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	Document Title: <b>FULL OPENING MANHOLE</b>	Revision: <b>0</b>
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**MODEL NUMBERS (Including, but not inclusive)**

8310	8327	8368	8369	8370	8387	8350	8355	8261	8205	8260
8380	8324	8329	8303	8399	8418	8535	8525	8530		



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## 1.0 General Maintenance Manual Guidelines

- 1.1 It is strongly recommended that this entire manual be read prior to any operation, disassembly, or assembly of this equipment.
- 1.2 Betts Industries, Inc. provides this manual as a guideline for reference only and assumes no responsibility for personal or property damage that may occur in conjunction with this manual. Betts Industries, Inc. cannot be held responsible for incorrect installation, operation or maintenance of product.
- 1.3 Betts Industries, Inc. recommends all equipment be placed on a regular maintenance schedule that includes the routine replacement of seals and gaskets and visual inspection for leaks and corrosion. The end user must make their own determination and set their own schedule based upon use and environment. In some cases, regulations may dictate the minimum testing frequency of items. Make sure operators are aware of all applicable codes.
- 1.4 Only trained personnel should attempt to perform maintenance on this equipment.
- 1.5 As with any maintenance work, proper safety gear and procedures must be used at all times. A list of hazards may include but are not limited to contents under pressure, loaded springs, residual product, flammable liquid and vapors, pinch points.
- 1.6 Safety alert symbols are used to alert operator to potential personal injury hazards. These symbols are per ANSI Z535.5 and are listed below. Operator **MUST** obey all instructions that follow a safety symbol.

Alerts will be used to indicate known safety concerns. Additional concerns are possible and should be identified and avoided by the operator.

	Indicates an imminently hazardous situation which, if not avoided, <b>will result</b> in death or serious injury.
	Indicates a potentially hazardous situation which, if not avoided, <b>could result</b> in death or serious injury.
	Indicates a potentially hazardous situation which, if not avoided, <b>may result</b> in minor or moderate injury. It may also be used to alert against unsafe practices.



- 1.7 Product Warranty shall be void if product is subject to misapplication, misuse, neglect, alteration, or damage.
- 1.8 Specific design details described in this document are for reference only and are subject to change without notice. See Betts Industries, Inc. web page for the most recent revision to this document. [www.bettsind.com](http://www.bettsind.com)
- 1.9  **WARNING:** This product can expose you to chemicals including Chromium (hexavalent compounds), which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to: [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)
- 1.10 For additional questions or more detailed technical assistance, contact the Betts Industries, Inc. Sales or Engineering Department at (814) 723-1250.

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## 2.0 Installation and Use

This document provides details on maintenance and use of Betts Full Opening Pressure Manhole. To ensure optimal performance, the following steps must be followed. This information is intended to be used as a general guide. The end user shall develop a more detailed maintenance procedure depending on product being hauled and service conditions.

Cargo tank maintenance and operation is dangerous. Several known hazards are listed below but all additional hazards must be identified and addressed by the tank manufacturer or owner/operator.

 <b>WARNING</b>		<b>Fall Hazard</b> – Climbing on top of a cargo tank is dangerous and should be avoided without proper safety equipment. Falling can result in death or serious injury.
 <b>WARNING</b>		<b>Pressure Hazard</b> – Cargo tank may contain residual pressure. Failure to safely relieve could result in sudden loss of pressure causing death or serious injury.
 <b>WARNING</b>		<b>Flammable Product</b> – Cargo tank may contain product that could present a risk of fire, explosion, asphyxiation or other hazards resulting in death or serious injury.
 <b>WARNING</b>		<b>Corrosive Material</b> – Cargo tank may contain corrosive material. Protective clothing including gloves and face shield shall be worn.

1. **Manhole Installation:** Proper welding procedure of the collar to the tank is imperative. Exercise care to ensure collar remains flat and round during installation in the tank. If necessary, a weld fixture should be used to prevent distortion. Heat generated by welding should be kept to a minimum. A warped collar will not function properly.
2. **Gasket Material:** The choice of gasket material affects how well the manhole will seal. Working pressure, working temperature and lading must be taken into consideration when choosing a gasket. For example: braided packing may be ideal for viscous material and high temperature applications, but it does not seal bubble tight. See Table 1 for additional information.
3. **Visual Inspection:** It is important to visually inspect the manhole for potential problems before each load. Recognizing and addressing issues before there is a problem will help to reduce the probability of a costly accident.
  - 3.1. **Gasket Inspection:** The gasket is crucial to ensuring the proper sealing of the manway. Inspect the gasket prior to each load for nicks, wear, or cracks. A damaged or worn gasket must be replaced. Use only genuine Betts Industries replacement gaskets to ensure proper manhole sealing. Select gasket material to ensure compatibility with product carried.
  - 3.2. **Sealing surface inspection:** The gasket seals against the interior surface of the gasket channel and the top edge of the collar. A smooth finish in both areas is required for the gasket to seal. Nicks, gouges, or build-up on the seat may cause the manhole to leak. A thin or eroded collar will not allow proper sealing of the manhole.

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A “knife edge” on the top of the collar will cut through the gaskets and cause failure. Inspect the collar sealing edge for damage prior to each load.

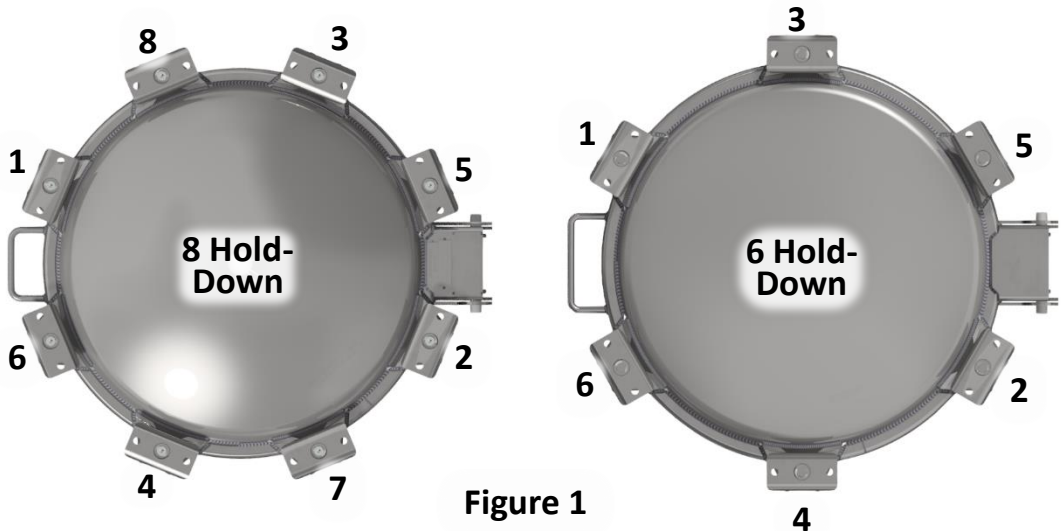
3.3. **Hold Down Inspection:** The wing-nuts, swing-bolts, and hold down lugs must be in good condition to ensure integrity of the manhole. Damaged or worn components must be replaced. The threads of the swing-bolts must be clean. A light lubricant or never-seize should be used on the threads to resist galling. For severer applications, sealed wing-nut assemblies are available that offer an integral grease fitting. The sealed wing-nut assemblies should be greased annually at a minimum.

3.4. Replacement swing-bolts for ASME units **must** be Betts ASME rated swing-bolts.

4. **Closing Instructions:**

4.1. Close the cover and verify the cover gasket is centered on the seat of the collar. There should not be metal-to-metal contact.


4.2. Rotate the wing-nuts into position and snug them up by hand following a star pattern tightening sequence as shown in Figure 1.



4.3. For some applications, hand-tightening the wing-nuts may be sufficient, but in applications where sealing is critical, the wing-nuts should be tightened down to a specific torque. A hammer should NOT be used to tighten the wing-nuts and the wing-nuts should never be tightened to more than 45 ft-lbs. See Table 1 for examples of torque values. Two styles of wing-nut tool are offered as shown in figure 2. Part number 6469SL is a wing-nut wrench with integral handle. Part number 6443SS is a wing-nut socket adapter which allows the use of a torque







Figure 2

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- wrench to tighten the wing-nut to a precise torque (torque wrench is not included).
- 4.4. After tightening by hand, continue to follow the star pattern sequence and tighten the wing-nuts to 50% of desired final torque.
  - 4.5. Following the star pattern tightening sequence, tighten the wing-nuts to 75% of desired final torque.
  - 4.6. Next, tighten to 100% of desired final torque following the star pattern tightening sequence shown in figure 1.

<b>Table 1</b> <b>Torque Applied to Wing-nuts on 20" Manhole *</b>						
	Hand-tight (Approx. 16 ft/lbs)		30 ft/lbs		45 ft/lbs	
	6 Wing-nuts	8 Wing-nuts	6 Wing-nuts	8 Wing-nuts	6 Wing-nuts	8 Wing-nuts
<b>Homogeneous Gaskets:</b> Buna, Hypalon, Viton, EPDM	40 psig	50 psig	75 psig	75 psig	80 psig	160 psig
<b>Synthetic Braided Fiber Impregnated w/ PTFE</b>	20-30 psig	30-40 psig	35-50 psig	40-65 psig	50-60 psig	70-80 psig
<b>Teflon Encapsulated Gaskets **</b>	20-35 psig	20-35 psig	40-65 psig	40-65 psig	50-75 psig	95-100 psig
* This table shows results that may be expected for a properly installed and maintained 20" ASME manhole with a new gasket. Actual test results may vary depending on installation, condition and service application of manhole.						
** See Engineering Bulletin 3-99 for additional information on Teflon Encapsulated Gaskets.						

- 4.7. Final tightening pass should be a circular sequence at 100% torque.
  - 4.8. Verify the manhole is sealing properly.
  - 4.9. If the gasket is leaking, verify proper tightening sequence.
  - 4.10. If gasket continues to leak, inspect all sealing surfaces including collar seat and inside surface of gasket channel. Inspect collar to verify it is not distorted or out of flatness. Repair or replace as needed. Inspect gasket and replace as needed.
5. **Opening Instructions:** All pressure must be relieved from tank prior to loosening wing-nuts.

 <b>WARNING</b>		<b>Fall Hazard</b> – Climbing on top of a cargo tank is dangerous and should be avoided without proper safety equipment. Falling can result in death or serious injury.
 <b>WARNING</b>		<b>Pressure Hazard</b> – Cargo tank may contain residual pressure. Failure to safely relieve could result in sudden loss of pressure causing death or serious injury.

- 5.1. Verify the manhole has a hinge pin securely installed at the hinge.

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- 5.2. Never lean directly over the manhole or position self behind the hinge while opening the manhole. Escaping air may blow up dust or debris from top of tank; safety glasses are recommended.
- 5.3. Use caution if tank contains elevated temperature product. Steam or hot vapors escaping from the manhole could cause burns.
- 5.4. A manhole cover stuck to the collar is very dangerous and must be safely released by following this procedure prior to fully disengaging the wing-nuts.
- 5.5. The lugs of the cover have a keyway opening which interlocks with the boss of the wingnut. This feature prevents the cover from opening fully if there is pressure pushing up on the cover. A stuck cover may mask this condition and must be addressed.
- 5.6. Loosen and disengage all wingnuts except the two wing-nuts on each side of the handle. See figure 3.
- 5.7. If air begins to escape at any time, stay clear of the manhole until pressure is fully released.
- 5.8. Loosen the two wing-nuts on each side of the handle so they are roughly  $\frac{3}{8}$ " off the lugs but do **not** disengage them from the cover. See figure 4. These two wing-nut assemblies must remain in the upright position engaged with the triangular cover hold-down lugs.
- 5.9. With the two wing-nuts on each side of the handle still in position but loosely engaged, pull up firmly on the cover to ensure cover is released from the collar. The cover should lift off the seat approximately  $\frac{1}{4}$ ", releasing any residual pressure. See figure 5.
- 5.10. After all pressure is released, disengage all swing-bolt/wing-nut assemblies and fully lift cover.

