

Packaging Management Council

Technical Requirements for the Procurement of 55-Gallon (208 Liter), Carbon Steel, Removable Head Drums

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Packaging Management Council (PMC) Approvals



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1/27/2020
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1.0 INTRODUCTION

The Packaging Management Council (PMC) has prepared these Technical Requirements for use by DOE contractors. This document is part of the PMC's effort to standardize practices by most, if not all, contractors. This document, along with any contractor's site-specific requirements, can be utilized to meet Department of Transportation regulations and DOE orders. If not specifically used, this document may act as a guidance document for contractors to create their own technical requirements. This document has been produced by the PMC Steel Box Working Group. Any questions, comments, or suggested changes should be directed to the PMC Coordinator.

2.0 Scope

This document is the Technical Requirements for 55-gallon, carbon steel, removable head drums commonly procured by the Department of Energy (DOE) complex. The drums meet both DOT non-bulk Performance-Oriented Packaging (POP) for hazardous materials and Type A requirements for non-fissile/fissile-excepted radioactive materials per Title 49 Code of Federal Regulations.

2.1 Regulatory Requirements

Each drum shall meet the 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* and shall be marked in accordance with 49 CFR 178.350 (b) and (c).

2.2 Drum Usage

The drum is designed to transport liquid and solid hazardous materials and hazardous wastes in commerce. Each drum is also designed and tested so that it can be used for storage incidental to transportation in commerce and for transporting on site solid radioactive materials and waste (including transuranic).

Some of these drums shall be used to transport onsite quantities of transuranic waste that have values greater than A₁ and A₂ quantities as 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).

3.0 Drum Specifications

3.1 Description of Base Drum Requirements

The minimum design requirements for a 55-gallon carbon steel open head drum are identified in Section 3.1.1. Section 3.2 provides additional features that, when selected; customize the drum to a User's specific requirements. For each drum, whether it is a basic drum or the basic drum with additional options selected, the supplier shall provide the appropriate documentation, e.g., test reports, and certification showing that all requirements are met.

3.1.1 Basic Configuration

Drum Type	Open Head (1A2)
Capacity	208 L (55-gallon)
Material of Construction	ASTM A1008 (or equivalent) carbon steel (Minimum thickness requirements in 49 CFR 173.28(b)(4) apply to drums intended for reuse.)
Lid Gasket (glued):	Round EPDM, EPT, or equal (Meets Type A conditions of -40°F to +158°F (49 CFR 173.412 (c)))
Rolling Hoops:	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.)
Overall Height	35" Maximum
Overall Diameter Including the Closure Ring	24" Maximum
Bung Fittings	3/4" fitting with flange plug (see section 3.2 for specific manufacturer)
Bung Gasket	EPDM, EPT, or equal (Meets Type A conditions of -40°F to +158°F (49 CFR 173.412 (c)))
Closure Ring	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, <i>Testing of Non-bulk Packagings and Packages</i> and 49 CFR 178.350, <i>Specification 7A; general packaging, Type A</i> . Once tested the Certifying organization shall control the design and fabrication to ensure consistency of fabrication.
Bolt and Nut Type	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.
Tamper Indicating Device (TID) requirements (wire seal)	Each bolt shall have nominal 5/16" hole drilled on center at a minimum of 1/2" from the tip of the threaded end.
Exterior Coating	User defined (min. thickness 0.4 mil) – Coverage shall be uniform and free of runs, sags, streaks, blisters, cracks, or de-lamination.
Interior Coating (lining)	Rust inhibitor (min. thickness 0.4 mil) – Coverage shall be uniform and free of runs, sags, streaks, blisters, cracks, or de-lamination.
Packing Group for solids:	PG I
Maximum Net Payload:	400 kg for POP packaging (See Section 4) For solid radioactive materials using DOE forms 1, 2, and 3 materials the maximum payload is user defined (See Section 4)
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, <i>Marking of Packagings</i> .
Type A Marking Requirements	Each drum shall be marked in accordance with 49 CFR 178.3 <i>Marking of packaging</i> . 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.

3.2 Options to the Basic Configuration

In this section are listed additional features that a DOE contractor may select that are either in addition to or replace features from the basic drum configuration identified in section 3.1.1.

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

PMC-Drum-001

Revision 3

- 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., 3/4-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 1/2" 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
- Stretch wrapped on pallet
- Corrugated sleeves

4.0 Performance Requirements

4.1 Requirements

Whether the drum meets the basic configuration as identified in Section 3.1.1 or Section 3.2, 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 4.2 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 meeting DOE Forms 1, 2, and 3 as surrogate contents the maximum payload is defined by the 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).
- All materials and components used in the drum shall be subject to the DOE 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 or 49 CFR 173 Appendix C)

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

4.2.1 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.

4.2.2 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.)

4.2.3 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.

5.0 QUALITY PROGRAM

5.1 Contractor's Quality Assurance Program (QAP) Requirements

The contractor's QAP is based on ASME NQA-1-2008/1a-2009, *Quality Assurance Requirements for Nuclear Facility Applications*. Using a graded approach, the contractor will establish specific NQA-1 requirements that the Supplier must implement to ensure the technical requirements identified in this specification will be met.

5.2 Contractor's Evaluation of the Supplier's Quality Assurance Program

The contractor has the option to either perform an onsite audit, perform a document review, or use a third party audit to ensure compliance with the QA requirements identified in Section 5.1.

5.2.1 Documentation Review

The contractor, working with their welding, DOT, QA, and other applicable SMEs develop a list of documents that the Supplier should provide upon request for the contractor's review. These documents can be, but not limited to, the following:

- The Supplier's current QAP documents
- A listing of the Supplier's procedures and forms (records) used to implement their QAP. This will allow the contractor's SMEs to request specific documents and records
- Test plans and procedures for performing tests required in Section 6 in this specification
- Inspection procedures
- Welding qualifications and certificates
- Certificate of Conformance procedure
- Training plans and records for both implementing the QA program and DOT regulations
- Fabrication drawings (complete set)

5.2.2 Onsite Audit

The contractor, at the request of the SMEs, will request documents similar to those in Section 5.2.1 in this specification. The contractor, acting as the intermediary between the Suppliers' QA Manager and the contractor's QA SME, will establish the audit plan. The contractor's SMEs will perform an onsite assessment to determine if the Supplier's QAP will ensure the technical requirements identified in this specification can be met. This onsite audit will be performed as a pre-assessment to the award of a purchase order.

5.2.3 When the Seller's QA program does not meet the Buyer's QA requirements?

When the contractor cannot meet the NQA-1 requirements identified in Section 5.1 above, the contractor may use the requirements in ASME NQA-1-2008/2009a Part II: *Quality Assurance Requirements for Nuclear Facility Applications*, Subpart 2.14: *Quality Assurance Requirements for Commercial Grade Items and Services*.

5.2.4 Use of a third party audit

DOE contractors who participate in the Energy Facility Contractors Group (EFCOG) Supply Chain Quality Task Group perform joint audits of various suppliers. They also make these audits available to other DOE contractors. A DOE contractor who chooses to use one of these audits are required to evaluate the audit report prior to acceptance to ensure the audit meets their specified QA requirements.

5.3 Suspect Counterfeit Item Prevention Program

The contractor will work with the Supplier to ensure the Supplier has a Suspect Counterfeit Item (S/CI) Prevention program as required by DOE Order 414.1D, CRD, Attachment 3.

As part of Seller’s QA and S/CI program the Seller will have a process in place to ensure that the certification documents, (e.g., CMTRs, Calibration Certs, ISO Certs, etc.), are verified. This process will ensure the effectiveness of the Supplier’s and the Supplier’s subcontractor’s certification approval system. This process is to establish a method that verifies the validity of the content of the certificates that the Supplier provides to the contractor. The contractor can use one of two ways to ensure the content of the certificates are accurate. First, the contractor can use an independent third party organization to verify the content of the certificates. Second, the contractor by direct examination of the Suppliers QAP can verify and validate the Suppliers processes that are used to ensure accuracy of the certificates.

5.4 Award of Purchase Order (PO)

When the contractor has completed their evaluation identified in Section 5.2 above, the contractor may request their representative be on site to perform specific inspections, witness tests, observe and verify processes (i.e. welding), perform document reviews, etc. The contractor and Supplier will work out a schedule to ensure these activities take place.

6.0 Documentation Requirements

6.1 Data Submittal Requirements

Upon request from the Contractor, the Supplier shall submit for review and acceptance the tests identified in Table 5.1.1. Any changes to the drum configuration and/or test report will required the Supplier submit a revised test report to the contractor for acceptance prior to the start of manufacturing.

6.1.1 Testing Configuration and Documentation

Table 6.1.1 – A, Listing of regulatory tests that are applicable to POP and Type A packages that shall be performed that determine compliance with the regulations.

Table 6.1.1 – A, Regulatory Tests		
Required Test	“POP” Required Test	7A Type A required Test
Drop Test	178.603	-
Water Spray Test	-	173.465 (b)
Free Drop Test	-	173.465 (c)(1)
Fissile Drop Tests	-	173.465(c)(2)
Stacking Test	178.606	173.465 (d)
Penetration Test	-	173.465 (e)
Reduction of ambient pressure	-	173.412 (f)
Vibration Capability	178.608	173.24a (a)(5)
Leakproofness Test	178.604	-
Hydrostatic Pressure Test	178.605	-
Production Leak Test	178.604	-

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

Table 6.1.1 – B, Lists the objective evidence, i.e., documentation that the Supplier shall submit with their proposal.

Table 6.1.1 – B, List of Objective Evidence		
Documentation	POP Packaging	Type A¹
Tested configuration documenting the materials of construction, tested design, dimensional characteristics, weight, closure and closure materials, and surrogate contents used during testing.	X	X
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		X
POP documentation of testing meeting 49 CFR 178.601(l), Records Retention	X	
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.		X
When the Supplier has packaging that meets the contractor's technical requirements they shall submit the completed tests reports to the contractor. But if the technical 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 for review and acceptance.	X	X

6.1.2 Packaging Configuration Drawing

The Supplier 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

¹ The information provided from the supplier manufacturer to the contractor for Type A packagings shall be inclusive of the 49 CFR 173.415(a) requirements.

- 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).

6.2 Shipment Data Submittal

Each order/shipment shall include a Certificate of Conformance² 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 the documentation package previously submitted to the Contractor.
- 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 QA program.
- 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 PO.

7.0 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

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

PMC-Drum-001
Revision 3

transport vehicle to prevent damage to the drums from contact with other palletized drums.