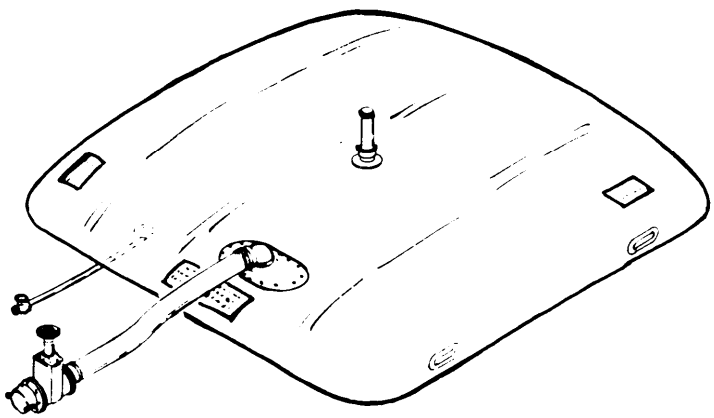
TM 5-5430-218-13

TECHNICAL MANUAL

OPERATOR'S, UNIT AND INTERMEDIATE DIRECT SUPPORT MAINTENANCE MANUAL



TANK, FABRIC, COLLAPSIBLE, 3,000 GALLON
NSN (5430-00-268-8187)

Approved for public release; distribution is unlimited

HEADQUARTERS, DEPARTMENT OF THE ARMY
14 SEPTEMBER 1987

WARNING

FLAMMABLE AND TOXIC FUEL HAZARD

This equipment is used to store flammable and toxic fuels. DEATH or serious injury may result if personnel fail to observe strict safety precautions.

- Dangerous and explosive conditions can exist anytime excessive fuel vapors are present.
- Fuel vapors can be absorbed by clothing and other materials, making them highly inflammable.
- Use of electrical or spark producing devices within 100 feet (30.50 meters) of the tank may ignite fuel vapors resulting in explosion or fire.
- Skin exposed to liquid fuels is subject to toxic chemical reaction which can cause injury to skin or eyes.
- Do not allow any smoking within 100 feet (30.50 meters) of the storage area.
- Avoid getting fuel on the body or clothing. If clothing becomes saturated, remove the clothing immediately and wash the body thoroughly with hot, soapy water.
- Avoid spillage of fuel. When spillage occurs, cover the affected area with dry soil to reduce its rate of evaporation. Position fire extinguishers at readily accessible positions around the tank.
- P-D-680 dry cleaning solvent, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F (38 degrees C).
- Safety berms must have capacities of not less than one and one half ($1^{1}/_{2}$) times of the tank capacity.
- The sludge which accumulates in the bottom of fuel storage tanks gives off explosive vapors. Inhalation of vapors can cause lead poisoning. When emptying tanks, ample ventilation must be provided to carry off harmful fumes. Residual sludge must be disposed of in accordance with local policy.
- Do not disassemble or replace tank components while tank is filled with fuel. Failure to heed this warning can result in injury to personnel.

CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 31 October 1994

Operator's, Unit and Intermediate
Direct Support Maintenance Manual

TANK, FABRIC, COLLAPSIBLE, 3,000 GALLON
NSN 5430-00-268-8187

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited

TM 5-5430-218-13, 14 September 1987, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
i and ii	i and ii
1-1 and 1-2	1-1 and 1-2
E-1 and E-2	E-1 and E-2

2. Retain this sheet in front of manual for reference purposes.

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Chief of Staff

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TECHNICAL MANUAL

NO. 5-5430-218-13

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WASHINGINGTON, D.C., 14 September 1987

Operator's, Unit and Intermediate
Direct Support Maintenance Manual

TANK, FABRIC, COLLAPSIBLE, 3,000 GALLON
NSN 543040-268-8187

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If mistakes are found or if a way to improve the procedures exists, please let us know. Mail a letter, DA Form 2028-2 located in the back of this manual, directly to: Commander, US Army Aviation and Troop Command, ATTN: AMSAT-1-MP, 4300 Goodfelw Blvd., St. Louis, MO 63120-1798. A reply will be sent to you.

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CHAPTER 1

INTRODUCTION

Section I - GENERAL INFORMATION

1-1. SCOPE

a. Type of Manual. This operation and maintenance manual includes operator, unit and intermediate direct support maintenance of a 3,000 gallon collapsible fuel tank.

b. Model Numder and Equipment Name. Tank, Fabric, Collapsible, 3,000 Gallon.

c. Purpose of Equipment. The 3,000 gallon tank is a collapsible fabric container designed to store petroleum-based fuels. The collaspible is intended for use as a fuel storage container when small capacity quick storage facilities are needed, and where permanent fuel storage facilities are not available. The tank will be used to store fuel that is off loaded from shipping tankers and then used to dispense fuel to support operations. The tank is primarily used in quick-response deployment operations.

d. Special Limitations Equipment. Tank fittings are made of aluminum alloy and can easily be damaged. Special care should be taken when handling tank components during assembly and disassembly.

1-2. MAINTENANCE FORMS, RECORDS AND REPORTS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS).

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR'S).

If the 3,000 gallon tank needs improvement, send an EIR. Users, should report problems with the equipment design, or performance. Mail an SF 368 (Quality Deficiency Report) to: Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MDO 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. A reply will be sent.

1-4. WARRANTY INFORMATION.

There is no warranty information provided in this technical manual.

1-5. NOMENCLATURE CROSS-REFERENCE LIST

This listing inches nomenclature cross-references used in this manual.

Common Name	Official Nomenclature
Dike	Berm

Section II. EQUIPMENT DESCRIPTION

1-6. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

a. Characteristics. The tank envelope is made from single ply nylon cloth coated on both sides with a fuel resistant elastomer. The tank and components are suitable for operational deployment at temperatures from plus 125°F (51°C) to minus 25°F (-31°C). The tank and components are designed to resist exposure to extreme temperatures, rain, snow, ice, fungi growth and high humidity conditions. Access to the inside of the tank can be made through the bonded filler/discharge fitting. The tank is self-supporting and does not require earth embankment support. The only support required involves using sand bags during filling operations.

b. Capabilities. The tank has the capacity to store 3,000 gallons (11,355 liters of fuel. The tank and components are compatible with US standard military fuel storage and handling equipment and can be quickly deployed on flat ground with a minimum of surface preparation.

c. Features. The collapsible integral tank envelope contains three bonded fittings for attaching one filler/discharge assembly, one drain assembly and one vent and pipe assembly. Handles are also bonded on the tank envelope to aid movement of an empty tank.

1-7. LOCATIONS AND DESCRIPTION OF MAJOR COMPONENTS.

The 3,000 gallon collapsible tank (See Figure 1-1) consists of the following major components:

a. Tank Envelope. The tank envelope is fabricated with elastomer coated panels to form an integral fuel storage container. The tank envelope comes with three bonded accessory fittings which secure the vent and pipe assembly, filler/discharge assembly, and drain assembly to the tank envelope.

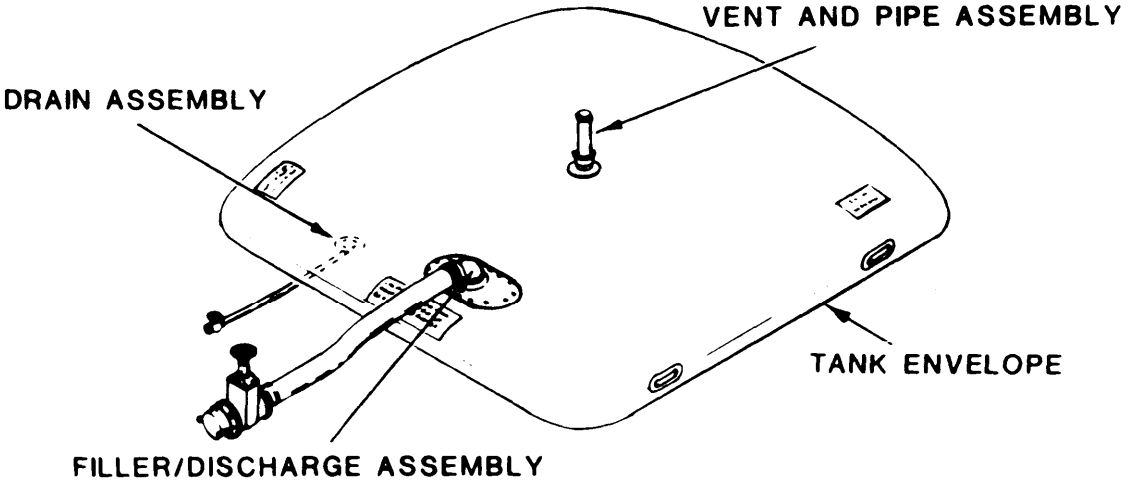


Figure 1-1. Collapsible 3000 Gallon Tank Assembly

b. Vent and Pipe Assembly (See Figure 1-2). The vent and pipe assembly is attached to the top center of the tank envelope using a 2 inch quick-disconnect coupling. The assembly uses a relief valve to vent air and fuel vapor during filling operations. The assembly also removes vapors during normal fuel storage and prevents air from entering the tank. The absence of air causes the tank to collapse as fuel is dispensed or drained.

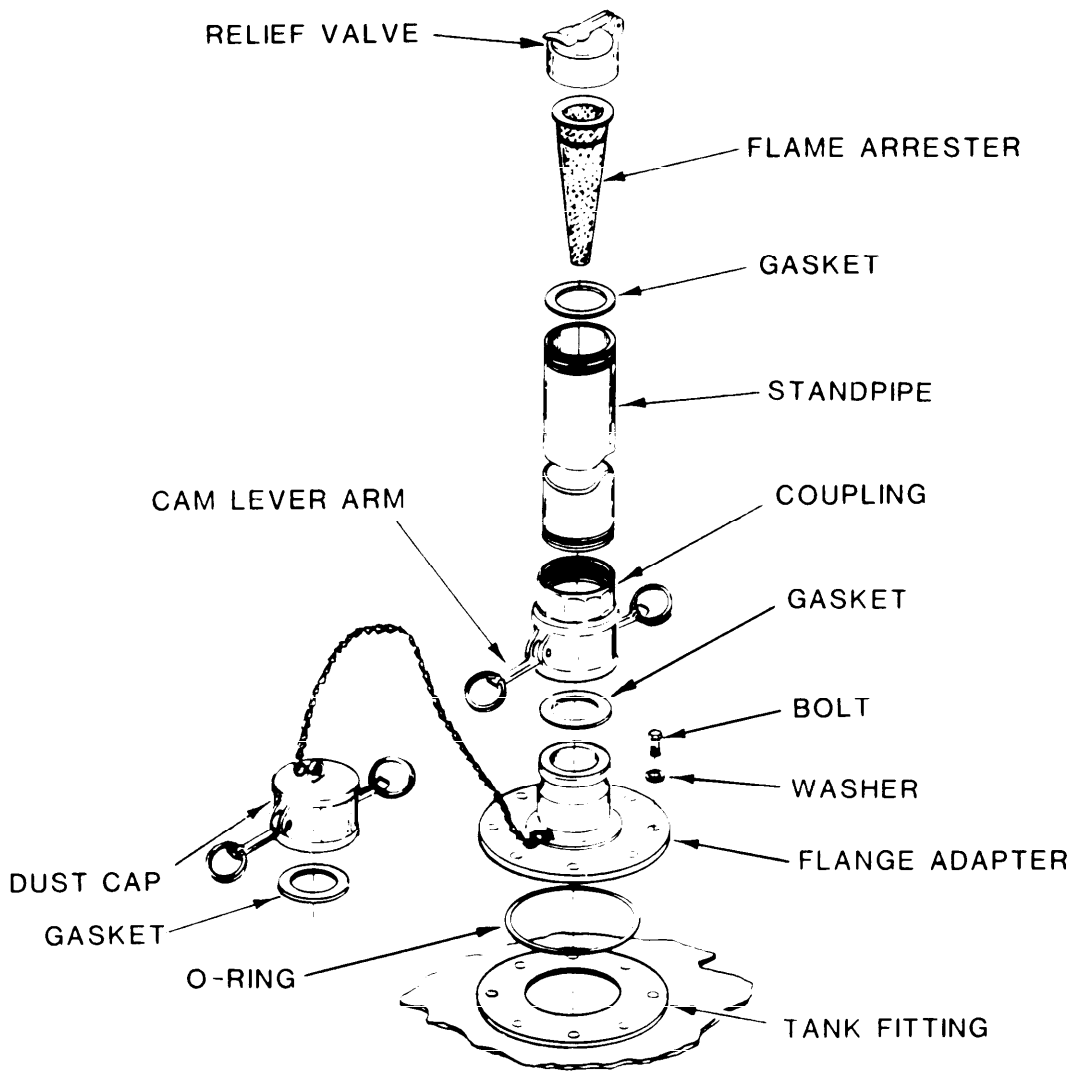


Figure 1-2. Vent and Pipe Assembly

1-7. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - (Continued).

c. Filler/Discharge Assembly (See Figure 1-3). The filler/discharge assembly consists of a ninety degree (90°) elbow, a flange adapter, a closure plate and a suction stub. A reducer and a four-foot section of 3 inch hose connects the 3 inch gate valve with the filler/discharge assembly. Filling and discharge operations can be made by connecting additional hoses to the unused connection on the gate valve. Dust caps and dust plugs are provided to protect unused connections.

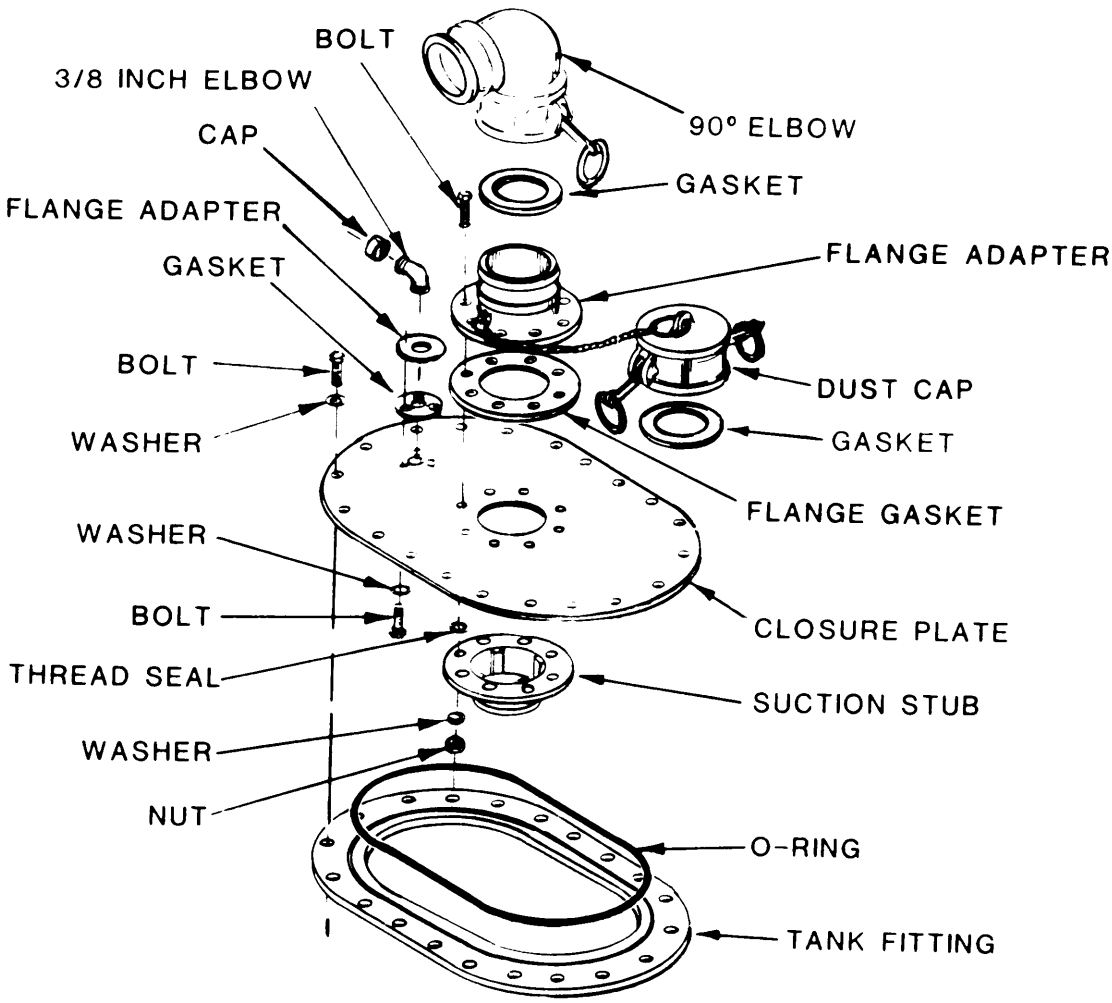


Figure 1-3. Filler/Discharge Assembly

d. Drain Assembly (See Figure 1-4). The drain assembly consists of a drain fitting, a drain hose and a drain gate valve. When assembled, the drain fitting is attached to the tank fitting. The drain hose connects the drain fitting to the drain gate valve. The drain assembly is used to drain residual fuel or trapped moisture from the bottom of the tank. The drain assembly must be in place with the drain gate valve fully closed before storing fuels. When the tank is not in use, the hose connection on the drain fitting is closed with a drain plug.

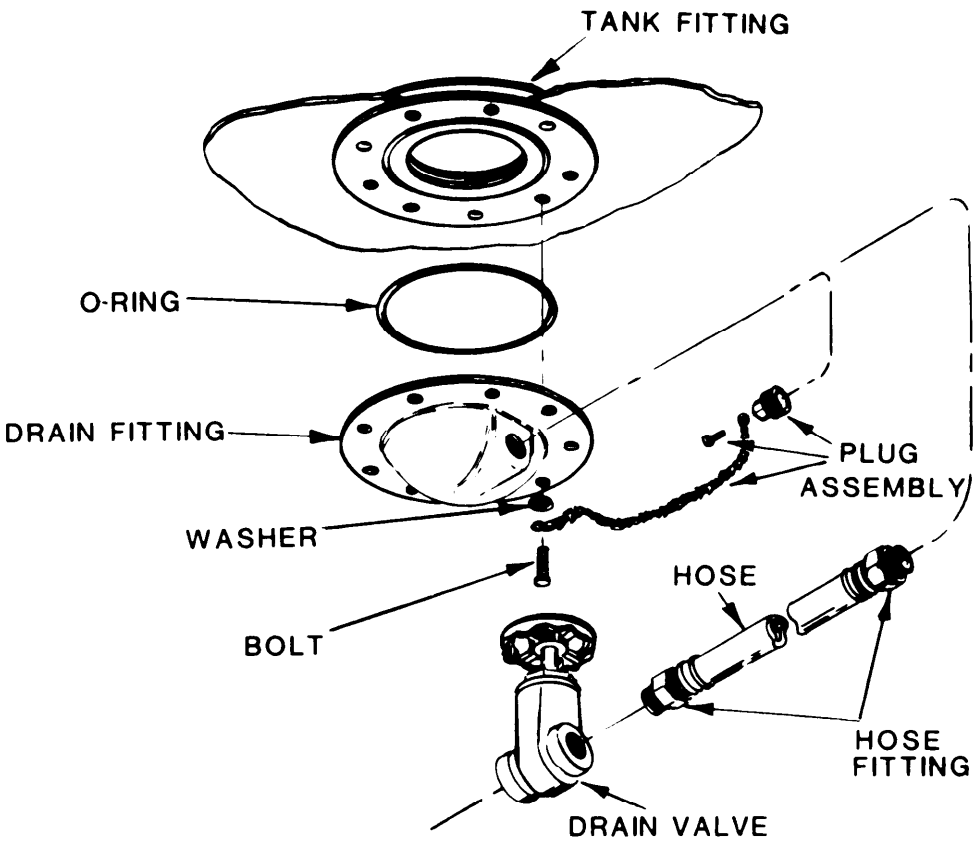


Figure 1-4. Drain Assembly

1-7. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - (Continued).

e. Tank Accessories (See Figure 1-5). The tank accessories are provided to permit normal operation of fuel transfer into and out of the collapsible storage tank. The tank accessories are considered part of the tank. They are supplied with the tank and consist of the following items:

(1)	2 inch vent and pipe assembly with relief cap.	1 Ea.
(2)	3 inch gate valve with couplings	1 Ea.
(3)	4 foot length of 3 inch hose	1 Ea.
(4)	Reducer (4 inch female to 3 inch male)	1 Ea.
(5)	Filler/discharge 90° elbow	1 Ea.
(6)	8 foot length of 1/2 inch hose.	1 Ea.
(7)	1/2 inch drain valve	1 Ea.

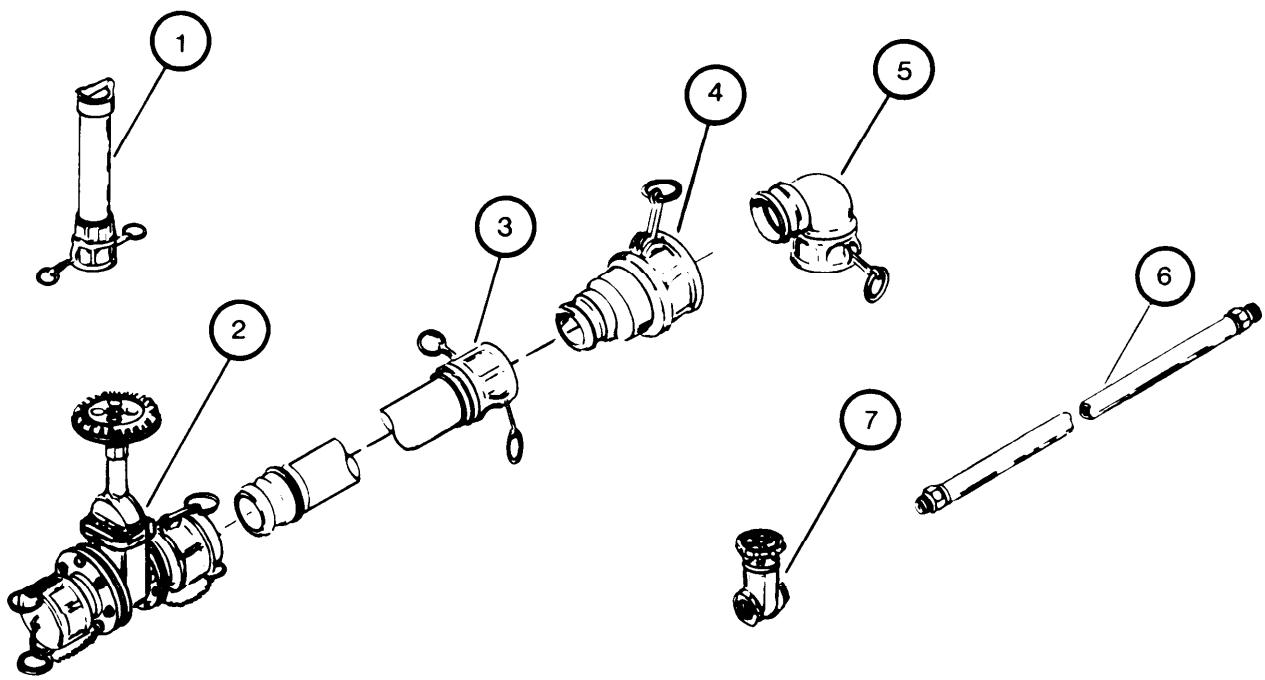


Figure 1-5. Tank Accessories

f. Repair Items (See Figure 1-6). Repair items are provided with the tank. These repair items are used when performing on-site maintenance of the fuel tank. The following repair items are supplied with the tank.

(1)	Vent and drain fitting ()-ring	2 Ea.
(2)	Filler/discharge fitting O-ring	2 Ea.
(3)	2 inch quick-disconnect gasket	2 Ea.
(4)	3 inch quick-disconnect gasket	2 Ea.
(5)	4 inch quick-disconnect gasket	2 Ea.
(6)	11/16 inch flange gasket	1 Ea.
(7)	3 inch flange gasket	2 Ea.
(8)	4 inch flange gasket	2 Ea.
(9)	3 inch repair plug	2 Ea.
(10)	5 inch repair plug	2 Ea.
(11)	3 inch sealing clamp	4 Ea.
(12)	5 inch sealing clamp	2 Ea.
(13)	7-1/2 inch sealing clamp	2 Ea.

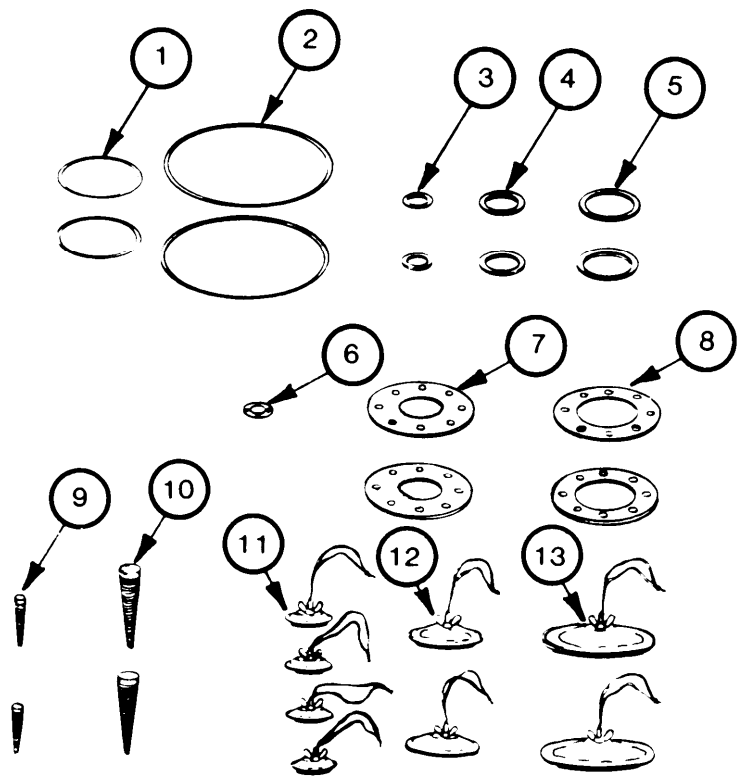


Figure 1-6. Repair Items

1-8. **EQUIPMENT DATA.**

a. Identification Plate. The tanks are fitted with a bonded identification label with the following data:

(1) Nomenclature
(2) National Stock Number
(3) Serial Number
(4) Manufacturer's Name and Plant Location
(5) Date of Manufacture
(6) Weight Empty
(7) Contract Number
(8) Lot Identification

b. Information Plate. The following information is located near each fitting assembly.

Maximum Torque . . . . . .85 inch-pounds

c. Dimensions and Weight.

(1) Empty Tank Dimensions . . . . . 14 ft x 14 ft (3.9 m x 3.9 m)

(2) Filled Tank Dimensions. . . . . .4 ft x 12.5 ft x 12. 5 ft (1.2 m x 3.8 m x 3.8 m)

(3) Empty Tank Weight . . . . . 135 lbs (Tank Only) (61.2 kg)

(4) Crated Tank Weight. . . . . .295 lbs (133.8 kg)

(5) Crate Dimensions . . . . . 5.4 ft X 2.3 ft x 1.6 ft (1.7 m x 0.7 m x 0.5 m)

(6) Tank Capacity . . . . . .3,000 gal (11.4 kilo liter)

Section III. TECHNICAL PRINCIPLES OF OPERATION

1-9. **GENERAL THEORY OF OPERATION.** The tank is filled by connecting a hose line from a shipping tanker or other fuel source to the 3 inch gate valve. The manually operated gate valve controls the flow of fuel. Fuel is discharged by connecting a hose from the 3 inch gate valve to the container being fueled.

1-10. **CONTROLS AND INSTRUMENTS.**

a. Vent and Pipe Assembly. The vent and pipe assembly is installed on a flanqe adapter located at the top center of the tank envelope. A relief-valve-opens when the fuel internal pressure reaches a range from 1 to 3 psi to remove vapors accumulated during normal fuel storage.

b. Drain Valve. The drain valve is a hand operated valve. When open, it allows fuel to drain from the tank. When closed, it blocks the flow of fuel.

c. Three Inch Gate Valve. The 3 inch gate valve is connected to the hose coming from the filler/discharge elbow. When open, the valve allows fuel to flow to or from the tank. When closed, the valve stops the flow of fuel.

CHAPTER 2
OPERATING INSTRUCTIONS

Section I - DESCRIPTION AND USE OF OPERATORS CONTROLS AND INDICATORS

2-1. **OPERATOR CONTROLS.**

a. Quick-Disconnect Couplings (See Figure 2-1). The following tank accessories come with quick-disconnect couplings.

(1) 3 inch filler/discharge hose
(2) 90° filler/discharge elbow
(3) 3 inch gate valve
(4) Vent pipe
(5) Dust plugs and caps
(6) 4 inch female to 3 inch male reducer

These quick-disconnect couplings are joined by inserting a male coupling into a female coupling and locking in place by pushing down both cam lever arms at the same time.

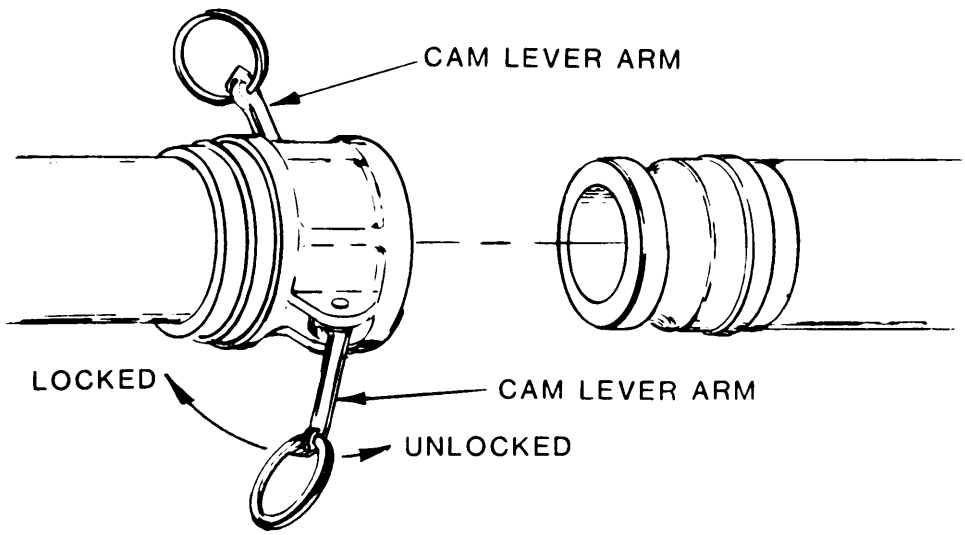


Figure 2-1. Cam Operated Quick-Disconnect Coupling

2-1. OPERATOR CONTROLS - (Continued).

b. Three Inch Gate Valve (See Figure 2-2). The flow of fuel into the tank through the filler/discharge assembly is controlled by a 3 inch gate valve. When the valve handle is fully rotated counterclockwise, the valve is open. Rotating it fully clockwise closes the valve. The valve is connected to the 3 inch hose using quick-disconnect couplings.

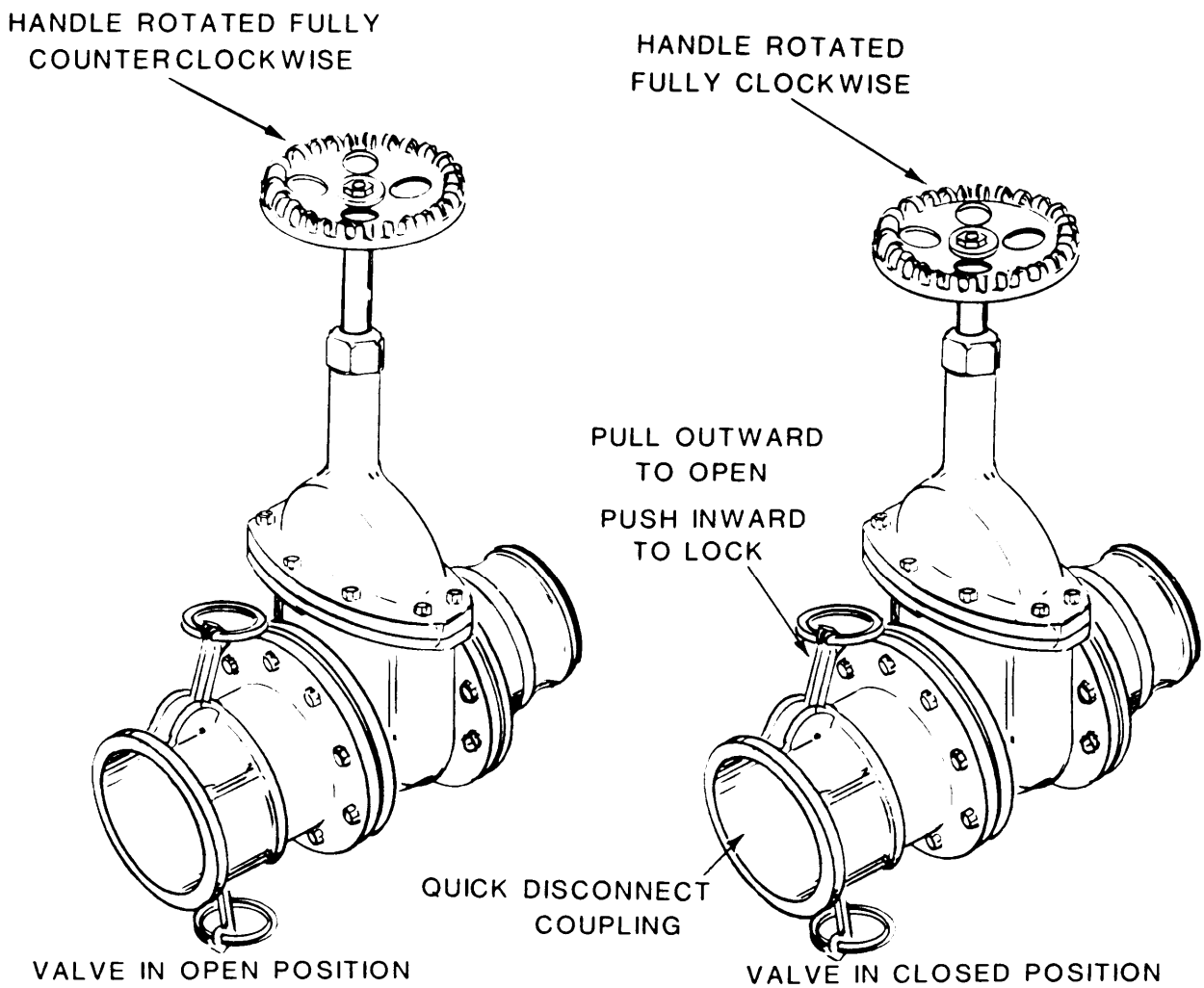


Figure 2-2. Three Inch Gate Valve

c. One-Half Inch Drain Valve (See Figure 2-3). The drain valve is used to remove fuel or trapped moisture from the bottom of the tank. The drain valve connects to the tank using an eight foot section of 1/2 inch hose. When the valve handle is fully rotated counterclockwise, the valve is open. Rotating the handle fully clockwise closes the valve.

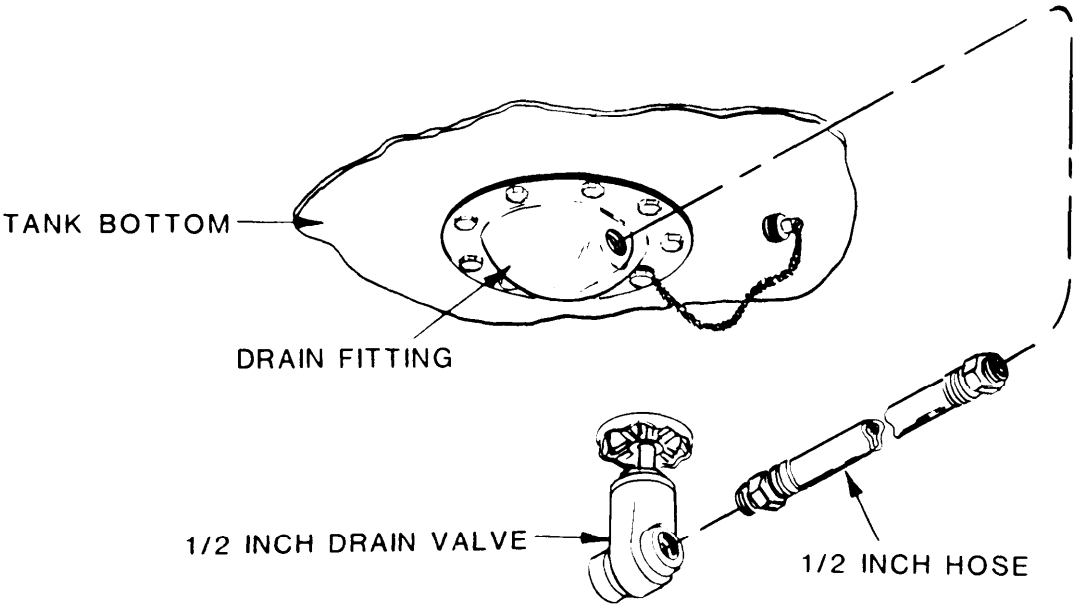


Figure 2-3. Drain Valve

2-2. **OPERATOR INDICATORS.** Operator indicators are not included with the 3,000 gallon fuel tank.

Section Il. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-3. **PMCS INTRODUCTORY MATERIAL.**

a. General. To ensure that the equipment is ready for operation at all times, it must be inspected systematically so that defects are discovered and corrected before they cause serious damage or equipment failure. The necessary preventive maintenance checks and services are listed in Table 2-1. Non-critical deficiencies discovered during operation of the system shall be noted for future correction. Corrections will be made as soon as operation has ceased. All deficiencies, together with corrective action taken will be recorded on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

WARNING

Equipment operation must be stopped immediately if an equipment damaged or life threatening deficiency is noticed. Failure to heed this warning can result in damage to equipment and injury to personnel.

(1) Before You Operate. Always keep in mind the CAUTIONS AND WARNINGS. Perform your 'before" (B) PMCS.

(2) While You Operate. Always keep in mind the CAUTIONS AND WARNINGS. Perform your "during" (D) PMCS.

(3) After You Operate. Be sure to perform your "after" (A) PMCS.

(4) If Your Equipment Fails to Operate. Troubleshoot using the correct tools and instruments. Report any deficiencies using the specified forms. See DA Form 2404.

b. PMCS Procedures. The following information will aid in understanding the PMCS procedures.

(1) Table 2-1, Preventive Maintenance Checks and Services, lists inspections and procedures required to keep equipment in good operating condition.

(2) The interval column of the PMCS table states when to perform a certain check or service.

(3) Some checks and services cannot be performed with fuel in the tank. Perform as many checks and services as possible without disturbing fuel storage operation.

(4) The procedure column of the PMCS states how to perform the required checks and services. Carefully follow these instructions. Unit maintenance performs the work when the procedure specifies or when required tools are not available.

(5) If equipment does not perform as required, Unit Maintenance must perform Chapter 3 Troubleshooting Procedures to correct the problem. Report malfunctions or failures using DA Form 2404.

(6) Equipment Is Not Ready/Available If: column describes conditions under which equipment cannot be used.

NOTE

The terms Ready/Available and Mission Capable refer to the same status: Equipment is on hand and is able to perform its combat mission.

TABLE 2-1
OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

B - Before D - During A - After

Item No.	Interval B	Interval D	Interval A	ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT NOT READY/AVAILABLE IF:
1.	•	•		Tank site.	
				a. Inspect surface area for stones and debris.	a. Area has debris which can damage tank.
				b. Check for presence of serviceable fire extinguisher.	b. Fire extinguisher is missing or not serviceable.
				c. Check for presence of required WARNING signs.	c. WARNING signs are missing.
2.	•	•	•	Tank Envelope.	
				a. Inspect tank envelope for tears, punctures and leaks.	a. Tank envelope has tears, punctures, or leaks.
3.	•	•	•	Filler/Discharge Assembly.	
				a. Inspect filler/discharge assembly for damage and leaks.	a. Damage prevents normal hose connections or assembly is leaking.
4.	•	•	•	Vent and Pipe Assembly.	
				a. Inspect vent pipe, relief cap, and quick-disconnect coupling for damage or leaks.	a. Damage prevents normal venting or quick-disconnect coupling is leaking.
5.	•	•	•	Drain Assembly.	
				a. Inspect drain assembly for leaks and damage.	a, Damage prevents normal hose connection or hose is leaking.
				b. Inspect drain area for evidence of leakage.	b. Drain area has evidence of leakage.
6.	•	•	•	Hoses and Valves.	
				a. Inspect filler/discharge hose for damage and leaks.	a. Damage prevents normal hose connection or hose is leaking.
				b. Inspect filler/discharge valve for damage and leaks.	b. Damage prevents normal valve operation or valve is leaking.
				c. Inspect drain hose for damage and leaks.	c. Damage prevents normal hose connection or hose is leaking.
				d. Inspect drain valve for Damage and leaks.	d. Damage prevents normal valve operation or valve is leaking.

Section III - OPERATION UNDER USUAL CONDITIONS

2-4. ASSEMBLY AND PREPARATION FOR USE.

CAUTION

Do not deploy the tank until the area has been cleared of sharp objects. Sharp objects can damage the tank.

a. Site Selection and Preparation (See Figure 2-4). Select or grade a level area of at 1 east 25 x 25 ft (7.6 x 7.6 meters); this will provide the desired 5 foot perimeter around the empty flat tank. If the site has a slight slope, place the tank side with the drain fitting at the lowest end. For best tank operation, the tank should have a slope of 3 inches per 100 feet. The site must not be subject to flooding or high water. Clear the site of all sharp objects.

NOTE

A ground cloth should be used, if available, under the tank.

b. Tank Deployment. The following steps provide the necessary actions to place the 3,000 gallon fuel tank in service. A minimum of two persons are required to deploy the tank once the crate containing the tank has been placed next to the prepared site.

CAUTION

Do not drop sharp objects on the tank. Walk on tank as little as possible. When walking on tank, wear soft-soled shoes. Failure to observe these precautions may result in punctures, tears, or scuffs which could damage the tank.

CAUTION

Do not drop or strike tank fittings or accessories. All metal i terns are made of aluminum alloy and are easily damaged.

(1) Cut and remove metal bands from around exterior of crate. Place removed bands outside site.

(2) Remove top of shipping crate.

(3) Remove tank accessories and repair items.

2-4. ASSEMBLY AND PREPARATION FOR USE- (CONTINUED).

NOTE

Equipment received should be checked against the Components of End Item List in Appendix D. If any items are missing, notify your supervisor.

(4). Remove rolled tank from crate.

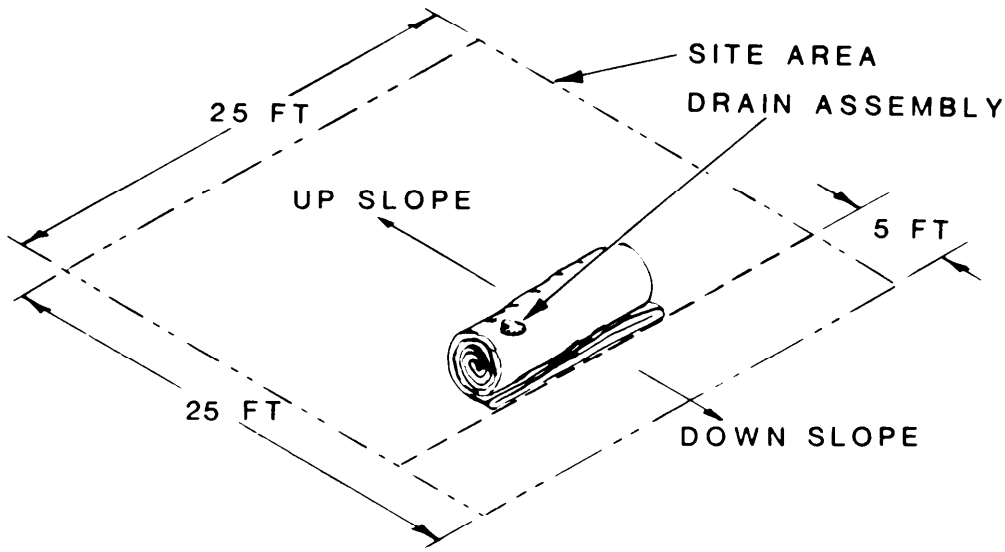


Figure 2-4. Rolled Tank

(5) Position rolled tank on down slope side of site (See Figure 2-4). Tank should be positioned to unroll toward up slope direction.

(6) Remove ties from rolled tank.

(7) Unroll tank (See Figure 2-5).

(8) Unfold tank so empty tank lies flat (See Figure 2-6).

(9) Use tank handles to center tank in prepared site.

2-4. ASSEMBLY AND PREPARATION FOR USE - (Continued).

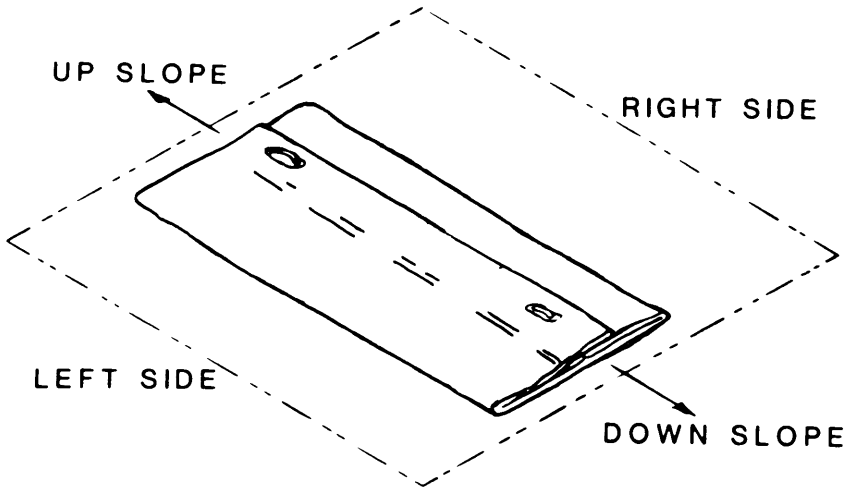


Figure 2-5. Fully Unrolled Tank

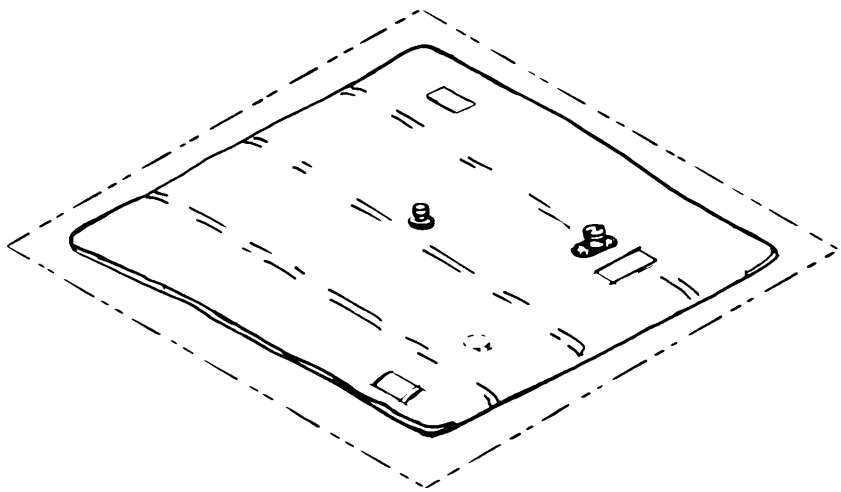


Figure 2-6. Unfolded Tank

c. Preassembly Inspection. To ensure that the tank has not been damaged during shipment, conduct an inspection before assembly. Perform the following inspection before assembly.

(1) Visually inspect all tank components for general damage.

(2) Check that each female coupling has a sealing gasket. Replace all missing gaskets.

(3) Check cam lever arm operation on al 1 female couplings. Do not use couplings with bent, broken, or faulty cam lever arms. Request that unit maintenance replace defective components.

(4) Check that gate valves open and close normally.

(5) Visually inspect tank envelope for punctures or tears. Refer to Chapter 2, Section V for tank envelope repairs.

d. Tank Assembly. After the tank has been unpacked, deployed, and inspected; perform the following steps to ready the tank for operations. Read and comply with all WARNINGS, CAUTIONS and NOTES.

CAUTION

Do not drop or strike tank fittings or accessories. All metal items are made of aluminum alloy and are easily damaged.

NOTE

For ease in emptying the tank completely, dig a hole under the drain assembly.

(1) Fold about 3 feet (0.9 m) of tank envelope back over tank to expose drain assembly connection.

(2) At point where drain fitting contacts ground, dig hole 3 ft x 3 ft (0.9 m x 0.9 m) about 3 inches (7.6 cm) deep. Keep drain fitting centered in hole.

(3) Attach drain hose to drain assembly connection.

NOTE

When attaching the drain hose to the drain assembly fitting, wrap the drain hose male threads with two or three layers of Teflon tape (Appendix F, Item 4) to ensure a positive seal.

(4) Unfold tank envelope to lope flat in original position. Drain hose and valve should extend from bottom of tank.

(5) Check that drain valve is closed. Valve handle must be turned fully clockwise.

NOTE

When mating quick-disconnect couplings, make certain that coupling sealing surfaces and gaskets are clean. If necessary, wipe connecting surfaces with a clean cloth (Appendix F, Item 2).

(6) Remove dust cap from vent fitting coupling.

2-4. ASSEMBLY AND PREPARATION FOR USE - (Continued).

(7) Place vent and pipe assembly on tank vent fitting coupling. Lock assembly in place by closing both disconnect cam lever arms at same time.

(8) Remove dust cap from filler/discharge coupling.

(9) Place 90° elbow on tank filler/discharge coupling. Ensure male opening is pointed toward nearest tank edge. Lock 90° elbow in place by closing both quick-disconnect cam lever arms at same time.

(10) Connect 4 to 3 inch reducer to 90° elbow. Lock connection by closing both quick-disconnect cam lever arms at same time.

(11) Connect 3 inch hose to reducer. Lock connection by closing both quick-disconnect cam lever arms at same time.

(12) Connect 3 inch gate valve to 3 inch hose. Lock connection by closing both quick-disconnect cam lever arms at same time.

(13) Check that 3 inch gate valve is closed. Valve handle must be turned fully clockwise.

(14) Remove crate from site.

NOTE

The tank is now fully assembled. Make certain that a dust cap covers the unused valve coupling.

e. Berm Construction (See Figure 2-7). The site must be bermed to contain the flow of fuel in case of tank rupture or leakage. The tank may be filled before it is bermed if the situation dictates. However, normal procedures are to berm the site area before the tank is filled. An erected berm (Figure 2-8) should have the following characteristics:

(1) At least a 5 foot (1.5 m) working area between the tank and the berm walls.

(2) Wall height should be 1.5 feet (45.7 cm). This will provide an internal volume of at least 937.5 cubic feet (26.61 cubic meters) or 7,000 gallons.

(3) Walls should be protected against erosion with a covering of sod or stone

(4) A drain pipe and valve should be placed through the berm at the low end of the site to remove accumulated rainwater. This drain is normally closed and can be opened as needed.

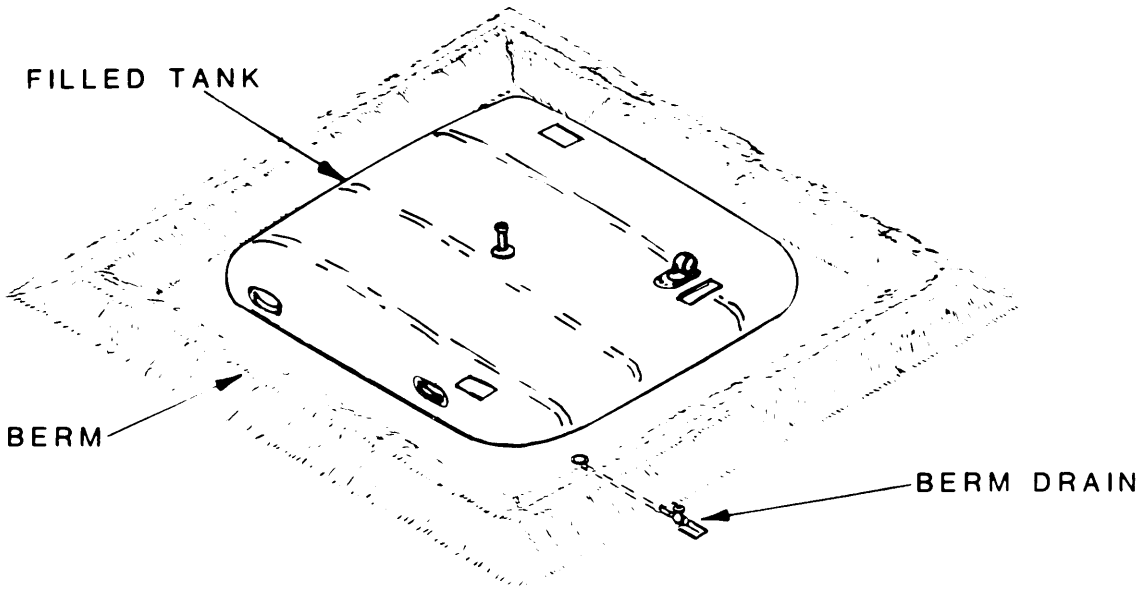


Figure 2-7. Bermed Site

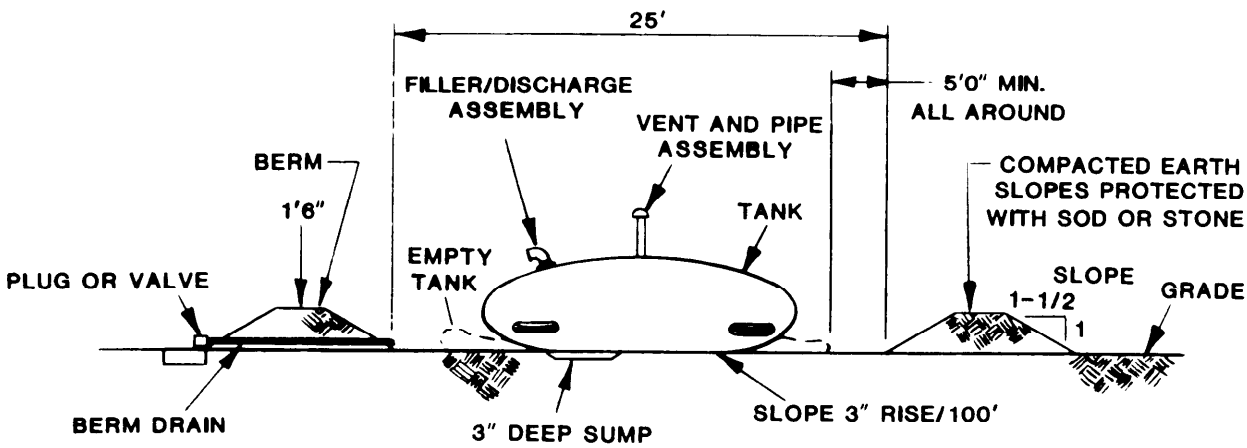


Figure 2-8. Tank Site

f. Final Site Preparation. Secure the site to prevent access by unauthorized personnel.

2-5. OPERATING PROCEDURE.

NOTE

Perform the operator preventive Maintenance Checks and Services (PMCS) before commencing with fueling operations (Refer to Table 2-l).

a. Filling Tank.

WARNING

- Dangerous and explosive conditions can exist anytime excessive fuel vapors are present.
- Fuel vapors can be absorbed by clothing and other materials, making them highly inflammable.
- Use of electrical or spark producing devices within 100 feet (30.50 meters) of the tank may ignite fuel vapors resulting in explosion or fire.
- Skin exposed to liquid fuels is subject to toxic chemical reaction which can cause injury to skin or eyes.
- Do not allow any smoking within 100 feet (30.50 meters) of the storage area.
- Avoid getting fuel on the body or clothing. If clothing becomes saturated, remove the clothing immediately and wash the body thoroughly with hot, soapy water.
- Avoid spillage of fuel. When spillage occurs, cover the affected area with dry soil to reduce its rate of evaporation. Position fire extinguishers at readily accessible positions around the tank.
- Safety berms must have capacities of not less than one and one half (1½) times of the tank capacity.
- The sludge which accumulates in the bottom of fuel storage tanks gives off explosive vapors. Inhalation of vapors can cause lead poisoning. When emptying tanks, ample ventilation must be provided to carry off harmful fumes. Residual sludge must be disposed of in accordance with local policy.
- Do not disassemble or replace tank components while tank is filled with fuel. Failure to heed this warning can result in injury to personnel.

CAUTION

- Do not drop sharp objects on the tank. Walk on tank as little as possible. When walking on the tank, wear soft-soled shoes. Do not drive vehicles over tank. Failure to observe these precautions may result in punctures, tears, or scuffs on the tank.
- Do not drop or strike tank fittings or accessories. All metal items are aluminum and can be easily damaged.

(1) Check that tank is properly deployed. It should be laying flat and smooth.

(2) Check that drain hose is attached to drain assembly.

(3) Check that drain valve is attached to drain hose.

(4) Close drain valve by turning handle fully clockwise. Hose and valve must extend outward from tank bottom.

(5) Check that vent and pipe assembly is installed.

(6) Check vent pipe relief cap for freedom of movement.

(7) Check that 3 inch hose and gate valve are attached to filler/discharge assembly.

(8) Remove dust cap from 3 inch valve male quick-disconnect coupling and connect fuel servicing hose.

CAUTION

Do not overfill the the tank. Do not exceed 3,000 gallons (11.4 kiloliter). Do not fill tank to a height above 4 feet (1.2 m). Overfilling may rupture tank causing uncontrollable leaks.

(9) Open 3 inch gate valve by turning handle fully counterclockwise.

(10) Activate fuel source.

NOTE

If the tank rolls or creeps while being filled, place sandbags along the lower edge of tank. This will prevent further creeping or rolling.

(11) Fill tank to capacity height of 4 feet (1.2 m).

2-5. OPERATING PROCEDURE - (Continued).

CAUTION

Observe the tank during entire filling operation. If problems arise, immediately cease the filling operations and stop fuel transfer.

(12) When tank is full, stop fuel transfer.

(13) Close 3 inch gate valve by turning valve handle fully clockwise.

(14) Disconnect servicing hose from 3 inch gate valve.

(15) Install protective dust cap on 3 inch gate valve.

(16) Check tank for leaks. If tank leaks, take appropriate action and notify supervisor.

b. Discharging Fuel.

WARNING

- Dangerous and explosive conditions can exist anytime excessive fuel vapors are present.
- Fuel vapors can be absorbed by clothing and other materials, making them highly inflammable.
- Use of electrical or spark producing devices within 100 feet (30.50 meters) of the tank may ignite fuel vapors resulting in explosion or fire.
- Skin exposed to liquid fuels is subject to toxic chemical reaction which can cause injury to skin or eyes.
- Do not allow any smoking within 100 feet (30.50 meters) of the storage area.
- Avoid getting fuel on the body or clothing. If clothing becomes saturated, remove the clothing immediately and wash the body thoroughly with hot, soapy water.
- Avoid spillage of fuel. When spillage occurs, cover the affected area with dry soil to reduce its rate of evaporation. Position fire extinguishers at readily accessible positions around the tank.
- Safety berms must have capacities of not less than one and one half (1½) times of the tank capacity.

WARNING

- The sludge which accumulates in the bottom of fuel storage tanks gives off explosive vapors. Inhalation of vapors can cause lead poisoning. When emptying tanks, ample ventilation must be provided to carry off harmful fumes. Residual sludge must be disposed of in accordance with local policy.

- Do not disassemble or replace tank components while tank is filled with fuel. Failure to heed this warning can result in injury to personnel.

CAUTION

- Do not drop sharp objects on the tank. Walk on tank as little as possible. When walking on the tank, wear soft-soled shoes. Do not drive vehicles over tank. Failure to observe these precautions may result in punctures, tears, or scuffs on the tank.

- Do not drop or strike tank fittings or accessories. All metal items are aluminum and can be easily damaged.

(1) Place servicing hose between tank requiring service and 3 inch gate valve.

(2) Remove protective dust caps and plugs from hose and valve connections.

(3) Connect servicing hose to 3 inch gate valve male quick-disconnect coupling.

(4) Connect opposite end of servicing hose to tank requiring service.

(5) Open 3 inch gate valve by turning valve handle counterclockwise to desired position.

CAUTION

Observe tanks, hoses and valves during the entire fuel transfer operation and monitor metering source. If problems arise, immediately stop fuel transfer and notify supervisor.

(6) When tank is full, stop fuel transfer.

(7) Close 3 inch gate valve by turning valve handle fully clockwise.

(8) Disconnect servicing hose from tank.

(9) Reinstall protective dust caps and plugs.

2-5. OPERATING PROCEDURE - (Continued) .

(10) Check tank for leaks. If tank leaks, notify supervisor.

NOTE

Repeat these procedures for each tank requiring service. When servicing operations are completed, make one final inspection for leaks or damage. Notify unit maintenance if repairs are needed.

c. Draining Fuel.

Fuel can be drained from the tank through the drain hose and valve. Draining fuel using this method is not recommended. Sludge and trapped moisture must be drained off before usable fuel can be obtained.

WARNING

- Dangerous and explosive conditions can exist anytime excessive fuel vapors are present.
- Fuel vapors can be absorbed by clothing and other materials, making them highly inflammable.
- Use of electrical or spark producing devices within 100 feet (30.50 meters) of the tank may ignite fuel vapors resulting in explosion or fire.
- Skin exposed to liquid fuels is subject to toxic chemical reaction which can cause injury to skin or eyes.
- Do not allow any smoking within 100 feet (30.50 meters) of the storage area.
- Avoid getting fuel on the body or clothing. If clothing becomes saturated, remove the clothing immediately and wash the body thoroughly with hot, soapy water.
- Avoid spillage of fuel. When spillage occurs, cover the affected area with dry soil to reduce its rate of evaporation. Position fire extinguishers at readily accessible positions around the tank.
- Safety berms must have capacities of not less than one and one half (1½) times of the tank capacity.
- Do not disassemble or replace tank components while tank is filled with fuel. Failure to heed this warning can result in injury to personnel.

WARNING

- The sludge which accumulates in the bottom of fuel storage tanks gives off explosive vapors. Inhalation of vapors can cause lead poisoning. When emptying tanks, ample ventilation must be provided to carry off harmful fumes. Residual sludge must be disposed of in accordance with local policy.

CAUTION

- Do not drop sharp objects on the tank. Walk on tank as little as possible. When walking on the tank, wear soft-soled shoes. Do not drive vehicles over tank. Failure to observe these precautions may result in punctures, tears, or scuffs on the tank.

- Do not drop or strike tank fittings or accessories. All metal items "are aluminum and can be easily damaged.

(1) Connect drain valve to fuel storage container.

(2) Open drain valve by turning valve handle counterclockwise to desired position.

(3) When container has desired level of fuel, close drain valve by turning handle fully clockwise.

d. Removing Tank from Service.

WARNING

The sludge which accumulates in the bottom of fuel storage tanks gives off explosive vapors. Inhalation of vapors can cause lead poisoning. When emptying tanks, ample ventilation must be provided to carry off harmful fumes. Residual sludge must be disposed of in accordance with local policy.

(1) Empty tank as completely as possible using Fuel Discharge procedures in paragraph 2-5b.

(2) Remove 90° elbow from filler/discharge assembly and place elbow, reducer, 3 inch hose, and gate valve outside site.

(3) Remove vent and pipe assembly from tank. Place outside site.

(4) Open drain valve by turning valve handle fully counterclockwise.

(5) Roll tank towards drain and filler/discharge openings. Remove residual fuel from tank.

2-5. OPERATING PROCEDURE - (Continued).

(6) Dry tank by purging with air pressure.

NOTE

Explosion-proof blower or compressed air source should be used to purge tank. The compressed air supply should not exceed 50 PSI (3.4 Atmospheres).

(a) Install dust cap on vent and pipe assembly flange adapter.

(b) Insert air hose through filler/discharge assembly opening.

(c) Place rags (Appendix F, Item 2) around hose at fitting to prevent air from escaping.

(d) Inflate tank until tank is 3 feet (0.9 m) high.

(e) Remove dust cap from vent and pipe assembly flange adapter. Allow air to vent for 30 minutes.

(f) Turn off air supply, and remove air hose and rags.

(7) Install dust cap on filler/discharge assembly flange adapter

(8) Disconnect drain hose and drain valve from drain assembly.

(9) Install dust cap on vent and pipe assembly flange adapter.

NOTE

- The drain assembly plug must be removed to allow the tank to vent freely during folding.
- If tank is destined for long time storage apply talcum powder (Addendix F, Item 3).

(10) Brush debris from top of tank.

(11) Fold right side of tank over top about 1/3 (See Figure 2-5).

(12) Fold left side over top.

(13) Starting at up slope end, roll tank toward down slope (See Figure 2-4) .

(14) After tank is vented, install drain plug.

(15) Secure rolled tank for ease of handling.

(16) Place tank and components in crate.

e. Tank Storage. Ensure that tank is clean and dry before storing. The tank and components should be placed in the appropriate shipping crate. If possible, store the crated tank in a ventilated building or warehouse. Observe the following storage criteria:

(1) Storage area temperatures should remain between -25°F to +125°F (-32°C to +52°C).

(2) Store in original shipping crate if possible.

(3) Store crated tank in cool , dark, and dry area.

NOTE

- If indoor storage space is not available, store the crated tanks on an open hardstand, if available. When storing tanks on unimproved surfaces, select a well drained area without excessive vegetation.

- Storage should provide maximum protection from the elements and allow easy access for inventory, inspection, and maintenance. The storage arrangement and layout should be compatible with operational deployment requirements.

(4) Mark the crate exterior to allow ease of equipment inventory.

2-5. OPERATING PROCEDURES - (Continued).

f. Operating Decals and Instructions. Operator cautions and instructions are located on the tank as shown in Figure 2-9.

(1) Tank Envelope:

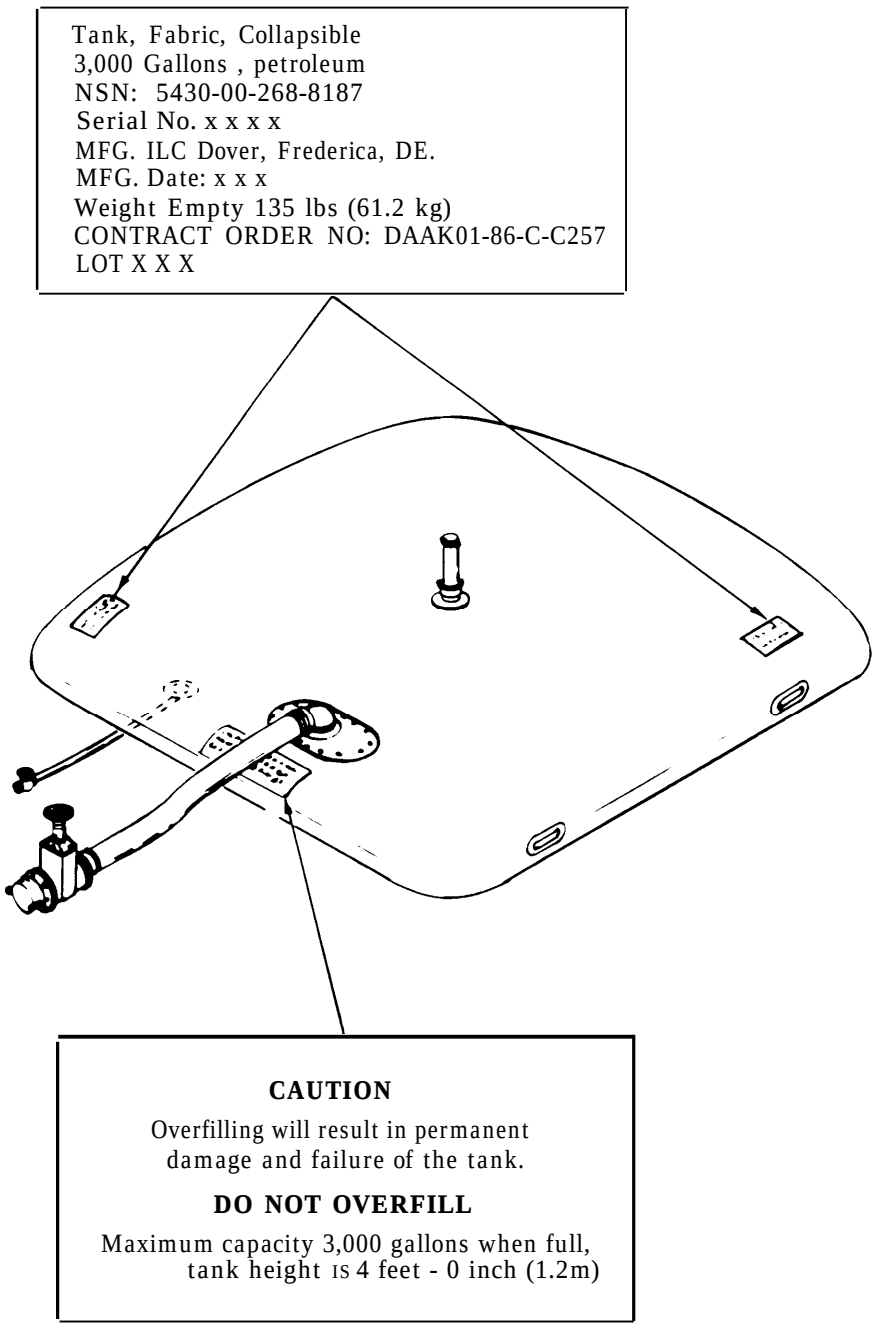


Figure 2-9. Operating Decals and Instructions

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-6. **GENERAL.** The fuel tank is designed to operate in extreme temperature conditions ranging from -25°F to +125°F (-32°C to +52°C). The instructions in this section supplement those in Section I.

2-7. **OPERATING IN EXTREME COLD.** When operating in temperatures below +32°F (0°C):

a. Keep snow and ice from accumulating on top of the tank.

b. All ice and snow must be removed from the quick-disconnect couplings to ensure proper use.

c. Avoid unnecessary folding, unfolding, or rolling of the tank which might cause flaking, cracking, or delamination of the tank envelope material.

2-8. **OPERATING IN EXTREME HEAT.** When operating in temperatures above +100°F (+37.7°C):

a. Install protective shades over the tank, but do not block air circulation.

b. Avoid unnecessary handling to keep tank envelope material from separating.

2-9. **OPERATION IN DUSTY OR SANDY AREAS.** When operating in dusty or sandy areas:

a. Clean and cover tank components when not in use.

b. Install dust caps and plugs on unused quick-disconnect couplings.

Section V. OPERATOR MAINTENANCE INSTRUCTIONS

2-10. **GENERAL.**

Operator maintenance should be limited to emergency tank repairs. If the tank develops a leak during operations, take appropriate action and notify your supervisor.

CHAPTER 3
UNIT MAINTENANCE INSTRUCTIONS

Section I - LUBRICATION INSTRUCTIONS

3-1. **GENERAL.** There are no periodic lubrication instructions for the 3,000 gallon collapsible fabric fuel tank presented in this technical manual.

Section II - REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

3-2. **COMMON TOOLS AND EQUIPMENT.** For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

3-3. **SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.** There are no special tools or equipment required for unit maintenance of the 3,000 gallon collapsible fuel tank.

3-4. **REPAIR PARTS.** Repair parts are listed and illustrated in TM 5-5430-219-23P.

Section Ill - SERVICE UPON RECEIPT OF EQUIPMENT

3-5. **GENERAL.** There are no special service-upon-receipt instructions for the 3,000 gallon collapsible fuel tank. See Chapter 2 for tank deployment instructions.

Section IV - UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-6. **GENERAL.** There are no routine preventive maintenance checks and services performed by unit maintenance personnel. If a storage tank in service has not been operated for a period of 30 days (one month), have unit maintenance personnel perform the "A" column inspections of the Operator Preventive Maintenance Checks and Services (Table 2-1) in this manual.

Section V - TROUBLESHOOTING

WARNING

Do not disassemble or replace tank components while tank is filled with fuel . Failure to heed this warning can result i n injury to personnel .

3-7. **GENERAL.** This section contains troubleshooting information for locating and correcting most operating problems. Each malfunction for an individual

3-7. **GENERAL** - (Continued).

component, unit or system is followed by a list of tests or inspections which will help determine the probable cause and appropriate corrective actions. Tests, inspections and corrective actions should be performed in the order listed. This manual cannot list all malfunctions that may occur, or all the tests/inspections and corrective actions. If a malfunction occurs that is not listed or corrected by these actions, notify your supervisor.

3-8. **TROUBLESHOOTING.** For troubleshooting procedures, refer to Table 3-1 in this manual.

NOTE

These troubleshooting procedures should be performed by a qualified unit maintenance person. Operators who are not qualified to perform troubleshooting and maintenance procedures should contact unit maintenance for problem isolation and correction. Operators who are qualified may perform these procedures when authorized by their supervisor.

Table 3-1. Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. TANK ENVELOPE LEAKS
Step 1 Check tank envelope for punctures. Repair puncture with wood plug (refer to paragraph 3-10a).
Step 2 Check tank envelope for tears or cuts. Repair tear or cut with sealing clamp (refer to paragraph 3-10b).
2. VENT AND PIPE ASSEMBLY LEAKS
Step 1 Check for loose or missing hexagon head bolts. Tighten loose bolts. Replace missing or defective bolts.
Step 2 Remove coupling from tank and inspect O-Ring for nicks and distortion. Replace O-Ring (refer to paragraph 3-11).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
Step 3. Check standpipe for cracks or damage. Remove and replace standpipe (refer to paragraph 3-11).
Step 4. Check quick-disconnect coupling for breaks or cracks. Remove and replace coupling (refer to paragraph 3-11).
3. RELIEF CAP WILL NOT CLOSE
Step 1. Check relief cap for freedom of movement. Clean and lubricate relief cap pivot pin.
Step 2. Check relief cap seating surfaces for debris. Clean seating surfaces.
4. FILLER/DISCHARGE ASSEMBLY LEAKS
Step 1. Check for loose or missing hexagon head bolts. Tighten loose bolts. Replace missing bolts.
Step 2. Remove closure plate and inspect tank fitting for nicks, breaks, and distortion. Replace damaged O-ring (refer to paragraph 3-12).
5. DRAIN ASSEMBLY LEAKS BETWEEN DRAIN FITTING AND TANK FITTING
Step 1. Check for missing or loose hexagon head bolts. Tighten loose bolts (refer to Figure 3-4). Replace missing bolts.
Step 2. Remove drain fitting and inspect O-Ring for nicks or distortion. Replace O-ring. (Refer to paragraph 3-13).
Step 3. Check drain fitting for cracks. Replace drain fitting. (Refer to paragraph 3-13).

Table 3-1. Troubleshooting - (Continued).

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
6. 3 INCH VALVE ASSEMBLY LEAKS	
Step 1. Check quick-disconnect couplings for leaking gaskets.	Replace leaking gaskets. (Refer to paragraph 3-14).
Step 2. Check quick-disconnect flange couplings for leaking flange gaskets.	Replace leaking flange gaskets (Refer to paragraph 3-14).
Step 3. Check valve stem for loose gland packing nut.	Tighten gland packing nut. (Refer to figure 3-5).
7. 3 INCH HOSE ASSEMBLY LEAKS	
Step 1. Check hose for cuts, breaks or leaks.	If hose is damaged, remove and replace hose assembly.
Step 2. Check male quick-disconnect couplings for dirt, damage or wear.	Clean coupling mating surfaces. If leak continues, replace hose assembly.
Step 3. Check gaskets in female quick-disconnect couplings for damage or wear.	Remove and replace damaged or worn quick-disconnect coupling gaskets.

Section VI. MAINTENANCE PROCEDURES

3-9. **GENERAL.** This section contains disassembly, repair, replacement, and bly instructions for the tank and components.

3-10. **EMERGENCY REPAIRS TO TANK ENVELOPE.** There are two ways to repair the tank envelope. Wood plugs should be used during emergency tank repairs to stop fuel leaks until a sealing clamp can be installed. Plug replacement may not be possible until the fuel height and internal pressure have been reduced. Plugs can be used for tears up to 1 1/2 inches (3.8 cm). Sealing clamps can be used for tears up to 6 inches (15.2 cm).

a. Repairs with Wood Plugs.

(1) Insert small end of plug into puncture, and turn clockwise until leak stops.

(2) Remove plug and install clamp when operation permits.

b. Repairs with Clamps (See figure 3-1).

(1) Select correct size of clamp using these guidelines for tears:

less than 2 inches (5 cm). → use 3 inch clamp

2 to 4 inch (5 to 10 cm). → use 5 inch clamp

4 to 6 inch (10 to 15 cm). → use 7½ inch clamp

CAUTION

Use extreme caution when enlarging a tear. Tension in the fabric may cause the fabric to rip further. Ideally, tank height should not exceed 2 feet (0.6 meters) when you make this type of repair.

(2) Loop cord at top of clamp around wrist to prevent loss of clamp into tank.

(3) Insert bottom half of clamp inside tank. If tear is too small for clamp to slip through, use pocket knife to enlarge tear to accommodate width of clamp.

(4) Rotate clamp so that clamp length aligns with tear. Pull bottom half of clamp up against fabric. Slide top half down and over stud.

(5) Tighten wing nut by hand until leak stops.

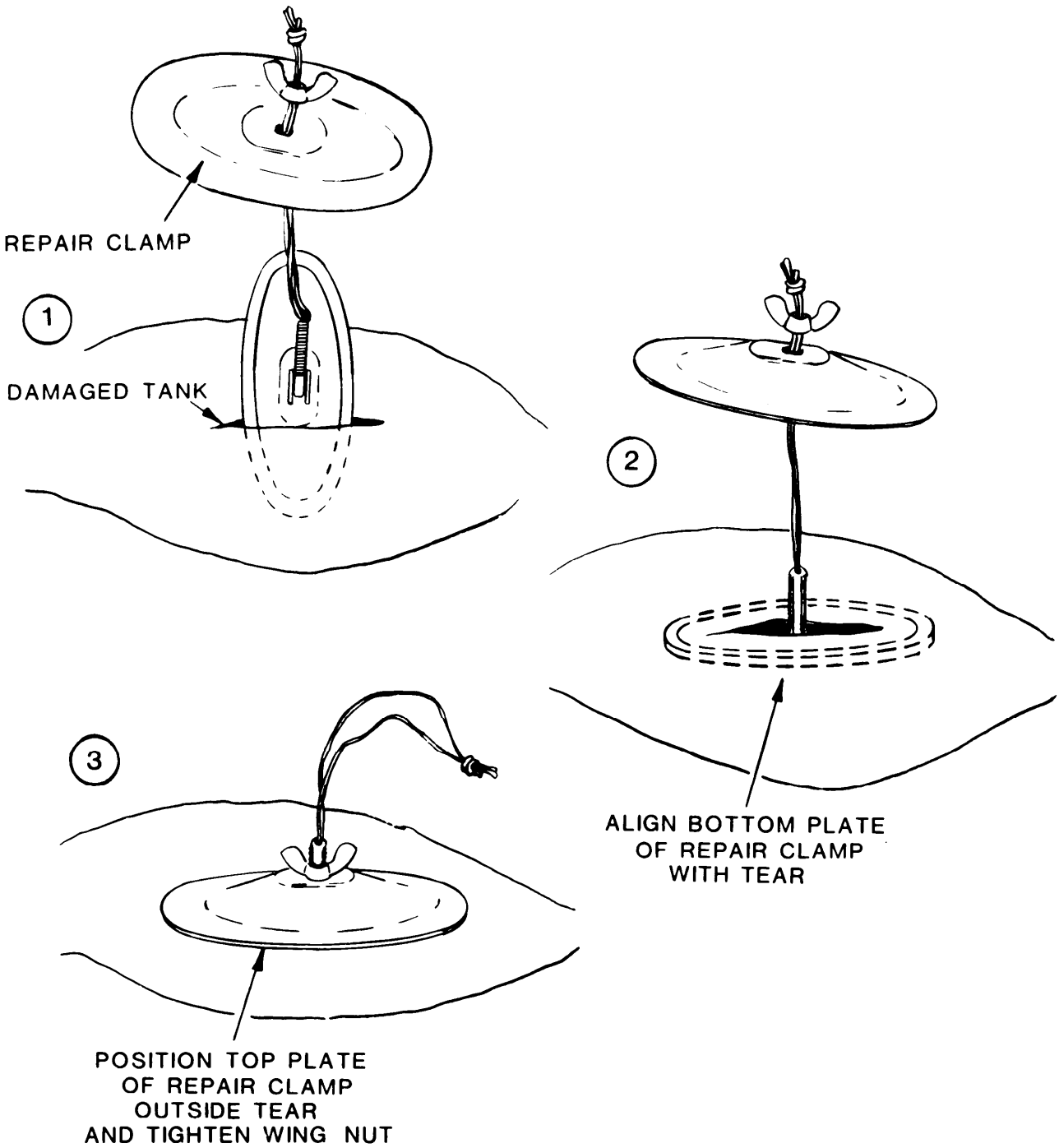


Figure 3-1. Repairing Tank Envelope with Sealing Clamp

3-11. VENT AND PIPE ASSEMBLY (See Figure 3-2).

a. Disassembly.

(1) Disconnect female coupling from flange adapter by pulling outward on cam lever arms. Lift female coupling from adapter. Remove gasket from female coupling.

(2) Remove standpipe from coupling by turning counterclockwise.

(3) Separate relief valve from standpipe by turning valve counter-clockwise.

(4) Remove bolts and washers. Lift flange adapter from tank fitting.

(5) Remove O-ring from groove in tank fitting.

b. Repair and Replacement.

(1) Clean parts by wiping with cloth (Appendix F, Item 2).

(2) Inspect parts for cracks, dents, breaks, or wear. Replace unserviceable parts.

(3) Verify that relief valve opening is clear.

c. Reassembly.

(1) Place O-ring into groove in tank fitting.

(2) place flange adapter on tank fitting. Rotate until holes in flange align with tapped holes in fitting. Install washers on bolts. Install bolts in flange holes and tighten bolts (Refer to Appendix G, Table G-l).

(3) Install relief valve on standpipe; and turn clockwise until tight.

(4) Thread standpipe into female coupling and turn clockwise until tight.

(5) Insert coupling gasket into female coupling.

(6) Install vent and pipe assembly on flange adapter.

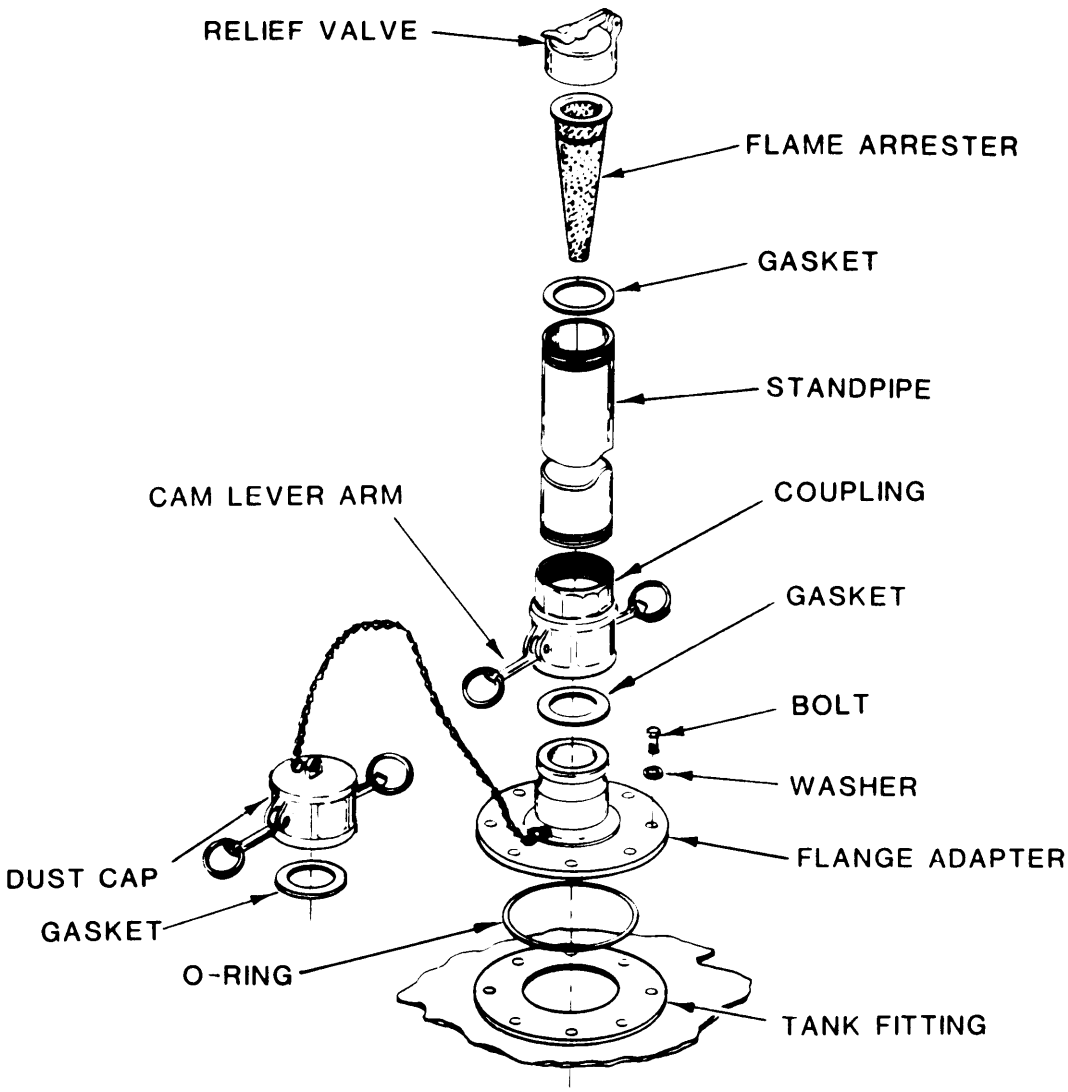


Figure 3-2. Vent and Pipe Assembly

3-12. FILLER/DISCHARGE ASSEMBLY (See Figure 3-3).

a. Disassembly.

(1) Pull outward on cam lever arms and remove 90° elbow from flange adapter.

(2) Remove gasket from inside 90° elbow.

(3) Remove hexagon head bolts and washers from closure plate.

(4) Remove closure plate from tank fitting.

(5) Remove O-ring from groove in tank fitting.

(6) Remove remaining hexagon head bolts and lockwashers from assembly. Remove flange adapter and gasket from top of closure plate. Remove suction stub from bottom of closure plate.

b. Repair and Replacement.

(1) Clean all parts by wiping with a cloth (Appendix F, Item 2).

(2) Inspect all parts for cracks, dents, or wear. Replace unserviceable parts.

c* Reassembly.

(1) Place suction stub on flat surface. Ensure that ring is positioned with holes facing up.

(2) Insert thread seals in suction stub holes.

(3) Place closure plate onto suction stub.

(4) Place flange gasket on closure plate.

(5) Place flange adapter on gasket.

(6) Insert bolts through holes in flange adapter and mate bolts with holes in closure plate and suction stub. Install lockwashers on bolts. Thread nuts on bolts and tighten.

(7) Place O-ring into groove in tank fitting.

(8) Place closure plate onto tank fitting.

(9) Install washers on bolts. Insert bolts through closure plate and into tapped holes in tank fitting. Tighten bolts (Refer to Appendix G, Table G-1).

(10) Install gasket and place 90° elbow on flange adapter. Pull cam lever arms upward until they lock.

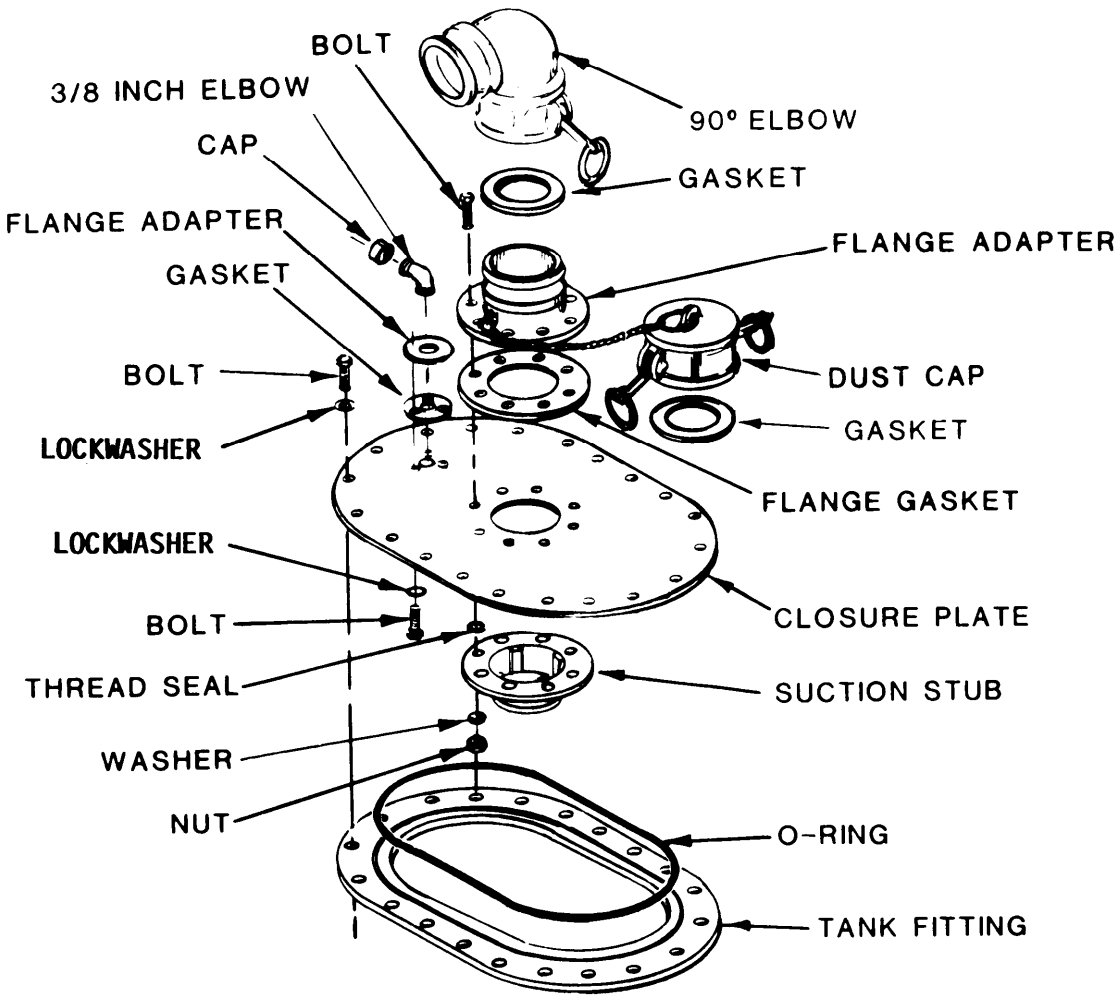


Figure 3-3. Filler/Discharge Assembly

3-13. DRAIN ASSEMBLY (See Figure 3-4).

a. Disassembly.

(1) Remove bolts and washers attaching drain assembly to tank fitting.

(2) Remove drain fitting and attaching hardware.

(3) Remove O-ring from groove in tank fitting.

(4) Remove drain hose from drain fitting by turning hose fitting counterclockwise.

(5) Remove valve from hose by turning hose fitting counterclockwise.

b. Repair and Replacement.

(1) Clean parts by wiping with a cloth (Appendix F, Item 2).

(2) Inspect parts for cracks, dents, breaks, or wear. Replace unserviceable parts.

c. Reassembly.

NOTE

Teflon tape may be used on drain hose threads to ensure a positive seal.

(1) Install drain hose on drain fitting. Turn hose fitting clockwise until tight.

(2) Install drain valve on drain hose. Turn valve clockwise until tight.

(3) Install O-ring in tank fitting groove.

(4) Install drain fitting on tank fitting. Ensure that hose connection faces nearest tank edge.

(5) Install washers on bolts and insert bolts through drain fitting holes.

(6) Thread bolts into tank fitting, and tighten bolts (Refer to Appendix G, Table G-1).

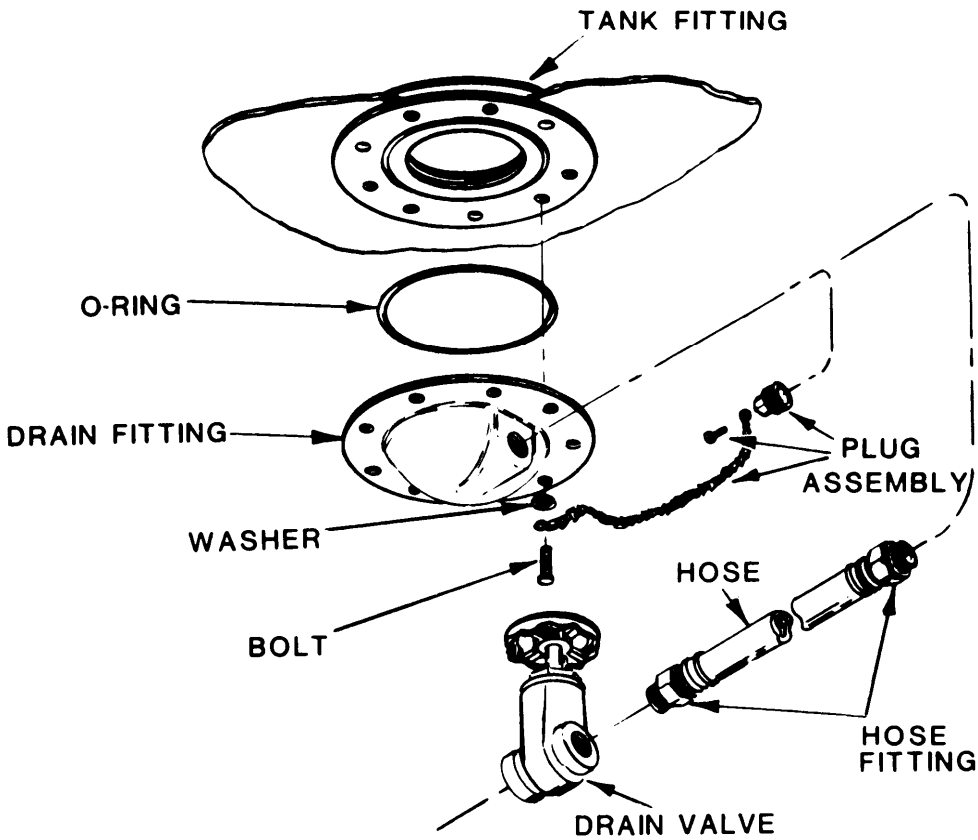


Figure 3-4. Drain Assembly

3-14. **THREE INCH VALVE ASSEMBLY (See Figure 3-5).**

a. Disassemble.

(1) Pull cam lever arms on valve assembly female coupling outward. Remove valve assembly from hose assembly.

(2) Remove hexagon nuts and lockwashers from male coupling.

(3) Remove bolts and washers and remove male coupling and gasket from valve assembly.

(4) Remove dust cap from female coupling by pulling cam lever arms outwards.

(5) Remove hexagon nuts and lockwashers from hexagon head bolts securing female coupling to valve assembly.

(6) Remove bolts and washers and remove female coupling and gasket.

b. Repair and Repalcement.

(1) Clean parts by wiping with cloth (Appendix F, Item 2).

(2) Inspect parts for cracks, dents, breaks, or wear. Replace unserviceable parts.

c. Reassembly.

(1) Install gasket in valve assembly female coupling.

(2) Install 3 inch flange gasket and female coupling on valve assembly.

(3) Assemble coupling using washers and bolts. Insert bolts through coupling, gasket, and valve assembly.

(4) Install lockwashers and nuts on bolts and tighten nuts.

(5) Install 3 inch flange gasket and male coupling on valve assembly.

(6) Assemble male coupling using washers and bolts. Insert bolts through coupling, gasket, and valve assembly.

(7) Install lockwashers and nuts on bolts and tighten nuts.

(8) Inspect valve assembly female coupling. Ensure coupling is clean and serviceable gasket is installed.

(9) Insert hose male coupling in female valve assembly coupling. Push in cam lever arms until locked.

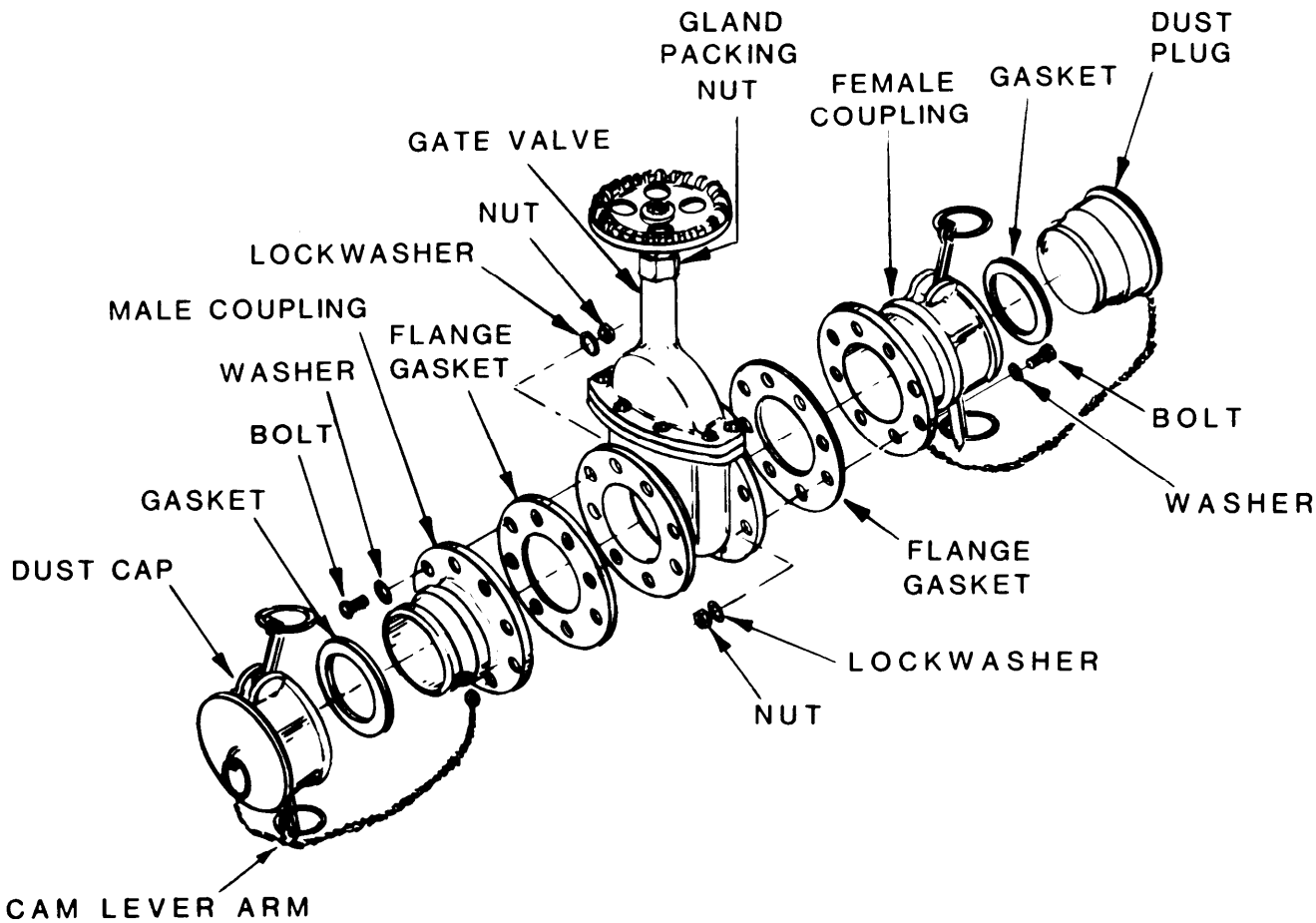


Figure 3-5. Three Inch Valve Assembly

3-15. **THREE INCH HOSE ASSEMBLY.**

a. Disassembly of 3 Inch Hose Assembly (See Figure 3-6).

NOTE

The tank should be drained prior to disassembling the 3 inch hose assembly.

(1) Disconnect hose from filler/discharge assembly by pulling coupling cam lever arms outward (See Figure 3-5).

(2) Disconnect hose from valve assembly by pulling coupling cam lever arms outward.

b. Replacement. Unpack new hose and check female coupling for serviceable gasket.

c. Reassembly of 3 Inch Hose Assembly (See Figure 3-6).

(1) Clean filler/discharge assembly coupling.

(2) Connect hose assembly to 4 to 3 inch reducer. Push in cam lever arms at same time.

(3) Connect valve assembly to hose male coupling. Push in cam lever arms at same time.

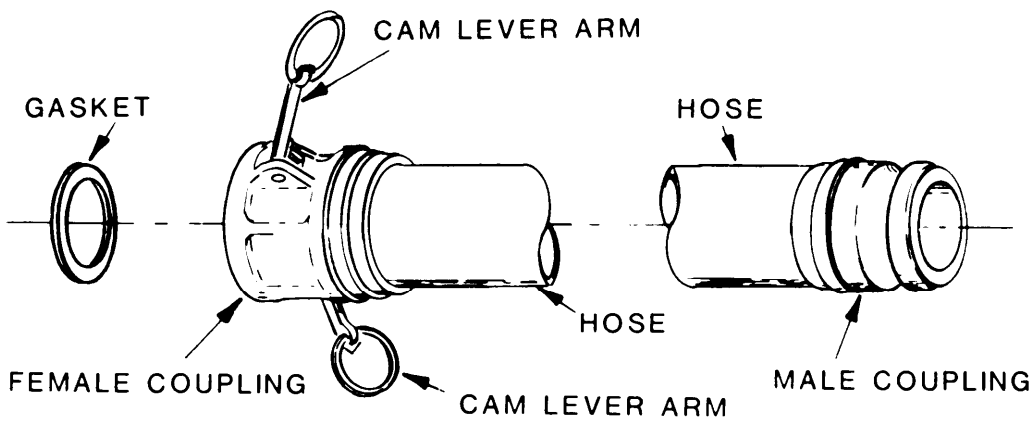


Figure 3-6. Three Inch Hose Assembly

3-16. **PERFORMANCE VERIFICATION.**

The only performance verification required for the 3,000 Gallon Collapsible Fuel Tank is a visual inspection of the parts that have been repaired or replaced.

CHAPTER 4
INTERMEDIATE (DS) MAINTENANCE INSTRUCTIONS

Section I - TROUBLESHOOTING

4-1. **GENERAL.** There are no troubleshooting procedures for Intermediate Maintenance Level prescribed in this technical manual.

Section II - MAINTENANCE PROCEDURES

4-2. **GENERAL.** There are no maintenance procedures for the Intermediate Maintenance Level prescribed in this technical manual.

4-3. SERVICEABILITY. The 3000 gallon tank is evaluated for serviceability and shelf life in accordance with SB740-99-1. If the tank does not meet the criteria for repair, a disposition form will be issued for disposal.

APPENDIX A
REFERENCES

A-1. **SCOPE.**

This appendix lists all forms, technical manuals, field manuals, and miscellaneous publications required for operation and maintenance of the 3000 gallon collapsible fabric fuel tank.

A-2. **FORMS.**

Hand Receipt/Annex Number . . . . . DA Form 2062

Equipment Inspection and Maintenance Worksheet . . . . . DA Form 2404

Maintenance Request . . . . . DA Form 2407

Recommended Changes to Equipment Technical Publications . . . . . DA Form 2028-2

Recommended Changes to Publications and Blank Forms . . . . . DA Form 2028

A-3. **TECHNICAL MANUALS.**

Arctic Construction . . . . . TM 5-349

Chemical, Biological, and Radiological (CBR) Decontamination . . . . . TM 3-220

Firefighting and Rescue Procedures in Theaters of Operation . . . . . TM 5-315

Military Petroleum Pipeline Systems . . . . . TM 5-343

Petroleum Handling Equipment and Operations . . . . . TM 10-1101

Preservation: Packaging and Packing of Military Supplies and Equipment . . . . . TM 38-460

Storage, Inspection, and Preservation of POL Pipeline Equipment . . . . . TM 38-230

Unit and Intermediate Direct Support Maintenance Repair Parts and Special Tools List for Tank Fabric, Collapsible, Pol, 3,000 Gallon, 20,000 Gallon, 50,000 Gallon and 5,000 BBL . . . . . TM 5-5430-219-23P

A-4 **FIELD MANUALS.**

Basic Cold Weather Manual FM 31-70

Camouflage . . . . . FM 5-20

First Aid Procedures . . . . . FM 21-11

Northern Operations . . . . . FM 31-71

A-4. FIELD MANUALS - (Continued).

Nuclear, Biological, and Chemical (NBC) Defense (Reprinted with Basic Incl. C1). . . . . FM 21-40

Organizational Maintenance: Military Petroleum Pipelines, Tanks, and Related Equipment . . . . . FM 10-20

Petroleum Terminal and Pipeline Operations . . . . . FM 10-18

A-5. MISCELLANEOUS PUBLICATIONS.

Army Medical Department Expendable/Durable Items . . . . . .CTA 8-100

Consolidated Index of Army Publications and Blank Forms . . . . . DA Pam 310-1

Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items) . . . . . CTA 50-970

Hand Portable Fire Extinguishers. . . . . .TB 5-4200-200-10

The Army Maintenance Management System (TAMMS). . . . . DA Pam 738-750

Storage Serviceability Standard for TSARCOM Material . . . . . SB 740-99-1

APPENDIX B
MAINTENANCE ALLOCATION CHART

Section I - INTRODUCTION

B-1. **GENERAL**.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in section II designates overall authority and responsibility for the performance of maintenance functions to the end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from section II.

B-2. **MAINTENANCE FUNCTIONS.** Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, Pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Align. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the 3d position code of the SMR code.

i. Repair. The application of maintenance services[1], including fault location troubleshooting[2], removal/installation, and disassembly/assembly[3] procedures, and maintenance actions[4] to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

---

[1]Services - inspect, test, service, adjust, align, calibrate, and/or replace.

[2]Fault locate/troubleshooting - The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

[3]Disassemble/assemble - encompasses the step-by-step taking apart (or breakdown) or a spare/functional group coded item to the level of its least componency identified as maintenance significant (i.e., assigned an SMR code) for the category of maintenance under consideration.

[4]Actions - welding, grinding, riveting, straightening, facing, remachinery, and/or resurfacing.

B-3. **EXPLANATION OF COLUMNS IN THE MAC, SECTION II.**

a. Column 1. Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group number shall be "00".

be Column 2. Component/Assembly. Column 2 contains the names of components assembles, subassemblies, and modules for which maintenance is authorized.

c. Column 3. Maintenance Function. Column 3 lists the functions to be performed on the item listed in Column 2. (For detailed explanation of these functions, see paragraph B-2.)

d. Column 4. Maintenance Category. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The system designations for the various maintenance categories are as follows:

C	Operator or crew
O	Unit Maintenance
F	Intermediate Direct Support Maintenance
H	Intermediate Genera. Support Maintenance
L	Specialized Repair Activity (SRA)[5]
D	Depot Maintenance

e. Column 5. Tools and Equipment. Column 5 specifies, by code, those column tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

---

[5]This maintenance category is not included in Section II, column (4) of the Maintenance Allocation Chart. To identify functions to this category of maintenance, enter a work time figure in the "H" Column of Section II, column (4), and use an associated reference code in the Remarks column (6). Key the code to Section IV, Remarks, and explain the SRA complete repair application there. The explanatory remark(s) shall reference the specific Repair Parts and Special Tools List (RPSTL) TM which contains additional SRA criteria and the authorized spare/repair parts.

f. Column 6. Remarks. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in Section IV.

B-4. **EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III.**

a. Column 1. Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2. Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3. Nomenclature. Name or identification of the tool or test equipment.

d. Column 4. National Stock Number. The National stock number of the tool or test equipment.

e. Column 5. Tool Number. The manufacturer's part number.

B-5. **EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.**

a. Column 1. Reference Code. The code recorded in column 6, Section II.

b. Column 2. Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART
FOR
TANK, FABRIC, COLLAPSIBLE, 3,000 GALLON FUEL

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
00	TANK, FABRIC, COL-LAPSIBLE 3,000 GALLON FUEL	Inspect Replace Repair	.2	 1.0 .5			 4.0	1	
01	TANK ENVELOPE	Inspect Replace Repair	.2	 1.0 .5	 .5			1	Serviceability/ Disposition
02	VENT AND PIPE ASSEMBLY	Inspect Replace Repair	.2	 .2 .5				1	
03	FILLER/DISCHARGE ASSEMBLY	Inspect Replace Repair	.2	 .2 .5				1	
04	DRAIN ASSEMBLY	Inspect Replace Repair	.2	 .2 .5				1 1	
05	3 INCH VALVE ASSEMBLY	Inspect Replace Repair	.2	 .2 .5				1	
06	HOSE ASSEMBLIES	Inspect Replace	.2	 .2				1	
07	REPAIR ITEMS	Inspect Replace Repair		.2 .1 .2				 1	

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR TANK, FABRIC, COLLAPSIBLE, 3,000 GALLON FUEL

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/ NATO STOCK NUMBER	TOOL NUMBER
1	F	TOOL KIT, GENERAL MECHANICS	5180-00-177-7033	

APPENDIX C

NOT APPLICABLE

APPENDIX D
COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

D-1. **SCOPE.** This appendix lists all components of end item and basic issue items for the 3,000 Gallon Fuel Tank to help you inventory items required for safe and efficient operation.

D-2. **GENERAL.** The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item" whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the 3,000 Gallon Tank in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the 3,000 Gallon Tank during operation whenever it is transferred between property accounts.

The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

D-3. **EXPLANATION OF COLUMNS.** The following provides an explanation of columns found in the tabular listings:

a. Column (1) - Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

b. Column (2) - National Stock Number. Indicates the National stock number assigned to the end item and will be used for requisitioning purposes.

c. Column (3) - Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number. If item needed differs for different models of this equipment, the model is shown under the "Usable On" heading in this column. These codes are identified as:

D-3. EXPLANATION OF COLUMNS - (Continued).

d. Column (4) - Unit of Measure (U/M). Indicates the measure used in performing the actual operation/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea. in, pr).

e. Column (5) - Quantity Required (Qty. Rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEM

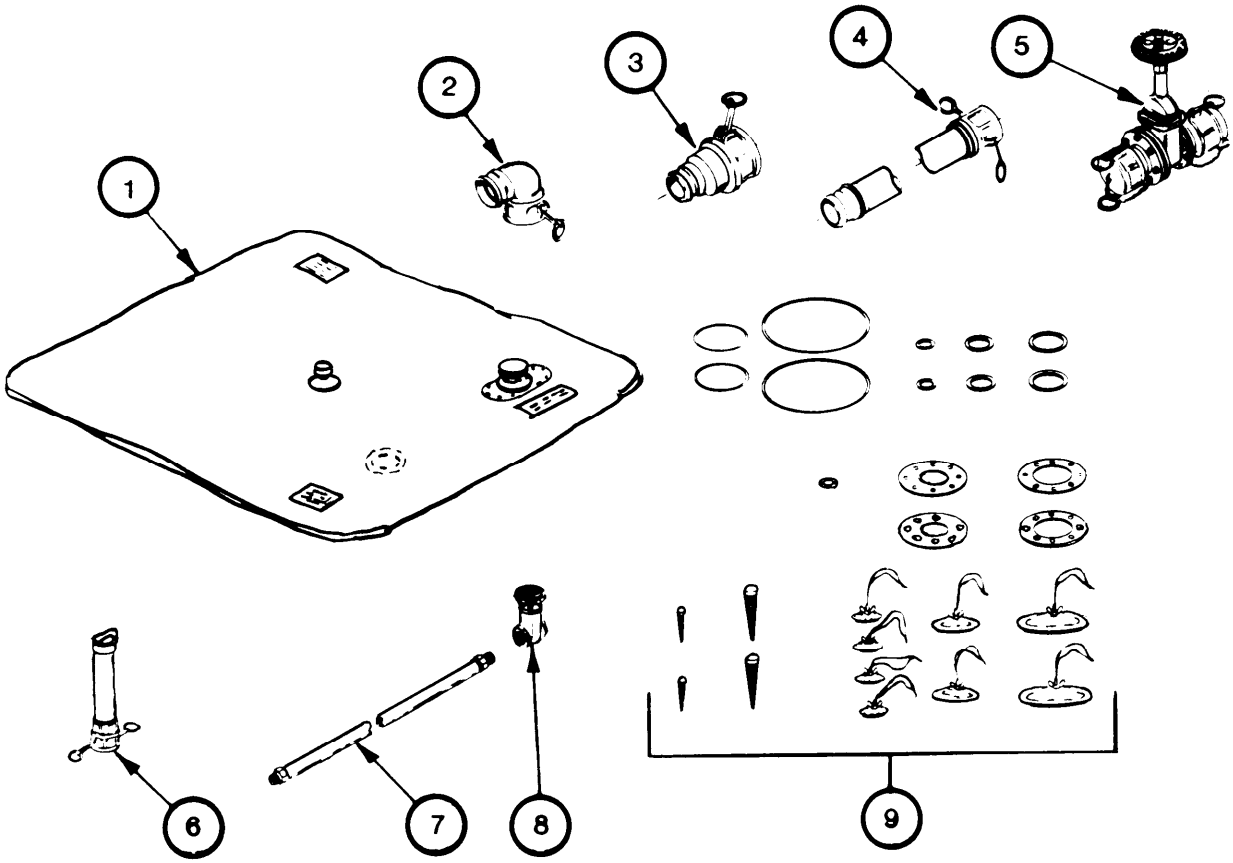


Figure D-1. Tank, Fabric, Collapsible, 3,000 Gallon Fuel

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	Usable On Code	(4) U/M	(5) Qty Rqr
1		Tank Envelope		EA	1
		Accessories			
2		...90° Elbow 4"		EA	1
3		...Reducer, 4" Female to 3" Male		EA	1
4		...Hose, 3" (4 foot length)		EA	1
5		...Gate Valve Assembly, 3"		EA	1
6		...Vent and Pipe Assembly		EA	1
7		...Hose, 1/2" (8 foot length)		EA	1
8		...Gate Valve, 1/2"		EA	1
9		Emergency Repair Items		ST	1

Section III. BASIC ISSUE ITEMS

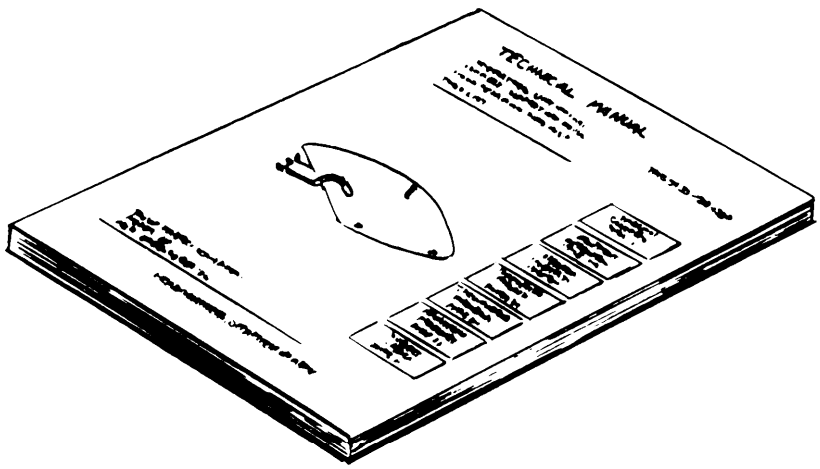


Figure D-2. Technical Manual

(1) Illus number	(2) National Stock number	(3) Description FSCM and Part number	Usable On Code	(4) U/M	(5) Qty rqr
1	TBD	TM 5-5430-218-13, Operator's Unit and Intermediate, Direct Support Maintenance Manual.		EA	1

APPENDIX E
ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

E-1. **SCOPE.**

This appendix lists all additional items your authorized for the support of the 3,000 gallon collapsible fabric fuel tank.

E-2. **GENERAL.**

This list identifies items that do not have to accompany the 3,000 gallon fuel tank and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

E-3. **EXPLANATION OF LISTING.**

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by number under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you. If item required differs for different models of this equipment, the model is shown under the "Usable on" heading in the description column. These codes are identified as:

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION CAGEC & PART NUMBER USABLE ON CODE	(3) EA	(4) QTY. AUTH
5430-01-237-3658	Liner, Berm, Tank, Fabric (81349) M53081-1	EA	1
5430-01-352-6073	Repair Kit, Collapsible Fabric Tank (ROCTAD) (63775) 201225	EA	1
5430-01-359-1078	Repair Kit, Collapsible Fabric Tank (ROCTAD) (0F6E1) BOV-USA-1	EA	1

*U.S. GOVERNMENT PRINTING OFFICE: 1995 - 655-028/20048

APPENDIX F
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

F-1. **SCOPE.**

This appendix lists expendable supplies and materials you will need to operate and maintain the 3,000 gallon collapsible fabric fuel tank. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

F-2. **EXPLANATION OF COLUMNS.**

a. Column (1)Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify material (e.g., “Use clean cloth, item 5, App D)").

b. Column (2)-Level. This column identifies the lowest level of maintenance that requires the listed item.

C . . . . . Operator/Crew.
O . . . . . Unit Maintenance/AVUM.

c* Column (3)-National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4)-Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacture (FSCM) in parenthesis followed by the part number.

e. Column (5)-Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in., pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1.	0	6950-00-281-1985	Cleaning Solvent, P-D-680, Type II	GL
2.	0	7920-00-205-1711	Rags, Wiping, Cotton, and Cotton Synthetic, A-A-53	EA
3.	0	6810-00-270-9988	Talc, Technical, T1 and T3, MIL-T-50036	LB
4.	0	8030-00-902-1155	Tape, Ant seize	EA

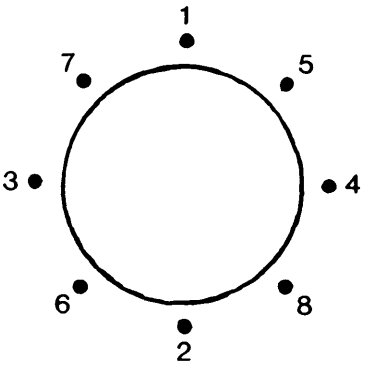
APPENDIX G
TORQUE LIMITS

Section I - INTRODUCTION

G-1. **GENERAL.** This appendix lists standard torque values which are shown in Table G-1. Refer to these torque values only when specific torque value information is not provided in the maintenance sections of this technical manual.

Section II - TORQUE VALUES

Table G-1. 3,000 Gallon Collapsible Fabric Tank Torque Values

Item	Assembly	Torque Value	Remarks
1.	Vent and Pipe Assembly	75 inch lbs	a. Set torque wrench at 75 inch lbs. **NOTE** Torque sequence number 1 (one) can be started at any bolt position of Vent and Pipe Assembly. b. Torque all bolts to 75 inch lbs using the sequence in Figure G-1.  Figure G-1

Section II - TORQUE VALUES - (Continued).

Table G-1. 3,000 Gallon Collapsible Fabric Tank Torque Values

Item	Assembly	Torque Value	Remarks
2.	Drain Assembly	75 inch lbs	a. Set torque wrench at 75 inch lbs. **NOTE** Torque sequence number 1 (one) can be started at any bolt position of Drain Assembly. b. Torque all bolts to 75 inch lbs using the sequence in Figure G-1.
3.	Filler/Discharge Assembly	75 inch lbs	a. Set torque wrench at 75 inch lbs. **NOTE** Torque sequence number 1 (one) can be started at bolt position 1 (one) or 3 (three) of Filler/ Discharge Assembly. b. Torque all bolts to 75 inch lbs using the sequence in Figure G-2.

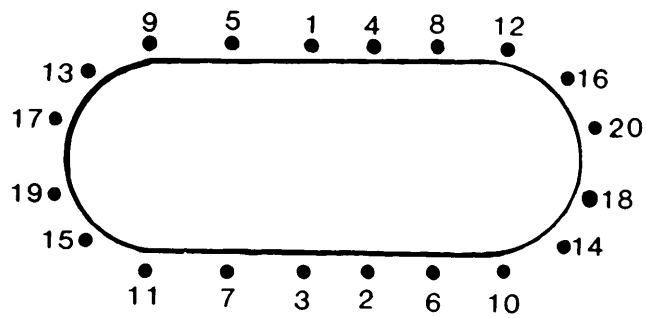


Figure G-2

GLOSSARY

Section I - ABBREVIATIONS

IDS	Intermediate Direct Support
MAC	Maintenance Allocation Chart
NIIN	National Item Identification Number
NSN	National Stock Number
RPSTL	Repair Parts and Special Tools List
SMR	Source, Maintenance and Recoverability Code
TBD	To be Determined
UOC	Usable on Code

Section II - DEFINITION OF UNUSUAL TERMS

Berm	A mound or wall of earth that surrounds and protects the tank.
Drop Cloth	Any kind of protective material placed between the ground and the tank.
Preformed packing	An O-ring type gasket.

ALPHABETICAL INDEX

ALPHABETICAL INDEX - (Continued).

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

OFFICIAL :

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

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Operator, Unit and Direct Support and General Support Maintenance Requirements for Tank, Fabric, Collapsible, POL 50,000, 10,000, 3,000 Gal.

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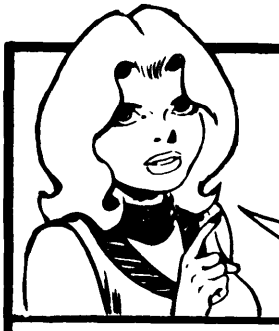

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COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 5-5430-218-13	14 Sep 87	TANK, FABRIC, COLLAPSIBLE, 3,000

BE EXACT. PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
6	2-1 a		
B1		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylenders. The engine on my set only has 4 Cylenders. Change the manual to show 4 Cylenders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (268) 317-7111

SIGN HERE John Doe
JOHN DOE

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TM 5-5430-218-13	14 Sep 87	TANK,FABRIC,COLLAPSIBLE, 3,000 Gal

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PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

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PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 5-5430-218-13	14 Sep 87	TANK, FABRIC, COLLAPSIBLE 3,000 Ga

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE

DA FORM 1 JUL 79 **2028-2**

PREVIOUS EDITIONS ARE OBSOLETE.

DRSTS-M Overprint 2, 1 Nov 80.

P S --IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

TEAR ALONG PERFORATED LINE

REVERSE OF DA FORM 2028-2 Reverse of DRSTS-M Overprint 2, 1 Nov 80

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TEAR ALONG PERFORATED LINE

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 063100-000