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| TITLE: Inspection and Operation of UF6 Cylinder Handler or Straddle Carrier | DUF6-X-CYP-2513 | Rev. 1 |
| DOCUMENT TYPE: Technical Procedure | PREPARER: J. Anglemyer | Page 1 of 22 |
| SUBJECT MATTER AREA: Cylinder Yards | CONCURRENCE / DATE: See Form 4320 | |
| OWNER: Logistics and Plant Support Manager | APPROVED BY / DATE: T. Marshall / See Form 4320 | |
| \_X\_USQ Required \_\_ Categorically Excluded | EFFECTIVE DATE: 03/21/2019 | |
| FORC REVIEW REQUIRED? \_X\_ Yes \_\_ No | PERIODIC REVIEW: 2 years | |

Usage Requirements

Reference  Level 2 UET for: DUF6-X-CYP-2513-F01  Level 1 UET for: \_\_\_\_\_\_\_\_

**Note:** This procedure shall be available to workers, though not necessarily at the work location. Refer to the procedure, as needed, to ensure the task is completed properly.

**Note:** DUF6-X-CYP-2513-F01 must be under the control of the procedure user at the task location during periods of active performance. Each step or group of related steps of the procedure shall be read by the user or designated reader before performance of that step or activity. If procedure step sign-offs or data taking is required it shall be accomplished at the completion of the step.

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# PURPOSE

This procedure provides instruction for inspection and operation of cylinder handlers and straddle carriers. The cylinder handler or straddle carrier must be inspected before the first use during the shift, and found to be free of mechanical defects to ensure safe operation.

DUF6-X-TSR-004, 5.5.3.3 D

# SCOPE

This procedure applies to the normal inspection and operation of uranium hexafluoride (UF6) cylinder handlers and straddle carriers at Portsmouth.

Mid-America Conversion Services, LLC (MCS) Form DUF6-X-CYP-2513-F01, *Cylinder Handler/Straddle Carrier Inspection*, shall be used in-hand, in parallel with the use of this procedure. This procedure is also applicable to trained operator-technician personnel involved in movement of non-liquid uranium-bearing cylinders with the cylinder handler or straddle carrier.

DUF6-X-TSR-004, 5.5.3.2 C

# OTHER DOCUMENTS NEEDED

* DUF6-X-CYP-2513-F01, *Cylinder Handler/Straddle Carrier Inspection*

# RESPONSIBILITIES

Personnel responsible for performing this procedure:

* Cylinder Storage Yard Facility Manager
* Cylinder Yard Supervisor
* Operator Technician
* Spotter

# INITIAL CONDITIONS

* Equipment **shall** be inspected prior to use.
* Equipment preventive maintenance schedules **shall** be up-to-date.
* Personnel assigned to work in cylinder yards **or** operate cylinder-handling equipment **shall** be trained in accordance with the appropriate qualification requirements for the equipment.

DUF6-X-TSR-004, 5.5.3.2 C

# TOOLS AND EQUIPMENT

* Leather gloves
* Rags (to be used for fluid checks **or** to clean off areas for inspection)
* Starting Fluid

# PRECAUTIONS AND LIMITATIONS

## Precautions

* Any step in this procedure that cannot be performed as specified requires the procedure user to stop **and** contact the Cylinder Yard Supervisor for direction.
* The vehicle operator **shall** always start **and** stop the vehicle smoothly **and** avoid sharp turns.
* The vehicle operator **shall** set the parking brake when leaving the cab.
* Fluid levels **shall** be checked daily, prior to first use, when engine is cool.

Engine Oil

Radiator Coolant

* The vehicle operator **shall** be aware of overhead obstacles during pick up, transport, **and** delivery of load.
* Caution **shall** be exercised at all rail road crossings.
* Cylinder lift capacity **shall** be restricted to 31,654 lbs maximum for the NCH-35 Stacker.

## Limitations

WARNING

Cylinder Handling Equipment shall be attended by an Operator Technician  
while it is running.

* An Operator Technician **shall** be used for a spotter when handling cylinders with the cylinder handler **or** straddle carrier.
* Cylinder handlers **and** straddle carriers **shall** be operated on concrete pads, approved road surfaces, **and** approved transportation routes **only**. Operation outside these areas requires the Cylinder Yard Supervisor's permission.
* Pre-operational checks **shall** be implemented on approved cylinder handling equipment to identify fuel, hydraulic, **or** lube oil leaks **and** initiate corrective **or** preventive maintenance.

DUF6-X-TSR-004, 5.5.3.3 D

* UF6 cylinder movements shall use trained drivers.

DUF6-X-TSR-004, 5.5.3.2 C

* All cylinder movements using UF6 Cylinder Handler **or** Straddle Carrier **shall** be in accordance with DUF6-X-CYP-2501, *Handling, Transportation and Inspection of DOE 48-inch Diameter UF6 Cylinders* **or** DUF6-X-CYP-2505, *Transporting Uranium Oxide Cylinders.*

## Hazard Controls

* General hazards are captured in HCIC-X-16-0643, *Hazard Controls Identification Checklist (HCIC)* for DUF6-X-CYP-2513, *Inspection and Operation of UF6 Cylinder Handler or Straddle Carrier*.

# PROCESS

## Preparing for Field Work

Cylinder Yard Supervisor

1. **Conduct** a pre-task briefing with all parties who will be working on **or** supporting the task.

## Cylinder Handling Equipment Inspection

**Note**: Inspection steps may be completed in any logical order.

### Cylinder Handler or Straddle Carrier Inspection

Operator Technician

1. **Record** date **and** shift on DUF6-X-CYP-2513-F01, *Cylinder Handler/Straddle Carrier Inspection*.
2. **Record** equipment number of equipment being inspected at top of   
   DUF6-X-CYP-2513-F01.
3. **IF** a deficiency is discovered during the inspection,

**THEN** **Perform** the following:

* 1. **Immediately** **Report** deficiency to Cylinder Yard Supervisor.
  2. **IF** corrective action is taken,

**THEN Explain** action taken in “Remarks” section on   
DUF6-X-CYP-2513-F01.

* 1. **IF** corrective action cannot be taken,

**THEN** **Immediately** **Report** corrective action problem to Cylinder Yard Supervisor.

1. **Walk** completely around cylinder handler **or** straddle carrier to ensure no obstacles have been placed in the path of travel.

**Note**: After each inspection on Steps 8.2.1 [5] through [8], the appropriate box **shall** be marked on DUF6-X-CYP-2513-F01 to indicate the results of the inspection.

1. **Inspect** for damage, general appearance, **and** potential structural damage (such as cracked welds).
2. Visually **Inspect** tires for cuts, bulges, bruises, tire-tread wear, improper tire pressure, **and** wheel nuts in place.
3. Visually **Inspect** chain drive, wheels, **and** guards, if equipped.

**8.2.1 Cylinder Handler or Straddle Carrier Inspection** (continued)

1. **Inspect** fire extinguisher to verify acceptable operating pressure.
2. **IF** cylinder handler is being inspected,

**THEN** **Turn** battery switch “ON”.

1. **IF** HYSTER 400 Straddle Carrier is being inspected,   
   **THEN GO TO** Step 8.2.1[13].

WARNING

A 3-point contact shall be maintained while climbing onto equipment to prevent serious injury.

1. Visually **Inspect** engine oil as follows:
   1. **Remove** dirt **or** foreign matter that may contact outside of dipstick before removing dipstick from guard tube.
   2. **Check** oil level when engine is cold (before starting), if possible.
   3. **Mark** appropriate box on DUF6-X-CYP-2513-F01.
2. Visually **Inspect** hydraulic oil as follows:
   1. **IF** vehicle is equipped with hydraulic fluid gauge,

**THEN** **Perform** the following:

* + 1. **Ensure** engine is running.
    2. **Verify** needle is in normal operating range.
    3. **Mark** appropriate box on DUF6-X-CYP-2513-F01.
    4. **Go To** Step 8.2.1 [13].

WARNING

NCH-35 hydraulic oil tanks are pressurized. To prevent personnel injury vent valve should be opened to release pressure and closed before removing dipstick.

* 1. **Ensure** engine is not running,

**AND Remove** dirt **or** foreign matter in contact with outside of dipstick before removing dipstick from guard tube.

* 1. **Check** oil level with dipstick,

**AND** **Mark** appropriate box on DUF6-X-CYP-2513-F01.

1. **Ensure** gauges for engine oil, hydraulic oil and coolant are within operating parameters (HYSTER 400 Straddle Carrier only).

**8.2.1 Cylinder Handler or Straddle Carrier Inspection** (continued)

WARNING

Removing the radiator cap when engine is operating or when the engine is warm, may cause personnel injury or equipment damage.

1. Visually **Inspect** coolant as follows:
   1. **Verify** engine is not hot.
   2. **Remove** radiator cap.
   3. **Check** coolant level.
   4. **Ensure** radiator **or** expansion tank is filled to proper level.
   5. **Mark** appropriate box on DUF6-X-CYP-2513-F01.

**Note**: Supervision **shall** be notified when cylinder handler fuel level decreases to ¼ tank.

WARNING

Smoking or open flame near an open fuel tank may cause personnel injury or equipment damage.

1. **Ensure** vehicle has adequate fuel for job assignment,

**AND Mark** appropriate box on DUF6-X-CYP-2513-F01.

1. **Adjust** seat (to access controls), safety belt, **and** mirrors.
2. **Check** preventive maintenance due date **and** monthly inspection due date **AND Note** result on DUF6-X-CYP-2513-F01.
3. **Confirm** power light on Fire Suppression System Panel is flashing green (located on lower right side of cabinet),

**AND Mark** appropriate box on DUF6-X-CYP-2513-F01.

1. **IF** inspecting straddle carrier,

**THEN** **Go To** Step 8.2.3.

### Cylinder Handler Engine Operability Inspection

Operator Technician

**Note**: When ignition key is placed to ON, a buzzer will be heard **and** a red “NOT SAFE TO OPERATE” light will illuminate **until** air pressure increases above 60 psig.

1. **Place** ignition key to ON.
2. **Verify** emergency brake light **and** circuit light illuminate.
3. **Ensure** parking brake is applied (to prevent vehicle from moving during an inspection) **and** transmission is in neutral.

WARNING

The cylinder handler shall be attended while it is running.

1. **IF** weather is mild **or** engine is still warm,

**THEN** **Go To** Step 8.2.2 [6].

1. **IF** weather is cold,

**THEN** **Spray** starting fluid in air intake for approximately two seconds.

Caution

Engaging the starter for more than 15 seconds may cause equipment damage. Starter damage may occur if starter is not allowed to cool between starting attempts.

1. **Place** ignition key to START,

**AND Release** when either of the following occurs:

Engine starts

15 seconds have passed

Caution

If oil pressure does not increase within approximately 10 seconds after start or drops to zero during operation, the engine shall be stopped to prevent engine damage. If a cylinder is being moved, the cylinder shall be safely lowered before stopping engine.

1. **IF** engine started in Step 8.2.2 [6],

**THEN** **Perform** the following:

* 1. **Verify** gauges are in normal operating range**.**
  2. **Verify** oil pressure increases within approximately 10 seconds of engine start.

**8.2.2 Cylinder Handler Engine Operability Inspection** (continued)

* 1. **IF** no increase in oil pressure is observed,

**THEN** **Perform** the following:

* + 1. **Immediately** **Shut** theengine OFF.
    2. **Stop** and **Notify** Cylinder Yard Supervisor.
  1. **Mark** the appropriate box on DUF6-X-CYP-2513-F01.

Caution

Excessive engine wear can occur if the engine is not allowed to warm up before operation.

Only three unsuccessful starts may be attempted.

1. **IF** engine failed to start in Step 8.2.2 [6],

**THEN** **Perform** the following:

* 1. **Wait** at least two minutes.
  2. **Repeat** Steps 8.2.2 [1] through[7](no more than three times total).
  3. **IF** engine fails to start after third attempt,

**THEN** **Stop** and **Notify** Cylinde**r** YardSupervisor.

1. **Go To** Section 8.2.4.

### Straddle Carrier Engine Operability Inspection

Operator Technician

1. **Verify** Shift Lever is in neutral.
2. **DePress** accelerator pedal slightly.
3. During cold weather **Spray** starting fluid into air intake for two (2) seconds.

Caution

Do not hold starter engaged for periods longer than approximately 10 seconds.

Only three unsuccessful starts may be attempted.

1. **Start** engine as follows:
   1. **Press** high temp/low pressure oil over-ride button.
   2. **Place** ignition key to START in clockwise motion**.**

**8.2.3 Straddle Carrier Engine Operability Inspection** (continued)

* 1. **Release** when either of the following occurs:

Engine starts

10 seconds have passed

1. **IF** engine starts,

**THEN Perform** the following:

* 1. **Release** high temp/low pressure oil over-ride button.
  2. **Observe** gauges for operability.
  3. **Report** any unusual gauge response to supervision.

1. **IF** engine failed to start in Step 8.2.3 [4],

**THEN** **Perform** the following:

* 1. **Wait** at least one minute.
  2. **Repeat** Step 8.2.3 [4] (no more than three times total).
  3. **IF** engine fails to start after third attempt,

**THEN** **Stop** and **Notify** Cylinder Yard Supervisor.

1. **WHEN** Section 8.2.3 is complete,

**THEN Mark** appropriate box on DUF6-X-CYP-2513-F01.

### Continued Equipment Inspection

1. With engine running, **Listen** for unusual noises.
2. **IF** unusual noises are noticed,

**THEN** **Immediately** **Shut Down** engine,

**AND Notify** Cylinder Yard Supervisor.

1. **Check** exhaust system for leaks **and** excessive smoke**,**

**AND Mark** appropriate box on DUF6-X-CYP-2513-F01.

1. **Ensure** insulation is properly attached to exhaust system

**AND Mark** appropriate box on DUF6-X-CYP-2513-F01.

1. **Allow** engine to idle **until** water temperature reaches approximately 130°F.
2. **IF** inspecting cylinder handler,

**THEN** **Allow** engine to idle **until** the air pressure reaches at least 60 psig.

1. **IF** water temperature does not reach 130°F **or** (if inspecting cylinder handler) air pressure does not reach 60 psig,

**THEN** **Perform** the following:

* 1. **Stop** and **Notify** Cylinder Yard Supervisor.
  2. **Mark** appropriate box on DUF6-X-CYP-2513-F01.

1. **Verify** parking brake is applied by engaging either forward **or** reverse gear **AND Verify** resistance to movement.
2. **IF** inspecting Cylinder Handler,

**THEN** **Inspect** Air Control as follows:

* 1. **Set** air control to ON.
  2. **Verify** operation of the following:
* Side-shift lever
* Pile-slope lever
* Arm-rotate lever
* Hoist lever
* Carriage-rotate lever
  1. **Mark** appropriate box on DUF6-X-CYP-2513-F01.

**8.2.4 Continued Equipment Inspection** (continued)

1. **Verify** operation of hydraulics,

**AND Mark** appropriate box on DUF6-X-CYP-2513-F01.

**Note**: Due to the configuration of cylinder handling equipment, another person located outside the vehicle may be necessary to verify that the lights **and**/**or** signals are operating properly.

1. **Verify** lights (front, rear), carriage (Cylinder Handler **only**), signals, beacon, windshield wiper, horn, etc. are in proper operating condition as follows:
   1. **Verify** operation of lights **and** signals.
   2. **Verify** horn operability.
   3. **Verify** windshield wiper operability.
   4. **IF** necessary,

**THEN Clean** and **Adjust** windows **and** mirrors.

* 1. **Mark** appropriate boxes on DUF6-X-CYP-2513-F01.

1. **Remove** any unnecessary combustible items in **or** on the cylinder handling equipment (e.g., paper, rags),

**AND Mark** appropriate box on DUF6-X-CYP-2513-F01.

1. **Inspect** for signs of Fluid Leaks as follows:
   1. **Inspect** for signs of fuel leaks, hydraulic fluid leaks, transmission oil leaks, **and** lube oil leaks.

DUF6-X-TSR-004, 5.5.3.3 D

* 1. **Mark** appropriate box in DUF6-X-CYP-2513-F01.

## Approval

Operator Technician

1. **Complete** and **Sign** DUF6-X-CYP-2513-F01.

Cylinder Yard Supervisor

1. **Review** DUF6-X-CYP-2513-F01,

**AND Perform** the following:

* 1. **Determine** whether cylinder handler is approved for use.
  2. **Indicate** approval **or** disapproval for use on DUF6-X-CYP-2513-F01.
  3. **Sign** DUF6-X-CYP-2513-F01.

1. **IF** cylinder handler is not approved,

**THEN** **Contact** Garage Supervisor,

**AND** **Schedule** maintenance.

## Stacking Cylinders Using Cylinder Handlers

Caution

Cylinders placed into a storage configuration as determined by the Facility Manager shall be stored on concrete, asphalt, or a cylinder-support fixture approved by Facility Engineering.

WARNING

Cylinder lift capacity shall be restricted to 31,654 lbs. maximum for the NCH-35 Stacker.

Cylinder Handler Operator

1. **IF** deficiencies **or** discrepancies are found during Cylinder Handler operation, **THEN** **Perform** the following:
   1. **Place** load in a safe condition.
   2. **Stop** and **Notify** Cylinder Yard Supervisor.

WARNING

To prevent contact with overhead obstacles, the Cylinder Handler head   
should be raised no higher than necessary for movement.

1. **Move** Cylinder Handler to desired location.

***8.4 Stacking Cylinders Using Cylinder Handlers*** (continued)

Operator Technician

1. **Ensure** cylinder to be moved is on Cylinder Relocation Authorization Form.

Cylinder Handler Operator

1. **Position** head over cylinder, as directed by spotter on ground.
2. **WHEN** head is in desired location,

**THEN Release** hoist lever.

1. **Move** clamp lever to CLOSE **until** green Grapple Indicator light illuminates.
2. **Pick Up** cylinder using the appropriate controls as directed by spotter on ground.
3. **IF** cylinder is to be driven to another location,

**THEN** **Perform** the following:

* 1. **Tilt** head **until** parallel with ground.
  2. **Raise** or **Lower** boom **until** cylinder is just high enough to clear obstacles on ground.
  3. **WHEN** moving cylinders a considerable distance,

**THEN Perform** the following:

* + 1. **Turn** cylinder sideways (perpendicular to boom)**.**
    2. **Move** boom completely in to prevent boom from twisting **and** possibly cracking.

1. **Move** cylinder to desired location (refer to Attachment A, *Cylinder Stacking Configuration*, for stacking configuration) adhering to authorized cylinder transport routes (see Attachment B, *UF6 Cylinder Transportation Routes)*.

DUF6-X-TSR-004, 5.5.3.2 A

**Note**: Full 10-ton **and** 14-ton cylinders can be stacked no more than two high.   
Full 2.5-ton cylinders can be stacked no more than three high.   
Empty cylinders can be stacked no more than three high.

1. **Lower** cylinder using appropriate controls as directed by spotter on ground.
2. **Open** grappler tines fully.
3. **Verify** tines “OPEN” **and** yellow indicator light on Cylinder Handler console is ON.
4. **Raise** head clear of cylinder.

## Moving Cylinders Using Straddle Carriers

### Cylinder Pick Up and Transportation

Straddle Carrier Operator

1. **IF** deficiencies **or** discrepancies are found during Cylinder Handler operation, **THEN** **Perform** the following:
   1. **Place** load in a safe condition.
   2. **Stop** and **Notify** Cylinder Yard Supervisor.

**Note**: The engine **shall** be at idle before engaging the hydraulic pump.

Caution

A designated spotter shall be present prior to moving straddle carrier.

1. **Position** straddle carrier over cylinder using appropriate controls as directed by spotter on ground.

**Note**: Ground personnel **shall** ensure cylinder to be moved is on the cylinder Relocation Authorization Form.

1. **Set** parking brake.
2. **Place** shift lever in neutral.
3. **Engage** hydraulic hoist pump.
4. **Close** swing shoe to cylinder wall contact “IN” position to attain proper pre-lift contact with cylinder lugs.

WARNING

Lift shall be made only after approval from spotter.

Spotter

1. **Verify** proper lift configuration.
2. **Notify** driver to continue lifting cylinder.

Straddle Carrier Operator

1. **Move** cylinder to desired location following authorized cylinder-transport routes (see Attachment B, *UF6 Cylinder Transportation Routes*).

DUF6-X-TSR-004, 5.5.3.2 A

### Cylinder delivery

Spotter

1. **Direct** driver to pre-designated cylinder-delivery location.

Straddle Carrier Operator

1. **Stop** where directed.
2. **Lower** cylinder.

Spotter

1. **Verify** cylinder contact with ground retainer.

Straddle Carrier Operator

1. **WHEN** directed by spotter,

**THEN Release** brakes,

**AND Move** straddle carrier away from cylinder.

# RECORDS

Records generated or received as a result of performing this procedure must be submitted to Records Management and Document Control for retention **and** disposition in accordance with DUF6-U-DMP-0001, *Controlled Document Procedure*, **and** DUF6-U-DMP-0002, *Records Management Procedure*.

* DUF6-X-CYP-2513-F01, *Cylinder Handler/Straddle Carrier Inspection*

# REFERENCES

* *Director’s Final Findings and Orders* (latest revision)
* DUF6-U-QAP-0022, *Time Out/Stop Work*
* DUF6-U-CYP-0001, *Access Control for the Paducah and Portsmouth DOE UF6 Cylinder Storage Yards*
* DUF6-U-CYP-0002, *DOE UF6 Cylinder Storage Yards Combustible Material Control Program*
* DUF6-U-CYP-0010, *Paducah and Portsmouth UF6 Cylinder Storage Yard Management*
* DUF6-U-DMP-0001, *Document Control Procedure*
* DUF6-U-DMP-0002, *Records Management Procedure*

**10 REFERENCES** (continued)

* DUF6-U-SHP-0102, *General Safety Rules*
* DUF6-X-CYP-2501, *Handling, Transportation and Inspection of DOE 48-inch Diameter UF6 Cylinders*
* DUF6-X-CYP-2505, *Transporting Uranium Oxide Cylinders*
* DUF6-X-TSR-004, *Technical Safety Requirements for the DUF6 Conversion Project Cylinder Storage Yards, Piketon, Ohio*
* USEC-651, Uranium Hexafluoride: *A Manual of Good Handling Practices*, (latest revision)

# DEFINITIONS

**CID** Cylinder Information Database

**DFF&O** Director’s Final Findings & Orders

**DOE** Department of Energy

**DUF6** Depleted Uranium Hexafluoride

**Empty** a cylinder with a net weight of zero

**MCS** Mid-America Conversion Services

**Psig** Pounds per Square Inch Gauge

# REVISION HISTORY

|  |  |  |
| --- | --- | --- |
| **Revision Number** | **Effective Date** | **Summary of Changes** |
| 0 | 02/28/17 | Incorporated global changes approved by MCS. |
| 1 | 03/21/19 | Added action step for HYSTER 400 being inspected and ensure all components are within operating parameters in section 8.2.1. Updated step references in section 8.2.1. Updated Form F01 to reflect changes in procedure. Removed disclaimer on cover page. |

# ATTACHMENTS

Attachment A, *Cylinder Stacking Configuration*

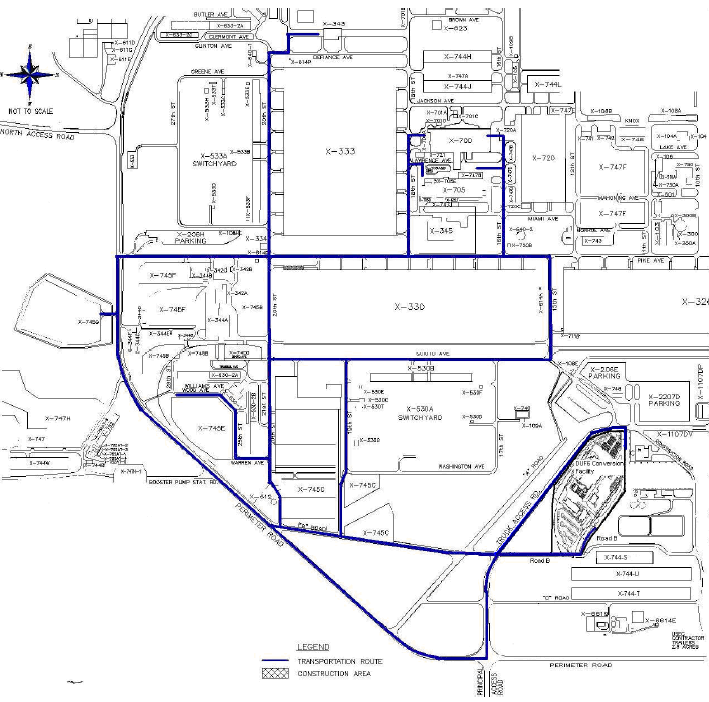
Attachment B, *UF6 Cylinder Transportation Routes*

## Attachment A, Cylinder Stacking Configuration

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## Attachment B, UF6 Cylinder Transportation Routes

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