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Level 2 Technical Procedure

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20	Revision: Removed FBP-WM-PRO-00093-F04, <i>Contaminated Component Greater than Safe Mass Verification</i> , and associated references; updated Table 3, <i>Container Handling and Transport</i> ; clarified TR steps as required by NMC&A; included FBP-FRM-01181 as applicable; grammatical and clarifying changes as needed; updated Source References.	4-5, 8-9, 11-13, 15, 17-19, 24-25, & 27

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1.0 PURPOSE

- 1.1** This procedure has been developed to implement applicable requirements from the following:
- FBP/PORTS-444, *Document Safety Analysis for the X-345 and X-744G Facilities at the Portsmouth Gaseous Diffusion Plant Piketon, Ohio*
 - NCSE-PLANT043, *Fissile Material Transport*
 - NCSE-PLANT120, *Criticality Incredible Component Handling, Storage, and Transportation*
 - NCSE-0333_035, *X-333 Demolition*
 - POEF-FBP-001, *Basis for Interim Operation of Former Uranium Enrichment Facilities (FUEF) At the Portsmouth Gaseous Diffusion Plant Piketon, OH*
 - POEF-FBP-002, *Technical Safety Requirements for Former Uranium Enrichment Facilities (FUEF) At the Portsmouth Gaseous Diffusion Plant, Piketon, OH – Section 3.9*
 - POEF-FBP-010, *Transportation Safety Document for the On-Site Transport of Hazardous Material at the Portsmouth Gaseous Diffusion Plant Piketon, Ohio*
- 1.2** This document implements applicable regulatory requirements. They are listed in Appendix A, *Regulatory Requirements Flow Down*.

2.0 SCOPE AND APPLICABILITY

- 2.1** This Level 2 procedure provides nuclear criticality safety controls for the on-site transport of fissile material containers and contaminated equipment within areas of the site controlled by Fluor-BWXT Portsmouth LLC (FBP).
- 2.2** This procedure addresses notification requirements for relocation of items tracked in the Criticality Incredible (CI) database repository directed by FBP-CCI-PRO-00008, *Data Flow and Review Process for Data Acquisition for Visual Inspection, Nondestructive Assay, Characterization and Criticality Incredible (DAVINCCI)*.
- 2.3** The instructions for the batch sheets referenced in this procedure must be used “in hand” when the batch sheets are being completed.
- 2.4** This procedure applies to FBP personnel and Contract Labor Resources who transport fissile material containers and contaminated equipment.
- 2.5** This procedure includes:
- The loading of a vehicle

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- The movement between buildings
- The unloading of the vehicle
- The movement/transport of UF₆ cylinders (5", 8", 10", and 12") within buildings unless covered by another specific Nuclear Criticality Safety Evaluation (NCSE)

2.6 This procedure does **not** apply to Process Services Laboratory sample transport **unless** transportation of samples between facilities is performed in areas without Criticality Accident Alarm System (CAAS) coverage. Process Services Laboratory sample transport within areas of CAAS coverage is covered by NCSA-PLANT095, *Handling and Storage of UF₆ Bulb Samples, Can Samples, and Hydrolyzed Samples*, and FBP-ER-PRO-00227, *Gas Sampling Uranium Hexafluoride (UF₆) Processing Equipment and Related Support Systems*.

2.7 This procedure DOES NOT apply to:

- A.** Transportation of material in full Department of Transportation (DOT) compliance (e.g., complete labeling, marking, placarding, packaging, vehicle, training, and shipping papers).
- B.** Transportation of material from a facility to a DOT vehicle staging area after loading for off-site shipment provided that the material is packaged in accordance with DOT requirements and has an evaluation conducted in accordance with FBP-WM-PRO-00272, *On-Site Transportation of Hazardous Materials*.

3.0 GENERAL INFORMATION

- 3.1** Notification to Nondestructive Assay/Characterization and Criticality Incredible (NDA/CCI) group should be made prior to moving any items or containers.
- 3.2** In instances where accountable material is being moved as it is being created, Nuclear Material Control and Accountability (NMC&A) does not require form FBP-MC-PRO-00067-F01, *Nuclear Material Transfer*, (referred to as Transfer Request [TR] within this procedure) to precede the move. In these instances, a TR is created after movement in accordance with FBP-MC-PRO-00067.

4.0 USE REFERENCES

- A.** FBP-BS-PRO-00062, *Records Management Process*
- B.** FBP-ER-PRO-00227, *Gas Sampling Uranium Hexafluoride (UF₆) Processing Equipment and Related Support Systems*
- C.** FBP-MC-PRO-00067, *Nuclear Material Container Transfers*
- D.** FBP-NO-PRO-00100, *Nuclear Criticality Safety (NCS) Requirements for Container and Component Handling and Storage*

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- E.** FBP-NO-PRO-00101, *Facility Inventory Control*
- F.** FBP-NSE-PRO-00089, *Response to Nuclear Criticality Safety Anomalous Conditions*
- G.** FBP-OS-PRO-00010, *Vehicle Safety*
- H.** FBP-OS-PRO-00028, *Work Stoppage Due to Environmental, Safety, Health and Quality Concerns*
- I.** FBP-RP-PRO-00041, *Vehicle Radiological Control Program*
- J.** FBP-RP-PRO-00054, *Conduct of Radiological Operations*
- K.** FBP-WM-PL-00051, *Transportation Training Plan*
- L.** FBP-WM-PRO-00016, *Spill Cleanup and Repackaging/Transferring Waste*
- M.** FBP-WM-PRO-00052, *Portsmouth Gaseous Diffusion Plant (PORTS) Motor Carrier Operations*
- N.** FBP-WM-PRO-00272, *On-Site Transportation of Hazardous Materials*

5.0 PRECAUTIONS AND LIMITATIONS

5.1 Special Hazards and Controls

5.1.1 All Activities

- A.** Anomalous Event:
 - Suspend work; Contact Supervisor
- B.** Defective Equipment/Tools:
 - A pre-operational inspection shall be completed to ensure equipment/tools are in good working order. If equipment/tools are found to be defective, tag out of service and notify supervisor.
- C.** Flying Debris/Particles:
 - Personnel shall wear American National Standards Institute (ANSI) - approved safety glasses with rigid side shields.
- D.** Overextension (Sprains/Strains):
 - Personnel shall report any medically imposed lifting restrictions to project supervision.

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- DO NOT lift more than 1/3 of your body weight or > 50 pounds, whichever is less, without assistance.
- Establish secure footing before attempting to lift.
- Keep your head straight and forward.
- Keep your back straight while standing, sitting, bending or lifting.
- Lift gradually using your legs without jerking or twisting your body while in motion.
- Use caution when pushing and pulling a heavily loaded cart. Distribute the load on the cart to avoid instability and tip over.
- Utilize buddy-system when moving large, bulky items or use mechanical equipment to move heavy or large loads, when possible.
- Be aware that one end of the polybottle may be heavier than the other, and that the center of gravity may shift as the container is lifted.
- Hold polybottle securely, use two people to lift it if necessary.

5.1.2 Work Involving Radiological Activities

- Radiological Exposure:
 - Obey postings and comply with Radiation Work Permit (RWP) requirements. Follow directions of project Radiological Control Technician (RCT).

5.1.3 Fissile Material Transport

A. Acid Caustic Contact

- Personnel shall complete a visual inspection to verify container integrity and signs of leaks before initiating polybottle movements.
- Ensure that container lids, tops and bungs are securely fastened and closed.
- Prior to movement, personnel shall ensure acid-resistant tape is placed around the lid of the polybottle to prevent a splash potential.
- To avoid pressure build up, tape shall be removed after transport and parking with taped bottles inside truck shall be minimized.
- Avoid skin contact with container contents - wear chemical-resistant gloves, safety shoes, safety glasses, long sleeved clothing.

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B. Shear/Pinch Points:

- Maintain eye and voice contact with the operator of the lift platform controls. Make sure that the lift platform is not moved up or down until you are ready and your hands, feet and body are out of danger.
- Non-essential personnel shall stand clear of the truck lift platform during the loading and unloading of containers.
- Be aware of the shear hazard presented by the moving lift platform. Hands and feet can be caught between the truck body and the moving lift platform and amputated.
- Ensure that all personnel are clear of truck Hydraulic Lift Platforms before the platform is raised or lowered.

C. Fall from Truck Bed:

- Maintain situational awareness of surroundings at all times during loading/offloading evolutions.
- Use a spotter person to warn the person moving the container of nearby platform edges and fall hazards.
- When moving a container from the truck bed to the hydraulic lift platform attached to the truck, be aware at all times of where the edge of the platform is. Know where the edge is to avoid personnel falls or inadvertently moving the container over the edge.

D. Crushed by, Hit Against, Hit By:

- Do not place your body in front of or under a container being unloaded from a truck bed or hydraulic lift platform.
- Non-essential personnel shall stand clear of the truck lift platform during the loading and unloading of containers.
- Ensure that all personnel are clear of truck Hydraulic Lift Platforms before the platform is raised or lowered.
- Make sure that the lift platform is not moved until you are ready and that your hands, feet and body are safely out of the way.
- Maintain eye and voice contact with the operator of the lift platform controls.
- Use a spotter person to warn the person moving the container of nearby platform edges and fall hazards.

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- Do not try to catch a heavy container that is falling; keep your body out of the impact zone.
- When moving a container from a truck bed to the hydraulic lift platform attached to the truck bed, be aware at all times of where the edge of the platform is located to avoid falls.

E. Cuts and Lacerations – sharp edges on containers

- Maintain situational awareness at all times.
- When a cut hazard is present, cut resistant gloves are required with a cut resistance level 2 or higher and when a puncture hazard is present, puncture resistant gloves level 3 or higher.

F. Inadvertent Cart Movement:

- Ensure wheel chocks are in place under transport cart before loading cart for movement.

G. Struck by Straps:

- Use caution when applying tie-down straps and do not over-tighten the straps. Straps can break if overtightened.

5.2 Other Limitations

5.2.1 Transportation Requirements:

- A.** Transportation in accordance with this procedure is limited to roadways where public access is restricted.
- B.** Vehicles and drivers used to transport material shall meet the requirements and limitations of FBP-WM-PRO-00052, *Portsmouth Gaseous Diffusion Plant (PORTS) Motor Carrier Operations*, and FBP-OS-PRO-00010, *Vehicle Safety*.
- C.** Personnel who handle, package, load, unload, or transport materials included in this procedure shall meet the training requirements of FBP-WM-PL-00051, *Transportation Training Plan*.
- D.** Prior to movement or transfer, ensure loads/cargo is secured with engineered tie downs or other appropriate constraints to prevent the cargo from leaking, spilling, or becoming damaged during transport.

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5.2.2 Precautions:

- A. All workers are responsible for stopping work in accordance with FBP-OS-PRO-00028, *Work Stoppage Due to Environmental, Safety, Health and Quality Concerns*, when they have a reasonable belief that quality, work risks, or hazards are not effectively controlled.
- B. No gasoline or propane powered equipment shall be used in the ISAs.

5.2.3 Limitations:

All personnel identifying a Nuclear Criticality Safety (NCS) anomalous condition shall follow FBP-NSE-PRO-00089, *Response to Nuclear Criticality Safety Anomalous Conditions*.

6.0 PREREQUISITES

- 6.1 Ensure CAAS coverage along transportation is active prior to start of material transport if CAAS coverage is required.

7.0 TEST EQUIPMENT, TOOLS, AND SUPPLIES

- 7.1 NCS-approved vehicles
- 7.2 NCS-approved position-retention devices
- 7.3 Mesh Bags
- 7.4 Cart for small diameter containers
- 7.5 Hand Tools
- 7.6 Personal protective equipment (PPE):
 - PPE requirements for work performed under an RWP shall be in accordance with the applicable RWP
 - Eyewear, Protective, with rigid side shields, meeting ANSI Z87.1 standard (latest revision)
 - Footwear, Protective (reinforced toe boots/shoes) meeting American Society for Testing and Materials (ASTM) F2412-11 and F2413-11 (formerly ANSI Z41 - 1991) standard requirements (latest revision)
 - When a cut hazard is present, cut resistant gloves are required with a cut resistance level 2 or higher; and when a puncture hazard is present, puncture resistant gloves level 3 or higher

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- PPE for Spill Control – Wear chemical-resistant gloves, safety shoes, safety glasses, long sleeved clothing, and other PPE as specified by IH

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8.0 ACTIONS

8.1 Planning

Qualified Worker

8.1.1 Complete Batch Sheet or load sheet as required by this procedure.

Supervisor or Facility Manager (FM)/Nuclear Facility Manager (NFM), as applicable

8.1.2 Ensure personnel are trained on NCS Requirements.

8.1.3 Ensure personnel are trained and qualified in accordance with FBP-WM-PL-00051, and the vehicle and driver meet the requirements of FBP-WM-PRO-00052.

8.1.4 Ensure the transport is evaluated in accordance with FBP-WM-PRO-00272, and that the appropriate pages from the DOT Emergency Response Guide and form FBP-WM-PRO-00272-F01, *Equivalent Level of Safety (ELS) for On-Site Transportation of Hazardous Materials*, is provided to the vehicle operator, as applicable.

8.1.5 Ensure personnel adhere to NCS requirements.

8.1.6 Establish and maintain a Transport Batch Log for Fissile material transported that requires batch documentation under NCSE-PLANT043.

8.1.7 Prior to movement, perform the following:

A. **IF** required by NMC&A, **THEN** obtain TR from NMC&A, authorizing accountable material transfer in accordance with FBP-MC-PRO-00067, *Nuclear Material Container Transfers*.

B. **IF** relocating items to an NCSE-PLANT120 storage area or to X-333, **THEN** ensure NDA/CCI authorization for relocation of items is documented on TR.

FBP-CCI-PRO-00008

C. **IF** relocating items or containers to NCSE-PLANT120 storage area or to X-333 building, **THEN** ensure NDA/CCI documents CI status of items on TR.

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NCSE-PLANT120

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NOTE

If TR and FBP-NO-PRO-00101-F01, *Facility Manager Inventory Control Check Sheet (FMCL)*, (referred to as the FMCL within this procedure) are both required for the container transfer, the TR and FMCL forms must be compared and verified by the shipper and receiver in the field.

- D.** Obtain FM/NFM approval for transfers to select facilities in accordance with FBP-NO-PRO-00101, *Facility Inventory Control*.

8.2 Fissile Material Transport

Qualified Worker

NOTE

When transferring fissile material please refer to the Appendix B, *CAAS Coverage Map*, when planning routes.

Material/ items packaged for on-site transport between facilities require package design features that meet the minimum standards for transport under conditions normally incident to on-site transfer/transport as witnessed through direct observation.

- 8.2.1** Prior to movement, transfer or transport, ensure package or packages have sufficient packaging, wrapping, and/or softening material to:
- Adequately cover/encase/contain the material/ item
 - Prevent loss of containment such as leaks, oozing, or bubbling from or through the package
 - Prevent the spread of contamination
 - Prevent the compromise of package integrity resulting from cuts/ abrasions
- 8.2.2** Ensure there are no visible cracks or openings that would allow spread of contamination or loose materials.
- 8.2.3** Ensure requirements of FBP-RP-PRO-00041, *Vehicle Radiological Control Program*, are met when transporting radioactive material by vehicle.
- 8.2.4** Confirm radioactive material being transported meets requirements in FBP-RP-PRO-00054, *Conduct of Radiological Operations*.

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Shipping Material Balance Area (MBA) Custodian

NOTE

FBP-MC-PRO-00067 requires Shipping MBA Custodian to physically verify each item on the TR prior to signing as Shipper. If transporting items designated as CI, this physical verification also satisfies the requirement of NCSE-PLANT120 to verify CI status prior to movement.

- 8.2.5** Verify each component/container identification label matches component/container identification on TR, and sign TR as Shipper.

NCSE-PLANT120

Supervisor

- 8.2.6** **IF** NMC&A requires a TR prior to movement, **THEN** ensure TR has appropriate authorization prior to relocating items.

NOTE

For X-333 only, MBA Custodian verification of items is required **PRIOR** to moving items into facility.

NCSE-0333_035

- 8.2.7** If transporting items to X-333, contact Receiving MBA Custodian to meet at predetermined location to verify items.

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NOTE

Use only vehicles for transport of small diameter containers which have NCSE-PLANT043 Augmented Quality-Nuclear Criticality Safety (AQ-NCS) labels.

NCSE-PLANT043

Table 1, *Vehicles Used for Fissile Material Transport*, should be used to identify types of vehicles and containers of fissile material that are authorized for transport by these vehicles. All vehicles used must be government owned or leased by FBP or an FBP subcontractor.

Table 1. Vehicles Used for Fissile Material Transport

Vehicle	Container
Pickup trucks or vans with small diameter container racks	<ul style="list-style-type: none"> • Small diameter container (e.g., polybottles, F-cans, Z-cans, GP containers) • 5-inch UF₆ cylinders • 1S, 2S, small sample containers, and small sample tubes • Contaminated components
Pickup trucks or vans without small diameter container racks	<ul style="list-style-type: none"> • Drums, barrels, general containers • Limited safe volume containers (> 1 liter and ≤ 6 gallons) • 1S, 2S, small sample containers, and small sample tubes • 5-inch, 8-inch, 10-inch, and 12-inch UF₆ cylinders on dollies • Contaminated components
Flatbed trucks, flatbed tractor-trailers combinations, or tractor-van trailer combinations	<ul style="list-style-type: none"> • Drums, barrels, general containers • Limited safe volume containers (> 1 liter and ≤ 6 gallons) • 1S, 2S, small sample containers, and small sample tubes • 5-inch, 8-inch, 10-inch, and 12-inch UF₆ cylinders on dollies • B-25 and other large boxes • Contaminated components
Barrel lifts and barrel dollies	<ul style="list-style-type: none"> • Drums, barrels, general containers
20-position step van	<ul style="list-style-type: none"> • Small diameter containers (e.g., polybottles, F-cans, Z-cans, GP containers, etc.) • 5-inch UF₆ cylinders • 1S, 2S, small sample containers, and small sample tubes • Drums, barrels, general containers • Contaminated components
12-position step van	<ul style="list-style-type: none"> • Small diameter containers (e.g., polybottles, F-cans, Z-cans, GP containers, etc.) • 5-inch UF₆ cylinders • 1S, 2S, small sample containers, and small sample tubes • Contaminated components
Forklifts, mobile cranes, straddle carriers, or shop tractor/wagon combination capable of transporting large pieces of equipment or large containers	<ul style="list-style-type: none"> • Large (30-inch and 48-inch) UF₆ cylinders (solid UF₆ phase only) • B-25 and other large boxes • Contaminated components • Drums, barrels, general containers

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Qualified Worker

- 8.2.8** **WHEN** using single cylinder dollies, **THEN** ensure dollies have NCSE-PLANT043 AQ-NCS labels unless containers are moved within one facility under the storage NCSE.

NCSE-PLANT043

- 8.2.9** **WHEN** loading, unloading, moving, or transporting fissile material described in Table 2, *Allowed Safe Mass*, and Table 3, *Container Handling and Transport*, **THEN** adhere to the following requirements for container handling. Table 6, *UO₂F₂ Volumes Containing a Non-oily Safe Mass of ²³⁵U for Various Enrichments*, may be used to confirm a given non-oily volume is less than a safe mass. Table 8, *UF₄ Volumes Containing an Oily Safe Mass of ²³⁵U for Various Enrichments*, may be used to confirm a given oily volume is less than a safe mass.

NCSE-PLANT043

- 8.2.10** Transport item(s) to location directed by supervisor.

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NOTE

Safe Mass is defined for two conditions that are observable or known to qualified workers:

- Potentially Water Moderated Material – Wet or Moist (including exposure to Atmospheric Air)
- Potentially Oil Contaminated Material – Oily Gunk

Table 2 provides safe mass limits based on enrichment for the two conditions. (The maximum enrichment for the cascade building can be assumed for equipment from that building; be aware of equipment stored in a lower enrichment building. If the enrichment is unknown, 350-gram mass limit applies. If there is more than one fissile source to be transported, the safe mass limit for the highest enrichment source shall be used.)

Table 2. Allowed Safe Mass

Enrichment Wt. % ²³⁵ U	Safe Mass	
	Water ¹ ²³⁵ U (kg)	Oil ² ²³⁵ U (kg)
100	0.35	0.24
93	0.35	-
75	0.36	-
50	0.39	0.28
40	0.41	-
30	0.44	-
20	0.48	0.35
15	0.52	-
12	0.56	-
10	0.60	0.43
8.0	0.65	-
6.0	0.74	-
5.0	0.80	0.67
4.0	0.90	-
3.5	1.00	-
3.0	1.18	1.17
2.5	1.50	-
2.0	2.40	-
1.75	3.15	-
1.50	4.50	-
1.25	11.8	-
1.00	55.6	-

Note 1 Table 1, GAT-225, "Nuclear Criticality Safety Guide for the Portsmouth Gaseous Diffusion Plant," J. L. Feuerbacher, March, 1981

Note 2 POEF-LMUS-44, *Estimated Critical Conditions for UF₄-Oil Systems in Fully Oil-Reflected Spherical Geometry*, M. J. Plaster, May 1997

Note 3 Use the next higher enrichment gram limit if the enrichment is not specifically listed in Table 2.

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Table 3. Container Handling and Transport

Container	Requirements
A. Small diameter containers (e.g., polybottles, F-Cans, Z-Cans, GP-Containers, 5" UF ₆ cylinders [not on a 35" center-to-center dolly])	<ol style="list-style-type: none"> 1. Store containers only in designated holders in NCS approved vehicles. 2. Remove any snow from pickup truck beds prior to loading or unloading. 3. Do not transport with any other type of fissile material container. 4. Move only one container at a time (except for vehicle movement). 5. Load and unload vehicle such that containers in motion are not moved between or over occupied storage locations. 6. Softeners may be used in holders as long as they don't cover the holes in the holders. <p>NOTE: For 744G Polybottles with enrichment down blended solution from DOE HEU cylinder cleaning, a cutoff GP container may be inserted into the holder on the transport vehicle.</p>
B. 1S and 2S sample containers	<ol style="list-style-type: none"> 1. Transport only one safe group (as defined in Table 4, <i>Maximum Number of Small UF₆ Sample Tubes and Sample Cylinders in a Safe Group, at Various Enrichments</i>) at a time in a vehicle. 2. Do not transport with any other type of fissile material container.
C. 5", 8", 10" and 12" UF ₆ cylinders on 35" center-to-center dollies	<ol style="list-style-type: none"> 1. Use NCS approved single position dollies to maintain at least 35 inches center-to-center spacing on vehicle. 2. Do not transport with any other type of fissile material container.
D. General containers and drums	<ol style="list-style-type: none"> 1. If ²³⁵U mass in an individual drum is unknown, or mass in all containers being transported exceeds safe mass (as defined in Table 2) and the UH safe mass limit given in FBP-NO-PRO-00100, <i>Nuclear Criticality Safety (NCS) Requirements for Container and Component Handling and Storage</i>, maintain a minimum spacing of two feet edge-to-edge between containers. 2. If the cumulative ²³⁵U mass in all drums being transported is at or below safe mass (as defined in Table 2) or the UH safe mass limit given in FBP-NO-PRO-00100, there are no spacing requirements between individual containers. 3. Containers staged in a DOT Single Shipment Staging Area shall have no more than one shipment (meaning the amount of material that is transported off-site on one conveyance) worth of fissile material in its approved packaging. No packing/unpacking is permitted in the staging area. Minor container repairs are allowed. There shall be a minimum of two feet edge-to-edge spacing from the group of containers in a DOT staging area and other uranium-bearing materials outside the staging area or other DOT staging areas. There are no spacing requirements between containers within a DOT staging area. 4. There shall be a minimum of two feet edge-to-edge spacing from the group of containers in the staging area and other uranium-bearing materials. 5. Do not transport with any other type of fissile material container

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Container	Requirements
E. UF ₆ small sample tubes (e.g., P-10 tube, hoke tube, pinch tube, U-tube)	<p>NOTE: If enrichment is > 20%, completion of FBP-WM-PRO-00093-F02, <i>Uranium Hexafluoride (UF₆) Small Sample Tube > 20% Enrichment Transport Batch Sheet</i> is required prior to movement of these containers.</p> <p>Transport only one safe group (as defined in Table 4) at a time in a vehicle.</p> <ol style="list-style-type: none"> 1. A second person is required to verify that the number of tubes does not exceed the safe group value if enrichment > 20 wt. % before loading onto the transportation vehicle or transporting by hand or bicycle. 2. Do not transport with any other type of fissile material container.
F. Small liquid and solid sample containers (e.g., nominal 1 liter, 500 mL and 250 mL bottles)	<p>NOTE: Completion of FBP-WM-PRO-00093-F03, <i>Small Liquid and Solid Sample Containers Transport Batch Sheet</i>, is required prior to movement of these containers.</p> <ol style="list-style-type: none"> 1. Total volume transported on a single vehicle, by hand or bicycle must be less than or equal to the following: <ul style="list-style-type: none"> • 1 nominal liter (1.25 liters) for oily or greasy materials of any enrichment. • 3 nominal liters for non-oily and non-greasy material with enrichment greater than 10 wt. % • 10 nominal liters for non-oily and non-greasy material with enrichment less than or equal to 10 wt. %. 2. Batch volume must be verified by second person before loading onto the transportation vehicle or transporting by hand or bicycle. 3. Do not transport with any other type of fissile material container.
G. Limited safe volume containers (FBP-NO-PRO-00100 container volume is > 1 liter and ≤ 6 gallons)	<ol style="list-style-type: none"> 1. Maintain a minimum two feet edge-to-edge spacing between containers. 2. Do not transport with any other type of fissile material container.
H. B-12, B-25 and 6 x 6 x 8 boxes	<ol style="list-style-type: none"> 1. Since the ²³⁵U mass in each individual box is known to be less than a safe mass or the box is Category 1 contaminated metal, there are no spacing requirements. 2. Do not transport with any other type of fissile material container.

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Container	Requirements
I. Contaminated components (Not applicable to Planned Expeditious Handling [PEH] components)	<ol style="list-style-type: none"> 1. Maintain a minimum of two feet edge-to-edge spacing when moving multiple components on same load (NOTE: If a specific NCSE allows grouping specific types of contaminated components without spacing inside of a building, then components may be transported without being spaced). 2. Do not transport with any other type of fissile material container. 3. Only one container or piece of equipment with greater than safe ²³⁵U mass (covered by an NCSE) shall be transported at time. 4. A second person is required to verify there is only one container or piece of equipment with greater than safe ²³⁵U mass before loading onto a transportation vehicle or transporting by hand or bicycle.

8.2.11 WHEN multiple items which require spacing from one another are transported, **THEN** secure each item in place such that the required spacing is maintained during normal transport and during small transport abnormalities (e.g., sudden stops, minor collisions, etc.).

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8.2.12 Space individual containers, safe groups of containers, or approved arrays of containers at least two feet edge-to-edge (except for loading and unloading within an array wherein spacing applies) from all other uranium-bearing containers and equipment. Containers being staged for or unloaded from approved DOT shipments may be considered a “safe group” and shall be maintained two feet edge to edge from all other uranium-bearing containers and equipment.

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Table 4. Maximum Number of Small UF₆ Sample Tubes and Sample Cylinders in a Safe Group, at Various Enrichments

Containers	Enrichment		
	≤ 5.25%	> 5.25% and ≤ 20%	> 20% and ≤ 100%
Sample tubes (P-10, Hoke, and pinch tubes)	100 tubes	18 tubes	2 tubes
U-tubes	265 tubes	40 tubes	6 tubes
1S cylinders only	75 cylinders	10 cylinders	10 cylinders
2S cylinders only	36 cylinders	4 cylinders	4 cylinders
1S and 2S cylinders (mixed batch)	36 cylinders	4 cylinders	4 cylinders

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- 8.2.13** The requirements in Table 5, *Container and CAAS Coverage Requirements*, for container handling shall be adhered to when transporting fissile material addressed by NCSE-PLANT043. See map of CAAS covered roads (Appendix B, *CAAS Coverage Map*). Table 7, *UO₂F₂ Volumes Containing a Non-Oily Safe 700 g of ²³⁵U for Various Enrichments*, may be used to confirm a given non-oily volume is less than a 700-gram mass. Table 9, *UF₄ Volumes Containing an Oily 700 g of ²³⁵U for Various Enrichments*, may be used to confirm a given oily volume is less than a 700-gram mass.

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Table 5. Container and CAAS Coverage Requirements

Container	CAAS Coverage Requirements
A. Small diameter containers (e.g., polybottles, F-cans, Z-cans, GP containers, 5" UF ₆ cylinders [not on a 35" center-to-center dolly])	Transportation of small diameter containers shall be restricted to those roadways having CAAS coverage (see Appendix B), unless it can be confirmed that the total mass involved in the transport is less than safe mass (as defined in Table 2), the UH safe mass limit per FBP-NO-PRO-00100, or that the maximum concentration in any container being transported is ≤ 500 parts per million (ppm) ²³⁵ U. Additionally, if the mass is < 700 grams per transport, the load may be transported on any plant roadway.
B. 1S and 2S sample cylinders	For enrichment ≤ 5.25 wt. %, safe groupings (as defined in Table 4) of 1S and 2S sample cylinders may be transported on any plant roadway. For enrichments > 5.25 wt. %, safe groupings (as defined in Table 4) of 1S and 2S sample cylinders shall be restricted to those roadways having CAAS coverage (see Appendix B), unless it can be confirmed that the total mass involved in the transport is less than safe mass (as defined in Table 2) or the UH safe mass limit per FBP-NO-PRO-00100. Additionally, if the mass is < 700 grams per transport, the load may be transported on any plant roadway.
C. 5", 8", 10", and 12" UF ₆ cylinders on 35" center-to-center dollies	Transportation of small UF ₆ cylinders shall be restricted to those roadways having CAAS coverage (see Appendix B), unless it can be confirmed that the total mass involved in the transport is less than safe mass (as defined in Table 2) or the UH safe mass limit per FBP-NO-PRO-00100. Additionally, if the mass is < 700 grams per transport, the load may be transported on any plant roadway.
D. General containers and drums	Transportation of general containers or drums shall be restricted to those roadways having CAAS coverage (see Appendix B), unless it can be confirmed that the total mass involved in the transport is less than safe mass (as defined in Table 2), the UH safe mass limit per FBP-NO-PRO-00100, or that the maximum concentration in any container being transported is ≤ 500 ppm ²³⁵ U. Additionally, if the mass is < 700 grams per transport, the load may be transported on any plant roadway. Any single DOT shipment of containers either on the vehicle or in the staging area does not require CAAS coverage. Containers of either Category 1 dry active waste (DAW) or Category 1 Contaminated Metal may be transported on any plant roadway.

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Container	CAAS Coverage Requirements
E. UF ₆ small sample tubes (e.g., P-10 tube, Hoke tube, pinch tube, U-tube)	Safe grouping (as defined in Table 4) of UF ₆ small sample tubes may be transported on any plant roadway.
F. Small liquid and solid sample containers (e.g., nominal 1 liter, 500 mL, and 250 mL bottles)	Small liquid and solid sample containers in the volume given in Table 3 (F.1) shall be restricted to those roadways having CAAS coverage (see Appendix B), unless it can be confirmed that the total mass involved in the transport is less than safe mass (as defined in Table 2), the UH safe mass limit per FBP-NO-PRO-00100, or that the maximum concentration in any container being transported is ≤ 500 ppm ²³⁵ U. Additionally, if the mass is < 700 grams per transport, the load may be transported on any plant roadway.
G. Limited safe volume containers (FBP-NO-PRO-00100 container volume is > 1 liter and ≤ 6 gallons)	Transportation of limited safe volume containers shall be restricted to those roadways having CAAS coverage (see Appendix B), unless it can be confirmed that the total mass involved in the transport is less than safe mass (as defined in Table 2), the UH safe mass limit per FBP-NO-PRO-00100, or that the maximum concentration in any container being transported is ≤ 500 ppm ²³⁵ U. Additionally, if the mass is < 700 grams per transport, the load may be transported on any plant roadway.
H. B-12, B-25 and 6x6x8 boxes	Transportation of B-12, B-25 or 6 x 6 x 8 shall be restricted to those roadways having CAAS coverage (see Appendix B), unless it can be confirmed that the total mass involved in the transport is less than a safe mass, the UH safe mass limit per FBP-NO-PRO-00100, or that the maximum concentration in any container being transported is ≤ 500 ppm ²³⁵ U. Additionally, if the mass is < 700 grams per transport, the load may be transported on any plant roadway. Containers of either Category 1 DAW or Category 1 Contaminated Metal may be transported on any plant roadway.
I. Contaminated components (Not applicable to PEH components)	<p>Transportation of single or multiple contaminated components requiring spacing shall be restricted to those roadways having CAAS coverage (see Appendix B), unless it can be confirmed that the total mass involved in the transport is less than safe mass (as defined in Table 2).</p> <p>Transportation of single contaminated components meeting the mass requirements of FBP-NO-PRO-00100 for Uncomplicated Handling (UH) safe mass limit may be transported on any plant roadway.</p> <p>Transportation of one container or piece of equipment with greater than safe ²³⁵U mass (covered by an NCSE) shall be restricted to those roadways having CAAS coverage.</p>

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Table 6. UO₂F₂ Volumes Containing a Non-Oily Safe Mass of ²³⁵U for Various Enrichments

Enrichment (%)	²³⁵U Safe Mass (g)	UO₂F₂ Mass (g)	UO₂F₂ Theoretical Density (g/mL)	Volume (mL)
100	350	454.2	6.37	71
75	360	622.5	6.37	97
50	390	1,010.8	6.37	158
40	410	1,327.9	6.37	208
30	440	1,899.6	6.37	298
20	480	3,107.5	6.37	487
15	520	4,487.9	6.37	704
12	560	6,040.9	6.37	948
10	600	7,766.4	6.37	1,219
5	800	20,707.6	6.37	3,250
3	1180	50,903.2	6.37	7,991

Table 7. UO₂F₂ Volumes Containing a Non-Oily Safe 700 g of ²³⁵U for Various Enrichments

Enrichment (%)	²³⁵U Safe Mass (g)	UO₂F₂ Mass (g)	UO₂F₂ Theoretical Density (g/mL)	Volume (mL)
100	700	908.5	6.37	142
75	700	1,210.4	6.37	190
50	700	1,814.3	6.37	284
40	700	2,267.2	6.37	355
30	700	3,022.0	6.37	474
20	700	4,531.7	6.37	711
15	700	6,041.4	6.37	948
12	700	7,551.1	6.37	1,185
10	700	9,060.9	6.37	1,422
5	700	18,119.1	6.37	2,844
3	700	30,196.8	6.37	4,740

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Table 8. UF₄ Volumes Containing an Oily Safe Mass of ²³⁵U for Various Enrichments¹

Enrichment (%)	²³⁵U Safe Mass (g)	UF₄ Mass (g)	UF₄ Theoretical Density (g/mL)	Volume (mL)
100	240	317.6	6.7	47
75	-	-	-	-
50	280	739.9	6.7	110
40	-	-	-	-
30	-	-	-	-
20	350	2,310.1	6.7	344
15	-	-	-	-
12	-	-	-	-
10	430	5,674.4	6.7	846
5	670	17,680.4	6.7	2,638
3	1,170	51,454.8	6.7	7,679

Note 1 POEF-LMUS-44, *Estimated Critical Conditions for UF₄ Oil Systems in Fully Oil-Reflected Spherical Geometry*

Table 9. UF₄ Volumes Containing an Oily 700 g of ²³⁵U for Various Enrichments

Enrichment (%)	²³⁵U Safe Mass (g)	UF₄ Mass (g)	UF₄ Theoretical Density (g/mL)	Volume (mL)
100	700	926.3	6.7	138
75	-	-	-	-
50	700	1,849.8	6.7	276
40	-	-	-	-
30	-	-	-	-
20	700	4,620.1	6.7	689
15	-	-	-	-
12	-	-	-	-
10	700	9,237.5	6.7	1,378
5	700	18,472.1	6.7	2,757
3	700	30,784.9	6.7	4,594

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8.2.14 IF NMC&A did not require a TR prior to movement, **THEN** go to Step 8.2.19.

NOTE

FBP-MC-PRO-00067 requires Receiving MBA Custodian to physically verify each item on the TR prior to signing as Receiver. If receiving items designated as CI, this physical verification also satisfies the requirements of NCSE-PLANT120 to confirm CI Status and item identification prior to introduction into a CI Storage Area. For X-333 only, this verification also satisfies the requirement of NCSE-0333_035 to verify items satisfy their respective CI criteria prior to introduction into the X-333.

Receiving MBA Custodian

8.2.15 Verify component/container identification label matches component/container identification documented on TR.

*NCSE-0333_035
NCSE-PLANT120*

8.2.16 IF receiving into NCSE-PLANT120 storage area or X-333, **THEN** confirm NDA/CCI has documented CI status of items on TR and TR has been signed.

*NCSE-0333_035
NCSE-PLANT120*

8.2.17 After verifications have been completed, sign as Receiver on TR.

Qualified Worker

8.2.18 **AFTER** item(s) have been verified, **THEN** stage items in approved storage area and record location on TR.

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8.2.19 **AFTER** all movements have been completed, **THEN** confirm recorded storage location on TR and/or FBP-FRM-01181, *Component Data Sheet*.

8.2.20 Notify NDA/CCI and NMC&A of completed move.

FBP-CCI-PRO-00008

9.0 POST-PERFORMANCE ACTIVITIES

Ensure copies of completed TR and FBP-FRM-01181 are forwarded to CI Database Repository Administrator (via email to CCIDataRepository@ports.pppo.gov) and NMC&A by the end of the shift on which the movement occurs and no later than the end of the next business day.

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10.0 RECORDS

10.1 Records Generated

- A. FBP-FRM-01181, *Component Data Sheet*
- B. FBP-MC-PRO-00067-F01, *Nuclear Material Transfer*
- C. FBP-NO-PRO-00101-F01, *Facility Manager Inventory Control Check Sheet (FMCL)*
- D. FBP-WM-PRO-00093-F02, *Uranium Hexafluoride (UF₆) Small Sample Tube > 20% Enrichment Transport Batch Sheet*
- E. FBP-WM-PRO-00093-F03, *Small Liquid and Solid Sample Containers Transport Batch Sheet*
- F. FBP-WM-PRO-00272-F01, *Equivalent Level of Safety (ELS) for On-Site Transportation of Hazardous Materials*

10.2 Requirements

Records generated or received as a result of performing this procedure shall be managed according to FBP-BS-PRO-00062, *Records Management Process*.

11.0 DEFINITIONS/ACRONYMS

11.1 Definitions

- A. **Accountable**– Nuclear materials and related containers recorded on Portsmouth Materials Accountability System (PORTSMAS) as directed by applicable Department of Energy (DOE) Orders for Materials Control and Accountability (MC&A).
- B. **Criticality Incredible (CI)** – Criteria established in NCS documents to allow burial of components in Onsite Waste Disposal Facility (OSWDF) with a not credible propensity for criticality. The criteria may be met qualitatively or quantitatively. Examples of criteria include: A condition in which an inadvertent nuclear criticality is a non-credible event without implementation of any further NCS specific controls.

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- C. Fissile Material**– In strict terms, fissile or fissionable materials are radionuclides capable of sustaining a neutron-induced fission chain reaction (for example, ^{233}U , U enriched in ^{235}U , ^{236}Np , ^{239}Pu , ^{241}Pu , $^{242\text{m}}\text{Am}$, ^{243}Cm , ^{245}Cm , ^{247}Cm , ^{249}Cf , and ^{251}Cf). As applied to plant operations and for purposes of this procedure, fissile material is: 1) uranium material > 15 grams ^{235}U enriched to > 1.0 wt. %, and fissile metals > 0.93 wt. %; 2) material containing other fissionable radionuclides capable of sustaining a chain reaction in quantities greater than or equal to 1.6% of their maximum subcritical mass.
- D. Material Balance Area (MBA) Custodian** – The assigned individual(s) who has/have the vested responsibility for all additions, removals, and inventory of the nuclear materials for their assigned MBA. With that understanding, the MBA Custodian is responsible for ensuring all material control and accountability policies and procedures are consistently implemented in their MBA. An MBA Custodian can be assigned to multiple MBAs as long as they never approve shipment and receipt of the same nuclear material. A Nuclear Material Custodian can be authorized by the MBA Custodian to ensure this type of conflict does not occur. Independent checks by the shipping and receiving MBA Custodians ensure a nuclear material transfer is authorized and accounted for and helps to maintain the integrity and independence of the MBAs. They may authorize a Nuclear Material Custodian to verify or sign MBA documents on their behalf.
- E. Nuclear Criticality Safety Evaluation (NCSE)** – A physical or administrative control specified and documented for an operation, facility, or activity which provides an appropriate margin of safety during the process, thereby ensuring criticality safety. Requirements are generally those conditions of approval provided in an NCSE which implement the double contingency principle.
- F. Qualified Worker** – FBP personnel who are trained, qualified, and authorized to perform work at the Portsmouth Gaseous Diffusion Plant (PORTS) worksite.
- G. Uranium-Bearing Material/Solution** – For purposes of maintaining interaction (spacing) control identified in NCSEs, uranium-bearing material is any single component/item or a batch of items which is known or reasonably suspected of having ≥ 15 grams ^{235}U in or on it enriched to 1.0 wt. % or higher. Uranium-bearing solutions (oily, aqueous or organic) have concentrations above 50 ppm ^{235}U .

11.2 Acronyms

- A. ANSI** – American National Standards Institute
- B. AQ-NCS** – Augmented Quality-Nuclear Criticality Safety
- C. ASTM** – American Society for Testing and Materials
- D. CAAS** – Criticality Accident Alarm System

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- E. CCI** – Characterization and Criticality Incredible
- F. DAW** – Dry Active Waste
- G. DOT** – Department of Transportation
- H. FM** – Facility Manager
- I. FMCL** – Facility Manager Inventory Control Check Sheet
(FBP-NO-PRO-00101-F01)
- J. LAW** – Low Assay Withdrawal
- K. NCS** – Nuclear Criticality Safety
- L. NDA** – Nondestructive Assay
- M. NFM** – Nuclear Facility Manager
- N. NMC&A** – Nuclear Material Control and Accountability
- O. PEH** – Planned Expeditious Handling
- P. PPE** – Personal Protective Equipment
- Q. RMDC** – Records Management and Document Control
- R. RWP** – Radiation Work Permit
- S. TR** – Transfer Request (Nuclear Material Transfer [FBP-MC-PRO-00067-F01])

12.0 SOURCE REFERENCES

- A.** ASTM F2412-11 and F2413-11 (formerly ANSI Z41 - 1991) standard requirements (latest revision)
- B.** FBP-CCI-PRO-00008, *Data Flow and Review Process for Data Acquisition for Visual Inspection, Nondestructive Assay, Characterization and Criticality Incredible (DAVINCCI)*
- C.** FBP-JHA-24-5012, *JHA for procedure, FBP-WM-PRO-00093, NCS Controls for Fissile Material Transport*
- D.** FBP-MC-PRO-00059, *Item Control Program*
- E.** FBP/PORTS-444, *Document Safety Analysis for the X-345 and X-744G Facilities at the Portsmouth Gaseous Diffusion Plant Piketon, Ohio*
- F.** NCSA-PLANT095, *Handling and Storage of UF₆ Bulb Samples, Can Samples, and Hydrolyzed Samples*

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- G.** NCSE-0333_035, *X-333 Demolition*
- H.** NCSE-PLANT043, *Fissile Material Transport*
- I.** NCSE-PLANT120, *Criticality Incredible Component Handling, Storage, and Transportation*
- J.** POEF-FBP-001, *Basis for Interim Operation of Former Uranium Enrichment Facilities (FUEF) At the Portsmouth Gaseous Diffusion Plant Piketon, OH*
- K.** POEF-FBP-002, *Technical Safety Requirements for Former Uranium Enrichment Facilities (FUEF) At the Portsmouth Gaseous Diffusion Plant, Piketon, OH*
- L.** POEF-FBP-010, *Transportation Safety Document for the On-Site Transport of Hazardous Material at the Portsmouth Gaseous Diffusion Plant Piketon, Ohio*

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Appendix A
REGULATORY REQUIREMENTS FLOW DOWN

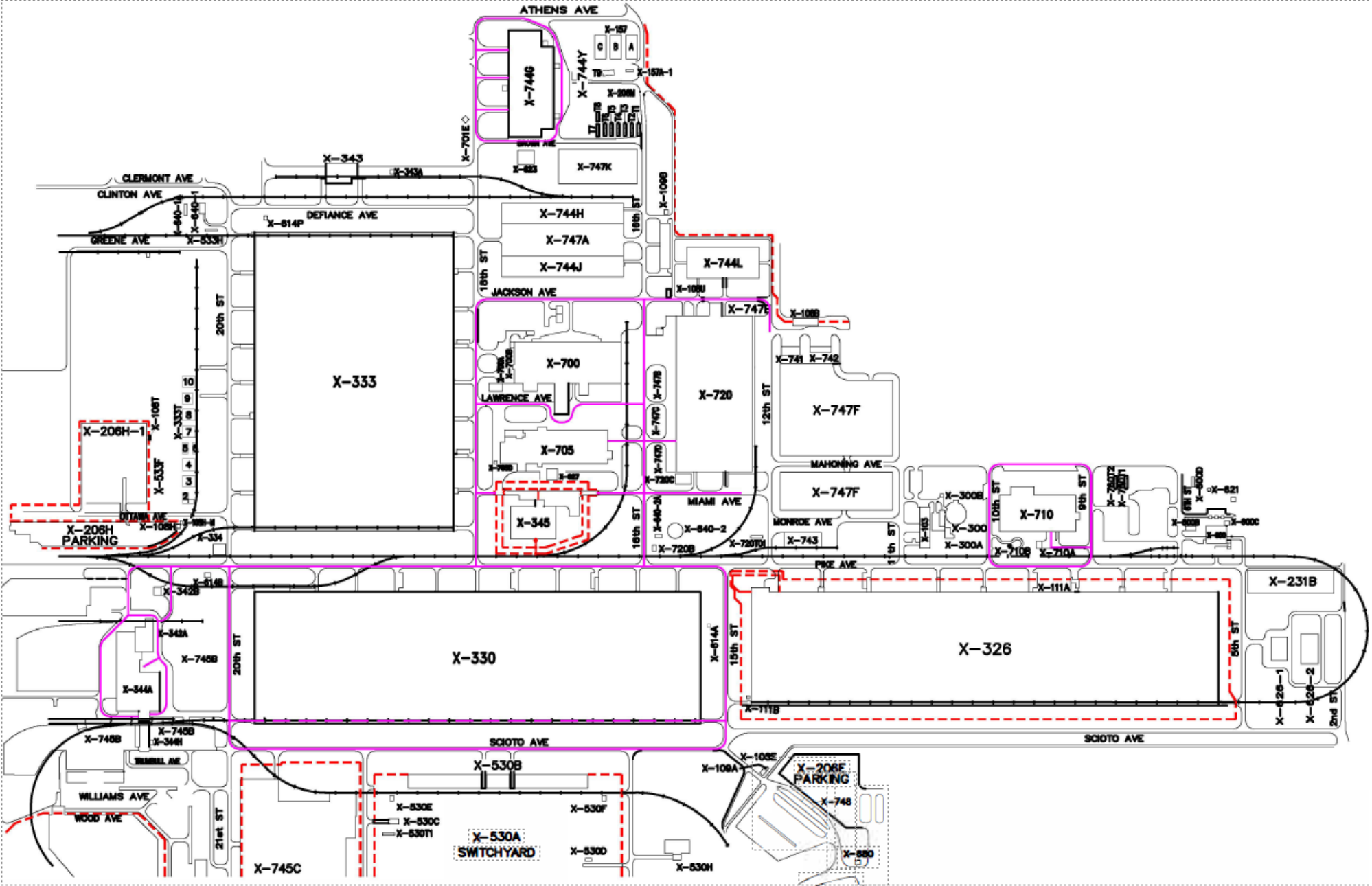
10 CFR Part 830, *Nuclear Safety Management*, Subpart A; *Quality Assurance Requirements*

Appendix B
CRITICALITY ACCIDENT ALARM SYSTEM (CAAS) COVERAGE MAP

NOTE

When transferring fissile material, please utilize this *CAAS COVERAGE MAP* when placing routes.

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Attachment A
URANIUM HEXAFLUORIDE (UF₆) SMALL SAMPLE TUBE > 20% ENRICHMENT
TRANSPORT BATCH SHEET
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Uranium Hexafluoride (UF₆) Small Sample Tube
> 20 % Enrichment Transport Batch Sheet

Transported From: _____ To: _____

Container Type (e.g., P-10, hoke tube, pinch tube, U-tube)	Container ID or Sample Transfer, if applicable

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Note: Limits on number of containers are two (2) Sample Tubes OR six (6) U-Tubes for >20% enrichment.

Operator Signature, Badge#, Date, Time

Verifier Signature, Badge#, Date, Time

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Attachment A
URANIUM HEXAFLUORIDE (UF₆) SMALL SAMPLE TUBE > 20% ENRICHMENT
TRANSPORT BATCH SHEET
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Uranium Hexafluoride (UF₆) Small Sample Tube
> 20 % Enrichment Transport Batch Sheet

Operator Instructions

1. Enter where batch came from (building, etc.) and where batch is being delivered to (building, etc.).
2. Enter Container type; and Container ID or Sample Transfer (if applicable).
3. Verify number of containers are limited to two (2) Sample Tubes or six (6) U-tubes for >20% enrichment.
4. Place signature, badge number, date and time on Operator Signature, Badge#, Date, Time line.

Verifier Instructions

1. Verify applicable totals do not exceed NCSE controls.
2. Place signature, badge number, date and time on Verifier Signature, Badge#, Date, Time line.

NOTE: IF any discrepancies are noted, **STOP**, notify Supervisor and do not continue until problem is resolved.

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Attachment B
SMALL LIQUID AND SOLID SAMPLE CONTAINERS TRANSPORT BATCH SHEET
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Small Liquid and Solid Sample Containers
Transport Batch Sheet

Transported From: _____ To: _____

Container ID or Sample Transfer, if applicable	Assay	Nominal Volume (e.g., nominal 1 liter, 500ml, 250ml bottles)	Non-oily/ Non-greasy (Check(✓))	Oily/Greasy (Check(✓))
Total Volume				

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- Note:**
1. A batch/safe group must consist of only one of the three types of material as described in number 2 below.
 2. Limits on total volume for a batch/safe group are as follows:
 - 1 nominal liter (1.25 liters) for oily or greasy materials of any enrichment.
 - OR
 - 3 nominal liters for non-oily and non-greasy material with enrichment greater than 10% up to and including 100%.
 - OR
 - 10 nominal liters for non-oily and non-greasy material with enrichment less than or equal to 10%.

Operator Signature, Badge#, Date, Time

Verifier Signature, Badge#, Date, Time

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Attachment B
SMALL LIQUID AND SOLID SAMPLE CONTAINERS TRANSPORT BATCH SHEET
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Small Liquid and Solid Sample Containers
Transport Batch Sheet

Operator Instructions

1. Enter where batch came from (building, etc.) and where batch is being delivered to (building, etc.).
2. Enter Container ID or Sample Transfer (if applicable), Assay and Nominal Volume. If assay is unknown, use building maximum assay.
3. Place a check mark (✓) in appropriate Non-oily/Non-greasy or Oily/Greasy column.
4. Verify total volume is within limits.
5. Place signature, badge number, date and time on Operator Signature, Badge#, Date, Time line.

Verifier Instructions

1. Verify total volume does **not** exceed NCSE controls.
2. Place signature, badge number, date and time on Verifier Signature, Badge#, Date, Time line.

NOTE: IF any discrepancies are noted, **STOP**, notify Supervisor and do not continue until problem is resolved.