

Author	Status	Effective Date
Michael Boblit	Final	10/6/2022

## 1.0 Purpose

According to the DOT [49 CFR 178.2 (c) (1) (ii)], closing instructions are required to be provided to whomever a packaging is transferred. The closing instructions contain “information specifying the type(s) and dimensions of the closures, including gaskets and any other components needed to ensure that the packaging is capable of successfully passing the applicable performance tests. This information must include any procedures to be followed, including closure instructions for inner packaging and receptacles, to effectively assemble and close the packaging for the purpose of preventing leakage in transportation.”

## 2.0 Scope

Just as important, fillers and shippers of hazardous materials packaging must follow the closing instructions they receive. This includes making sure you apply the correct torque to all drum closures, crimp lids properly, insert plugs per spec, etc. In order to fulfill this obligation the shipper often turns to the packaging manufacturer for this training since the manufacturer has designed, produced and tested the packaging to meet UN performance standards. This procedure will contain closing instructions from each commonly used container supplier. These instructions will be posted in the Fill-off environments as well for quick reference.

## 3.0 Safety



**\*Absolutely NO Electronic Devices in the Hazardous Environments.  
(Production, Fill-Off, TWP Room)**

**\*Absolutely NO use of headphones, ear buds, etc. inside the Warehouse and/or Hazardous Environments.**

## 4.0 DOT Container Closing Instructions

**FOLLOW WORK PROCEDURES IN ORDER TO DO YOUR JOB ACCURATELY.**

#### 4.1 One Gallon and Quart Cans

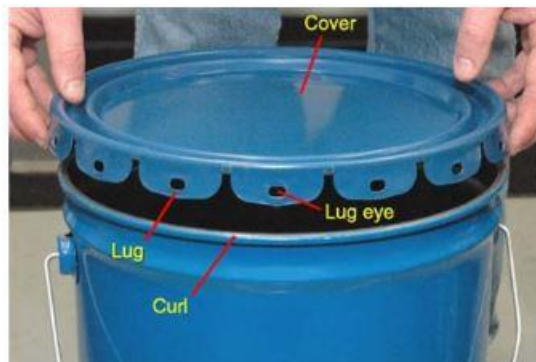


Insert plug into ring (top of container) to a depth of .025\"/>A diagram showing a close-up of the top of a metal container. A red arrow points from the text ".025\"/>

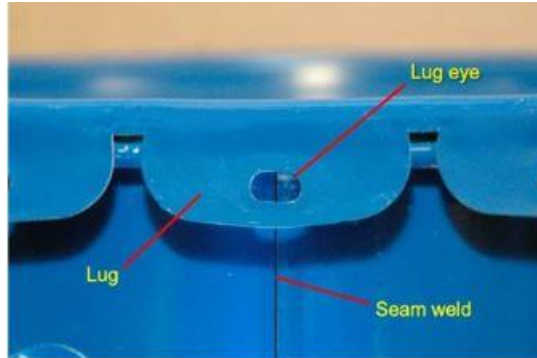
#### 4.2 5-Gallon Pails

4.2.1 Determine that the pail/cover combination is the correct specification for the material being filled.

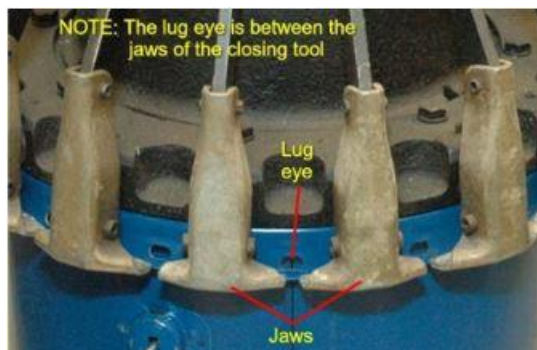
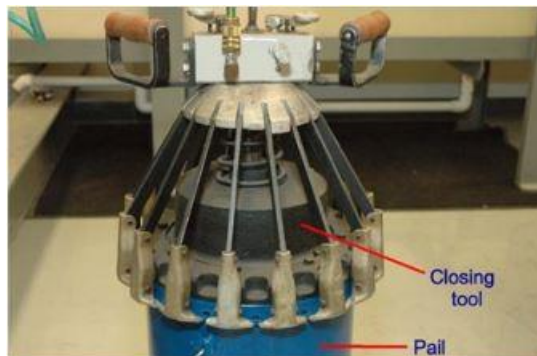
4.2.2 Place the cover on pail. Ensure that it is evenly seated around the curl of the pail.



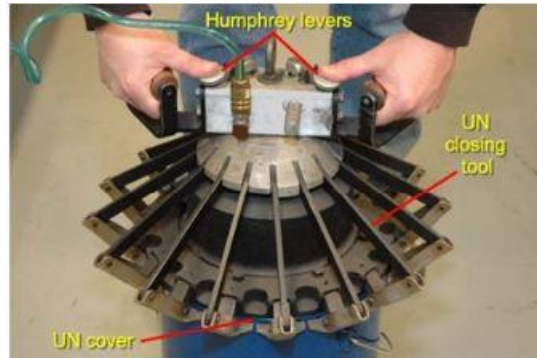
The eye of one of the lugs should be centered directly over the seam weld of the pail



4.2.3 Lower the closing tool onto the cover. Rotate the tool in order to position the lug eyes between the jaws of the closing tool.

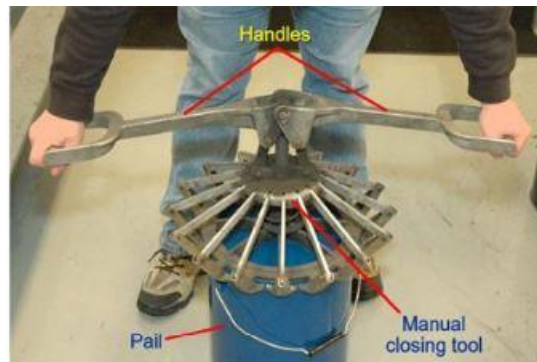


4.2.4 To close the pail with the **pneumatic closing tool**, push the Humphrey levers on the top of the closing tool



When the downward motion of the tool stops, release the levers

- 4.2.5 To close the pail with the **manual closing tool**, push the handles down and out until the downward motion stops

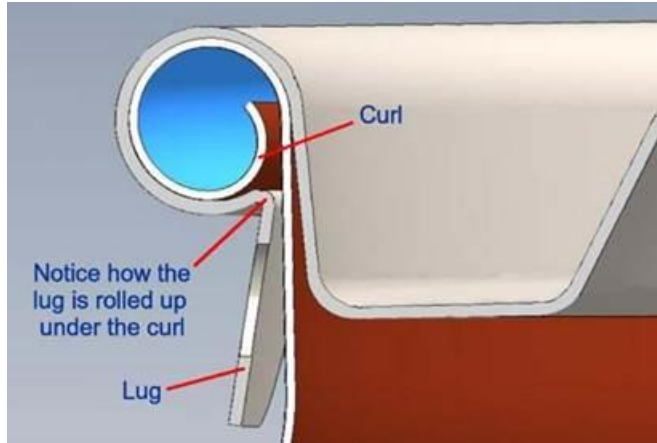


When the downward motion of the tool stops, release the handles.



**Note:** The use of pneumatic and manual closing tools is detailed in this closing instruction; however, many packaging facilities use automated closing tools; regardless of the closing tool used, the quality of the closure is critical.

- 4.2.6 Check the integrity of the close to be sure that the cover is properly crimped. Ideally, the cover lugs should be rolled up under the curl as shown in the drawing below.



4.2.7 Remove the closing tool. The lugs should be crimped under the curl of the pail at least 90° from the starting position

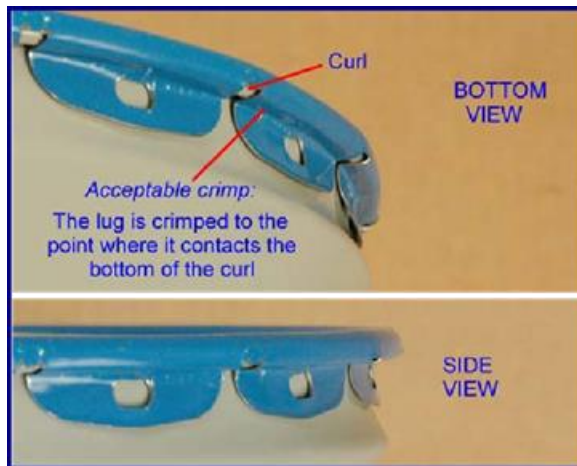
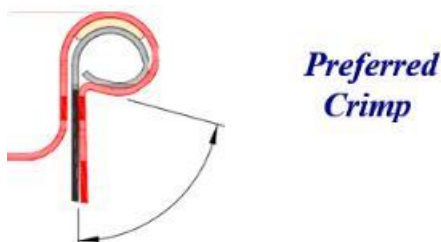


Figure 1: Preferred Crimp

Review the following photographs and drawings that illustrate the **preferred** crimp, the **acceptable** crimp and the **unacceptable** crimp.



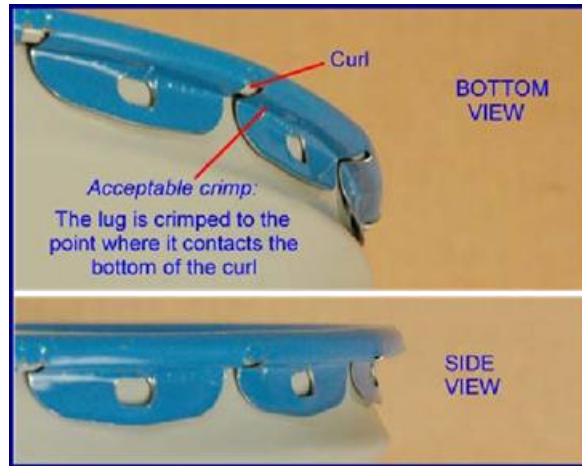


Figure 2: Unacceptable Crimp



4.3 Reconditioned Steel Drums



**EarthMinded™**

**DRUMCO**  
AN EARTHMINDED COMPANY  
M4918

RESPONSIBLE CONTAINER MANAGEMENT  
UN 1A1 and UN 1A2 CONTAINER CLOSURES

1. Inspect cover gasket to ensure it is fully retained in cover.
2. Place cover on container making sure ring lugs are pointed down toward the ground.
3. Apply sufficient downward pressure so that the bottom edge of the closing ring is fully engaged under the bottom of the drum curl.
4. Insert 5/8" bolt through ring lug (and jam nut if used). During the performance testing of this package, jam nuts were not used. Use of a jam nut is therefore optional but not required. As you tighten bolt, sharply tap down and in with a brass or equivalent hammer starting 180 degrees from the bolt and then at several different areas around ring, working back toward the lugs, until there is no further loosening of the bolt.
5. Use calibrated torque wrench and torque bolt to 60 ft/lbs. When jam nut is used lock jam nut against ring lug without threads.

**NOTE:** When filling 1A1 drums, refer to the chart below. Also, use this same chart when filling a 1A2 drum through the 2" opening.

Recommended Plug or Bung torque in ft/lbs

SIZE/TYPE	TRISURE STEEL	RIEKE STEEL	TITE SEAL STEEL
Gasket	Rubber/Poly	Rubber/Poly	Bung/Gasket
2"	20 ft/lbs	30 ft/lbs	40 ft/lbs
3/4"	12 ft/lbs	15 ft/lbs	30 ft/lbs

1H1 and 1H2 Fittings Rubber or Poly 20 ft/lbs

NYLON FIRE RATED HEX OR ROUND HEAD

2" – 18 to 22 ft/lbs – 3/4" – 7 to 11 ft/lbs

UN Certified container closures must be installed and secured in accordance with the above procedures and specifications. Users should retain a copy of this information for future use.

It is your responsibility to distribute these closure instructions to the appropriate people responsible for the assembly and shipping of the drum.

#### 4.4 Steel Drums

The conversion ft/lb – Kgm-Nm has been rounded off; the following conversion factors were used.

1 Kgm =10 Nm

1 ft/lb = 0.13825 Kgm

After tightening of plugs, torques will reduce over a period. Particularly plastic components are subject to stress relaxation resulting in reduction of torque. In general, no re-tightening of plugs will be required when the recommended torques have been applied.

For Quality Assurance purposes, it is recommended to calibrate pneumatic torque wrenches.

Rubber includes Buna, EPDM, Viton, etc. and P.E. stands for standard Polyethylene and P.I. stands for Poly Irradiated.

#### RECOMMENDED CLOSING TORQUES

Plug Type	Washer Type	¾" Closure			2" Closure		
		Ft/lbs	Kgm	Nm	Ft/lbs	Kgm	Nm
Steel Plugs	Rubber	12 (+/- 1)	1.5 – 1.8	14.7 - 17.7	20 (+/- 1)	2.6 - 2.9	25.5 - 28.4
	P.E.	12 (+/- 1)	1.5 – 1.8	14.7 – 17.7	20 (+/- 1)	2.6 – 2.9	25.5 – 28.4
Plastic Plugs	Rubber	10 (+/- 1)	1.2 – 1.5	11.8 – 14.7	22 (+/- 1)	2.9 – 3.2	28.4 – 31.4
	P.E.	10 (+/- 1)	1.2 – 1.5	11.8 – 14.7	16 (+/- 1)	2.1 - 2.4	20.6 – 23.5

Over torquing is just as bad as under torquing. Use recommended value range:

#### 4.5 Open Head Drums

### Drum Closure Specifications

Steel & Plastic Drum Torque Settings		
3/8" Wrench	¾" Bung	12 ftlbs.
3/8" Wrench	2" Bung	25 ftlbs.
1/2" Wrench	Open Lid Steel Drum Exterior Bolt	70 ftlbs.

#### FULL OPEN TOP STEEL DRUM WITH BOLTED RING CLOSURE

- Place cover on drums.
- Snap the closing ring over the cover and top lip of the drum. Make sure the ring's lugs point down below the ring. Also make sure that the bottom edge of the closing ring engages under the top lip of the drum.
- Insert the bolt through the lug without threads. Next, screw on the locking nut. Finally, screw the bolt onto the threaded lug.
- While tightening the bolt, tap the entire perimeter of the ring with a mallet, starting directly across from the bolt.
- Tighten the bolt until 70 foot pounds of pressure is reached. The cover and ring should not spin, but the free ends of the rim should have a ¼" space maximum.
- Drums closed in this manner have met the UN performance test requirements as specified in the container marking



- 4.5.1 All removable head, UN 1A2, steel drums, 49 CFR 178.504(a)(2), that are supplied with bolt rings, bolts, gaskets and lids must be closed for shipment using only the components supplied in the design tests for the drum.
- 4.5.2 Place lid with gasket in place, as supplied, on the curl at the top of the drum body.
- 4.5.3 Place cover ring around the drumhead and curl. Verify cover and drum curl are pinched together and within the recess of ring profile. You are required to pound ring with non-sparking mallet or use head press to compress gasket.

#### For bolt ring

1. insert bolt into ring right lug.
  2. Thread jam nut into bolt, if needed, and then into threaded lug, and tighten bolt to specification.
  3. Hammer around circumference of ring while torque is applied to further seat head onto drum.
  4. Continue hammering on ring circumference and torque the bolt until the torque does not loosen when further hammering on the ring circumference is performed.
  5. Tighten jam nut against unthreaded lug. Ring ends must **not** touch when proper torque is applied.
  6. Drive bolt into the lug until the ends of the bolt ring are as follow: A gap of 3/16" – 1/8" is achieved.
- 4.5.4 If prescribed ring gap cannot be achieved, torque ring to 75 +/- 5 ft/lbs. Then ends of the ring should **not** be touching.

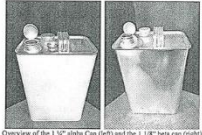
## 4.6 F-Style One Gallon Cans

### 4.6.1 Closing Instructions

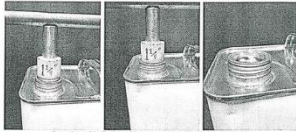
**CLOSING INSTRUCTIONS FOR F-STYLE CANS**

**TIN COATED STEEL SCREW CAPS**

- Fill container to desired level. Do not exceed maximum gross mass or fill volume.
- Using an insertion tool or other similar tool, locate the inner seal and press firmly into place making sure it is seated uniformly into the opening of the nozzle.
- Place cap evenly on threaded nozzle.
- Screw the cap onto the threaded nozzle to the appropriate torque value using some of the techniques and tools listed below:
  - One-piece 1 1/2" alpha cap with Solvesal liner with inner seal 26 in-lbs.
  - One-piece 1 1/4" beta cap with Solvesal liner 23 in-lbs.



Overview of the 1 1/2" alpha Cap (left) and the 1 1/4" beta cap (right)



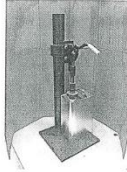
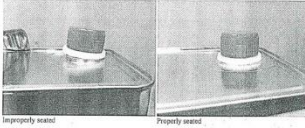
Press the seal in firmly and be sure to seat uniformly into the nozzle

Mauser Corporate Quality    Revised: 01/04/2020    Supersedes: 02/06/2019

**MAUSER**  
Packaging Solutions

**PLASTIC CLOSURE INSERTION**

- Fill container to desired level. Do not exceed maximum gross mass or fill volume.
- Place plastic closure evenly on flanged opening.
- Using a Bofill model M0445-H2 insertion tool:
  - Make sure tool is adjusted to proper height.
  - Raise lever.
  - Place can with closure resting on flanged opening beneath the plunger.
  - Lower lever until closure seats into flanged opening.
- Manually:
  - Apply even pressure to closure until fully seated into the flanged opening.
  - The closure will normally snap in with a distinct sound.
- Do not continue to apply force after the insertion is complete because this could result in damage to the opening.
- Inspect to make sure the closure is completely and evenly seated.

Improperly seated                      Properly seated

Plastic closures are available from:  
Tollite Packaging Systems  
500 West 79<sup>th</sup> St.  
Ashburn, IN 46106  
(317) 923-3700  
[www.tollitepackaging.com](http://www.tollitepackaging.com)

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## 4.7 Plastic Drums

### 4.7.1 Closing Instructions

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**MAUSER USA, LLC** **CLOSING INSTRUCTIONS - PLASTIC DRUMS**

United States Department of Transportation regulations state that packaging manufacturers are required to notify each person to whom the packaging is transferred of all requirements not met at the time of transfer. This requirement is given in Title 49, Code of Federal Regulations (49 CFR), Part 178 Specifications for Packaging, § 178.2 (c). In addition this Paragraph requires the closing information to be provided to any person to whom this package is transferred who may need to close the packaging prior to re-shipment. Furthermore, it is the shipper's responsibility as set forth in § 178.22(a)(4) to ensure that these closing instructions are carried out as described. In order to ensure the instructions are followed in a manner to result in safe transport of hazardous materials the shipper is obligated, as set forth in § 172.704(a)(4), to train the shipper other than the packaging manufacturer for this training since the manufacturer has designed, produced and tested the packaging to meet UN performance standards. MAUSER is prepared to provide this training in addition to supplying closing instructions. It has been the practice of MAUSER to send closing instructions attached to the shipping documents with each shipment of drums. This document provides specific information on closing MAUSER packaging.

These closing instructions must be given to the individuals responsible for closing the packaging prior to shipment. Many companies use electronic copies as site specific work instructions and/or use laminated hard copies posted at the fill lines for reference by the fill line operators. A hard copy (printed) must be maintained by the filler or operator for shipment.

The following tables and text give examples of the parts and closing torque required to prepare the drum for shipment so that it is capable of meeting the performance standards indicated by the UN marking on the side or top of the packaging.

MAUSER recommends that only parts that have been tested and certified by MAUSER be used to close the packaging for shipment. Any UN marking is valid if parts or components other than those as sold with the original packaging design are used. Each closure is supplied with the proper gasket in accordance with the UN design type tests for the packaging supplied. In the case of removable head drums the lids, gaskets and locking rings are supplied as tested.

**PRIOR TO CLOSING:**

Inspect each closure to ensure that the closure has the proper gasket and that both closure and gasket are in good condition. Inspect the sealing surface for damage and make sure the threads and sealing surfaces are dry. Replace any defective gaskets, plugs or lids with new, defect free parts identical to those in the design qualification.

**CLOSING PROCEDURES FOR PLUGS AND CAPS:**

1. The plug or cap is inserted into the appropriate opening and screwed down "hand tight" until the gasket is in contact with the sealing surface.
2. A torque wrench capable of applying the proper torque to the fitting as specified by the closing instructions following is then used to tighten the plug or cap until it reaches the pre-set torque as indicated by a release or click. These wrenches should be calibrated at least annually. Adjustable wrenches available at hardware stores, auto parts stores, and through equipment catalog suppliers and drum parts suppliers.

**PLASTIC NON-REMOVABLE HEAD DRUMS**

All non-removable head, UN 1H1, 1H1W Plastic Drums, 49 CFR § 178.500(a)(1), 15 gallon to 65 gallon nominal capacity supplied with plug or screw cap closures with gaskets must be closed for shipment using only the closures and gaskets supplied and specified in the design qualification test for the drum as indicated below:

Part Size / Part Number (Plug number with gasket)	Torque
A 2-inch buttress: L10 EPDM; L10B Buna; L10VT FPM	20-25 ft.-lbs.
B 2-inch NPS: L18 EPDM <sup>1</sup> ; L16B Buna; L16VT FPM; L16RVCLG	20-25 ft.-lbs.
C 2-inch buttress: L10V Vented EPDM; L10V-B Buna; L10V-VT FPM	20-25 ft.-lbs.
D 2-inch NPS: L18 Vented EPDM; L16V Buna; L16VT FPM	20-25 ft.-lbs.
E 2-inch NPS: L16R with L12 EPDM	20-25 ft.-lbs.
F 2-inch ACT <sup>1</sup> buttress: SA10B with A72	30-40 ft.-lbs.
G 3/4-inch NPS: C34 or C38 (S) AD with C31 EPDM; C31 Silicone	8-9 ft.-lbs.
H 2-inch: L10RHD with L11FH; L16RHD; Polyolefin and Santoprene® gaskets	25-30 ft.-lbs.
I Metric: 70x6 BCS LR10W w/LR11 EPDM; 70x6 BCS LR10W w/LR11VT FPM gaskets	35-40 ft.-lbs.
J Metric: 66x6 BCS LR17 with LR12 EPDM	20-25 ft.-lbs.
K Polycon® II <sup>2</sup> : 2-inch NPS L16-GRK/EPDM	37-42 ft.-lbs.
L Polycon® II <sup>2</sup> : 3/4-inch NPD C34-GRK/EPDM	8-10 ft.-lbs.

<sup>1</sup> ACT drums may also be supplied with the standard NPS and buttress fittings noted above and should be closed to those torque values  
<sup>2</sup> Polycon II may also be supplied with the standard NPS fittings noted above and should be closed with those torque values

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 Please check the controlled electronic copy to make sure that you have the latest version of this document.

## 5.0 References

Reference	Title
1	None