapped. One-half gallon bottle limited to 1000 grams of contained U 235.

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Crit Zone E-12, Hood

- (U) LIMIT: Two (2) 4-5/8" diameter one quart bottles containing a maximum of 500 grams each contained U 235 in the form of carbonaceous scrap for accountability processing.
- OR
- (U) One (1) 4-5/8 inch diameter one-half gallon bottle or metal can containing a maximum of 1000 grams contained U 235 in the form of carbonaceous scrap for accountability processing.
- OR
- (U) One (1) loaded Aerotec filter containing a maximum of 350 grams contained U 235.
- OR
- (U) 350 grams of contained uranium in any form for accountability processing.
- OR
- (U) One (1) 4-5/8 inch diameter bottle with a maximum capacity of one-half gallon containing carbonaceous scrap plus one fueled element in the process of being scrapped. One-half gallon bottle limited to 1000 grams of contained U 235.

Crit Zone E-13, Process Dust Storage, Individual Compartments
Numbered 1865 through 1892. (Special Controlled Area - No
Posting Required.)

- (U) Four (4) vertical storage casks (Item 301, Dwg. WT-500188, Revision B) are arranged in one row along the wall and spaced on two foot centers. Each cask consists of seven individual 5" diameter cylindrical compartments 9-1/2" high. There is a total of 28 compartments. The compartments are used to contain bottles of dust and process scrap until it is processed by Accountability. Plastic bottles must be contained within metal shells while stored in these casks.

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LIMIT PER COMPARTMENT:

- (U) NOTE: No more than two (2) one-quart containers or one (1) 1/2-gallon container to be out of the compartments at any one time. Only one cask door is to be open at one time.

1. 1000 grams contained U-235 in scrap or dust form in an approved container.

Crit Zone E-14, Weighing Table

Material from the shop will be weighed in this crit zone.

- (U) LIMIT: 1000 grams contained U 235 in an approved container.

OR

One (1) loaded Aerotec filter containing a maximum of 350 grams contained U 235.

OR

350 grams contained U 235 in any form for accountability processing.

- (U) Crit Zone E-15, Process Scrap Crusher and Pulverizer

- (U) Fuel elements and process scrap will be crushed and pulverized to make the scrap amenable for accountability sampling.

- (U) LIMIT: 1000 grams of contained U 235 distributed between the following containers:

1. One (1) 1/2-gallon polyethylene scrap processing bottle (4-5/8" O. D. x 9" high).

AND

2. One (1) 1/2-gallon polyethylene recovery processing bottle (4-5/8" O. D. x 9" high).

NOTE: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. It includes a 1/2-gallon metal can which is limited to 1000 grams contained U 235.

(U) Crit Zone E-16, Process Scrap Sampler

Process scrap will be sampled for accountability purposes during the packaging operation prior to storage and recovery.

(U) LIMIT: 3000 grams of contained U 235 distributed between the following containers:

1. One (1) 1/2-gallon polyethylene scrap processing bottle (4-5/8" O. D. x 9" high).

AND

2. One (1) 80 cubic inch scrap sample tray (6" long x 4-1/4" wide x 4-3/4" high).

AND

3. One 2.2 gallon polyethylene scrap storage bottle (4-7/8" O. D. x 31-5/8" high).

(U) Crit Zone E-17, Scrapper

Future equipment, not installed at present.

(U) Crit Zone E-18, "Chipmunk" Crusher

The "Chipmunk" Crusher is used to reduce carbonaceous uranium scrap to a size suitable for feeding the pulverizer. Types of scrap processed through the crusher are:

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- (U) 1. Full length fuel elements and/or fuel element sections contained in shipping tubes.
2. Bottled carbonaceous uranium scrap.

Limits will vary dependent upon the type of material being processed. Only one type will be processed at one time.

- (U) Full Length Fuel Elements and/or Fuel Element Sections Contained in Shipping Tubes.

- (U) LIMIT: Twenty (20) fuel elements in two approved aluminum fuel element storage trays on a transfer cart.

OR

Twelve (12) element shipping tubes containing fuel element sections in two approved aluminum fuel element storage trays on a transfer cart.

AND

One empty approved one-quart or 1/2-gallon polyethylene bottle to catch the crushed scrap.

NOTE 1: Not more than one element or one shipping tube containing element sections permitted out of storage tray at one time in transit to the crusher.

NOTE 2: The bottle full of crushed scrap will be removed from the crit zone prior to the start of refilling the next bottle.

- (U) Bottled Carbonaceous Uranium Scrap

LIMIT: One (1) approved one-quart or 1/2-gallon polyethylene bottle containing carbonaceous uranium scrap for processing through the crusher.

AND

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One (1) empty approved one-quart or 1/2-gallon polyethylene bottle to catch the crushed scrap.

NOTE 1: The bottle full of crushed scrap will be removed from the crit zone prior to the start of refilling the next bottle and prior to introducing another bottle of scrap into the crit zone for processing.

NOTE 2: The dust collection and filter system in this zone is maintained in accordance with C. I. No. 10. The system includes a 1/2-gallon metal can which is limited to 1000 grams contained U 235.

(U) Crit Zone E-19, Weighing Table

Material being processed in the work area will be weighed in this crit zone.

LIMIT: 1000 grams contained U 235 in an approved container.

OR

One (1) loaded Aerotec filter containing a maximum of 350 grams of contained U 235.

OR

350 grams contained U 235 in any form for accountability processing.

(U) Crit Zone E-20, Vacuum Cleaner Storage

LIMIT: When not in use, the nuclearly safe vacuum cleaner is to be stored within this zone. The vacuum cleaner has a one-quart plastic collection bottle which is limited to 500 grams contained U 235.

(U) Crit Zone E-21, Loaded Aerotec Filter Storage (Special Controlled Area - No Posting Required)

Individual cubicles numbered 1893 through 1902 in an array two wide and five high separated by one foot spacing in both the horizontal and vertical direction. Each cubicle is approximately 13 inches square. There is a total of ten cubicles.

LIMIT: One filter containing a maximum of 350 grams contained

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U 235. Not more than one filter is permitted out of the cubicles within the zone at any one time.

(U) Crit Zone E-22, Filter Shaking Hood

Loaded Aerotec filters will be shaken down in the hood of this crit zone.

LIMIT: One loaded Aerotec filter containing a maximum of 350 grams contained U 235 and one approved container for collecting dust.

(U) Crit Zone E-23, Cleaned Aerotec Filter Storage (Special Controlled Area - No Posting Required)

Individual cubicles numbered 1903 through 1938 in an array three high by twelve long. Total of 36 cubicles. Each cubicle is approximately 13" square. The lower most shelf is 1-1/2 feet above the upper most portion of the lower storage array (Crit Zone E-24).

LIMIT: One filter per cubicle. The maximum allowable weight of machining dust in the filter is 200 grams (equivalent to 75 grams U 235 maximum).

(U) Crit Zone E-24, Fuel Element Storage, Individual Cubicles Numbered 1939 through 1946 (Special Controlled Storage Area - No Posting Required)

(U) LIMIT: Sixteen (16) trays, two trays per cubicle, containing a maximum of twenty fuel elements per tray. Fuel elements will be in approved trays and may be separated by either plastic or rubber spacers. A total of eight cubicles. No more than two trays will be permitted out of the cubicles at any one time within the zone. No more than one element will be permitted out of tray within the zone at any one time.

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(U) Crit Zone E-25, Dust Sample Retainer Storage (Special
Controlled Area - No Posting Required)

Retainer samples of dust are stored in 2-inch diameter by 4-inch high plastic bottles. The bottles are contained in metal trays 2-1/4" wide, 3-1/4" high, and 35" in length. The trays are bolted in rows on the back of metal storage cabinets, 36 inches wide, 21 inches deep, and 78 inches high. There are three cabinets, each one holding ten trays with 6-3/4" tray to tray separation.

LIMIT: Thirty (30) grams contained U 235 per sample bottle.
Not more than two loaded sample bottles are permitted out of the trays within the zone at any one time.

Crit Zone E-26, Drum Survey Area - (Special Controlled Storage
Area - No Posting Required)

LIMIT: Twenty (20) 55-gallon, B. of E. Permit 2016 drums, each containing a maximum of 350 grams of contained U 235.

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Work Area F - Furnace Area

Crit Zone F-1, Bake Furnace

Limit: One retort with a bake furnace fixture (Dwg. 928F158, Rev. 2) containing 90 fuel elements. The fixture is an annular cylinder 16-1/2 inches O. D. and 9 inches I. D. containing 90 holes 0.936 inches in diameter.

Crit Zone F-2, Bake Furnace

Limit: One retort with a bake furnace fixture (Dwg. 928F158, Rev. 2) containing 90 fuel elements. The fixture is an annular cylinder 16-1/2 inches O. D. and 9 inches I. D. containing 90 holes 0.936 inches in diameter.

Crit Zone F-3, Bake Furnace

Limit: One retort with a bake furnace fixture (Dwg. 928F158, Rev. 2) containing 90 fuel elements. The fixture is an annular cylinder 16-1/2 inches O. D. and 9 inches I. D. containing 90 holes 0.936 inches in diameter.

Crit Zone F-4, Retort Storage

Limit: One retort with a bake furnace fixture (Dwg. 928F158, Rev. 2) containing 90 fuel elements. The fixture is an annular cylinder 16-1/2 inches O. D. and 9 inches I. D. containing 90 holes 0.936 inches in diameter.

Crit Zone F-5, Fixture Loading and Unloading and Miscellaneous Operations

Limit: A total of 90 elements dispersed as follows:

a. Ninety (90) elements in bake fixture (Dwg. 928F158, Rev. 2)

OR

b. Two (2) fuel element storage trays of 20 fuel elements each on transfer carts with the balance remaining in the bake fixture.

OR

c. Two (2) fuel element storage trays at weighing station containing a maximum of 20 fuel elements in one tray or a maximum of 20 fuel elements distributed in 2 trays with the balance remaining in the bake fixture.

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Crit Zone F-5, (continued)

- d. Up to 20 elements in fuel element storage tray and/or placed in a plane array on the top surface of the table with the balance remaining in the bake fixture.

Note: A dust collection and filter system which is maintained in accordance with C. I. No. 10 is included in this area. The system includes a one quart plastic bottle which is limited to 500 grams contained U-235.

Crit Zone F-6, Hold Area

Limit: 90 elements in bake fixture (Dwg. 928F158, Rev. 2)

Crit Zone F-7, In-Process Fuel Element Storage, Individual Cubicles Numbered 1594 through 1597 (Special Controlled Storage Area - No Posting Required)

Limit: 8 trays, two trays per cubicle, containing a maximum of 20 fuel elements per tray. Fuel elements will be in approved trays and will be separated by either plastic or rubber spacers. A total of 4 cubicles.

Crit Zone F-8, In-Process Fuel Element Storage, Individual Cubicles Numbered 1598 through 1601 (Special Controlled Storage Area - No Posting Required)

Limit: 8 trays, two trays per cubicle, containing a maximum of 20 fuel elements per tray. Fuel elements will be in approved trays and will be separated by either plastic or rubber spacers. A total of 4 cubicles.

Crit Zone F-9, Hold Area

Limit: 4 trays, two trays per cart, containing a maximum of 20 fuel elements per tray. A total of 80 elements. Carts to be parked in designated areas.

Crit Zone F-10, Hold Area

Limit: 4 trays, two trays per cart, containing a maximum of 20 fuel elements per tray. A total of 80 elements. Carts to be parked in designated areas.

Crit Zone F-11, "E" Furnace (Graphitizing)

Limit: 35 fuel elements in the furnace fixture (Dwg. 957D703, Rev. 4) or in fuel storage trays on transfer carts. The fixture is an 8-inch diameter cylinder. Fuel storage trays will be in the zone only during loading or unloading the furnace.

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Crit Zone F-12, "EA" Furnace (Graphitizing)

Limit: 74 fuel elements in the furnace fixture (Dwg. EDSK 321114F, Rev. 4) or a maximum of 40 fuel elements in two fuel storage trays on the transfer cart. The fixture is an annular cylinder 17-1/2 inches O.D. and 8.229 inches I.D. and 60 inches long with a total of 74 holes 0.914 inches in diameter.

Fuel storage trays will be in the zone only during loading or unloading the furnace.

Crit Zone F-13, Hold Area

Limit: 6 trays, two trays per cart, containing a maximum of 20 fuel elements per tray. Total of 120 fuel elements. Carts to be parked at designated areas.

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ASTRONUCLEAR CORE OPERATIONS
APPROVED CRITICALITY INSTRUCTIONS

SECTION IV

INFORMATION CATEGORY

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~~RWB Brown 11-20-67~~
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SECTION IV

<u>Number</u>	<u>Description</u>
C.I. No. 1	Physical Movement of Fuel and Fuel Bearing Materials
C.I. No. 2	Approved Containers
C.I. No. 3	Transfer of Fuel Elements
C.I. No. 5	Processing of Solvent Residues Generated During Cleaning of Mixing, Chopping, and Extrusion Tooling
C.I. No. 6	Handling of Green Recycle Material and Dry Scrap
C.I. No. 7	Scrubbing of Shop Floors - Building 6
C.I. No. 8	Cleanup of Spilled Fuel Material
C.I. No. 9	Handling of Vacuum Cleaner Residue
C.I. No. 10	Processing of Machining Residues
C.I. No. 11	Changing of Vacuum Pump Oil
C.I. No. 12	Monitoring and Cleaning of Sump Pump (Shop Two Area)
C.I. No. 15	Processing of Leach Furnace Residues (Water-Cooled Trap)
C.I. No. 15a	Processing of Leach Furnace Residues (Refrigerated Trap)
C.I. No. 20	Processing of Coating Furnace Residues
C.I. No. 22	Processing of "AA" and "AB" Furnace Residues
C.I. No. 23	Flushing of Coating and Leach Furnace Exhaust Stacks
C.I. No. 30	Processing of Low-Level Scrap and Waste
C.I. No. 31	Intra-Building Transportation of Fuel Elements

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Section IV
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PHYSICAL MOVEMENT OF FUEL AND FUEL
BEARING MATERIALS

1.0 SCOPE

1.1 This instruction covers the movement of fuel and fuel bearing materials in the various areas in the Laboratory.

2.0 GENERAL

- 2.1 Special instructions and procedures for the release of fuel particles from the split bead storage area to the "V" blenders work area.
- 2.2 Standard procedures covering transfer of fuel material between criticality zones and the posting of such transfers.
- 2.3 Methods used for physical transfer of fuel particles and fuel bearing materials.

3.0 FUEL PARTICLE RELEASE AND MIXING

- 3.1 The blender size, eight quart or sixteen quart, for the intended mixing will be specified in writing by the Superintendent of Operations or the WNCO Plant Manager. Eight quart blenders shall be used for batch loading 0 to 600 mg/cc of U 235. Sixteen quart blenders shall be used for batch loading of 0 to 500 mg/cc of U 235. The blenders specified will be placed in the blending hoods and the other size blenders placed in storage boxes, Drawing EDSK-333471-C, and removed from the area. Only one size blender, either eight quart or sixteen quart, will be in any of the four blending hoods at one time.
- 3.2 Before bringing any new materials into Crit Zones B-2, B-3, B-4, or B-5 ("V" blender hoods), the Operations technician will check the hood proper, the blender, and the varcum dispenser in these areas to assure that the equipment is empty and does not contain more than trace residues from the previous batch.
- 3.3 The Operations technician will transfer pre-weighed dry carbon ingredients and pre-weighed varcum for the next extrusion batch

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from the materials preparation room to the storage shelf located above the "V" blenders in Crit Zones B-2, B-3, B-4, or B-5.

- 3.4 The Accountability Clerk will be notified by the Operations Technician to transfer fuel particles to the weighing hood (Crit Zone B-1). Before the transfer is made, the accountability clerk will check to determine that the "V" blender hoods (Crit Zones B-2, B-3, B-4, or B-5) and the weighing hood (Crit Zone B-1) do not contain any fuel material from the previous extrusion batch. This will include a visual inspection of the "V" blenders and the varcum dispenser as well as a survey of the dry carbon ingredients on the shelf with a portable gamma survey meter. When the survey is complete and conditions satisfied, the Foreman will be notified and requested to sign the fuel particle transfer sheet for the release of the next batch of fuel. The fuel particles will then be transferred by the Accountability Clerk from the split bead storage area to the weighing hood (Crit Zone B-1). The Accountability Clerk will then initial the fuel particle transfer sheet.
- 3.5 The Operations Technician will check-weigh the beads in the weighing hood (Crit Zone B-1) and will then charge the dry carbon ingredients and fuel particles into the "V" blender and initiate the dry blending cycle.

NOTE: The "V" blenders are not to be left unattended with the lids off unless completely empty. Also, never make additions to the blenders until it has been ascertained that the materials to be added are part of the intended batch.

4.0 STANDARD PROCEDURES COVERING TRANSFER OF FUEL MATERIALS BETWEEN CRITICALITY ZONE

- 4.1 Before fuel material is moved into a crit zone, the employe will:
- 4.1.1 Determine from the crit zone posting the amount of uranium or quantity of fuel elements in the crit zone. Crit zones designated as special controlled storage areas do not require posting.
- 4.1.2 Verify the "posted" amount of uranium or quality of fuel elements by physical check. Crit zones designated

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as special controlled storage areas do not require posting.

- 4.1.3 Determine that the addition of the proposed fuel movement will not exceed the limits for this crit zone.
- 4.1.4 If the visual check and crit zone record are in agreement and the proposed movement is within the crit zone limits, the employe will proceed with the fuel movement.
- 4.2 The employe will make the fuel movement and change the posted record at the crit zone to show the new crit zone content. If there is no material in the zone, it shall be posted in a manner that clearly indicates it is empty. Crit zones designated as special controlled storage areas do not require posting.
- 5.0 The following methods will be used for the physical transfer of fuel particles and fuel bearing materials:
  - 5.1 Fuel elements in storage trays will be moved either one tray at a time (maximum of 20 elements) by hand carrying, or two trays at a time (maximum of 40 elements) through the use of the approved fuel transfer cart. Single elements (one only) may be hand carried without being placed in a handling or storage device.
  - 5.2 Furnace fixtures containing fuel will be moved with the appropriate transfer fixture.
  - 5.3 Wet mix fuel material is transferred between crit zones in a plastic bag, sample bottles, or approved trays for storage.
  - 5.4 Extrusion billets are hand carried.
  - 5.5 Fuel beads and finely divided fuel bearing materials are hand carried in closed plastic or metal containers.
  - 5.6 Effort should be exercised when movements pass in approved aisles to keep the maximum distance between the containers being moved.
  - 5.7 No enriched material in transit is to be left unattended in an aisle.

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APPROVED CONTAINERS

1.0 SCOPE

- 1.1 This instruction describes containers approved for fuel or fuel bearing material at WNCO.

2.0 GENERAL

- 2.1 Strict compliance to containment of fuel or fuel bearing materials will be enforced to ensure criticality and accountability procedures are not violated.
- 2.2 Material identification and content weight shall be affixed to the container or must be readily available.

3.0 APPROVED CONTAINERS

- 3.1 Fuel beads may be stored in the following containers in accordance with limits prescribed in Crit Zones:
- 3.1.1 Single metal or plastic containers five inches or less in diameter. Plastic bottles containing fuel beads may be stored in the storage casks (Drawing WT-500188) providing the bottle is contained in a metal shell.
- 3.2 Process scrap may be stored in the following containers within limits specified:
- 3.2.1 Plastic one-quart bottle, 4-5/8 inches in diameter and 4-3/4 inches high. Limited to 500 grams of contained U 235.
- 3.2.2 Plastic one-half gallon bottle, 4-5/8 inches in diameter and nine inches high. Limited to 1000 grams of contained U 235.
- 3.2.3 Plastic 2.2 gallon bottle, 4-7/8 inches in diameter and 31-5/8 inches high. Limited to 3000 grams contained U 235.

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3.3 The fuel element storage tray (Drawing EDSK-307915-C) is an aluminum container with inside dimensions of 4-3/4 inches wide, 62 inches long, and 3-9/16 inches deep. The tray will hold and is limited to:

- a) Five fuel elements in a row, four rows high (total of twenty elements) with each row of five elements separated by either three rectangular 3/16 inch thick plastic spacers or three rectangular closed cell foam rubber spacers (2-3/4 X 4-7/8 inches).

OR

- b) Four fuel elements in a row, four rows high (total of sixteen elements) separated by full length closed cell rubber cushions (Drawing EDSK-333027-D).

Each end of the tray has a 1/2 inch thick closed cell rubber pad. Drain holes are provided in the bottom and sides of the trays. Use of the aluminum lid on the storage tray is optional except when the tray is used to transport elements between buildings at the Cheswick site. When the tray is used in the transporter, the lid must be taped to the tray as specified in Criticality Instruction No. 31.

3.4 The fuel element storage tray transfer cart (Drawing NT-500047, Revision C) will hold two trays of fuel elements on top of the cart with 5.6 inches edge to edge spacing of trays.

3.5 Pans used for storage of green mix and certain waste residues must not exceed a maximum depth of 1-1/2 inches. Contents of trays must be available at all times.

3.6 Collection containers on dust collection and filter system or on portable vacuums may be:

3.6.1 One-half gallon stainless steel can, five inches O.D. by 6-3/4 inches high with a limit of 1000 grams of contained U 235.

3.6.2 One quart plastic bottle, 4-5/8 inches O.D. by 4-3/4 inches high with a limit of 500 grams of contained U 235.

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- 3.7 55-gallon birdcage drums used to store and ship fuel and process scrap are:
- 3.7.1 B. of E. Permit 1489 drum with a five inch internal pipe. Drawing 928F245. This drum normally holds three one-half gallon (4-5/8 inch O.D. by nine inches high) plastic bottles and one quart (4-5/8" X 4-3/4" high) plastic bottle. Any combination of quarts or half gallon containers may be placed in the pipe providing they do not project above the top of the pipe. One 2.2 gallon (4-7/8" O.D. by 31-5/8" high) plastic bottle may be placed in the pipe. This drum is limited to 10 kg of contained U 235 as coated fuel particles, 3500 grams of contained U 235 as process scrap or 600 grams of contained U 235 as waste from the leach furnace trap and filtering system.
- 3.7.2 ICC 6L drum with a five inch internal pipe. Drawing EDSK-333283. This drum normally holds three one-half gallon (4-5/8" O.D. by 9" high) plastic bottles or five quart (4-5/8" O.D. by 4-3/4" high) plastic bottles. Any combination of quarts or half gallon containers may be placed in the pipe providing they do not project above the top of the pipe. Mounted metallography samples, leach waste or leach filters may not be placed in ICC 6L drums. This drum is limited to 10 kg of contained U 235 as coated fuel particles or 3500 grams of contained U 235 as process scrap.
- 3.8 Fuel particles are received in vendor 55-gallon birdcage type drums.
- 3.9 Combustible waste and low level contaminated uranium waste is stored and shipped in 55-gallon ICC 17E drums, B. of E. Permit 2016. This drum is limited to 350 grams of contained U 235.
- 3.10 Fuel elements or sections of fuel elements are shipped in suitcase containers, Drawing 976D212-Long or Drawing 976D167-Short. Nineteen elements in shipping tubes or twelve or fourteen elements in a molded plastic insert assembly.
- 3.11 The individual suitcases are transported in a truck birdcage. Drawing 934J693-Long, or Drawing 928F207-Short. The truck birdcages are limited to eight suitcases.

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- 3.12 The Oak Ridge fuel element shipping container, DOT Special Permit No. 5246 may be used to ship 2880 grams of 93.15% enriched uranium in fuel element form. The content of this container is further limited to nine fuel elements.
- 3.13 The Oak Ridge fuel element shipping container, B. of E. Permit 1560, ICC-SP-5097, may be used to ship 7.5 kilograms of 93% enriched uranium in the form of 44 unirradiated solid fuel elements. The maximum uranium content of an element is not to exceed 173 grams, the uranium loading is not to exceed 600 mg/cc and the carbon-to-uranium atomic ratio is not to be less than 66 to 1.
- 3.14 Uranium containing samples or stored vials not exceeding 2" by 2" square by 4" high. The loaded vials are stored in the containers defined in 3.2.1, 3.2.2, and 3.2.3; or in a special rack designed for their retention.

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TRANSFER OF FUEL ELEMENTS

1.0 SCOPE

- (U) 1.1 This instruction is to ensure that movement of fuel elements to or from WNCO are within the approved loading limit.

2.0 GENERAL

- (CRD) 2.1 Fuel element loadings are identified by the 3-digit prefix contained in the fuel element serial number. When this 3-digit prefix is greater than 500 and less than 600, the fuel element is defined as "high-loaded" and may be transferred to any Material Balance Area except Reactor Assembly or WANEF. All fuel elements with 2-digit prefixes (load codes 39 through 99 and 11 through 27) contain fuel loadings less than 500 mg U/cc. These may be transferred to any Material Balance Area without exception. Likewise, 3-digit prefixes smaller than 500 may be transferred without exception.
- (CRD) 2.2 It should be noted that the serial number in itself is unclassified but revelation of the mere fact that the 3-digit prefix defines fuel loading is classified information and must be protected as such.
- (U) 2.3 This instruction supplements existing Shipping and Receiving procedures in the SS Accountability Procedures Manual.
- (U) 2.4 Only approved containers will be used for transferring material.

3.0 INCOMING SHIPMENTS

- (U) 3.1 Accountability personnel will review the paperwork accompanying the shipment and will verify that the listed serial number prefix for each element is within limit specified in 2.1 and can be received at WNCO.
- (U) 3.2 Verification will be documented on the attached form.

4.0 OUTGOING SHIPMENTS

- 4.1 Accountability personnel will review the paperwork to accompany the shipment and will verify that the listed serial number prefix for each element is within the limit specified in 2.1 and can be shipped to the Material Balance Area designated.
- 4.2 Verification will be documented on the attached form.

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Prepare in duplicate. Original to Accountability; copy to Operations.

SHIPMENT REVIEW

DATE _____

Material Transfer Ticket No. _____

Container Number _____

Incoming ☐ from _____

Outgoing ☐ to _____

I certify that the paperwork accompanying this shipment has been reviewed and according to the listed serial number prefix for each element, the shipment may be received at _____ (designate MBA, i.e., WNCO, WANL, Shipping & Receiving, etc.)

Signed: _____
Accountability

Incoming Shipments Only:

Shipment accepted by Operations.

Signed: _____
Operations Foreman

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(CRD) PROCESSING OF SOLVENT RESIDUES GENERATED DURING CLEANING OF
MIXING, CHOPPING, AND EXTRUSION TOOLING

1.0 SCOPE

(CRD) 1.1 This instruction covers the handling of fuel bearing solvents generated during the cleaning of mixing, chopping, and extrusion tooling.

2.0 GENERAL

(CRD) 2.1 This procedure shall be performed on each piece of equipment immediately after the last batch of the day has been passed through final extrusion.

(U) 2.2 Technicians shall not transport more than one pan or container at one time during any of the transfer procedures cited in this instruction.

2.3 Intensifier bar containers or graduated cylinders shall be filled with acetone by taking them one at a time to the drum storage area and not by transporting acetone into the work area.

3.0 CLEANING OF TOOLING (TECHNICIANS)

(CRD) 3.1 After the last mixing charge of the day has been "dumped", the intensifier bar from each mixer used shall be thoroughly cleaned and then immersed in acetone in approved containers (4-inch diameter by 16-inches high per EDSK-320615-B) and covers shall be placed on the containers.

(U) 3.1.1 The containers containing acetone shall be stored in Crit Zone B-7 in approved holding brackets per EDSK-320616-C.

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- (U) 3.1.2 At one week intervals as denoted by the date affixed to the outside of the container, the contents of each shall be transferred to a 1-1/2 X 19-1/2 X 11-1/2 inch pan. Each pan shall be lined with a pre-weighed layer of aluminum foil. (NOTE: If a change in loading or fuel type is made between weekly cleanings, this procedure shall be accomplished prior to the change.)
- (U) 3.1.3 The pans shall be placed in an approved array one layer high in the Crit Zone B-7 hood.
- (U) 3.1.4 After the solvent has evaporated, a pre-weighed 4-5/8 inch O.D. X 4-3/4 inch or 9 inch high polyethylene bottle bearing the following information shall be obtained from the Accountability Clerk:
- (U) 3.1.4.1 Intensifier Bar Residue
- (U) 3.1.4.2 Type of Fuel
- (U) 3.1.4.3 Load Code Number
- (U) 3.1.4.4 Tare Weight of Bottle
- (CRD) 3.1.4.5 Extrusion Run Number or Numbers
- NOTE: If residue does not contain fuel (non-fuel), it may be placed directly into a drum labeled "Contaminated Waste".
- (U) 3.1.5 The tare weight of the two pieces of foil shall be recorded on the bottle.
- (U) 3.1.6 Place the bottle in the Crit Zone B-13 hood. Carefully remove the foil from the pans and transfer it to the bottle taking care to avoid spilling any residue.
- (U) 3.1.7 The bottle shall then be re-weighed, the weight of residue added shall be recorded on the bottle, and the bottle shall be returned to the Accountability Clerk.
- (CRD) 3.2 A 1-1/2 X 19-1/2 X 11-1/2 inch pan shall be lined with a pre-weighed layer of aluminum foil and placed in the Crit Zone B-6 chopper hood. (NOTE: If this chopper has not been used, proceed directly to Paragraph 3.4.)

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- (CRD) 3.3 1000 ml. of acetone shall be added to a 2000 ml. polyethylene graduated cylinder, (see Paragraph 2.3) and transferred to the 1-1/2 inch high pan. All chopper parts requiring cleaning shall be immersed in the acetone followed by a thorough cleaning and rinsing.
- (CRD) 3.4 The pan shall then be transferred to Crit Zone B-2, B-3, B-4, or B-5 and placed under the opening in the blender.
- (CRD) 3.5 1500 ml. of acetone shall be added to a 2000 ml. graduated cylinder (Paragraph 2.3) and transferred to the Varcum dispenser on one blender. (Outlet valve on dispenser shall be in closed position prior to transfer.)
- (CRD) 3.6 The interior of the blender shall be cleaned by directing a stream of acetone from the dispenser against the surfaces and allowing the solvent to drain into the pan.
- (CRD) 3.7 After one blender has been cleaned, the pan shall be removed from the hood and placed under the second blender.
- (CRD) 3.8 The graduated cylinder shall again be filled with acetone (Paragraph 3.5) and this material transferred to the Varcum dispenser on the second blender.
- NOTE: No more than two blenders shall be cleaned using acetone from Paragraphs 3.3 and 3.5.
- (CRD) 3.9 The second blender shall be cleaned in a manner identical to that described in Paragraph 3.6.
- (U) 3.10 The numbers of the batches from which the scrap was generated and the weight of the foil shall be recorded on the pan.
- (U) 3.11 The pan containing the residue shall then be transferred to Crit Zone B-7 and placed into the hood for evaporation. If the residue is wet or moist after the acetone has evaporated, transfer the pan containing the residue to Crit Zone B-16 (low temperature oven) for complete drying.
- (CRD) 3.12 While the solvent in the pan referenced in Paragraphs 3.2 through 3.11 is evaporating, a second pan (1-1/2 X 19-1/2 X 11-1/2) inches is lined with a pre-weighted layer of aluminum foil and placed on the extrusion work table Crit Zone B-9.

- (CRD) 3.13 The extrusion parts requiring cleaning shall be transferred to the pan. Care should be taken to avoid tearing the foil.
- (U) 3.14 2000 ml. of acetone shall be added to a 2000 ml. graduated cylinder (Paragraph 2.3).
- (CRD) 3.15 Any portion of the 2000 ml. may be added to the pan to clean and rinse the parts provided no additional quantities are subsequently used to clean extrusion tooling or chopper parts as described in Paragraph 3.16.
- (CRD) 3.16 Immerse the extrusion parts requiring cleaning into the solvent. Clean and rinse the parts in the pan using whatever quantity of acetone that remains in the graduated cylinder for rinsing. Unless specifically approved for extraordinary circumstances by the Nuclear Safety Engineer, no more than 2000 ml. of acetone may be used in the combined cleaning of extrusion and chopper tooling.
- (U) 3.17 The numbers of the batches from which the scrap was generated and the weight of the foil shall be recorded on the pan.
- (U) 3.18 The pan containing the residue shall then be transferred to Crit Zone B-7 and placed into the hood for evaporation. If the residue is wet or moist after the acetone has evaporated, transfer the pan containing the residue to Crit Zone B-16 (Low Temperature Oven) for complete drying.
- (U) 3.19 After evaporation of the solvent in the pans (Paragraphs 3.11 and 3.18) is complete, a pre-weighed 4-5/8 inch O.D. X 4-3/4 inch or 9 inch high polyethylene bottle bearing the following information shall be obtained from Accountability.
- (U) 3.19.1 "Cleaning Solvent Residue"
- (U) 3.19.2 Type of Fuel
- (U) 3.19.3 Load Code Number
- (U) 3.19.4 Tare Weight of Bottle
- (U) 3.19.5 Extrusion Run Number

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NOTE: If residue does not contain fuel (i.e., non-fuel), it may be placed directly into a drum labeled "Contaminated Waste".

- (U) 3.20 The tare weight of the pieces of foil shall be recorded on the bottle and the bottle placed in the B-13 hood.
- (U) 3.21 The foil shall be removed from the pans and placed in the bottle taking care that none of the residue is spilled.
- (U) 3.22 The bottle shall then be re-weighed, the weight of the residue added, the batch numbers represented therein shall be recorded on the outside of the bottle, and the bottle shall be returned to Accountability.

4.0 VAULT STORAGE AND ACCOUNTABILITY

- (CRD) 4.1 Bottles shall be issued from Accountability bearing the information cited in Section 3.1.4 or Section 3.19 depending upon application. ("Intensifier Bar Residue" or "Cleaning Solvent Residue").
- (U) 4.2 A bottle previously used for the same application, fuel loading and fuel type, shall be issued if available. (Re-use of bottles is permitted until the weight of residue in the bottle reaches 2000 grams or until volume limitations restrict further use.) If a bottle of the "proper" type is unavailable, a new bottle shall be properly identified and issued to the technician. Partially filled bottles shall be stored in approved bottle storage racks.
- (U) 4.3 After a bottle is full, as determined by the 2000 gram weight limit or the volume limit, calculate the uranium content of the bottle, and affix a completed numbered bottle label to the bottle.
- (U) 4.4 Completed bottles will be stored and shipped in B. of E. 1489 or ICC 6-L birdcage drums.
- (U) 4.5 Examine the batching record on the outside of the approved drum to determine if addition of the bottle will exceed the limits set for this material. If the addition will exceed the limits, start a new drum.

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- (U) 4.6 Record the addition on the batching record on the drum.
- (U) 4.7 Complete Accountability documents as required to record the transfer.
- (U) 4.8 When the drum is fully loaded, close and seal it.

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HANDLING OF GREEN RECYCLE MATERIAL AND DRY SCRAP

1.0 SCOPE

- (CRD) 1.1 This procedure covers the handling of green recycle material and mixing, chopping, and extrusion scrap.

2.0 GENERAL

- (CRD) 2.1 This procedure shall apply to handling of all fuel bearing material to be recycled through the extrusion operation and to fuel bearing materials processed through mixing, chopping, and extrusion operations which are judged to be scrap and not suitable for recycle through any of the above mentioned process steps.
- (CRD) 2.2 This procedure shall apply to recycle or scrap material generated during each day of mixing, chopping, and extrusion operation.

3.0 EXTRUSION RECYCLE MATERIAL

- (CRD) 3.1 Extrusion scrap generated by trimming elements to length shall be collected and weighed upon completion of each batch.
- (CRD) 3.2 Calculate the weight of U-235 by multiplying the weight of the extrusion scrap by the weight fraction of U-235 per gram of wet mix as shown on the batch blending sheet.
- (CRD) 3.3 Obtain the total U-235 content of the following batch to be extruded from the blending sheet.
- (CRD) 3.4 Add the calculated weight of U-235 in the extrusion scrap (Paragraph 3.2) to the total U-235 content of the following batch (Paragraph 3.3).

NOTE: ADD ONLY THE AMOUNT OF EXTRUSION SCRAP TO THE FOLLOWING BATCH WHICH WILL RESULT IN A TOTAL U-235 CONTENT OF 2000 GRAMS OR LESS.

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- (CRD) 3.5 Record the following information on the final extrusion data sheet of the batch to which the extrusion recycle scrap is being added:
- (U) 3.5.1 Batch number of scrap
- (CRD) 3.5.2 Total weight of extrusion scrap.
- (CRD) 3.5.3 Total weight of U-235 in extrusion recycle scrap
- (CRD) 3.5.4 Total weight of U-235 in extrusion recycle scrap plus weight of U-235 in batch to which recycle scrap is being added.
- (CRD) 3.6 If recycle scrap cannot be used in the following batch, it shall be chopped, weighed, placed in a storage pan, double bagged, and stored in the refrigerator, Crit Zone B-12. Bagged material must be identified as follows:
- (U) 3.6.1 Material code
- (U) 3.6.2 Net weight
- (U) 3.6.3 Weight of U-235
- (U) 3.6.4 Batch number
- (U) The total U-235 content of all recycle scrap stored in the refrigerator, Crit Zone B-12 shall be posted.

NOTE: Total U-235 content of all recycle scrap stored in Crit Zone B-12 shall not exceed 2000 grams.

(CRD) 4.0 DRY MIXING, CHOPPING, AND EXTRUSION SCRAP (NOT FOR RECYCLE)

- (CRD) 4.1 All mixing, chopping, and extrusion scrap classified as "no recycle" scrap shall be handled as follows:

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- (CRD) 4.1.1 Weigh dry mixing scrap and determine U-235 content by multiplying scrap weight by weight of U-235 per gram of wet mix as shown on batch blending data sheet.
- (CRD) 4.1.2 Weigh chopping scrap and determine U-235 content by multiplying scrap weight by weight of U-235 per gram of wet mix as shown on batch blending data sheet.
- (CRD) 4.1.3 Chop and weigh extrusion scrap and determine U-235 content by multiplying scrap weight by weight of U-235 per gram of wet mix as shown on batch blending data sheet.
- NOTE: All extrusion scrap must be run through the chopper to reduce the size of the material and insure complete drying.
- (CRD) 4.1.4 Load Code and extrusion run number identification must be maintained until material is actually scrapped.
- (CRD) 4.2 Mixing, chopping, and extrusion scrap may be combined provided the total U-235 content of the combined scrap DOES NOT EXCEED 2000 GRAMS.
- (CRD) 4.3 Place the combined mixing, chopping, and extrusion scrap in a 1-1/2 inch by 12-1/2 inch by 21 inch pan. Identify on fiber glass tape the following:
- (U) 4.3.1 Material code
- (U) 4.3.2 Net weight
- (U) 4.3.3 Weight of U-235
- (CRD) 4.3.4 Extrusion run number
- (U) 4.4 Place the pan containing scrap material in the oven (Crit Zone B-16) and heat for eight (8) hours at $250^{\circ} \pm 25^{\circ}\text{C}$.

NOTE: DO NOT EXCEED CRITICALITY LIMITS FOR TOTAL ALLOWABLE U-235 CONTENT IN CRIT ZONE B-16.

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- (U) 4.5 Upon completion of heating cycle, remove pan from oven (Crit Zone B-16) and weigh scrap.
- (U) 4.6 Place scrap in a polyethylene bottle 4-5/8 inch O.D. x 9 inch high and record the following information on the bottle:
  - (CRD) 4.6.1 Extrusion run number
  - (U) 4.6.2 Total scrap weight
  - (U) 4.6.3 Total U-235 weight as determined by adding 4.1.1, 4.1.2, and 4.1.3.
- (U) 4.7 Submit to Accountability for disposal.

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SCRUBBING OF SHOP FLOORS - BUILDING 6

1.0 SCOPE

- 1.1 This instruction covers the scrubbing of floors in or around Criticality Work Areas and in adjacent areas where scrubbing is required for cleanliness or decontamination purposes. Special care must be employed to avoid washing any recoverable quantities of enriched material into the drains.

2.0 GENERAL

- 2.1 Water is supplied for the purpose of scrubbing floors from hose reels or faucets which are mounted on the walls and from one sink located in Group "A" and one sink in Group "C". Unauthorized use of this equipment is deterred by a locked cap over each supply valve to the hose reels and faucets and a locked door to each sink. Only supervisory personnel shall have keys to these locks, and use is permitted only after all preliminary procedures as indicated in this instruction have been completed.
- 2.2 In addition to electric scrubbing machines, the only permissible scrubbing equipment is as follows:
- 2.2.1 Conventional scrubbing buckets
  - 2.2.2 Mops
  - 2.2.3 Squeegees
  - 2.2.4 Liquid soap in 5-gallon containers with small necked pour spouts
- 2.3 With respect to the scrubbing of floors, the shop area shall be divided into six groups.
- 2.3.1 Group "A"--this includes the following Work Areas and connecting aisles and stairwells:

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- 2.3.1.1 Work Area "H"
- 2.3.1.2 Work Area No. 1
- 2.3.1.3 Work Area No. 3
- 2.3.1.4 Work Area No. 17
- 2.3.2 Group "B"--this includes the following Work Areas and connecting aisles and stairwells:
  - 2.3.2.1 Work Area "J"
- 2.3.3 Group "C"--this includes the following Work Areas and connecting aisles and stairwells:
  - 2.3.3.1 Work Area No. 7
  - 2.3.3.2 Work Area No. 9
  - 2.3.3.3 Work Area No. 11
  - 2.3.3.4 Work Area No. 12
  - 2.3.3.5 Work Area No. 20
  - 2.3.3.6 Work Area No. 21
  - 2.3.3.7 Work Area No. 22
  - 2.3.3.8 Work Area No. 14
- 2.3.4 Group "D"--this includes the following areas and connecting aisles and stairwells requiring periodic floor scrubbing:
  - 2.3.4.1 Work Area "K"
  - 2.3.4.2 Equipment room
  - 2.3.4.3 Boiler room

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- 2.3.4.4 Contaminated change room
- 2.3.4.5 Building service room (Rotoclone)
- 2.3.5 Group "E"--this includes the following areas and connecting aisles and stairwells requiring periodic floor scrubbing:
  - 2.3.5.1 Work Area No. 24
- 2.3.6 Group "F"--this includes the following Work Area, connecting aisles, offices, and stairwells requiring periodic floor scrubbing:
  - 2.3.6.1 Work Area No. 25
- 2.4 In the event that any floor scrubbing is required in or around a given Work Area, all fuel bearing materials must be removed from the entire Scrubbing Group (Group "A", "B", "C", "D", or Group "E" as defined in Paragraph 2.3) of which it is a part and placed in proper storage array in the vault, vault storage area, or wall racks prior to use of water. Retaining fuel bearing materials in furnace fixtures is also permissible. Group "A" may be scrubbed without removal of fuel bearing material from Group "F". However, Group "F" may not be scrubbed without removal of fuel bearing material from Group "A".
- 2.5 Paragraph 2.4 does not apply to Group "D", but strict adherence to procedures cited below (Paragraph 6.0) for this area is required.

3.0 SCRUBBING GROUP "A"

- 3.1 The following work areas, floors, and adjacent aisles shall be scrubbed using buckets, mops, scrubbing machines, and squeegees ONLY:
  - 3.1.1 Work Area No. 1
  - 3.1.2 Work Area No. 17

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3.2 The remaining work areas and aisles in Group "A" may be scrubbed using hose reels in addition to the equipment cited in Paragraph 3.1 provided that Paragraph 2.4 requirements are fulfilled prior to use, and care is exercised to prevent any contact of water with fuel or fuel bearing materials in their proper storage arrays.

3.3 All contaminated water generated in the scrubbing shall be poured or washed down the trough drains or round drains labeled "monitor".

3.4 After completion of scrubbing, the hose reels and access doors to the sinks shall be immediately re-locked by the supervisor.

4.0 SCRUBBING GROUP "B"

4.1 The following work area, floors, and adjacent aisles shall be scrubbed using buckets, mops, scrubbing machines, and squeegees ONLY:

4.1.1 Work Area "J"

5.0 SCRUBBING GROUP "C"

5.1 The remaining work areas and aisles in Group "C" may be scrubbed using water supplied from hose reels, mops, buckets, scrubbing machines, and squeegees provided that Paragraph 2.4 requirements are fulfilled prior to use, and care is exercised to prevent any contact of the water with fuel or fuel bearing materials in their proper storage arrays.

5.2 All contaminated water generated in scrubbing shall be poured or washed down the trough drains or round drains labeled "monitor".

5.3 After completion of scrubbing, the hose reels and access doors to the sinks shall be immediately re-locked by the supervisor.

6.0 SCRUBBING GROUP "D"

6.1 All rooms grouped in Scrubbing Group "D" may be cleaned at one time or separately as required.

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- 6.2 Removal of fuel or fuel bearing materials from Scrubbing Group "A", "B", "C", "E", or "F" is not required while Scrubbing Group "D" provided that; (1) all doors connecting the Group "D" room (or rooms) being scrubbed to Group "A" or Group "C" are closed and (2) care is exercised to prevent water entering Group "A" or Group "C".
- 6.3 Buckets, mops, scrubbing machines, and squeegees ONLY shall be used to scrub floors in Work Area "K". The remaining work areas and aisles in Group "D" may be scrubbed using water supplied from hose reels in addition to the equipment cited above provided that Paragraph 2.4 requirements are fulfilled prior to use, and care is exercised to prevent any contact of the water with fuel or fuel bearing materials in their proper storage arrays.
- 6.4 All contaminated water generated in scrubbing shall be poured or washed down trough drains or round drains labeled "monitor".
- 6.5 After completion of scrubbing, any hose reels used shall be re-locked by the supervisor.

7.0 SCRUBBING GROUP "E"

The following work area and aisles in Group "E" may be scrubbed using hose reels in addition to the equipment cited in Paragraph 3.1 provided that Paragraph 2.4 requirements are fulfilled prior to use, and care is exercised to prevent any contact of water with fuel or fuel bearing materials in their proper storage arrays.

7.1 Work Area No. 24

8.0 SCRUBBING GROUP "F"

- 8.1 The following work area, floors, offices and aisle shall be scrubbed using buckets, mops, scrubbing machines and squeegees ONLY. Group "F" shall not be scrubbed without removal of fuel bearing material from Group "A".

8.1.1 Work Area 25

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CLEAN UP OF SPILLED FUEL MATERIAL

1.0 SCOPE

- 1.1 This instruction covers the procedures to be followed when fuel or fuel bearing material is inadvertently spilled on the floor.

2.0 GENERAL

- 2.1 The area surrounding the spilled material shall be immediately roped off to prevent spreading of contamination.
- 2.2 Shift Foreman and Health Physics Technician shall be notified of the spill and shall determine if any special precautions are required and recommend decontamination procedure.
- 2.3 The Superintendent of Operations shall also be notified of the spill.

3.0 PROCESSING

3.1 Fueled Beads

- 3.1.1 Perform the duties prescribed in Paragraph 2.0.
- 3.1.2 Remove original bottle from area.
- 3.1.3 Weigh original bottle and determine the quantity of material spilled. Record on the bottle the weight spilled and the weight remaining in the bottle.
- 3.1.4 Brush the spilled beads into a dust pan (1-1/2" high, maximum) and transfer them into a 4-5/8" O.D. x 9" high polyethylene bottle.
- 3.1.5 Seal bottle and record the following information:
  - 3.1.5.1 Label as "FUEL BEAD SCRAP"
  - 3.1.5.2 Weight of beads in bottle
  - 3.1.5.3 Lot number
- 3.1.6 Transfer the bottle to Accountability personnel.

3.2 Green Mix

- 3.2.1 Perform the duties prescribed in Paragraph 2.0.

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- 3.2.2 Remove original container and any material remaining in it out of the area.
- 3.2.3 Brush the green mix into a dust pan (1-1/2" high, maximum).
- 3.2.4 Transfer the green mix from the dust pan into a 1-1/2" x 12" x 21" pan and process per C.I. No. 6.
- 3.3 Fuel Elements (From Trays or Fixtures)
  - 3.3.1 Perform the duties prescribed in Paragraph 2.0.
  - 3.3.2 Place the larger element sections in trays.
  - 3.3.3 Cut the longer sections into 7-inch lengths and place them in 4-5/8" O.D. x 9" high polyethylene bottles. All sections must be identified with serial number and load. U-235 content of the bottle must not exceed 1000 grams.
  - 3.3.4 Label the bottle with the following information:
    - 3.3.4.1 "ELEMENT SCRAP"
    - 3.3.4.2 Batch numbers and element serial numbers represented
    - 3.3.4.3 Last operation before spill (Cure, Bake, etc.)
    - 3.3.4.4 Contained U-235
    - 3.3.4.5 If element scrap material HAS NOT been completely cured, place element sections into cure fixture and heat to 250° ±25°C for eight (8) hours. Other scrap pieces must be processed per C.I. No. 6.
  - 3.3.5 Brush any small pieces or dust into a dust pan (1-1/2" high, maximum).
  - 3.3.6 Transfer the material from the dust pan into a 4-5/8" O.D. x 9" high polyethylene bottle.
  - 3.3.7 Label bottle as in Paragraph 3.3.4.
  - 3.3.8 Transfer bottles to Accountability personnel.
- 3.4 Absolute Filters, Bottles, Pans, Etc.
  - 3.4.1 Perform the duties prescribed in Paragraph 2.0.
  - 3.4.2 Brush spilled material into a dust pan (1-1/2" high, maximum).
  - 3.4.3 Transfer material into original container and process per applicable Criticality Instruction (C.I. No. 's 5, 6, 10, 15, or 20).

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HANDLING OF VACUUM CLEANER RESIDUE

1.0 SCOPE

This instruction covers the handling of residue accumulated during the use of vacuum cleaners in processing and inspection areas.

2.0 GENERAL

- 2.1 Respirators shall be worn when removing fuel-bearing containers and filters from the Aerotec filter assemblies and vacuum cleaners.
- 2.2 Filters and containers shall be replaced when changing from one enrichment to another as well as when changing from another type of element (i.e., enriched or non-fuel).
- 2.3 Containers used on vacuum cleaners are: a one quart 4-5/8" diameter by 4-3/4" high polyethylene bottle or a one-half gallon stainless steel can, 5" in diameter by 6-3/4" high. The one quart bottle is limited to 500 grams of contained U-235 and the one-half gallon can to 1000 grams of contained U-235.

3.0 PROCESSING AND INSPECTION AREA PROCEDURES

- 3.1 A pre-weighed Aerotec filter and pre-weighed approved container shall be obtained. These shall be identified by the Accountability Clerk as follows:
  - 3.1.1 Type of fuel
  - 3.1.2 Code number
  - 3.1.3 Tare weight of bottle only
  - 3.1.4 Label "Vacuum Cleaner Residue"
- 3.2 Filter changes shall be made as required to maintain vacuum cleaner efficiency unless the restrictions cited in Section 2.2 are applicable.
- 3.3 After the container is approximately three-quarters full, it shall be replaced with a new pre-weighed container.

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4.0 VAULT STORAGE AND ACCOUNTABILITY

4.1 Container Processing

4.1.1 After receipt, the metal can will be emptied into a one-half gallon pre-weighed polyethylene bottle. The bottle shall be weighed, calculations made, and the following information recorded on the outside of the bottle:

4.1.1.1 Gross weight of bottle

4.1.1.2 Net weight of bottle contents

4.1.1.3 Estimated weight of U-235 in bottle

4.1.2 Close the bottle, seal and place in an approved storage port to await further processing.

4.2 Filter Processing

4.2.1 After receipt of the filter, it is installed on vibrator assembly.

4.2.2 A bottle labeled with proper loading and type of fuel shall be installed beneath the vibrator assembly.

4.2.3 The filter is vibrated until further collection has ceased. An approved vacuum cleaner may be used to aid in removing dust from the filter.

4.2.4 The filter is re-weighed to determine if further use is possible. If filter dust content weight cannot be reduced to less than 200 grams without damaging the filter, the filter will be scrapped. If deemed usable, it may be stored in Crit Zone 16-2 or resubmitted to the machining area when a batch of the proper loading and fuel type is to be processed. Any filter having a dust content weight of 200 or more grams may not be stored in Crit Zone 16-2.

4.2.5 If the filter is deemed unfit for further use, it will be scrapped using applicable accountability scrapping procedures as follows:

4.2.5.1 Continue to shake filter using vacuum cleaner and rubber mallet to remove a maximum amount of uranium bearing material. When removal operations are completed, the filter must contain less than 50 grams of uranium bearing material as determined by deducting the tare weight of the filter from the gross loaded weight.

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- 4.2.5.2 Determine the uranium content of the filter by multiplying the weight of the uranium bearing material by the appropriate accountability factor for the loading of the dust contained in the filter.
  - 4.2.5.3 Determine the U-235 content of the filter by multiplying the uranium content determined in 4.2.5.2 by .9315.
  - 4.2.5.4 Complete a bottle label and affix it to the filter.
  - 4.2.5.5 Double bag the filter using polyethylene bags. Heat seal or tape the closures to insure against dust leakage.
  - 4.2.5.6 These filters will be stored and shipped in B. of E. 2016 drums. Check the batching record on the drum to insure that addition of the filter will not exceed the drum limit of 350 grams of contained U-235. If addition of the filter exceeds the drum limit, seal the old drum, and start a new one. A polyethylene drum liner should be placed in new drum before starting to make additions.
  - 4.2.5.7 Post the addition of the filter to the drum on the drum batching record. Place the filter in the drum.
  - 4.2.5.8 Complete applicable accountability paperwork to record the transfer.
- 4.2.6 When the bottles used to collect the filter dust (see Section 4.2.2) are full, they are sealed and treated in a manner similar to that cited in Section 4.1.

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PROCESSING OF MACHINING RESIDUES

1.0 SCOPE

- 1.1 This instruction covers the handling of residues accumulated during the following operations: (1) reaming, (2) broaching, (3) parting, (4) facing to length, (5) counterboring of serial numbered end, (6) engraving, (7) undercutting and stoning, (8) facing to final length, (9) diamond milling, (10) assorted operations utilizing the cut-off saw in Crit Zone B-24, (11) final machining, (12) bore cleaning, (13) removing elements from the bake fixture, and (14) Accountability crushing and pulverizing.

2.0 GENERAL

- 2.1 Respirators shall be worn when removing fuel-bearing containers and filters from the Aerotec filter assemblies and vacuum cleaners.
- 2.2 Filters and containers shall be replaced when changing from one loading to another on the reaming, diamond milling, and broaching operations, or when the container or filter is loaded. On the other operations, changes will be made only when switching from fueled to non-fuel or vice versa or when the containers or filters are loaded.
- 2.3 Machines shall be thoroughly cleaned when a change in enrichment is made.
- 2.4 Containers used to collect machining residues are: a one quart 4-5/8" diameter by 4-3/4" high polyethylene bottle, or a one-half gallon stainless steel can, 5" in diameter by 6-3/4" high. The one quart bottle will be used on operations which generate small quantities of residues. The one quart bottle is limited to 500 grams of contained U-235 and does not require external protection. The one-half gallon metal can is limited to 1000 grams of contained U-235. The type of container to be used is specified in each crit zone description which utilizes a dust collection and filter system.

3.0 MACHINING AREA PROCEDURE

- 3.1 Elements shall be transferred to the machining area.
- 3.2 A pre-weighed Aerotec filter and pre-weighed container specified for the crit zone shall be obtained. These shall be identified by the Accountability personnel as follows:

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- 3.2.1 Type of fuel
- 3.2.2 Load Code number
- 3.2.3 Tare weight
- 3.2.4 Crit Zone in which container is to be used.
- 3.3 After the container and filter have been installed, the date and time of filter installation shall be recorded in the machine log book.
- 3.4 After the container is approximately three-quarters full, it is replaced with a new pre-weighed container. Past experience must be used to judge the level in a metal can.
- 3.5 The filter shall be replaced and the loaded filter returned to Accountability personnel in the Accountability work area after 72 hours of reaming operations unless the restrictions cited in Section 2.2 are applicable. (NOTE: Filter change requirements on other machines shall be standardized similarly based on experience factors.)

4.0 STORAGE AND ACCOUNTABILITY

4.1 Container Processing

- 4.1.1 After receipt from the machining area, the metal can will be emptied into a one-half gallon pre-weighed polyethylene bottle. The bottle shall be weighed, calculations made, and the following information recorded on the outside of the bottle:
  - 4.1.1.1 Gross weight of container
  - 4.1.1.2 Net weight of container contents
  - 4.1.1.3 Weight of U-235 in container
- 4.1.2 The bottle shall be placed in an approved storage area and held for pulverizing and sampling as per established accountability procedures.

4.2 Filter Processing

- 4.2.1 After receipt of filter from the machining area, it is installed on vibrator assembly.
- 4.2.2 A bottle labeled with proper loading and type of fuel shall be installed beneath the vibrator assembly.

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- 4. 2. 3 The filter is vibrated until further collection has ceased. An approved vacuum cleaner may be used to aid in removing dust from the filter.
- 4. 2. 4 The filter is re-weighed to determine if further use is possible. If filter dust content weight cannot be reduced to less than 200 grams without damaging the filter, the filter will be scrapped. If deemed usable, it may be stored in Crit Zone 16-2 or resubmitted to the machining area when a batch of the proper loading and fuel type is to be processed. Any filter having a dust content weight of 200 or more grams may not be stored in Crit Zone 16-2.
- 4. 2. 5 If the filter is deemed unfit for further use, it will be scrapped using applicable accountability scrapping procedures as follows:
  - 4. 2. 5. 1 Continue to shake filter using vacuum cleaner and rubber mallet to remove a maximum amount of uranium bearing material. When removal operations are completed, the filter must contain less than 50 grams of uranium bearing material as determined by deducting the tare weight of the filter from the gross loaded weight.
  - 4. 2. 5. 2 Determine the uranium content of the filter by multiplying the weight of the uranium bearing material by the appropriate accountability factor for the loading of the dust contained in the filter.
  - 4. 2. 5. 3 Determine the U-235 content of the filter by multiplying the uranium content determined in 4. 2. 5. 2 by .9315.
  - 4. 2. 5. 4 Complete a bottle label and affix it to the filter.
  - 4. 2. 5. 5 Double bag the filter using polyethylene bags. Heat seal or tape the closures to insure against dust leakage.
  - 4. 2. 5. 6 These filters will be stored and shipped in B. of E. 2016 drums. Check the batching record on the drum to insure that addition of the filter will not exceed the drum limit of 350 grams of contained U-235. If addition of the filter exceeds the drum limit, seal the old drum, and start a new one. A polyethylene drum liner should be placed in new drums before starting to make additions.

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- 4.2.5.7 Post the addition of the filter to the drum on the drum batching record. Place the filter in the drum.
- 4.2.5.8 Complete applicable accountability paperwork to record the transfer.
- 4.2.6 When the bottles used to collect the filter dust (see Section 4.2.2) are full, they are sealed and treated in a manner similar to that cited in Section 4.1.

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CHANGING OF VACUUM PUMP OIL

1.0 SCOPE

This instruction describes the procedures to be followed when draining the oil in any vacuum pump in the Facility.

2.0 GENERAL

All movements of oil containers must be made through designated aisles--no movements are to be made through marked crit zones.

3.0 HANDLING OF ALL VACUUM PUMP OIL CHANGES

3.1 Obtain an empty five-gallon container with a resealable type lid and a five-gallon container of new vacuum pump oil.

3.2 Transfer the above containers to the vacuum pump requiring an oil change. Caution shall be taken so as not to enter any crit zone. USE AISLE ONLY.

3.3 Drain the used vacuum pump oil into the empty five-gallon container.

3.4 Continue to drain oil until vacuum pump has been completely drained.

NOTE: Vacuum pump contains approximately 4.5 gallons of oil.

3.5 Flush the vacuum pump with two (2) quarts of new oil. Collect this oil as described in 3.3 and 3.4 above.

3.6 Seal the five-gallon container of used oil and transfer to the outside oil storage area. Transfer the oil to a 55-gallon drum and return the five-gallon container to the locked storage area. Caution shall be taken so as not to enter any crit zone. USE AISLE ONLY.

3.7 Fill the vacuum pump with new oil.

3.8 Reseal the new oil container and transfer to locked storage area. Caution shall be taken so as not to enter any crit zone. USE AISLE ONLY.

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MONITORING AND CLEANING OF SUMP PUMP
(SHOP TWO AREA)

1.0 SCOPE

- 1.1 This instruction covers the procedures to be followed during the checking and cleaning of sump basin.

2.0 GENERAL

- 2.1 This procedure shall be performed on a monthly basis.
- 2.2 Maintenance group will be notified by Industrial Hygiene Department to remove the sump pump for inspection as required.

3.0 CLEANING PROCEDURE

- 3.1 Prior to entering the sump area, a survey will be made with a G.M. survey meter or equivalent.
- 3.2 Maintenance will then remove the sump pump from the basin and measure the depth of water.
- 3.3 Industrial Hygiene will take two 20cc samples from the undisturbed water to determine the amount of uranium in solution. This will be determined by alpha counting the residue of evaporated sample.
- 3.4 Industrial Hygiene will give approval to remove water if uranium content is below 1.0 grams of U 235 per liter. If uranium content is more than 1.0 grams of U 235 liter, Industrial Hygiene will notify the Nuclear Safety engineer.
- 3.5 Maintenance will remove the water from the basin until contacting the sludge level. The water will be placed into five gallon cans and dumped back into the sump after removing the sludge.
- 3.6 Sludge will be measured for thickness and removed from the basin into two quart bottles, Nuclearly safe. Two 20cc samples will be taken after the sludge has been thoroughly mixed. The sludge will be contained in the bottles until cleared by Industrial Hygiene.

INFORMATION CATEGORY
UNCLASSIFIED

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R.D. Brown 11-20-67
Authorized Classifier Date

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4.0 SAMPLING

4.1 The four 20cc samples collected will be weighed and densities calculated. One sample from liquid and sludge will be sent to Atomic Equipment Division, Chemistry Laboratory, for total U per ml and total U per gram analysis. The remaining two samples will be prepared and alpha counted by Industrial Hygiene.

4.2 A memo of alpha count results and details of liquid and sludge quantities will be sent to the Nuclear Safety engineer at WANL. Upon receiving chemical analysis results, both alpha count calculations and chemistry data will be compared and submitted to management.

5.0 DISPOSAL

5.1 Results of the sludge analysis and the two quart bottles of sludge will be forwarded to Accountability for processing.

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PROCESSING OF LEACH FURNACE RESIDUES
(Water Cooled Trap)

1.0 GENERAL

- 1.1 This procedure shall be performed immediately after EACH leach furnace cool-down cycle.
- 1.2 Effort shall be made to minimize the exposure time of all leach residues to the atmosphere.
- 1.3 Protective respirators shall be worn at all times when residue is open to the atmosphere.
- 1.4 Before opening the furnace trap for cleaning, weigh each element in the furnace load to determine its weight loss. Obtain a total furnace load weight loss by adding the individual element weight losses. If the total furnace load weight loss is 500 grams or more, do not open the furnace trap for cleaning. Notify the Manager of WNCO or the Superintendent of Operations.
- 1.5 Washing of leach trap baffle assembly or inner tube with water is not permitted.
- 1.6 Drying of leach trap baffle assembly and/or inner tube in drying oven is permitted only after thorough cleaning with Freon MF.
- 1.7 Acetone must not be used for trap cleaning under any circumstances.

2.0 TRAP CLEANING

- 2.1 Lay a six foot section of white blotter paper on the floor east of the leach furnace but within the criticality zone. Obtain a spatula.
- 2.2 Disconnect the trap from the downstream piping by disengaging the flange.
- 2.3 If required, disconnect the trap cooling water lines. Then remove the flange bolts from the end of the water-cooled section of the trap and carefully lower the trap.
- 2.4 If required, remove the inner tube from the water-cooled jacket and place it upright in a 1-1/2" x 12-1/2" x 21" pan lined with tare weighed aluminum foil.
- 2.5 Fill a 2,000 ml. polyethylene graduated cylinder with Freon MF and transfer it to the leach furnace criticality zone.

MANDATORY: While the leach trap is being cleaned, no other liquids shall be permitted in the leach furnace criticality zone and no additional quantities of Freon MF shall be used to clean the trap!

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- 2.6 A small quantity of Freon MF shall be poured into the top of the inner tube, thoroughly wetting all residue in order to decrease airborne contamination.
- 2.7 Remove the baffle plate assembly from the inner tube and place it in the pan.
- 2.8 Using a combination of spatula, brush, and the Freon MF remaining in the graduated cylinder, remove the residue from the inner tube (if removed) and baffle plate assembly. (All residue and used Freon MF shall be collected in the 1-1/2" x 12-1/2" x 21" pan.)
- 2.9 Inspect the interior of the water-cooled jacket and downstream piping. If any residue is observed, repeat operations per Section 2.8 and collect all Freon MF and residue in the same pan. Do not combine the residues from more than one run in the same pan.
- 2.10 To determine the estimated U-235 contained in the pan, multiply the total furnace load weight loss (see 1.4) by .70. Identify the tray with the furnace run and mark with estimated U-235.
- 2.11 Transfer the pan containing the Freon MF and leach residue to Crit Zone 21-1 (low temperature oven). Dry for a minimum of 8 hours at 120°C.
- 2.12 Reassemble the leach trap.
- 2.13 Periodically inspect the graphite exhaust extension elbow and polyvinyl chloride pipe for leach waste build-up. Remove and clean as required.
- 2.14 After the Freon MF has evaporated and the residue dried, transfer the residue to a pre-weighed plastic bag and place into a pre-weighed 4-5/8" O.D. x 9" or 4-3/4" high polyethylene bottle.
- 2.15 Tightly screw the pre-weighed bottle lid on the bottle.
- 2.16 Gross weigh the bottle (including lid) and contents. Mark the gross weight on the bottle. Separately list on the bottle the tare weight of the bottle, lid, aluminum foil, and plastic bag and total. Deduct the total tare from the gross weight and mark the resulting net weight of residue on the bottle. Identify the bottle as "leach trap residue" and with the furnace run number. Mark the estimated U-235 content as determined in 2.10 above. These weighing operations must be performed as soon as possible after removal from the oven as the leach waste is hygroscopic and will pick up weight from moisture absorption rapidly after removal from the furnace.
- 2.17 Place the bottle in plastic bag and transfer it to the Accountability processing area for scrapping.

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- 2.18 Affix a properly completed bottle label to the bottle. The bottle label will contain in addition to other information the U-235 content of the bottle calculated using current accountability procedures.
- 2.19 Transfer the loaded bottle to an approved storage rack or an approved birdcage drum. If the transfer is to a drum, enter the required data including cumulative U-235 on a drum batching record affixed to the drum.

3.0 FILTER DISPOSAL

- 3.1 Carefully remove the filter from its housing and transfer it to a tray. To determine the U-235 content of the filter for transfer purposes, multiply the total furnace load weight loss (see 1.4) by .30. Identify the filter with the furnace run and mark with estimated U-235.
- 3.2 Transfer the tray and filter to Crit Zone 21-1, (low temperature oven). Dry for a minimum of eight hours at 120°C.
- 3.3 After the filter has dried, remove it from the oven and place into a pre-weighed plastic bag. Weigh the loaded bag. This weighing must be performed as soon as possible after removal from the oven as the leach waste in the filter will absorb moisture from the air and gain weight rapidly. Subtract the initial filter weight (recorded on the filter frame) and the tare weight of the bag from the total obtained on the weighing just completed. Record this weight difference on the bag identified as "factor net." Determine the estimated U-235 content of the filter for transfer purpose by multiplying the "factor net" by .60. Mark the bag with the leach run identification and the estimated U-235 content.
- 3.4 Transfer the bag and its contents to the accountability processing area for scrapping.
- 3.5 Obtain a new filter, weigh, and record its weight on the frame and reassemble the filter in its housing. Install the filter just prior to making the leach run in order to minimize filter moisture absorption.
- 3.6 In the hood remove the filter from the bag and remove the corrugated filtering section from the frame by sawing next to the frame. Remove samples as required.
- 3.7 Place the two ends containing no attached filter media or waste into a plastic bag, seal with tape, and discard in a contaminated waste drum. See 4.2.
- 3.8 Collapse or section the remaining portions of the filter and place into the bag in which the material was originally received. Place the loaded bag into an approved 1/2 gallon bottle, affix a bottle label properly completed to the bottle. The bottle label will contain in addition to other information the U-235 content of the bottle calculated using current accountability procedures.

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- 3.9 Transfer the bottle to an approved storage rack or an approved birdcage drum.
If the transfer is to a drum, enter the required data including cumulative U-235 on the drum batching record affixed to the drum.

4.0 LOW LEVEL CONTAMINATED WASTE DISPOSAL

- 4.1 Place all combustible low level contaminated cleaning and handling materials such as gloves, blotter paper, and rags relating to a given run into one or more plastic bags.
- 4.2 Identify the bag or bags with the run number and transfer to Accountability.
- 4.3 Accountability will add any low level combustible contaminated waste generated in their packing and handling activities to the bag or bags.
- 4.4 Place loaded bag or bags into a drum labeled "Contaminated Waste - Leach Operation." No other types of material will be added to this drum.
- 4.5 Record the run numbers on a drum batching record affixed to the drum.

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PROCESSING OF LEACH FURNACE RESIDUES

(Refrigerated Trap)

1.0 GENERAL

- 1.1 This procedure shall be performed immediately after EACH leach furnace cool-down cycle.
- 1.2 Effort shall be made to minimize the exposure time of all leach residues to the atmosphere.
- 1.3 Protective respirators shall be worn at all times when residue is open to the atmosphere.
- 1.4 Before opening the furnace trap for cleaning, weigh each element in the furnace load to determine its weight loss. Obtain a total furnace load weight loss by adding the individual element weight losses. If the total furnace load weight loss is 500 grams or more, do not open the furnace trap for cleaning. Notify the Manager of WNCO or the Superintendent of Operations.
- 1.5 Washing of leach trap cooling assembly or trap shell assembly with water is not permitted.
- 1.6 Drying of leach trap cooling assembly and/or trap shell assembly in drying oven is permitted only after thorough cleaning with Freon MF.
- 1.7 Acetone must not be used for trap cleaning under any circumstances.

2.0 TRAP CLEANING

- 2.1 Lay a six-foot section of white blotter paper on the floor East of the leach furnace but within the criticality zone. Obtain a spatula.
- 2.2 Disconnect the trap from the downstream piping by disengaging the flange.
- 2.3 If required, disconnect the trap refrigerant lines. Then remove the flange bolts from the end of the trap shell assembly and carefully lower the trap.
- 2.4 If required, remove the trap shell assembly and place it upright in a 1-1/2" x 12-1/2" x 21" pan lined with tare weighed aluminum foil.
- 2.5 Fill a 2,000 ml. polyethylene graduated cylinder with Freon MF and transfer it to the leach furnace criticality zone.

MANDATORY: While the leach trap is being cleaned, no other liquids shall be permitted in the leach furnace criticality zone and no additional quantities of Freon MF shall be used to clean the trap.

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- 2.6 A small quantity of Freon MF shall be poured into the top of the trap shell assembly thoroughly wetting all residue in order to decrease airborne contamination.
- 2.7 Remove the trap cooling assembly from the shell and place it in the pan.
- 2.8 Using a combination of spatula, brush, and the Freon MF remaining in the graduated cylinder, remove the residue from the shell and trap cooling assembly. (All residue and used Freon MF shall be collected in the 1-1/2" x 12-1/2" x 21" pan.)
- 2.9 Inspect the interior of the bellows assembly and downstream piping. If any residue is observed, repeat operations per Section 2.8 and collect all Freon MF and residue in the same pan. Do not combine the residues from more than one run in the same pan.
- 2.10 To determine the estimated U-235 contained in the pan, multiply the total furnace load weight loss (see 1.4) by .70. Identify the tray with the furnace run and mark with estimated U-235.
- 2.11 Transfer the pan containing the Freon MF and leach residue to Crit Zone 21-1 (low temperature oven). Dry for a minimum of 8 hours at 120°C.
- 2.12 Reassemble the leach trap.
- 2.13 Periodically inspect the graphite exhaust extension elbow and polyvinyl chloride pipe for leach waste build-up. Remove and clean as required.
- 2.14 After the Freon MF has evaporated and the residue dried, transfer the residue to a pre-weighed plastic bag and place into a pre-weighed 4-5/8" O. D. x 9" or 4-3/4" high polyethylene bottle.
- 2.15 Tightly screw the pre-weighed bottle lid on the bottle.
- 2.16 Gross weigh the bottle (including lid) and contents. Mark the gross weight on the bottle. Separately list on the bottle the tare weight of the bottle, lid, aluminum foil, and plastic bag and total. Deduct the total tare from the gross weight and mark the resulting net weight of residue on the bottle. Identify the bottle as "leach trap residue" and with the furnace run number. Mark the estimated U-235 content as determined in 2.10 above. These weighing operations must be performed as soon as possible after removal from the oven as the leach waste is hygroscopic and will pick up weight from moisture absorption rapidly after removal from the furnace.
- 2.17 Place the bottle in plastic bag and transfer it to the Accountability processing area for scrapping.

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- 2.18 Affix a properly completed bottle label to the bottle. The bottle label will contain in addition to other information the U-235 content of the bottle calculated using current accountability procedures.
- 2.19 Transfer the loaded bottle to an approved storage rack or an approved birdcage drum. If the transfer is to a drum, enter the required data including cumulative U-235 on a drum batching record affixed to the drum.

3.0 FILTER DISPOSAL

- 3.1 Carefully remove the filter from its housing and transfer it to a tray. To determine the U-235 content of the filter for transfer purposes, multiply the total furnace load weight loss (see 1.4) by .30. Identify the filter with the furnace run and mark with estimated U-235.
- 3.2 Transfer the tray and filter to Crit Zone 21-1, (low temperature oven). Dry for a minimum of eight hours at 120°C.
- 3.3 After the filter has dried, remove it from the oven and place into a pre-weighed plastic bag. Weigh the loaded bag. This weighing must be performed as soon as possible after removal from the oven as the leach waste in the filter will absorb moisture from the air and gain weight rapidly. Subtract the initial filter weight (recorded on the filter frame) and the tare weight of the bag from the total obtained on the weighing just completed. Record this weight difference on the bag identified as "factor net." Determine the estimated U-235 content of the filter for transfer purpose by multiplying the "factor net" by .60. Mark the bag with the leach run identification and the estimated U-235 content.
- 3.4 Transfer the bag and its contents to the accountability processing area for scrapping.
- 3.5 Obtain a new filter, weigh, and record its weight on the frame and reassemble the filter in its housing. Install the filter just prior to making the leach run in order to minimize filter moisture absorption.
- 3.6 In the hood remove the filter from the bag and remove the corrugated filtering section from the frame by sawing next to the frame. Remove samples as required.
- 3.7 Place the two ends containing no attached filter media or waste into a plastic bag, seal with tape, and discard in a contaminated waste drum. See 4.2.
- 3.8 Collapse or section the remaining portions of the filter and place into the bag in which the material was originally received. Place the loaded bag into an approved 1/2 gallon bottle, affix a bottle label properly completed to the bottle. The bottle label will contain in addition to other information the U-235 content of the bottle calculated using current accountability procedures.

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- 3.9 Transfer the bottle to an approved storage rack or an approved birdcage drum.
If the transfer is to a drum, enter the required data including cumulative U-235
on the drum batching record affixed to the drum.

4.0 LOW LEVEL CONTAMINATED WASTE DISPOSAL

- 4.1 Place all combustible low level contaminated cleaning and handling materials
such as gloves, blotter paper, and rags relating to a given run into one or more
plastic bags.
- 4.2 Identify the bag or bags with the run number and transfer to Accountability.
- 4.3 Accountability will add any low level combustible contaminated waste generated
in their packing and handling activities to the bag or bags.
- 4.4 Place loaded bag or bags into a drum labeled "Contaminated Waste - Leach
Operation." No other types of material will be added to this drum.
- 4.5 Record the run numbers on a drum batching record affixed to the drum.

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PROCESSING OF COATING FURNACE RESIDUES

1.0 GENERAL

- 1.1 This procedure shall be performed during the cool-down cycle of EACH coating furnace run.
- 1.2 This procedure applies to the cleaning of traps from coating furnaces only when the load or any portion of the load contains fuel. When the load is entirely "non-fuel" residues shall be placed in plastic bags, sealed, and marked as "non-fuel" and turned over to Accountability for retention for possible recovery of the niobium pentachloride.
- 1.3 Effort shall be made to minimize the exposure of all coating residues to the atmosphere.
- 1.4 Protective respirators shall be worn at all times when the residue is open to the atmosphere.
- 1.5 All outside doors shall be closed and exhaust fans shall be turned off during the cleaning operations.

2.0 TRAP CLEANING

- 2.1 Obtain the bag containing the sheet metal scraper (aluminum spacer plate).
- 2.2 Lay a six-foot section of white blotter paper on the floor in front of the trap flanges.
- 2.3 Open trap cover of Trap No. 1. Remove the spacer plate from its bag, and place it inside the trap.
- 2.4 Place plastic bag over the trap opening and seal it to the trap with tape.
- 2.5 Grasping the tantalum wire through the bag, vigorously shake it to remove the residue.
- 2.6 Placing the wire in an "out-of-the-way" location in the trap, scrape all of the residue from the trap into the bag using the spacer plate.
- 2.7 After the residue is in the bag, remove the bag from the trap and seal its opening with tape.

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- 2.8 Remove the spacer plate from the trap and replace the plate in its bag.
- 2.9 Replace the tantalum wire in its proper position in the trap and re-attach the flange to the trap.
- 2.10 Proceed in like manner on the remaining traps. (NOTE: Make certain that the exhaust line and all piping between traps is free of residue. Clean connecting piping if required.) Residues from external exhaust lines should be combined with the trap material. Residues from internal piping contains a higher concentration of uranium and will be separately bagged and labeled.
- 2.11 After all traps have been cleaned, seal bags with tape and record the following information:
  - 2.11.1 Coating Residue - Trap or Coating Residue - Internal Exhaust
  - 2.11.2 Coating Run Number
- 2.12 Transfer the loaded bags to Accountability.

3.0 VAULT STORAGE AND ACCOUNTABILITY

- 3.1 Remove samples as required.
- 3.2 Accountability personnel will transfer the material to a pre-weighed polyethylene bag contained in a pre-weighed approved 1/2 gallon or 1-quart container. Affix a label to the bottle. This label will include, in addition to other information, the U-235 content of the bottle calculated in accordance with current Accountability procedures.
- 3.3 Place the lid on the bottle and seal with vinyl tape. Place the loaded bottle into a polyethylene bag to which approximately two handful of desiccant material has been added. Seal the bag with vinyl tape.
- 3.4 Residue identified as Coating Residue - Trap and Coating Residue - Internal Exhaust will be transferred to an approved 55-gallon drum - B.E. Permit 2016 containing a polyethylene insert. Coating residue - trap and coating residue - internal exhaust may be combined in the same drum, but not in the same bottle. Additions to the drum will be recorded on a drum batching record affixed to the drum. In addition to other data, this record will show the cumulative U-235 contained in the drum and the total U-235 permitted in the drum.

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PROCESSING OF "AA" AND "AB" FURNACE RESIDUES

1.0 GENERAL

- 1.1 This procedure shall be performed after the cool-down cycle of every tenth coating furnace run.
- 1.2 This procedure applies to the cleaning of traps from "AA" and "AB" furnaces only when the load or any portion of the load contains fuel. When the load is entirely "non-fuel," residues shall be placed in plastic bags, sealed, marked as non-fuel and transferred to Accountability to be held for potential recovery of the niobium pentachloride.
- 1.3 Effort shall be made to minimize the exposure of all coating residues to the atmosphere.
- 1.4 All cleaning operations shall be performed under a well ventilated exhaust hood.
- 1.5 All outside doors shall be closed and exhaust fans shall be turned off during the cleaning operations.

2.0 TRAP CLEANING

- 2.1 Obtain a polyethylene plastic bag containing a sheet metal scraper (aluminum spacer plate).
- 2.2 Lay a section of white blotter paper on the shelf of an exhaust hood.
- 2.3 Remove the flange bolts from the trap. Remove the trap from the cooling chamber and place under the exhaust hood.
- 2.4 Remove the lid from the trap and place scraper plate inside. Place a pre-weighed plastic bag over the trap opening and seal it to the trap with tape. (Pre-weigh tape also.)
- 2.5 Scrape all of the residue from the trap into the bag using the spacer plate.
- 2.6 After the residue is in the bag, remove the bag from the trap and seal its opening with tape. Record the following information on the bag:
  - 2.6.1 Coating run number
  - 2.6.2 Trap number

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- 2.7 Remove the spacer plate from the trap and replace the plate in its bag.
- 2.8 Re-attach the trap flange.
- 2.9 After the trap has been cleaned, weigh the plastic bag and record the net weight of residue on the bag.
- 2.10 Seal the plastic bag with tape. Transfer to Accountability personnel.

3.0 VAULT STORAGE AND ACCOUNTABILITY

- 3.1 Repackage the coating waste into a pretared plastic bag contained in a pretared approved polyethylene bottle or bottles.
- 3.2 Calculate the uranium content of the bottle by multiplying the weight of the coating waste by the current accountability coating waste uranium factor. If the waste is from a non-fuel run, assume the uranium content is zero.
- 3.3 Calculate the U-235 content by multiplying the uranium content determined in 3.2 by .9315.
- 3.4 Complete a serial numbered bottle label and affix it to the bottle.
- 3.5 Seal the lid to the bottle with vinyl tape.
- 3.6 Place approximately 2 handfuls of adsorbent into a polyethylene bag and place the loaded bottle in the bag. Close the bag and seal using either vinyl tape or a heat sealer. Place the bagged bottle into another polyethylene bag and seal this bag using either vinyl tape or a heat sealer.
- 3.7 If the material is from a non-fuel run, place it into a plastic lined B. of E. 2016 drum prominently marked "Coating Waste from Non-Fuel Runs Only."
- 3.8 If the material is from a fueled run, transfer it to a plastic lined B. of E. 2016 drum marked "Fueled Coating Residues Only." All additions to the drum must be recorded on a drum batching record affixed to the drum. This record includes, among other items, the cumulative total U-235 in the drum, and the total U-235 permitted in the drum.

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FLUSHING OF COATING AND LEACH FURNACE EXHAUST STACKS

1.0 SCOPE

- 1.1 This instruction covers the flushing of roof exhaust stacks from the coating and leaching furnaces.

2.0 GENERAL

- 2.1 This operation shall be performed after completion of furnace cool-down cycle or during cool-down cycle with exhaust lines connected to temporary exhaust stack.
- 2.2 Water is supplied on the roof of Shop 2 for the purpose of flushing stacks. The requirements of Criticality Instruction No. 7 must be adhered to and met prior to starting this operation.
- 2.3 Safety goggles and respirators must be worn while disconnecting the exhaust lines prior to flushing. Safety glasses only are required after connections are completed.

3.0 STACK FLUSHING

- 3.1 Disconnect exhaust line from furnace coating waste traps to exhaust line roof riser.
- NOTE: In the case of leach stack flush, remove leach exhaust filter box.
- 3.2 Connect by means of flexible rubber coupling the required lengths of 2-inch P.V.C. piping to reach Shop 2 trough drains from the exhaust stack riser. Make sure connections are firm and will not leak.
- 3.3 Proceed to the roof of Shop 2 and connect water hose to feed line.
- 3.4 Remove plug from roof manifold exhaust system over stack to be flushed and insert special hose spray nozzle completely down furnace exhaust line until flush with top of tee. Secure in place.
- 3.5 Turn on water supply and flush exhaust stack for the necessary time it takes for the flush water to run clear. (Approximately .5 to 1.0 hour.)

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- 3.6 Secure water and lock out water supply valve.
- 3.7 Remove hose adaptor and plug flush hole.
- 3.8 Remove drain assembly and store. Rig and attach blower to flushed line and dry assembly trap and stack exhaust system.

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PROCESSING OF LOW LEVEL SCRAP AND WASTE

1.0 SCOPE

- 1.1 This instruction covers the handling of shop generated uranium contaminated scrap and waste.

2.0 CONTAINERS

- 2.1 All contaminated material for disposal will be collected in modified 55-gallon ICC 17-E drums, B.E. Permit Number 2016. A plastic liner will be inserted into each drum before the addition of contaminated materials. Drums will be enclosed in plastic bags before being introduced into a contaminated area in order to reduce decontamination efforts. Each drum will be serially numbered and will be labeled on the side as follows:

"RADIOACTIVE MATERIALS
B.E. PERMIT NO. 2016"

Empty drums in the storage area awaiting use will have an "EMPTY" label or tag affixed. This label or tag will be removed at the time the drum is moved into the use area. These drums will not be used for other than contaminated and low-level materials.

3.0 MATERIAL RESTRICTIONS

- 3.1 These drums will be used to accumulate, store, and ship only contaminated materials and dry low density materials such as floor sweepings, filters, and coating waste. All highly contaminated or noxious materials such as residues from coating operations will be transferred to the Accountability Section for packaging prior to placement in a drum. All highly contaminated material such as the above will be double wrapped in plastic or placed in plastic bottles before introduction into a drum. Uranium content of a drum is limited to 350 grams of U-235.

4.0 LOCALIZATION OF LOSSES

- 4.1 A record of the location in which each drum is used will be maintained by the Accountability Section to permit tracing of drums with abnormally high uranium contents.

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5.0 DECONTAMINATION

- 5.1 After a drum has been filled it will be closed, decontaminated if necessary, and transferred to an outside storage pad. Those drums protected by undamaged plastic bags will not require decontamination. The bag must be removed before moving the drum into a clean area in such a manner as to prevent contamination of the exterior surfaces of the drum.

6.0 URANIUM CONTENT DETERMINATION

- 6.1 Uranium content of the drums will be determined by a radiation survey or by application of appropriate accountability uranium factors dependent upon the nature of the contents of the drum. Radiation survey procedures are defined in the Accountability Procedures Manual (WANL-IL-009). After the uranium content of the drums has been determined, the drums will be sealed using a serial numbered seal and stored in Crit Zones I-1, I-2, or I-3 pending disposition. Any drum containing over 100 grams of U-235 will be labeled on the top and side as follows:

"NO INTERNAL BIRDCAGE - 350 GRAMS
U-235 LIMIT"

7.0 DISPOSITION

- 7.1 When an economical shipping quantity of drums has been accumulated, a listing will be prepared and submitted to the SS Representative requesting disposition. Upon receipt of the disposition from the SS Representative, the drums will be shipped for recovery or burial as determined by the SS Representative. Areas to be used in shipping must be approved by the Nuclear Safety Engineer prior to loading of the shipping vehicle.

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INTRA-BUILDING TRANSPORTATION OF FUEL ELEMENTS

1.0 SCOPE

- 1.1 This instruction describes methods to be used in the panel truck transportation of fuel elements between buildings at the Cheswick complex of the Westinghouse Astronuclear Core Operations using the transfer box assembly (dwg. 321164-D).

2.0 GENERAL

- 2.1 Standard procedures for the transfer of fuel elements between criticality zones and the posting of such transfers shall be followed.
- 2.2 Any one tray containing fuel elements shall not be handled unless a strip of tuck tape encircles the lid and body of the tray to keep the lid secure.
- 2.3 This procedure shall not apply to fuel elements in other than trays.
- 2.4 All movements of trays to and from the panel truck shall be made through passageways. No movements are to be made through criticality zones.

3.0 FUEL TRAY MOVEMENT

- 3.1 Trays containing fuel elements shall be covered not only with their mating metal lid, but encircled with a strip of tuck tape to keep the lid secure.
- 3.2 Transfer of the tray shall be made from the contaminated areas as follows:
  - 3.2.1 In unloading the panel truck the driver opens the doors of the truck and secures the doors open. Then backs up a few feet so the rear of the truck is over in the contaminated area. A strip of blotter paper shall be placed along the floor of the truck under the container. Proceed to unscrew the lid and unload the container.
  - 3.2.2 In loading the panel truck, a strip of blotter paper shall be placed on the rear bed of the truck and then carefully insert the tray into the specialized container in the panel truck. The lid shall then be secured on the specialized container by tightening the screws. Remove the blotter paper and discard in the proper contaminated waste receptacle. The driver shall move the panel truck a few feet so he can get behind the truck in a non-contaminated area and secure the panel truck doors closed and proceed to the other building.

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4.0 RESTRICTIONS

- 4.1 The panel truck may only be used off site when the specialized container is empty and secured.
- 4.2 The panel truck must be released by Industrial Hygiene before it is used off site.

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