Technical Description for DOE Complex
Procurement of 208-Liter (55-Gallon),
Removable Head,
Performance Oriented Package (POP)
And
7A Type A, Carbon Steel Drum with Closure Ring

55-Gallon Drum Specification PMC–D01
Revision 1

October 4, 2017

Packaging Management Council
1.0 Scope

This document identifies standardized specifications for the 55-gallon, removable head steel drums to be procured within the DOE complex. The drums shall meet DOT non-bulk Performance-Oriented Packaging (POP) and 7A - Type A standards for hazardous material and non-fissile/fissile-excepted radioactive materials provided in Title 49 Code of Federal Regulations.

1.1 Regulatory Requirements

Each drum shall meet the regulatory requirements in 49 CFR 178.504, Standards for Steel Drums, tested to 49 CFR 178 Subpart M, Testing of Non-Bulk Packagings and Packages, and marked to 49 CFR 178.503, Marking of Packages. Each drum shall also meet the regulatory requirements identified in 49 CFR 178.350 Specification 7A; General Packaging, Type A.

1.2 Drum Usage

Each drum is designed and tested so that it can be used to store and transport solid radioactive materials and waste (including transuranic) and to transport liquid and solid hazardous materials and hazardous wastes.

Some of these drums shall be used to transport on site quantities of transuranic waste greater and the A₁ and A₂ quantities identified in the regulations (49 CFR 173.435). These transfers are conducted within the DOE site boundaries and under a site-approved onsite Transportation Safety Document (TSD).

2.0 Drum Specifications

2.1 Description of Base Drum Requirements

The minimum design requirements for an open head 55-gallon carbon steel drum identified in Section 2.1.1, shall meet the applicable regulatory requirements in 49 CFR 178 Subpart L, Non-bulk Performance-Oriented Packaging Standards and shall be qualified to meet both 49 CFR 178 Subpart M, Testing of Non-bulk Packagings and Packages and 49 CFR 178.350, Specification for Packagings for Class 7 (Radioactive) Materials. Section 2.2 of this specification provides additional features that, when applicable boxes are checked; customize the drum to a User’s specific requirements. For each drum, whether it is a basic drum or the basic drum with applicable options, the supplier shall provide the appropriate documentation, e.g., test reports, and certification showing that all requirements are met.
### 2.1.1 Basic Configuration

<table>
<thead>
<tr>
<th><strong>Drum Type</strong></th>
<th>Open Head (1A2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capacity</strong></td>
<td>208 L (55-gallon)</td>
</tr>
<tr>
<td><strong>Material of Construction</strong></td>
<td>ASTM A1008 (or equivalent) carbon steel (Minimum thickness requirements in 49 CFR 173.28(b)(4) apply to drums intended for reuse.)</td>
</tr>
<tr>
<td><strong>Lid Gasket (glued):</strong></td>
<td>EPDM, EPT, or equal Round (Meets Type A conditions of –40°F to +158˚F (49 CFR 173.412 (c))</td>
</tr>
<tr>
<td><strong>Rolling Hoops:</strong></td>
<td>Three (The body of the drum shall have a minimum of two expanded rolling hoops or two separate rolling hoops. If there are separate rolling hoops, they must be fitted tightly on the body and so secured that they cannot shift. Rolling hoops are not be spot-welded.)</td>
</tr>
<tr>
<td><strong>Overall Height</strong></td>
<td>35” Maximum</td>
</tr>
<tr>
<td><strong>Overall Diameter Including the Closure Ring</strong></td>
<td>24” Maximum</td>
</tr>
<tr>
<td><strong>Bung Fittings</strong></td>
<td>3/4” fitting with flange plug (see section 2.2 for specific manufacturer)</td>
</tr>
<tr>
<td><strong>Bung Gasket</strong></td>
<td>EPDM, EPT, or equal (Meets Type A conditions of –40°F to +158˚F (49 CFR 173.412 (c))</td>
</tr>
<tr>
<td><strong>Closure Ring</strong></td>
<td>The closure ring shall be the same design that was tested when qualifying the packages to meeting the requirements of 49 CFR 178 Subpart M, Testing of Non-bulk Packagings and Packages and 49 CFR 178.350, Specification for Packagings for Class 7 (Radioactive) Materials. Once tested the Certifying organization shall control the design and fabrication to ensure consistency of fabrication.</td>
</tr>
<tr>
<td><strong>Bolt and Nut Type</strong></td>
<td>Zinc plated steel with a hex head. 5/8-inch x 4-inch long. Shall meet ASTM A307. Manufacturer's markings shall be indicated on the head per applicable standard.</td>
</tr>
<tr>
<td><strong>Tamper Indicating Device (TID) requirements (wire sear)</strong></td>
<td>Each bolt shall have nominal 5/16” hole drilled on center at a minimum of 1/2” from the tip of the threaded end.</td>
</tr>
<tr>
<td><strong>Exterior Coating</strong></td>
<td>User defined (min. thickness 0.4 mil) – Coverage shall be uniform and free of runs, sags, streaks, blisters, cracks, or de-lamination.</td>
</tr>
<tr>
<td><strong>Interior Coating (lining)</strong></td>
<td>Rust inhibitor (min. thickness 0.4 mil) – Coverage shall be uniform and free of runs, sags, streaks, blisters, cracks, or de-lamination.</td>
</tr>
<tr>
<td><strong>Packing Group for solids:</strong></td>
<td>PG I</td>
</tr>
</tbody>
</table>
Maximum Net Payload: 400 kg for POP packaging (See Section 3).
For solid radioactive materials using DOE forms 1, 2, and 3 materials the maximum payload is user defined (See Section 3).

| Packing Group for liquids | PG II |
| Specific Gravity          | 1.4 minimum |
| Minimum Hydrostatic Test Pressure | 100 kPa |

**POP Marking Requirements**
Each drum shall be marked in accordance with 49 CFR 178.3, and 49 CFR 178.503, Marking of Packagings.

**Type A Marking Requirements**
Each drum shall be marked in accordance with 49 CFR 178.3. The Supplier shall not apply the marking to the drum as required by 49 CFR 178.350(b). Instead the Supplier shall provide the marking on a fade resistant label having a permanent adhesive able to withstand all types of weather conditions with fade resistance ink. The Supplier shall provide a label for each Type A drum purchased.

**Additional Marking Requirements**
Each drum shall have stenciled 6-inches left of the drum seam and between the top and middle rolling hoop the assigned lot number, purchase order number or sites assigned catalog number, as specified below.

### 2.2 Options to the Basic Configuration

In this section are listed additional features that the DOE contractor may select that are either in addition to or replace features from the basic drum configuration identified in section 2.1.1.

**Drums Construction**
- Material of construction is user defined

**Gasket, ASTM D1056 (style)**
- EPDM Moon
- EPDM Multiseal
- EPDM Pinocchio style

**Bungs**
- 3/4” Trisure with flange and plug
- 3.4” Rieke with flange and plug
- 2” Rieke with flange and plug
- 2” Trisure with flange and plug

Note: Gaskets for bung(s) shall meet Type A temperature range (−40°F to +158°F)
Closure Ring Assembly
- 100% weld of lug nuts to ring
- Lever Lock Ring

Closure Bolt
- With 11/32" dia. hole in lieu of the nominal 5/16" dia.
- With nominal 5/16" dia. hole on center located 1-1/4" from tip of threaded end
- With two (2) 5/16" dia. Holes one in bolt head on center and the other 1-1/4" on center from tip of threaded end

Coatings – Exterior
- Standard color other than black, the color will be specified on the DOE contractor’s purchase order
- Alkyd enamel
- Special order (non-standard), this will be specified on the DOE contractor’s purchase order
- Powdered (baked)
- Epoxy phenolic
- 2-part epoxy

Coatings – Interior (linings)
- Epoxy/phenolic liquid coating
- Double epoxy/phenolic liquid coating
- 100% phenolic
- Primer
- Polyethylene
- Line-X
- Teflon Type

Liners
- Specific liners will be specified on the DOE contractor’s purchase order. These may be 4 or 6-mil poly bag, 90-mil rigid poly liner etc.

Filter Vents
- The diameter and manufacturer of the filter vents will be specified on the DOE contractor’s purchase order, e.g., ¾-inch Nuclear Filter Technologies.

Markings
- When a Type A Drum is purchased the supplier shall provide a label for each Type A drum, which states: "USA DOT 7A Type A". Markings shall be a minimum of ½" high or the size designated on the DOE contractor’s purchase order.
- User’s assigned serial number and/or catalog number

Drum Shipping Preparations/Handling
- Palletizing and secured with strapping
- New wood pallet
- Recycled wood pallets
3.0 Performance Requirements

3.1 Requirements

Whether the drum meets the basic configuration as identified in Section 2.1.1 or Section 2.2, Options to the Basic Configuration the Supplier shall meet these performance requirements.

- Each drum shall meet the UN performance requirements identified in 49 CFR subpart M - Testing of Non-bulk Packagings and Packages for both solids and liquids. The drums shall also meet performance requirements for Type A packagings identified in 49 CFR 178.350 (a) for solids using DOE forms 1, 2, & 3 as surrogate contents (see Section 3.2 for descriptions of DOE forms 1, 2, and 3.)
- The packagings shall be tested to meet the UN Performance Oriented Package for solids and liquids.
- All packagings designed to ship solids shall be tested at Packing Group I for solids and PGII for liquids
- All packagings that meet the required performance criteria shall be marked per 49 CFR 178.503.
- For solid hazardous waste and substances each package shall be tested using a 400 Kg maximum net payload.
- For solid radioactive materials using DOE forms 1, 2, and 3 as surrogate contents the maximum payload is defined by the DOE contractor.
- Gaskets used with the bungs; vents and/or the lid shall meet the temperature requirements identified in 49 CFR 173.412 (c).
- Each Type A drum shall be capable of meeting the pressure requirement identified in 49 CFR 173.412 (f).
- Each bolt used in the drum closure ring shall be subject to the Department of Energy Suspect Counterfeit Program.
- Each Type A drum shall be capable of withstanding the effects of any acceleration, vibration or vibration resonance that may arise under normal conditions of transport (49 CFR 178.608, Vibration Standard)

3.2 Descriptions of DOE Forms 1, 2, and 3 Non-fissile/fissile-excepted Radioactive Material that may be used as surrogate contents for testing

3.2.1 Form Number 1: Solids—any particle size
- A packaging qualified for these contents shall contain non-fissile/fissile-excepted radioactive contents of any representative particulate size.

3.2.2 Form Number 2: Solids—large particle size only (i.e., sand, concrete, debris, soil)
- Contents of a corresponding particulate size such as soil or construction debris. (Glass or plastic lab-ware having fine particulate available for dispersion does not fit this category and requires a packaging qualified for
fine particulate, Form Number 1.)

3.2.3 **Form Number 3: Solids—objects with no significant dispersible or removable contamination (for definition, see 49 CFR 173.443, "Contamination control")**
- Metals with activation products
- Forms of metals/alloys/compounds of uranium, thorium
- Solid materials with the radioactive material firmly fixed in place, possibly by the application of a fixing media (i.e., paint)
- Solidified material.

4.0 **Quality Program**
The DOE Packaging Management Council (PMC) and the Energy Facility Contractors Group (EFCOG) Supply Chain Quality Task Team (SCQTT) developed a, “Guidance Document for Tailoring the Applicable Quality Assurance Requirements for Department of Transportation Packaging.” This document guides the DOE contractor in describing how the QA and DOT SME work to tailor the applicable NQA-1 requirements that will be passed down to the packaging supplier to ensure that the technical requirements identified in this specification will be met. The tailored NQA-1 requirements shall be consistent with importance and/or complexity of the item being procured. When applicable NQA-1 requirements are developed, they will be attached to the procurement document along with these technical requirements for the procurement of a 55-gallon metal drum.

When DOT packaging (i.e., 55-gallon metal drum) is used for onsite transfers or in a nuclear facility and has been designated Safety Class or Safety Significant, the QA and DOT SMEs will work with the Nuclear Safety Basis Group to determine the technical and NQA-1 requirements needed to ensure performance of the safety function.

When a supplier cannot meet NQA-1 requirements that are attached to this specification for the procurement of a 55-gallon drum, the DOE contractor should follow the guidance provided in the U.S. Department of Energy, Office of Environmental Safety and Quality, Guidance for Commercial Grade Dedication, September 2011, that implements the ASME NQA-1-2008/2009a Part II: Quality Assurance Requirements for Nuclear Facility Applications, Subpart 2.14: Quality Assurance Requirements for Commercial Grade Dedication.

5.0 **Data Submittal Requirements**

5.1 **Data Submittal Requirements**
The Supplier shall submit an Initial Data Package (IDP) to the respective DOE contractor for review and approval with the proposal. Any changes to the design or testing configuration require a revised IDP to be submitted back to the DOE contractor for approval prior to the start of manufacturing. Section 5.1.1 sets forth the information and documentation that is required for the IDP.
5.1.1 Testing Configuration and Documentation for the IDP

Table 5.1.1 – A, Regulatory Tests lists all the applicable tests that POP and Type A Packages that shall be performed when determining compliance to the regulations.

<table>
<thead>
<tr>
<th>Required Test</th>
<th>“POP” Required Test</th>
<th>7A Type A required Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop Test</td>
<td>178.603</td>
<td>-</td>
</tr>
<tr>
<td>Water Spray Test</td>
<td>-</td>
<td>173.465 (b)</td>
</tr>
<tr>
<td>Free Drop Test</td>
<td>-</td>
<td>173.465 (c)</td>
</tr>
<tr>
<td>Stacking Test</td>
<td>178.606</td>
<td>173.465 (d)</td>
</tr>
<tr>
<td>Penetration Test</td>
<td>-</td>
<td>173.465 (e)</td>
</tr>
<tr>
<td>Reduction of ambient pressure</td>
<td>-</td>
<td>173.412 (f)</td>
</tr>
<tr>
<td>Vibration Capability</td>
<td>178.608</td>
<td>173.24a (a)(5)</td>
</tr>
<tr>
<td>Leakproofness Test</td>
<td>178.604</td>
<td>-</td>
</tr>
<tr>
<td>Hydrostatic Pressure Test</td>
<td>178.605</td>
<td></td>
</tr>
<tr>
<td>Production Leak Test</td>
<td>178.604</td>
<td>-</td>
</tr>
</tbody>
</table>

49 CFR 173 Subpart I, does not describe what is required in a test report for Type A Packaging and Packages. The supplier shall use 49 CFR 178.601(l), Records Retention, as a template when documenting Type A tests.

Table 5.1.1 – B, Initial Data Package Documentation, lists the objective evidence, i.e., documentation that the Supplier shall submit with their proposal.

<table>
<thead>
<tr>
<th>Documentation</th>
<th>POP Packaging</th>
<th>Type A¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested configuration documenting the materials of construction, tested design, dimensional characteristics, weight, closure and closure materials, and surrogate contents used during testing.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Type A documentation of testing (test report), including date, place of test, signature of testers, a detailed description of each test performed including equipment used, and the damage to each item of the containment system resulting from the tests</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>POP documentation of testing meeting 49 CFR 178.601(l), Records Retention</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Type A package when demonstration of compliance with tests authorized in 49 CFR 173.461, a detailed analysis, which shows that, for the contents being shipped, the package meets the pertinent design and performance requirements for a DOT 7A Type A specification package.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>When the Supplier has packaging that meets the DOE contractor’s technical requirements as part of the initial data package, the supplier shall provide the completed tests reports. But if the technical</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

¹ The information provided from the supplier manufacturer to the DOE contractor for Type A packagings shall be inclusive of the 49 CFR 173.415(a) requirements.
requirements provided require that the supplier perform the tests in table 5.1.1 – A, the supplier shall then submit a test plan and procedures as to how they will perform these tests.

5.1.2 Packaging Configuration Drawing
The Supplier as part of the initial data package shall submit a fabrication drawing showing the following elements:
- Materials of Construction
- Type of weld seam
- Type of chime used
- Hoop Placement
- Convexity of top (lid) and bottom
- Material type and thickness
- When a bung is used identify the manufacturer’s type of flange and gasket
- Type of gasket and design used in the lid
- Closure ring design, Lug requirements and placement, weld location, and bolt and nut. Also show location of hole in bolt for TID.
- Documentation describing: coating material used, surface preparation, application procedure used by Seller, coating manufacturer’s recommended application procedure, exterior dry film thickness (DFT), interior DFT, method and frequency of checking for holidays, and Material Safety Data Sheet (MSDS) for coating(s).

5.2 Shipment Data Submittal
Each order/shipment shall include a Certificate of Conformance showing the following:
- Buyer’s purchase order number
- POP and Type A design/model number
- Quantity of drums provided
- A statement indicating that the drums meet the requirements of the purchase order, this specification, and that no changes have been made to documentation package that was previously submitted to the DOE site.
- A listing of the complete DOT markings including those depicted on the drum bottom and side as well as the manufacturer’s identification markings.
- A statement certifying that the Seller has performed a final inspection in accordance with the Seller’s DOE-evaluated QA Plan
- A statement certifying that all the gaskets supplied have 75% of the shelf life remaining at the time of shipment and these gaskets have been stored in conditions recommended by their respective manufacturers
- Copies of Certified Material Test Reports (CMTRs)
- Gasket meets requirements of 173.412 (c)
- Drum and closure ring Material
- A copy of the drum closure instructions
- In-process and final Inspection Documents
- Exceptions or variances to the Purchase Order.

2 The Supplier shall have at the time of proposal submittal, a procedure documenting how their Certificates of Conformance are developed, reviewed, and approved.
6.0 Shipping Requirements

The drums shall be assembled and shipped with the top lid, closure ring, bolt, gasket, and locking nut in place. The bolt shall only be engaged sufficiently to retain the ring and placement of the locking nut shall be as specified to meet the performance requirements, but not tightened. As a precaution, the Supplier shall take the necessary action to equalize the pressure and prevent unnecessary pressurization of drums (e.g., place a strap over the curl) during transport. Drums shall be shipped in a closed transport vehicle (van trailer).

Preparation of drums for shipment shall be done in a manner that ensures containers arrive in a condition compliant with the requirements of this specification. This may require covering and/or separating containers with packing material. Care shall be taken to avoid damage to the outside coating. Care shall be exercised in loading the transport vehicle to prevent damage to the drums from contact with other palletized drums.