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| TITLE: In-Storage Inspection of 30” & 48” DOE UF6 Cylinders | DUF6-X-CYP-2502 | Rev. 2 |
| DOCUMENT TYPE: Technical Procedure | PREPARER: M. Eberle | Page 1 of 16 |
| SUBJECT MATTER AREA: Cylinder Yards | CONCURRENCE / DATE: See Form 4320. | |
| OWNER: Logistics Manager | APPROVED BY / DATE: T. Warren / Refer to 4320. | |
| \_X\_USQ Required \_\_ Categorically Excluded | EFFECTIVE DATE: 02/24/2021 | |
| FORC REVIEW REQUIRED? \_\_ Yes \_X\_ No | PERIODIC REVIEW: 2 years | |

Usage Requirements

Information Contained Within

**DOES NOT CONTAIN**

**OFFICIAL USE ONLY EXPORT CONTROLLED INFORMATION**

Reviewed by: Beth A. Hummel-Keener Date: 09/01/16

Reference  Level 2 UET for: Attachments A, B, C\_\_  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:** Attachments A, B and C 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.

**DISCLAIMER**

This document was prepared by Mid-America Conversion Services, LLC (MCS) under Department of Energy (DOE) Contract DE-EM0004559, and is intended for use solely in conjunction with the Depleted Uranium Hexafluoride (DUF6) Conversion Project. The information contained herein shall not be disclosed, duplicated, or released in whole or in part for any purpose other than the DUF6 Conversion Project without the express written consent of the U.S. DOE and MCS.

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# PURPOSE

This procedure provides directions for conducting baseline, periodic (daily, annual, quadrennial), and “special” visual in-storage inspections of 30-inch and 48-inch diameter U.S. Department of Energy (DOE) uranium hexafluoride (UF6) cylinders in long-term storage in DOE X-745C, X-745E, and X-745G cylinder storage yards.

DUF6-X-TSR-004, 5.5.3.3 A & B

# SCOPE

This procedure applies to inspection of UF6 cylinders in long-term storage that are owned by the DOE and stored in the Portsmouth DOE X-745C, X-745E, and X-745G UF6 cylinder storage yards. This procedure applies to all models of DOE 30-inch and 48-inch cylinders.

Operator technician representation shall be included during the planning, execution, and closeout of UF6 cylinder-related work activities.

# OTHER DOCUMENTS NEEDED

* CID Generated DOE UF6 Cylinder Information Database Inspection Requirements Detail with Defects
* DUF6-U-QAP-0005, *Issues Management*
* DUF6-U-CYP-0008, *Decontamination of Non-Fissile UF6 and Non-PCB Cylinder Valves and Plugs and/or Shells*
* DUF6-U-CYP-0001, *Access Control For the Paducah And Portsmouth DOE UF6 Cylinder Storage Yards*

# RESPONSIBILITIES

Personnel responsible for performing this procedure:

* Logistics Manager
* Facility Manager
* Cylinder Yard Supervisor
* Cylinder Yard Operator Technician
* Cylinder Storage Yard (CSY) Administrative Assistant

# INITIAL CONDITIONS

**Note**: The cylinder inspection periodicity should be based on cylinder history, cylinder handling activities, **and** environmental conditions to which the cylinder array is subjected.

The cylinder array should be arranged such that the cylinders can be viewed with sufficient ability as to determine the cylinder integrity. This may be accomplished with aisle spacing, periodic movement of cylinders, etc., **but** is left to the discretion of the Logistics Manager.

All cylinders containing greater than **or** equal to 1 wt. % 235U **and** greater than **or** equal to 15 grams 235U **shall** require periodic inspection for Nuclear Criticality Safety (NCS).

NCSE-SM-ER WM-006R06 #6.5.2

* Cylinder inspection frequency (daily, annual **or** quadrennial) has been determined **and** scheduled by the DOE UF6 Cylinder Information Database (CID).
* Periodic inspections **shall** be performed on fissile cylinders, according to CID, to verify cylinder integrity **and** to identify deteriorating cylinders.

DUF6-X-TSR-004, 5.5.3.3A&B

NCSE-SM-ERWM-006R06 #6.5.2

* Cylinder integrity may be verified by visual inspections of the cylinder walls to ensure there are no identifiable leakage paths for materials to enter into **or** exit from the cylinder.

**Note**: In the event of verified leakage paths, corrective measures **shall** be implemented as soon as practicable.

* **IF** any leakage paths are identified,   
  **THEN** corrective maintenance **shall** be performed.

DUF6-X-TSR-004, 5.5.3.3A&B

NCSE-SM-ERWM-006R06 #6.5.2

# TOOLS AND EQUIPMENT

The following equipment may be needed during cylinder inspection. This list is not comprehensive **and** there is no requirement to have all this equipment in the cylinder yard during all activities.

* Mirror with extension
* Flashlight
* Ruler **or** straight edge
* Tape measure
* CID printout listing any cylinder defects
* Inspection Check sheets

# PRECAUTIONS AND LIMITATIONS

## Precautions

* No climbing on cylinders.
* If visible signs of PCB paint is observed on the ground, in the main isle, **and/or** within fifteen (15) feet on either side of the cylinder, then the observation **shall** be documented on the inspection report **and** the Cylinder Yard Supervisor notified.
* No casual contact with cylinder surfaces unless work activity is authorized by procedure **and** the Radiological Work Permit (RWP)..
* Standoff distances **shall** be maintained between UF6 cylinders and vehicles left unattended (i.e., when personnel are not within the CYLINDER STORAGE YARD). (See Attachment D, *Safe Standoff Distances*.)

DUF6-X-TSR-004, 5.5.3.4 D

## Limitations

* Cylinder monitoring **shall** be implemented with appropriate corrective **or** preventive maintenance activities initiated to provide for containment of material within the UF6 cylinder.

DUF6-X-TSR-004, 5.5.3.3A

* Cylinder monitoring **shall** be implemented with appropriate corrective **and** preventive maintenance activities initiated to provide for containment of material within the cylinder **and** exclusion of moderator (e.g., water) from cylinders containing fissile material **and** detection of degradation of the cylinder wall due to corrosion **or** other mechanisms.

DUF6-X-TSR-004, 5.5.3.3B

## Hazard Controls

* General hazards are captured in HCIC-X-16-0639, *Hazard Controls Identification Checklist (HCIC)* for DUF6-X-CYP-2502, *In-Storage Inspection of 30” & 48” DOE UF6 Cylinders*.

# Process

## Preparing for Field Work

Cylinder Yard Supervisor/CSY Administrative Assistant

1. **Use** CID to identify cylinders due for inspection.

Cylinder Yard Supervisor

1. **Ensure** all cylinders containing greater than **or** equal to 1% 235U enrichment **and** greater than a heel quantity of material are inspected at least every year.
2. **Ensure** all cylinders containing UF6 that exceed 700g of fissionable material 235U **and** greater than **or** equal to 1% 235U enrichment are inspected following an earthquake at the site to ensure position shift has not occurred.
3. **Conduct** pre-task briefing with all parties who will be working on **or** supporting the task.

Operator Technician

1. **Sign** and **Comply** with applicable RWP.

## Cylinder Inspections

**Note**: Cylinders in the cylinder yards do not require movement prior to in-storage inspection. **Only** those surfaces that are visible require inspection.

Operator Technician

1. **Review** CID Generated *"DOE UF6 Cylinder Information Database Inspection Requirements Detail with Defects"* form prior to performing a cylinder inspection to identify any previous defects.

WARNING

Climbing on cylinders while performing inspections may result in falls and severe injury.

1. **Evaluate** material condition of each cylinder by performing visual inspection.
2. **Compare** any identified defects against listed defect codes contained in Attachment B.

***8.2 Cylinder Inspections*** (continued)

1. **Immediately Notify** Cylinder Yard Supervisor of cylinders with defects represented by any of the following defect codes:

A01 - Hole in cylinder/evidence of visible leakage/contamination/reaction product

A13 - Crack in cylinder wall

B01 - Cylinder shell body in ground contact

B06 - Improper support

C01 - Evidence of leakage/contamination on valve

D01 - Evidence of leakage/contamination on plug

Cylinder Yard Supervisor

1. **IF** cylinder has a structural defect represented by defect codes A01 (hole in cylinder/evidence of visible leakage/contamination/reaction product), A13 (crack in cylinder wall), B01 (cylinder shell body in ground contact), **or** B06 (improper upper tier cylinder support),

**THEN** **Notify** Facility Manager.

Facility Manager

1. **IF** cylinder has a defect represented by defect code A01, A13, **or** B01 **and** cylinder is visibly leaking UF6,

**THEN** **Notify** Plant Shift Superintendent (PSS).

Cylinder Yard Supervisor

1. **IF** any leakage paths are identified,

**THEN** **Perform** corrective maintenance.

DUF6-X-TSR-004, 5.5.3.3A&B

NCSE-SM-ERWM-006R06 #6.5.2

1. **IF** 30-inch **or** 48-inch cylinder has a defect represented by defect code C01 **and/or** D01,

**THEN** **Evaluate** cylinder in accordance with DUF6-U-CYP-0008, *Decontamination of Non-Fissile UF6 and Non-PCB Cylinder Valves and Plugs and/or Shells*.

***8.2 Cylinder Inspections*** (continued)

**Note**: Preventive maintenance checks/activities are addressed in DUF6-X-CYP-2520, *Portsmouth UF6 Cylinder Maintenance Program*.

1. **IF** Cylinder Inspection Form with Defects indicates cylinder has defect(s) listed in Step 8.2 [4] **or** any other questionable defects,

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

* **Contact** MCS Engineering,
* **OR Notify** MCS Code Inspection to perform cylinder inspections per the applicable inspection procedures,
* **AND** **Obtain** a copy of the MCS Code Inspection Form.

1. **IF** cylinder has a defect code of C01 **or** D01,

**THEN** **Request** HST perform a field evaluation.

1. **IF** Code Inspection Form indicates that cylinder is rejected,

**THEN** **Contact** Facility Engineering to assess cylinder.

Facility Manager/Cylinder Yard Supervisor

* 1. **Perform** the following using Engineering's written assessments:
* **Update** CID,
* **Initiate** a Condition Report in accordance with DUF6-U-QAP-0005, *Issues Management*,
* **Ensure** cylinder is not returned to service.

1. **Repeat** Steps 8.2 [1] thru [11] for each successive cylinder to be inspected.

## Closing Out Work Documentation

Operator Technician

1. **Compare** codes for each inspected cylinder to recorded codes contained on CID Generated *“DOE UF6 Cylinder Information Database Inspection Requirements Detail with Defects*.”
   1. **IF** there are no omissions,

**THEN** **Go To** step 8.3 [2].

***8.3 Closing Out Work Documentation*** (continued)

* 1. **IF** there are any omissions of a previously identified defect code,

**THEN** **Re-Examine** cylinder.

* 1. **IF** code is not applicable after re-examination,

**THEN Remove** code on inspection completion.

1. **Enter** inspection data from hard-copy DOE UF6 Cylinder Information Database Inspection Requirements Detail with Defects into hand held tablets.
2. **Return** completed DOE UF6 Cylinder Information Database Inspection Requirements Detail with Defects to CSY Administrative Assistant/Cylinder Yard Supervisor.

Cylinder Yard Supervisor or Designee

1. **Review**, **Sign**, and **Date** paper inspection check sheets.
2. **File** original DOE UF6 Cylinder Information Database Inspection Requirements Detail with Defects.
3. **Review** and **Approve** inspection data in CID.

## Post-Performance Actions

CSY Administrative Assistant/Cylinder Yard Supervisor

1. **Enter** discrepancies discovered while inspecting cylinders, which require maintenance action, in CID within 10 working days.

# 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*.

* CID Generated DOE UF6 Cylinder Information Database Inspection Requirements Detail with Defects report, in accordance with site requirements

# REFERENCES

* 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-0008, *Decontamination of Non-Fissile UF6 and Non-PCB Cylinder Valves and Plugs and/or Shells*
* DUF6-U-CYP-0010, *Paducah and Portsmouth UF6 Cylinder Storage Yard Management*
* DUF6-U-DMP-0001, *Controlled Document Procedure*
* DUF6-U-DMP-0002, *Records Management* *Procedure*
* DUF6-U-QAP-0005, *Issues Management*
* DUF6-U-QAP-0022, *Time Out/Stop Work*
* DUF6-X-CYP-2520, *Portsmouth UF6 Cylinder Surveillance and Maintenance Program*
* NCSE-SM-ERWM-006R06, *Storing and Handling Large Cylinders of Uranium Hexafluoride Material*
* *Ohio EPA Director's Final Findings and Orders*, latest revision
* DUF6-PLN-040, *Integrated Safety Management Plan*
* DUF6-PLN-074, *Worker Safety and Health Program*
* DUF6-X-TSR-004, *Technical Safety Requirements for the DUF6 Conversion Project Cylinder Storage Yards, Piketon, Ohio*
* *Implementation of Additional Fire Controls Requirements Analysis*, K-TSO-56, October 3, 1997
* *Long Term Storage Cylinder Integrity Management Plan*, WETO-114, Oak Ridge, Tennessee, September 1992

**10 REFERENCES** (continued)

* *Methods and Results for Stress Analysis on 14-Ton, Thin-Walled Depleted UF6 Cylinders*, ORNITM-13308, October 1996
* *Uranium Hexafluoride: A Manual of Good Handling Practices*, USEC-651
* DUF6-X-DSA-003, *Documented Safety Analysis for the DUF6 Conversion Project Cylinder Storage Yards, Piketon, Ohio*

# DEFINITIONS

**CID** DOE UF6 Cylinder Information Database

**CII** DOE UF6 Cylinder Computerized Inspection Interface

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

**DMSA** DOE Material Storage Area

**DOE** Department of Energy

**HF** hydrogen fluoride

**MCS** Mid-America Conversion Services, LLC

**NCS** Nuclear Criticality Safety

**NCSE** Nuclear Criticality Safety Evaluation

**PORTS** Portsmouth Gaseous Diffusion Plant

**ppm** parts per million

**PSS** Plant Shift Superintendent

**RWP** Radiological Work Permit

**TSR** Technical Safety Requirement

**ATTENDED** -An object or activity is ATTENDED when a FIRE QUALIFIED INDIVIDUAL remains in visual contact with the object or activity, watches for abnormal conditions, is able to perform notification of emergency conditions per plant procedure, and is equipped with a communication device.

DUF6-X-TSR-004, 1.2 & 5.5.3.4 D

**FIRE QUALIFIED INDIVIDUAL** –An individual who is trained as a FIRE WATCH, but is not required to be independent from the work activity of concern and may concurrently monitor for fires and perform other duties.

DUF6-X-TSR-004, 1.2

**Heel** - The results from the transfer operation when a small mass of non-transferable material, known as the cylinder "heel," remains (25 lb. or less in a   
30-inch cylinder and 50 lb. or less in a 48-inch cylinder).

# REVISION HISTORY

|  |  |  |
| --- | --- | --- |
| **Revision Number** | **Effective Date** | **Summary of Changes** |
| 0 | 02/28/17 | Implemented all global changes approved by MCS. |
| 1 | 01/19/18 | Changed X-745G-1 to X-745G due to changes Cylinder Yard TSR document. Added Data Entry Clerk to section 4. |
| 2 | 02/24/21 | * Periodic Review - Intent changes throughout document updating Cylinder Yard Manager to Logistics Manager and Data Entry Clerk to CSY Administrative Assistant. * Updated inspection sheet title to DOE DUF6 Cylinder Information Database Inspection Requirements Detail with Defects throughout procedure. * Section 3 (and throughout procedure, if necessary)   + Deleted reference to cancelled documents, DUF6-X-OSU-002 and 003, and DUF6-U-CYP-0004.   + Updated procedure titles; DUF6-U-QAP-0005 and DUF6-U-CYP-0008 * Section 10 (and throughout procedure, if necessary)   + Updated procedure titles of DUF6-U-DMP-0001 and 0002, DUF6-PLN-040, and DUF6-X-TSR-004,   + Corrected procedure number of DUF6-U-QAP-0022. * Updated Attachment B and title throughout procedure. * Updated Attachment C and title throughout procedure. |

# ATTACHMENTS

Attachment A, *CID Generated* *DOE UF6 Cylinder Information Database Inspection Requirements Detail with Defects* (Sample)

Attachment B, *Alternate DOE 48-Inch Diameter & CV UF6 Cylinder Inspection/Maintenance Checksheet and Instructions*

Attachment C, *Alternate DOE 30-Inch Diameter UF6 Cylinder Inspection/Maintenance Checksheet and Instructions*

Attachment D, *Safe Standoff Distances*

## 

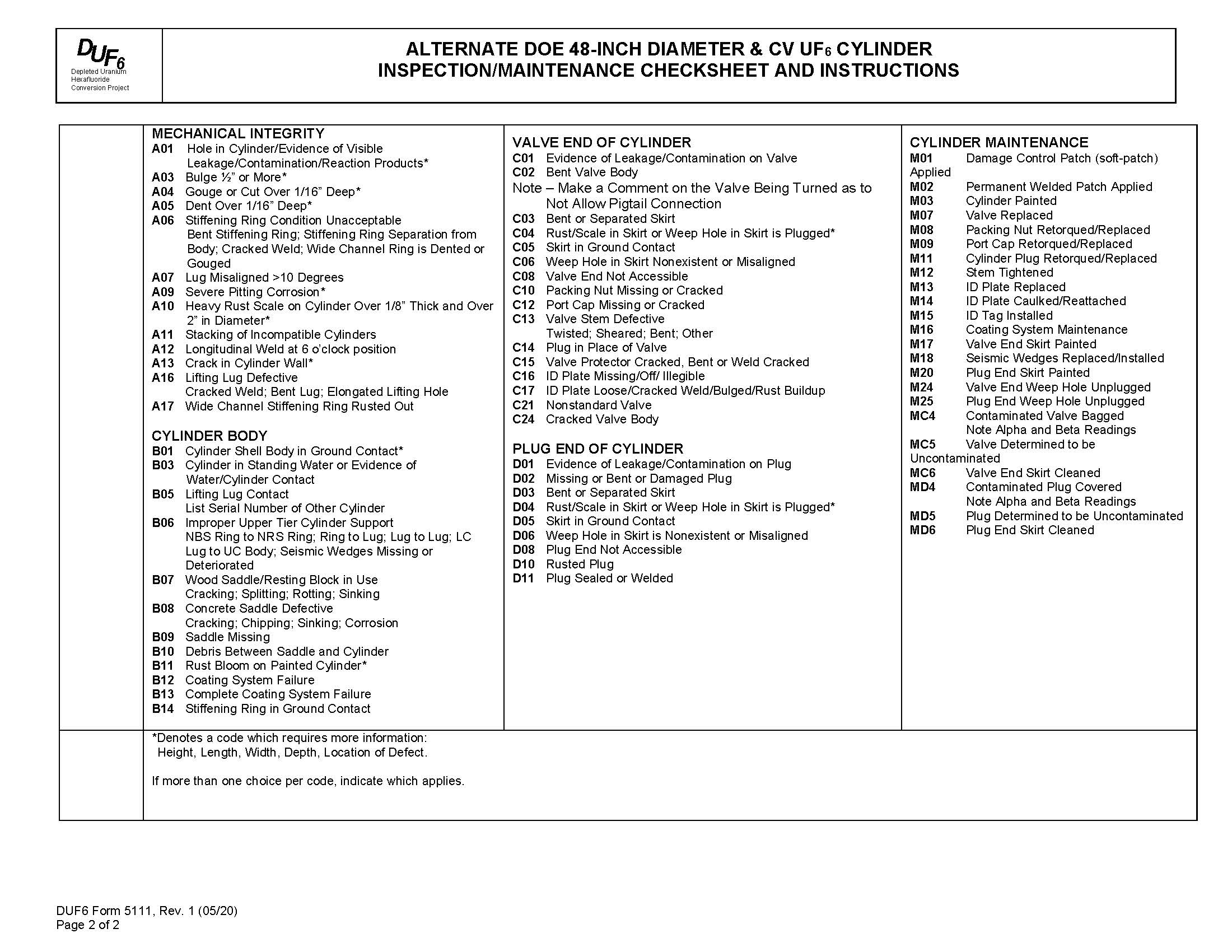
## Attachment A, CID Generated DOE UF6 Cylinder Information Database Inspection Requirements Detail with Defects Page 1 of 1

SAMPLE

## Attachment B, Alternate DOE 48-Inch Diameter & CV UF6 Cylinder Inspection/Maintenance

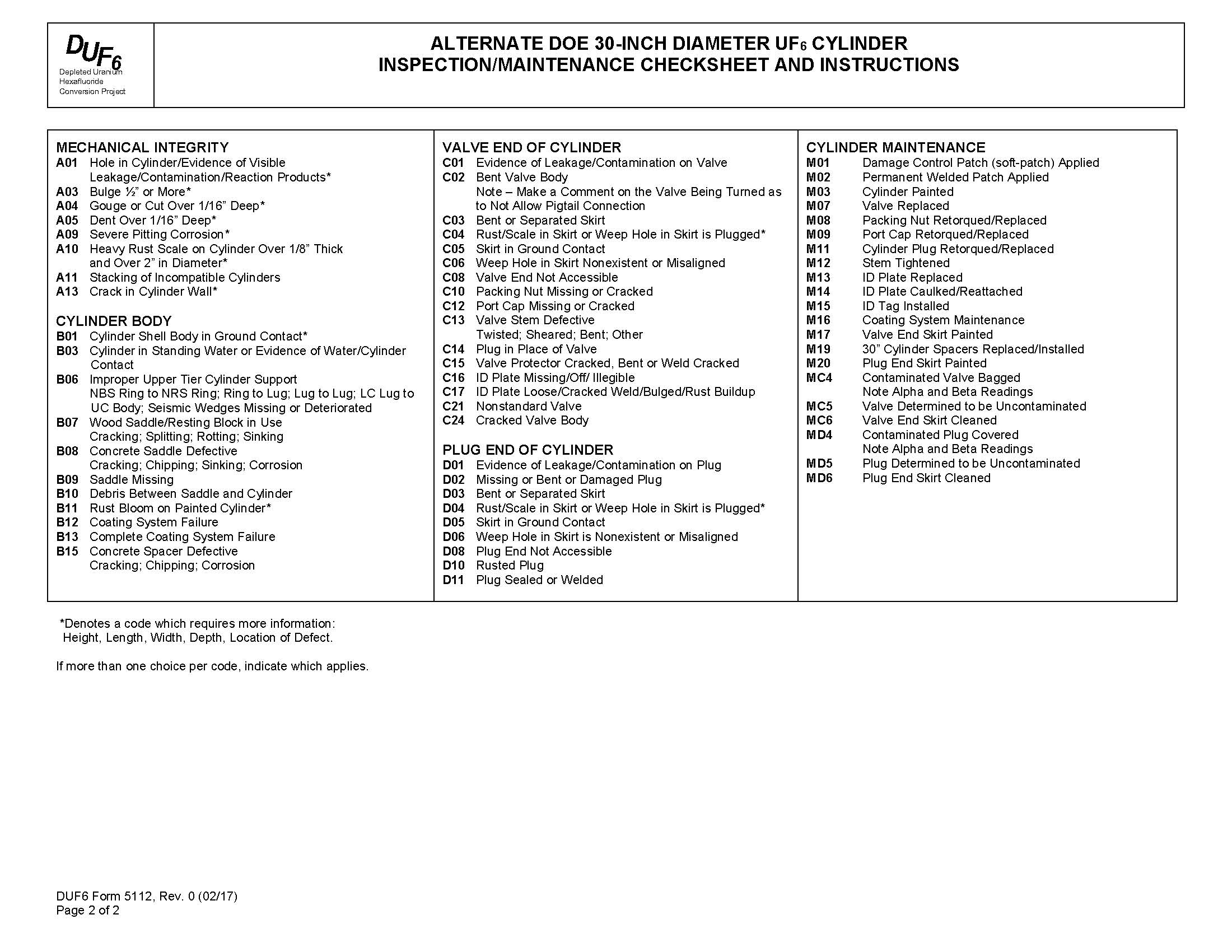
## Checksheet and Instructions

***Page 1 of 1***



## Attachment C, Alternate DOE 30-Inch Diameter UF6 Cylinder Inspection/Maintenance Checksheet and Instructions

***Page 1 of 1***



## Attachment D, Safe Standoff Distances

***Page 1 of 1***

Safe Standoff Distances Between UF6 Cylinders and Various Types of Unattended Vehicles/Equipment in the Cylinder Storage Yards

|  |  |
| --- | --- |
| **Vehicle/Equipment** | **Distance** **(ft)** |
| Vehicles with greater than 250 and less than **or** equal to 450 gallons of fuel capacity | 40\* |
| Vehicles with greater than 50 and less than **or** equal to 250 gallons of fuel capacity | 25\* |
| Vehicles/equipment with less than **or** equal to 50 gallons of fuel capacity | 10\* |

\* Applicable when personnel are not present in the Cylinder Storage Yard

*DUF6-X-DSA-003, Table 4-3*

**END OF DOCUMENT**