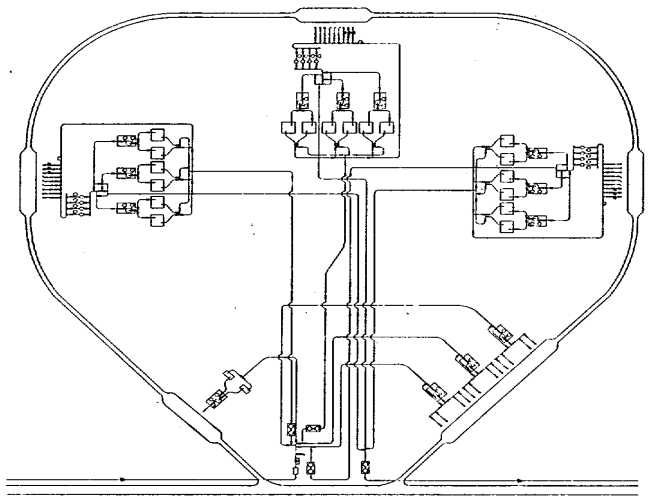
TECHNICAL MANUAL

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE MANUAL



TACTICAL PETROLEUM TERMINAL
MODEL TPT-1
(NSN 3835-01-288-4604)

HEADQUARTERS, DEPARTMENT OF THE ARMY
5 APRIL 1995

WARNING

SMOKING AND OPEN FLAMES

Allow no smoking, open flames, or spark producing items within 50 ft. of any facility or device storing or handling petroleum fuels. Erect "No Smoking" signs to this effect.

WARNING

MOVING PARTS

Engines and pumps have fast moving parts that can injure hands, feet etc. Take special care while in operation.

WARNING

HOT ENGINE PARTS

Engine parts, particularly the exhaust system can be very hot and cause severe bums. Do not touch until engine is shut down and cooled off. Avoid spilling fuel or oil on hot engine parts, which could result in a fire.

WARNING:

FIRST AID

If an injury occurs, refer to FM 21-11 for first aid procedures.

WARNING

LIFTING

Attempting to lift heavy objects without help can cause injury; always get additional personnel as needed to help.

WARNING

HOSE WHIP

Weigh down free hose ends and loops with sand bags. Leave hose in fuel dispensing area in a relatively straight stretched-out condition rather than coiled or tangled. Hose may tend to move rapidly or whip when pressure changes and can injure personnel.

WARNING

SHUT VEHICLE ENGINES OFF WHEN FILLING VEHICLE WITH FUEL

Vehicle engines must be shut down when filling the vehicle with fuel to minimize the risk of fire or explosion.

WARNING

FUEL AIR MIXTURES

Any mixture of fuel vapor or fuel droplets in air is potentially explosive. Air in contact with a fuel surface is potentially explosive or as a minimum flammable. Treat such conditions as hazardous and eliminate the cause immediately.

WARNING

LIQUID FUEL LEAKS

Promptly correct any fuel leakage that causes an accumulation of fuel on any surface. If it cannot be corrected safely while in operation, shut down and make corrections to stop the leak. Make a list of any minor leaks that cannot be corrected in operation and make repairs at the first shut down opportunity.

WARNING

LIQUID FUEL ACCUMULATION

The accumulation of liquid fuel, or hot lubricating oil is a fire hazard. Wipe and wash down such areas or surfaces promptly. Dispose of any wiping rags in an area removed from the fuel storage or handling areas. Apply no smoking rules within 50 ft. of any fuel accumulation.

WARNING

FUEL SATURATED SOIL

Fuel saturated soil is a fire hazard. Do not allow unnecessary personnel in the area. Do not allow smoking within 50 ft. of the area. Remove saturated soil and replace with clean soil.

WARNING

MAJOR TANK SPILLS

If a major spill occurs due to tank overflow or breakage, or hose breakage, do not go inside the tank berm or firewall until the accumulation has been removed and supervision approves entry. Special fire protection precautions must be taken under these conditions. Fire suppression equipment should be concentrated in the area.

WARNING

- **Certain textile materials can produce static electricity and present a fire and explosion hazard. Personnel should wear cotton clothing. Nylon, wool, silk and certain plastics should not be worn. Chamois should not be used to filter fuel as it can cause static electricity as well.**

ELECTRICAL STORMS

- **Discontinue fuel-handling operations at approach of electrical storms.**

- **Never use gasoline for cleaning parts, clothing, rags, or other items.**

- **Do not wash hands in fuels.**

- **Place all oily waste and rags in self-closing metal containers after use. Empty containers at an assigned disposal point frequently.**

- **Immediately remove any articles of clothing or shoes that have become soaked with fuels. This should be done in an area free from ignition sources.**

WARNING

CLEAN OPERATING AREAS

Keep operating areas cleaned up and picked up. Remove any unnecessary equipment, trash, large rocks etc. Such obstacles can be tripped over during the rush of operation and cause personnel injury.

WARNING

NOISE - HEARING DAMAGE

Areas near diesel engine-driven equipment have a high noise level. Wear ear protection devices to avoid temporary or possibly permanent hearing damage.

WARNING

FUEL SPLASH AND SPILL

Splashes and spills can cause eye injury and skin irritation. Wear face shield and approved gloves.

WARNING

GROUNDING AND BONDING

Never begin any fuel handling operation until all equipment is properly grounded and bonded.

WARNING

VEHICLE DISCONNECT

Make sure vehicles are disconnected from the dispensing assembly before moving.

WARNING

PRESSURIZED SYSTEM

Do not break (open) any flanges or open any couplings until the system is depressurized at that location. Injury and fuel spills can result.

WARNING

FUME ACCUMULATION

Strong fumes may be explosive and possibly dangerous to the eyes and respiratory system. Warn personnel that must be in the area. Get unnecessary personnel out of the area.

WARNING

Do not allow items to swing while suspended from a lifting device. Failure to observe warning may result in injury to personnel and damage to equipment.

WARNING

Use only explosion-proof electrical equipment in and around all areas in which fuel is present.

TECHNICAL MANUAL

TM 10-3835-231-13

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 5 APRIL 1995

OPERATOR'S, UNIT AND DIRECT SUPPORT MAINTENANCE MANUAL

TACTICAL PETROLEUM TERMINAL
MODEL TPT-1
(NSN 3835-01-288-4604)

REPORTING OF ERRORS

Reporting Errors and Recommending Improvements. You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Good fellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished to you.

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

TABLE OF CONTENTS

TABLE OF CONTENTS - continued

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS - continued

HOW TO USE THIS MANUAL

Be sure to read all Warnings before using your equipment.

This manual contains instructions for operation and maintenance of the Tactical Petroleum Terminal.

MANUAL OVERVIEW

a. Index Tabs.

See the front cover index of this manual. It lists the most important areas of the manual and guides you to those sections. Follow the black mark on the cover index edge through the pages to the edge mark on the section you want. The subjects on the front cover index are also highlighted in the table of contents by containers. A detailed alphabetical index is located at the back of this manual.

b. Contents.

The following gives you a summary of each chapter and appendix. Before beginning a maintenance task, you must familiarize yourself with the entire procedure.

- Chapter 1 - Introduces you to the equipment and gives you information such as weight and dimensions used and general theory of operation including technical principles of operation.
- Chapter 2 - Provides information necessary to identify and service the equipment. Operating instructions in this chapter tell you how to use the equipment in usual and unusual conditions.
- Chapter 3 - Provides operator troubleshooting procedures for identifying common equipment malfunctions and maintenance procedures for performing operator maintenance tasks.
- Chapter 4 - Provides unit maintenance personnel with procedures for lubrication and service upon receipt of equipment and instructions for performing repairs on equipment as authorized by the maintenance allocation chart.
- Chapter 5 - Provides direct support maintenance personnel with instructions for performing repairs on equipment as authorized by the maintenance allocation chart.

- Appendix A - Provides a list of frequently used forms and publications referenced or used in this manual.
- Appendix B - The maintenance allocation chart identifies repairable components and the maintenance level authorized to perform the repairs.
- Appendix C - Lists components of end item and basic issue items to help you inventory.
- Appendix D - Lists additional items that you are authorized for the support of the TPT.
- Appendix E -Lists expendable and durable items needed to operate and maintain the TPT.
- Appendix F - Lists manuals for specific component lubrication.
- Appendix G - Provides you with instructions for making items authorized to be manufactured or fabricated at unit, direct support, or general support maintenance.
- Appendix H - Lists maintenance procedures for specific component torque requirements.
- Appendix I - Mandatory replacement parts list.

- Glossary - Lists terms and abbreviations used in this manual and their definitions.

- Index - Lists subject matter contained in manual in alphabetical order.

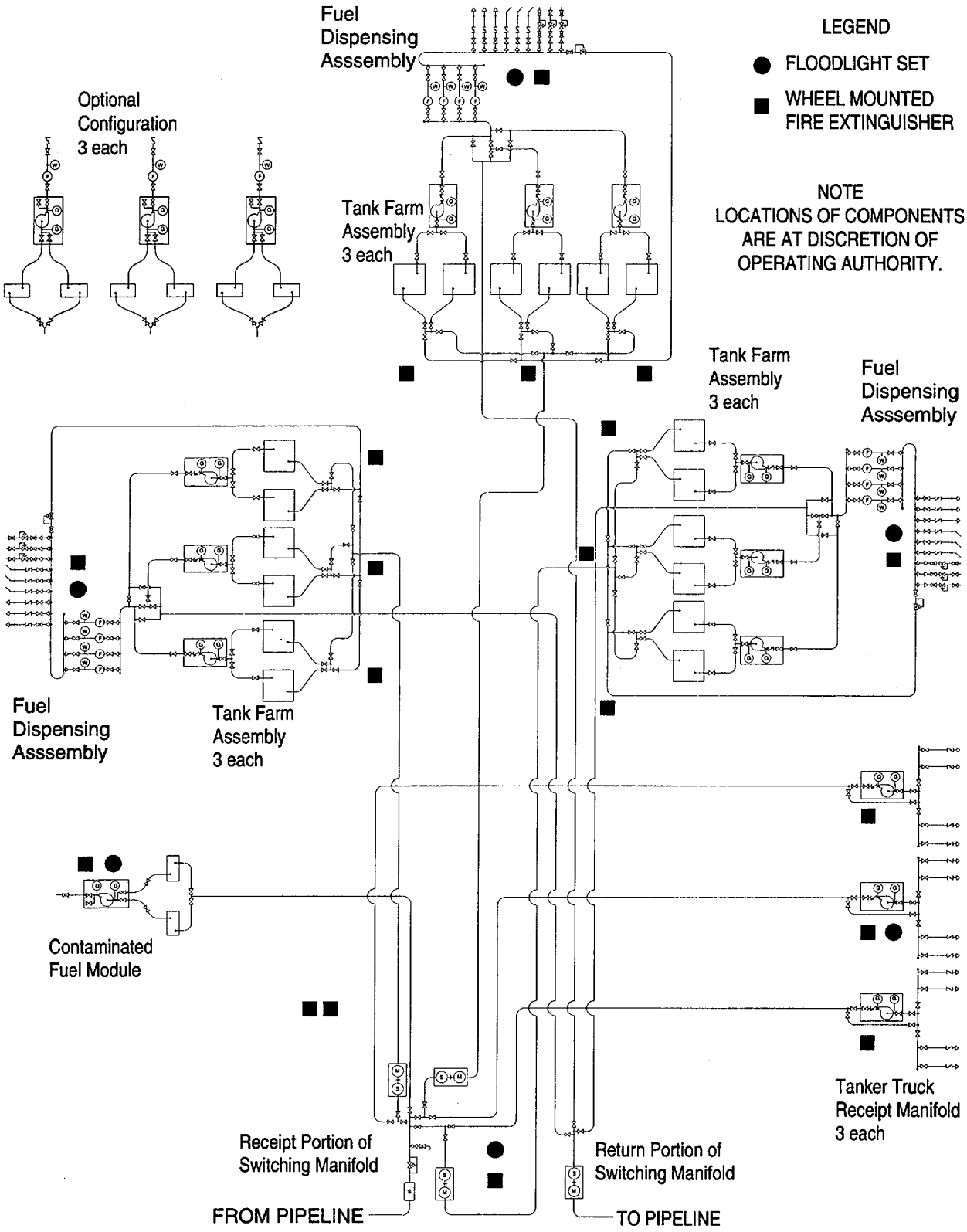


Figure 1-0. Tactical Petroleum Terminal

CHAPTER 1
INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE.

a. Type of manual: Operator, unit, and direct support maintenance manual.

b. Model number and equipment name: Tactical Petroleum Terminal, Model TPT-1.

c. Purpose of equipment: The equipment covered by this manual is intended for receipt, bulk storage, and distribution of petroleum fuels and makes up the Tactical Petroleum Terminal portion of the Inland Petroleum Distribution System.

1-2. MAINTENANCE FORMS AND PROCEDURES.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in the Maintenance Management Update.

1-3. CORROSION PREVENTION AND CONTROL (CPC).

a. Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

b. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

c. If a corrosion problem is identified, it can be reported using Standard Form 368, Product Quality Deficiency Report. Use of keywords such as "corrosion, "rust," deterioration," or "cracking" will ensure that the information is identified as a CPC problem.

d. The form should be submitted to the address specified in DA PAM 738-750.

1-4. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Refer to TM 750-244-3 (Destruction of Army Materiel to Prevent Enemy Use).

1-5. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATION (EIR).

If your Tactical Petroleum Terminal equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on SF 368 (Product Quality Deficiency Report). Mail it to us at Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MDO, 4300 Good fellow Blvd., St. Louis, MO 63120-1798. We will send you a reply.

Section II. EQUIPMENT DESCRIPTION

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

a. CHARACTERISTICS.

- Can store, distribute, and receive three types of fuel.
- Can be layed out to conform to operational and topographical needs.
- Fully adaptable to meet mission requirements.
- Standard TPT incorporates one pipeline connection assembly and three fuel units.

b. CAPABILITIES.

(1) Pipeline connection assembly.

- Provides necessary equipment to connect TPT to pipeline.
- Receives and stores contaminated fuel from pipeline.
- Provides means of directing fuel flow through the TPT.

(2) Fuel unit.

- Provides bulk storage of fuels.
- Provides means to distribute fuel.
- Provides means to receive from tanker-trucks or other sources.
- Provides additional tanks and components for further expansion.
- Provides total fuel storage capacity of 3,780,000 gal (14,307,300 1).

c. FEATURES.

- Stored in cargo containers.
- Self-contained, requiring no external power source.
- Extremely flexible in use.

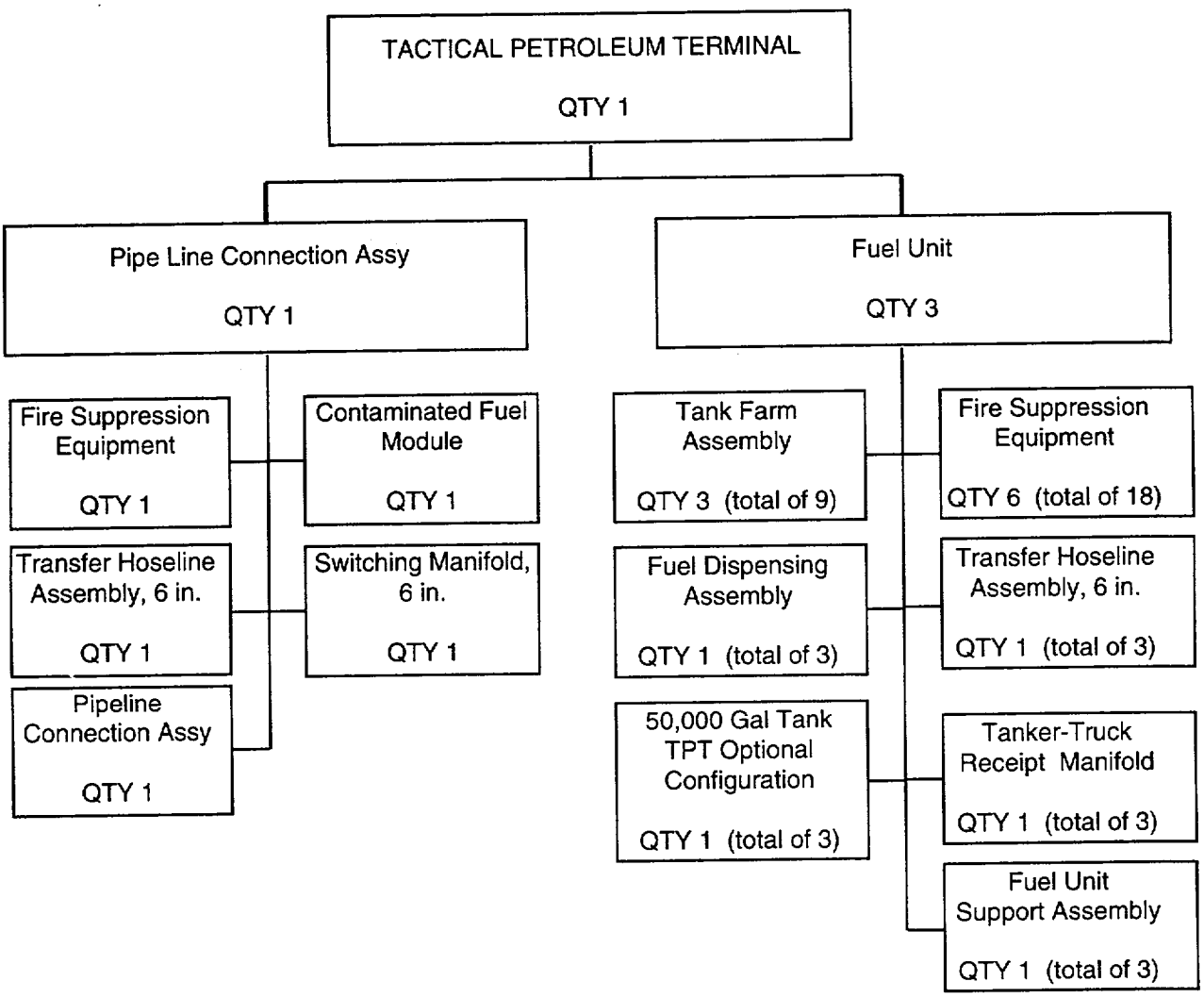
1-7. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

Tactical Petroleum Terminal (TPT). See table 1-1 for breakdown of sub-assemblies.

NOTE

For detailed information about component parts, including nomenclature, part number, and quantities, see appendix C.

Table 1-1. TPT Breakdown of Subassemblies



1-7. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. - continued

(1) Pipeline connection assembly.

(a) FIRE SUPPRESSION EQUIPMENT SET. Wheel mounted dual chemical fire extinguisher for suppression of fuel fires.

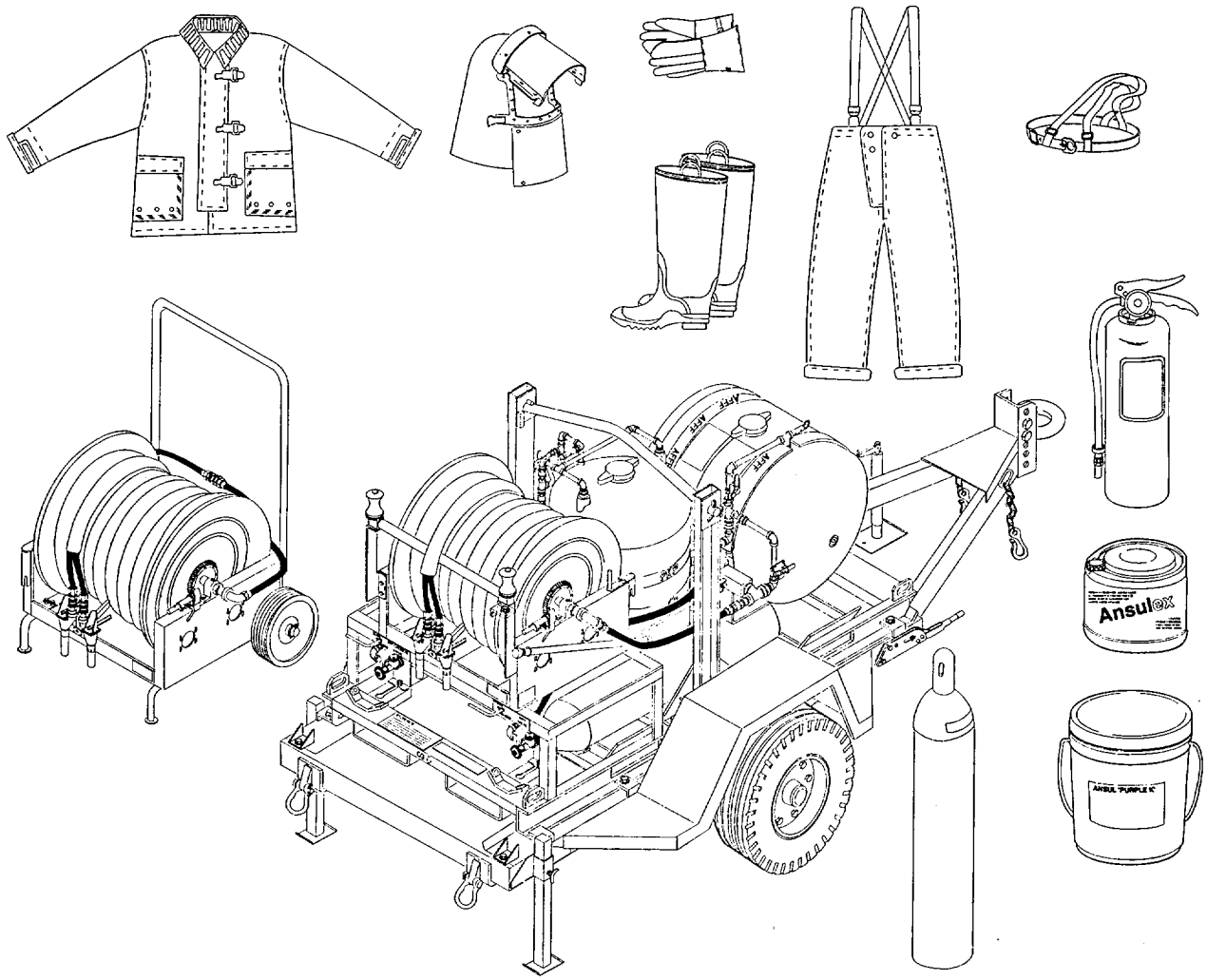


Figure 1-1. Fire Suppression Equipment Set

(b) CONTAMINATED FUEL MODULE. Provides storage for contaminated/mixed fuels received from the pipeline.

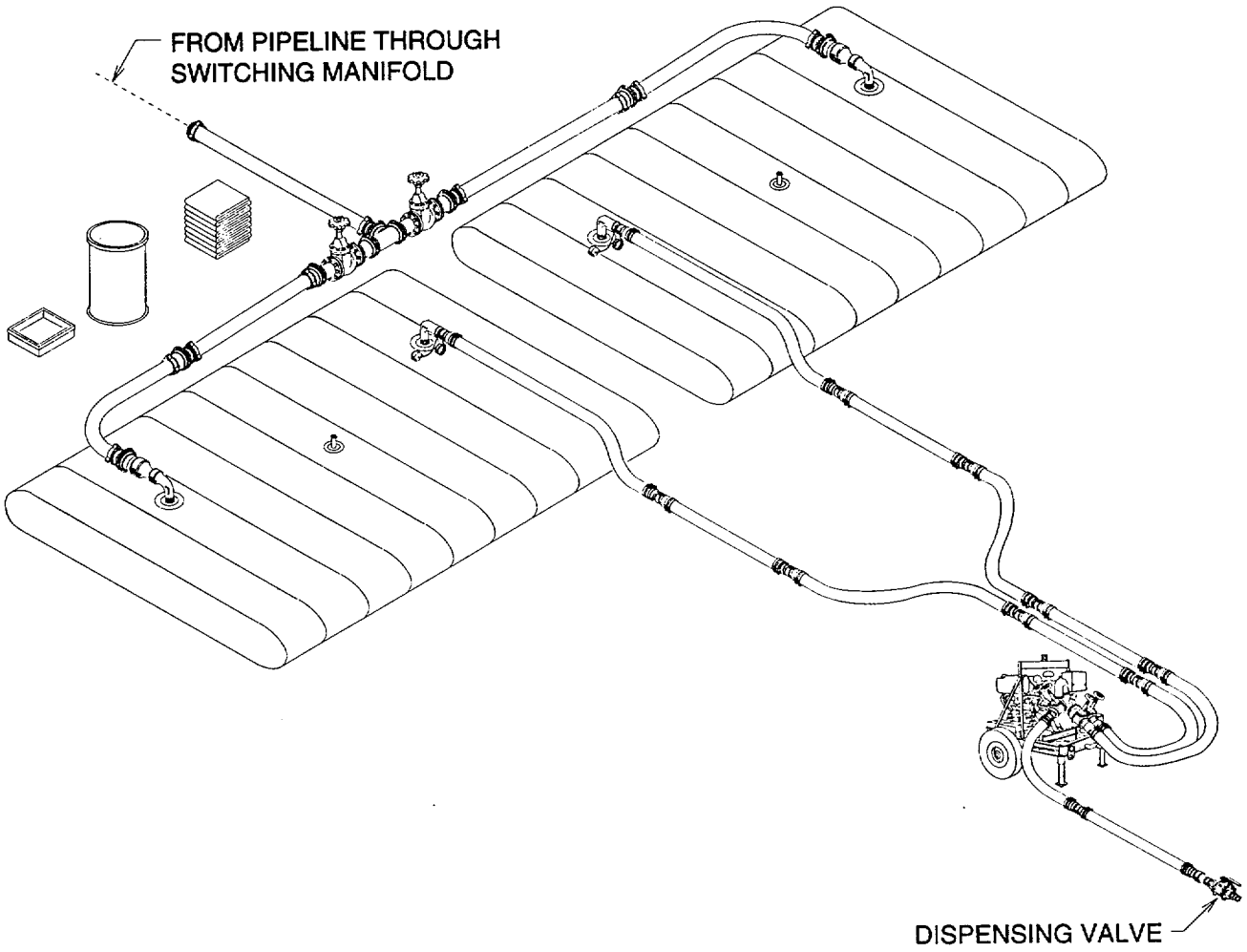


Figure 1-2. Contaminated Fuel Module

1-7. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. - continued

(c) TRANSFER HOSELINE ASSEMBLY AND INSTALLATION TOOLS. Provides piping and tools necessary to connect the tank farm assemblies in a fuel unit to the switching manifold and fuel dispensing assembly.

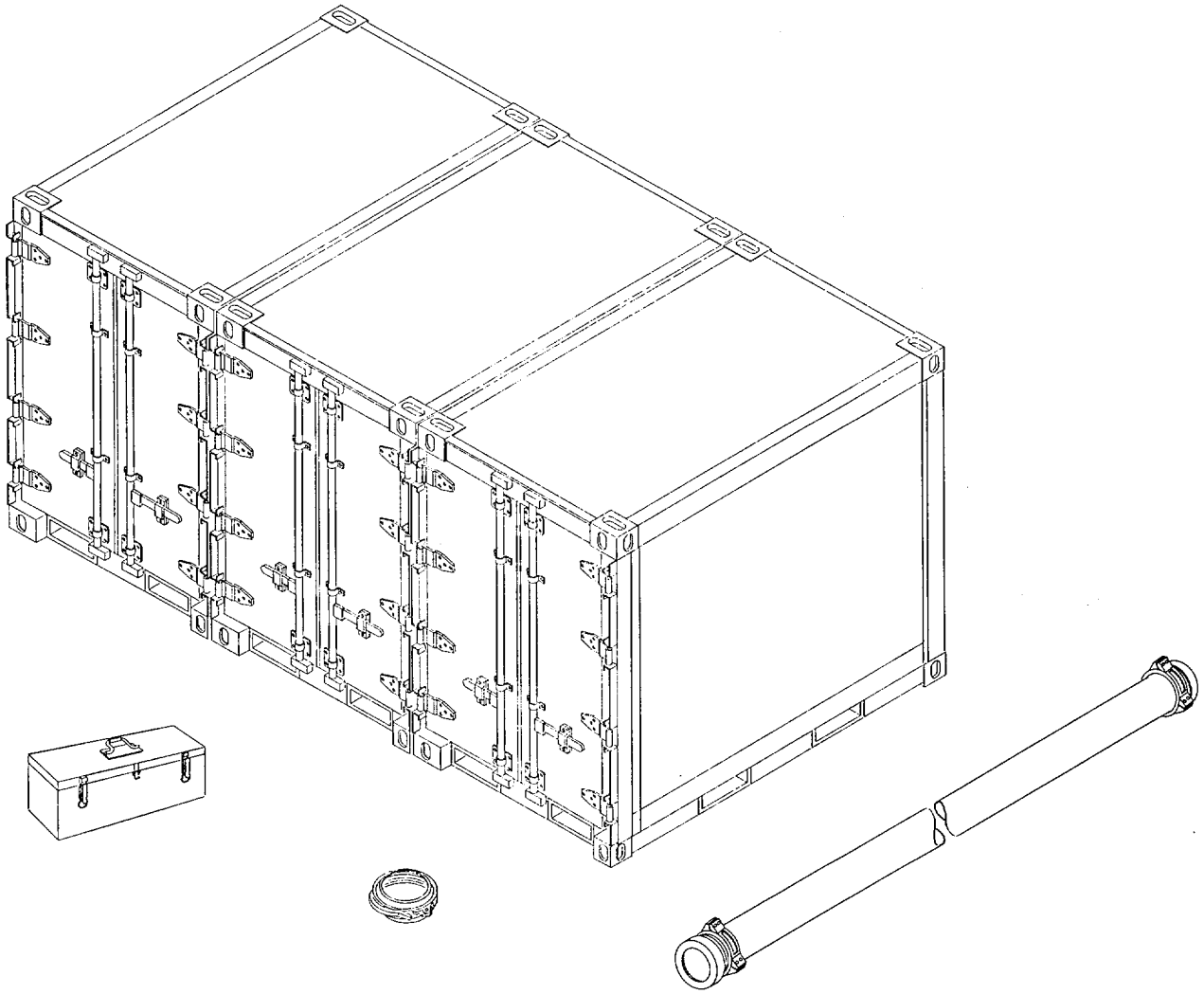


Figure 1-3. Transfer Hoseline Assembly and Installation Tools

(d) SWITCHING MANIFOLD. Provides means of directing fuel flow through the Tactical Petroleum Terminal from the pipeline and tanker-trucks to storage tanks or back to the pipeline.

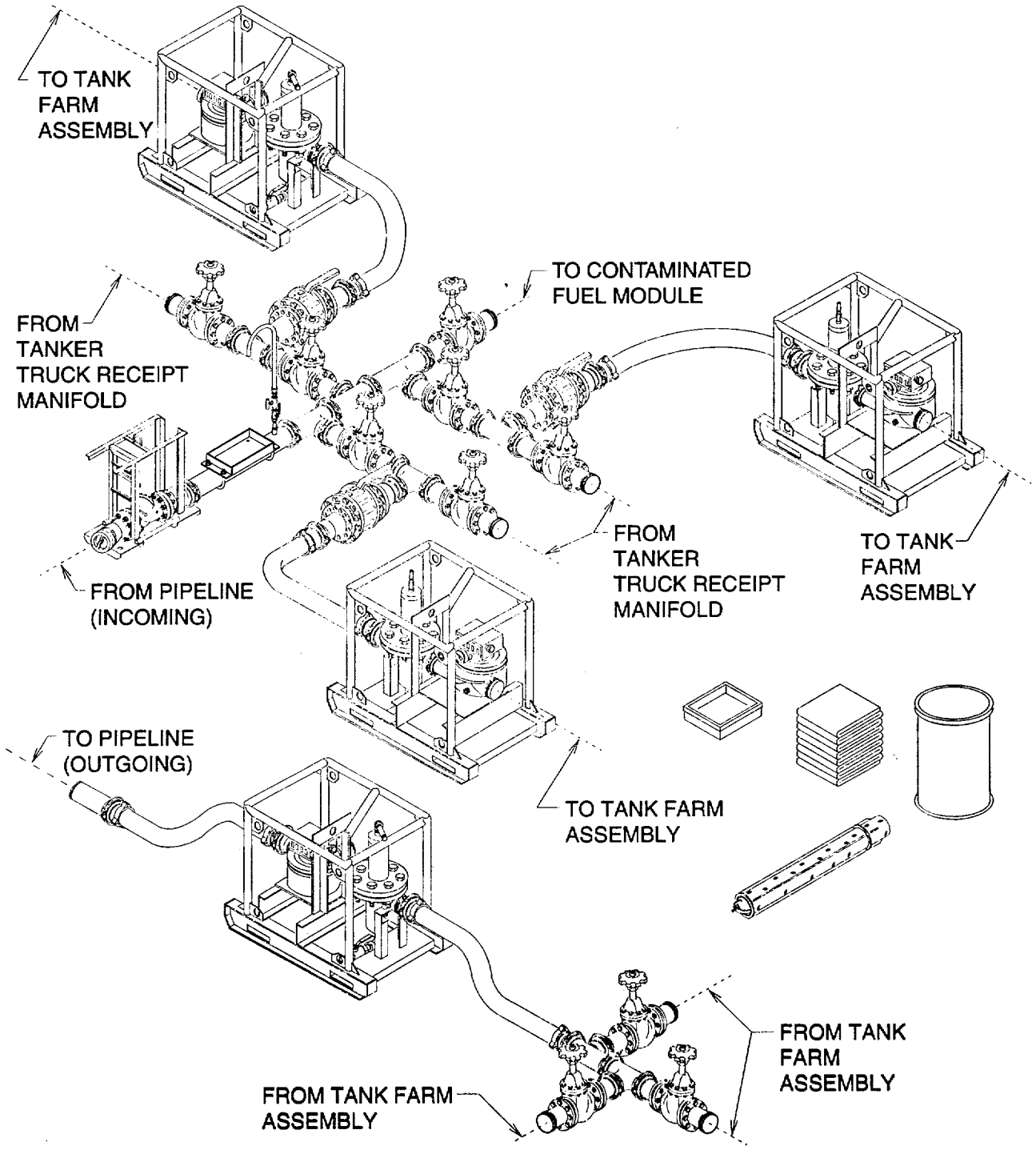


Figure 1-4. Switching Manifold

1-7. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. - continued

(e) PIPELINE CONNECTION SUPPORT AND HOSELINE INSTALLATION AND REPAIR ASSEMBLIES. Provides equipment and tools necessary to connect and run hoselines and connect to pipeline.

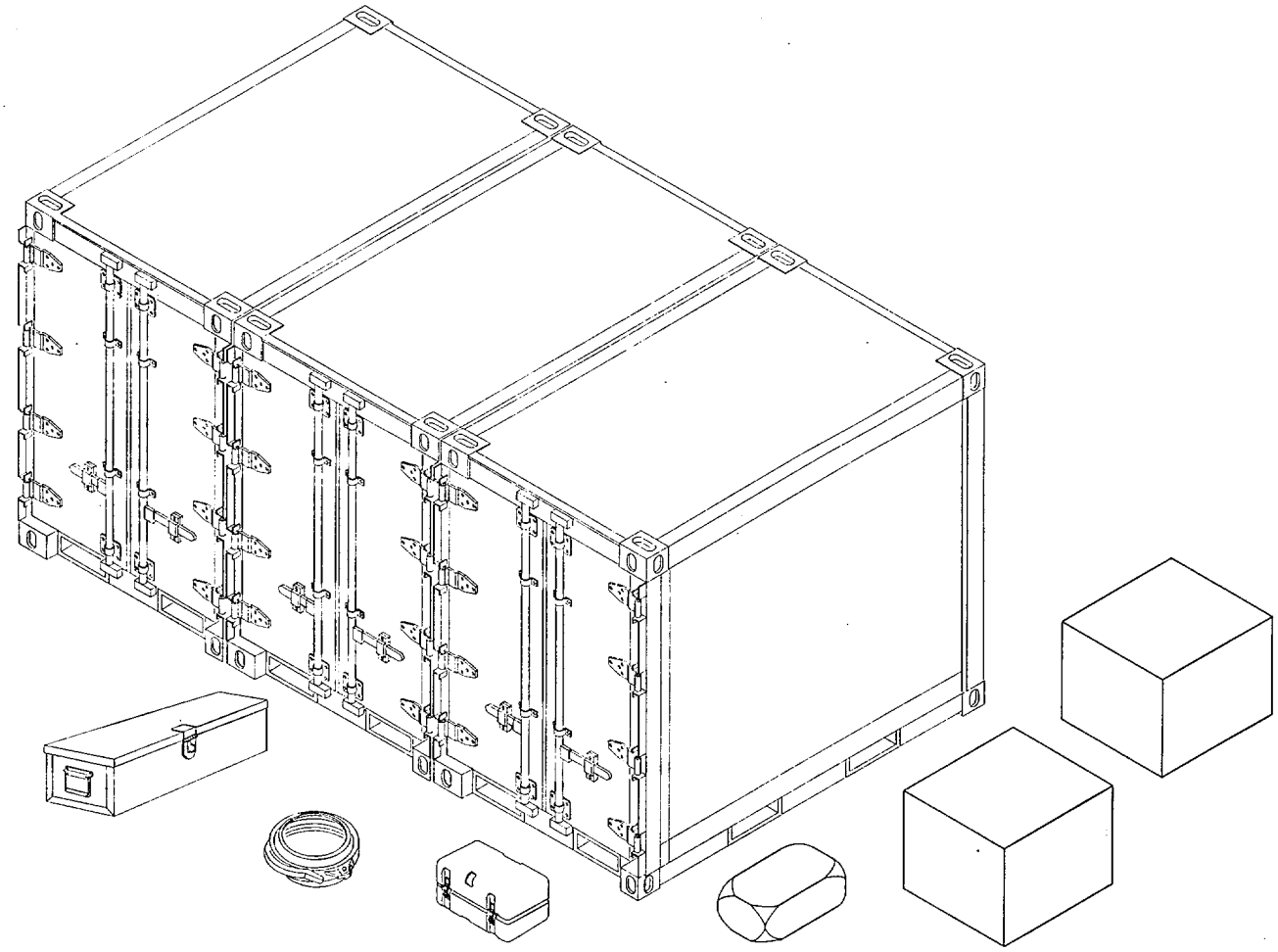


Figure 1-5. Pipeline Connection Support and Hoseline Installation and Repair Assemblies

(f) INTERIM SUPPORT ITEMS LIST (ISIL) PIPELINE CONNECTION SUPPORT ASSEMBLY. Provides the necessary equipment and parts to connect the various components within the terminal as well as make the connection to the pipeline.

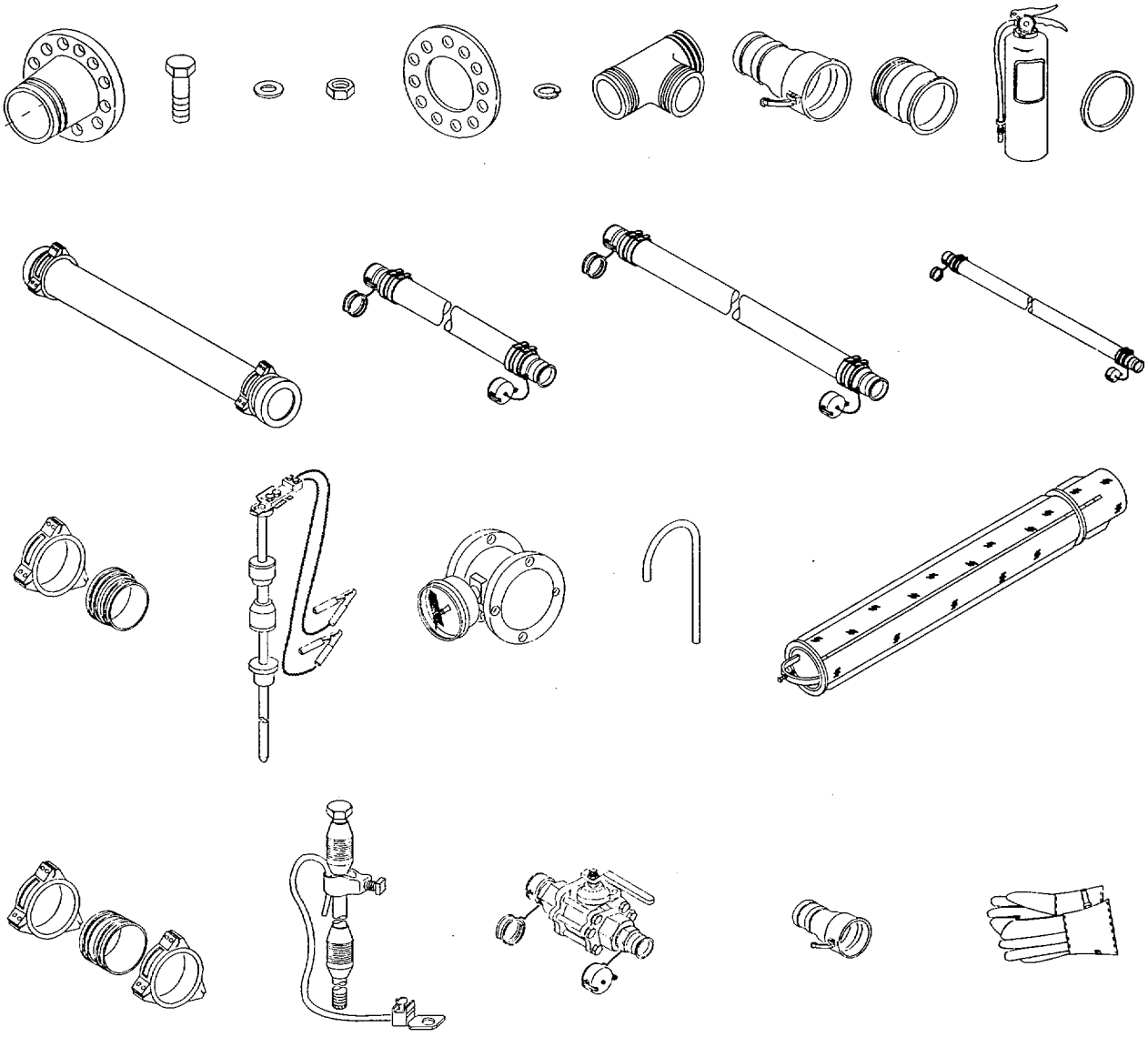


Figure 1-6. Interim Support Items List (ISIL) Pipeline Connection Support Assembly

1-7. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. - continued

(2) Fuel unit.

(a) FIRE SUPPRESSION EQUIPMENT SET. See para 1-7, (1), (a) for description of components.

(b) TANK FARM ASSEMBLY. Three tank farm assemblies make up each of three fuel units. The tank farm assemblies store the bulk fuel and each fuel unit can store a different fuel type.

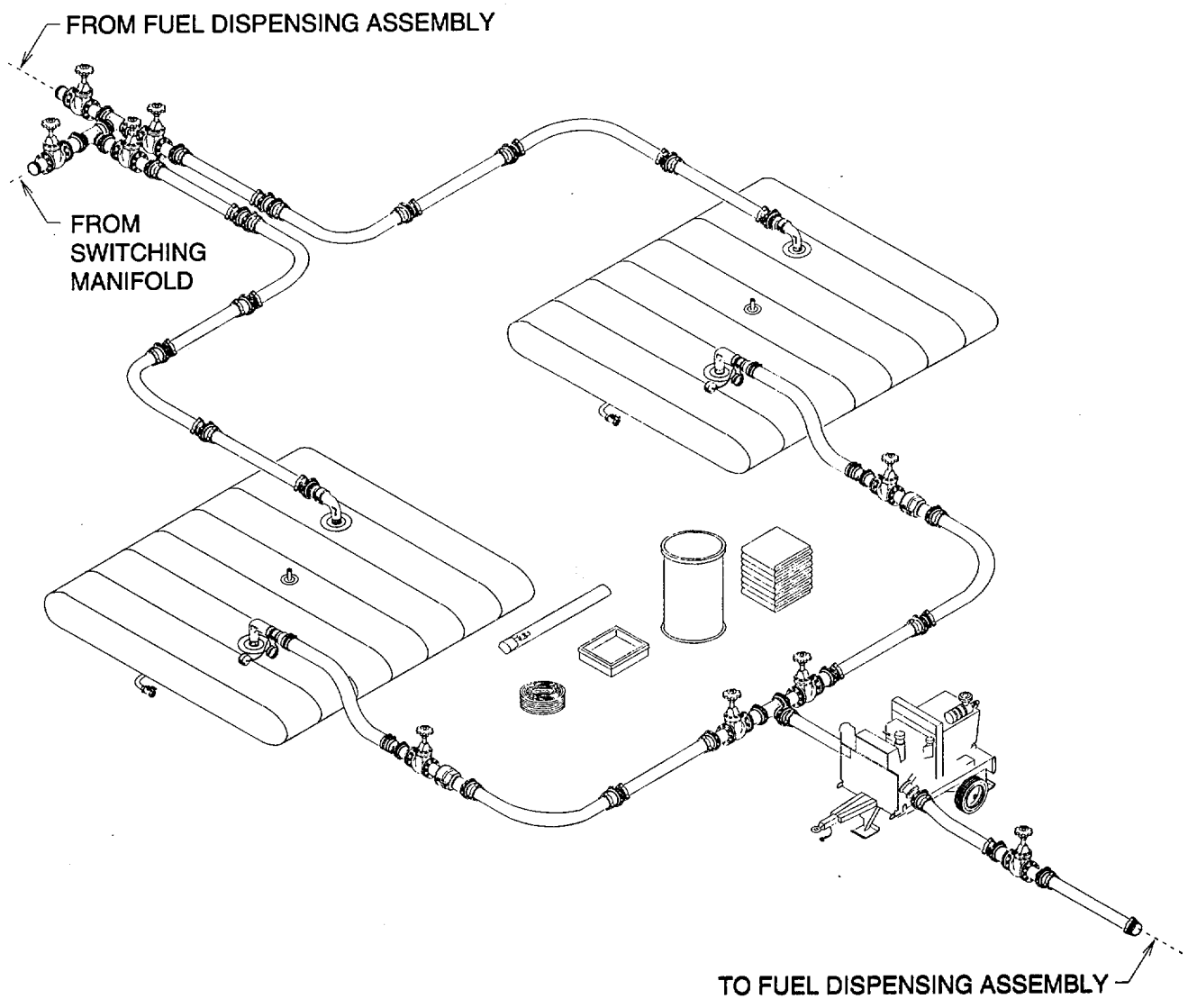


Figure 1-7. Tank Farm Assembly

(c) TRANSFER HOSE LINE ASSEMBLY AND INSTALLATION TOOLS. See para 1-7, (1), (c) for description of components.

(d) FUEL DISPENSING ASSEMBLY. The fuel dispensing assembly is used to dispense fuel from the fuel unit into tanker-trucks or drums.

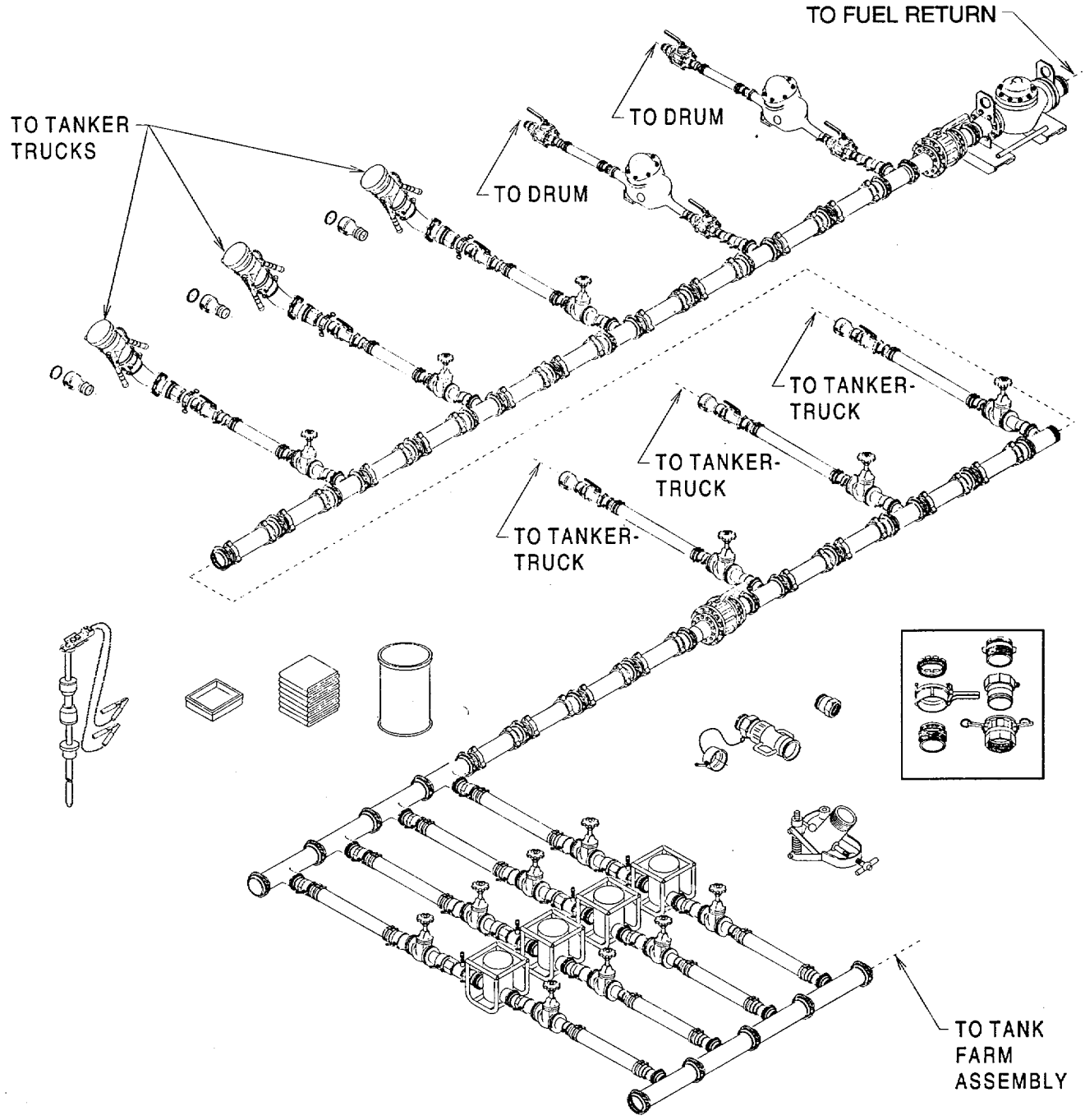


Figure 1-8. Fuel Dispensing Assembly

1-7. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. - continued

(e) TANKER-TRUCK RECEIPT MANIFOLD. The manifold receives fuel from tanker-trucks and pumps it to the switching manifold.

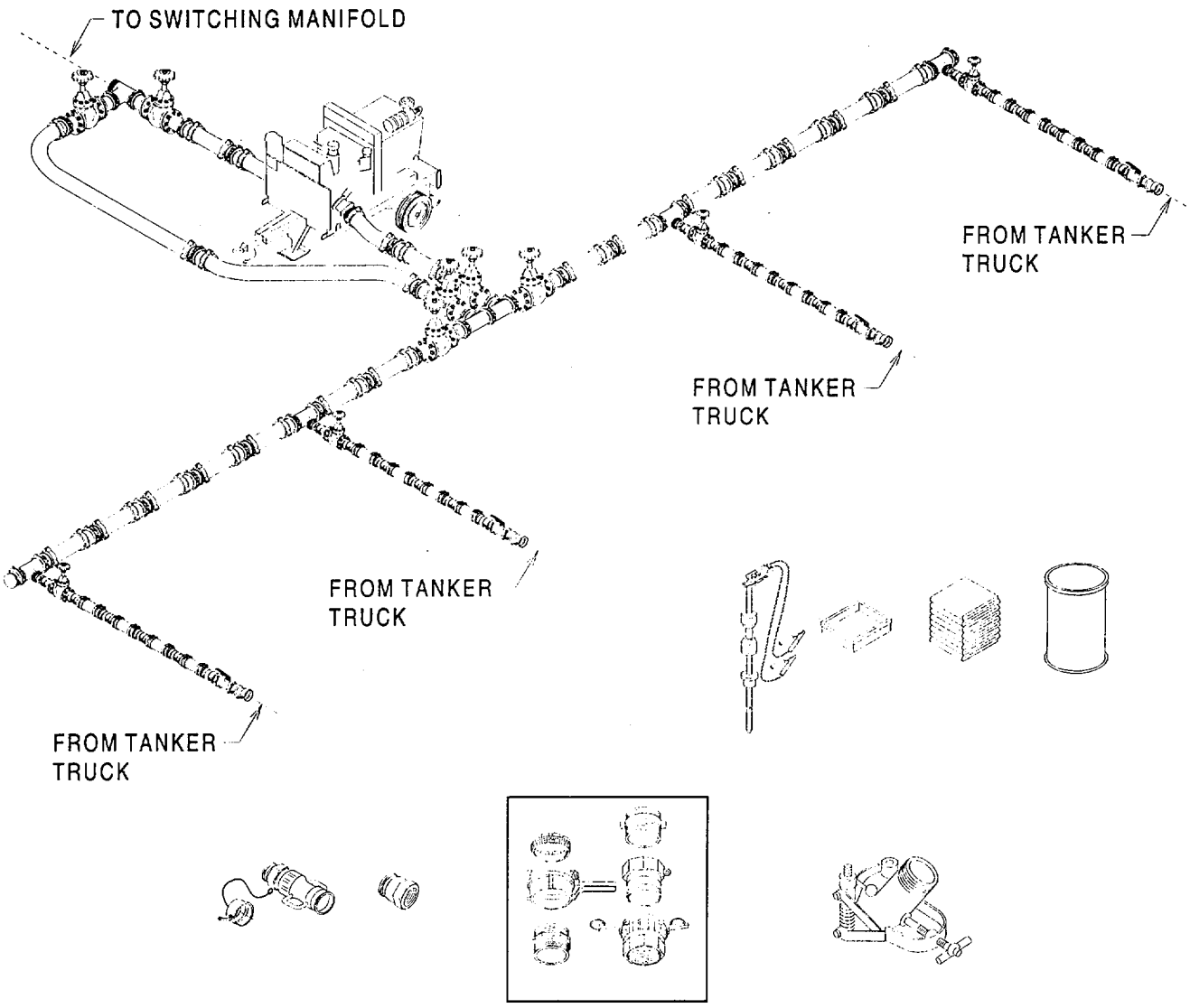


Figure 1-9. Tanker-Truck Receipt Manifold

(f) OPTIONAL TANK CONFIGURATION. This can be used to replace a tank farm assembly, supplement a fuel unit, replace or supplement the contaminated fuel module, or stand alone as a fuel unit/dispensing assembly.

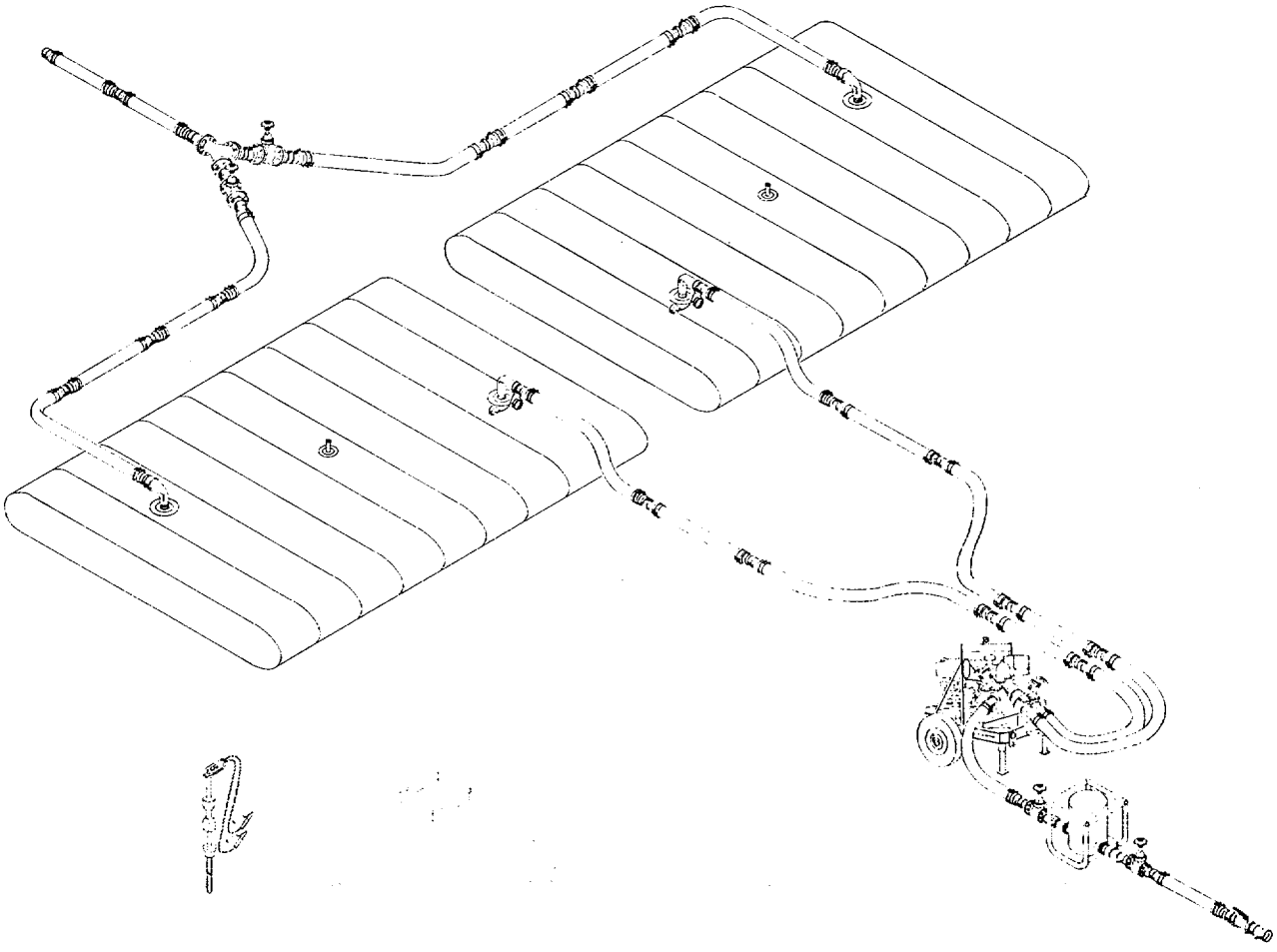


Figure 1-10. Optional Tank Configuration

1-7. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. - continued

(g) FUEL UNIT SUPPORT AND HOSE LINE INSTALLATION AND REPAIR ASSEMBLIES. Provides equipment and tools necessary to connect and run hoselines to the fuel unit.

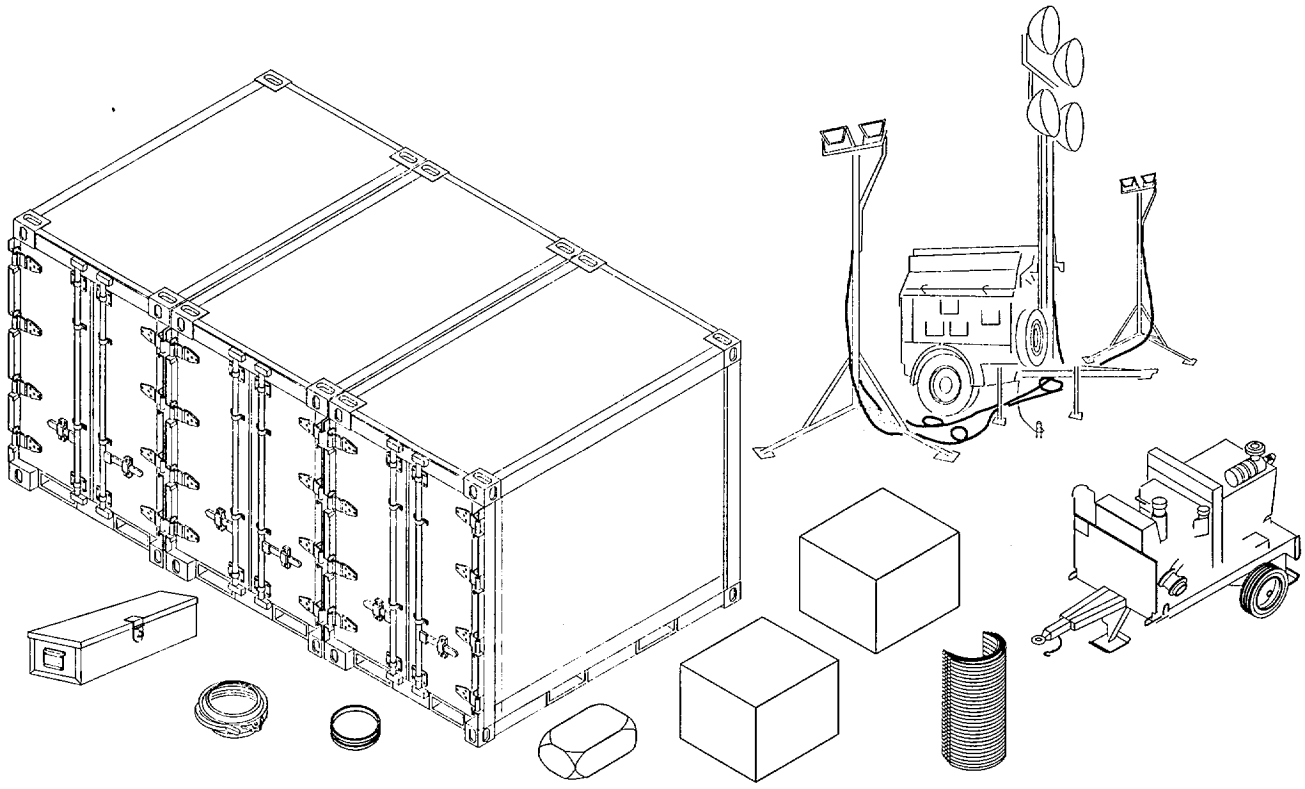


Figure 1-11. Fuel Unit Support and Hose Line Installation and Repair Assemblies

(h) INTERIM SUPPORT ITEMS LIST (ISIL) FUEL UNIT SUPPORT ASSEMBLY. Provides the necessary equipment and parts to connect the various components within the terminal as well as make the connection to the fuel unit.

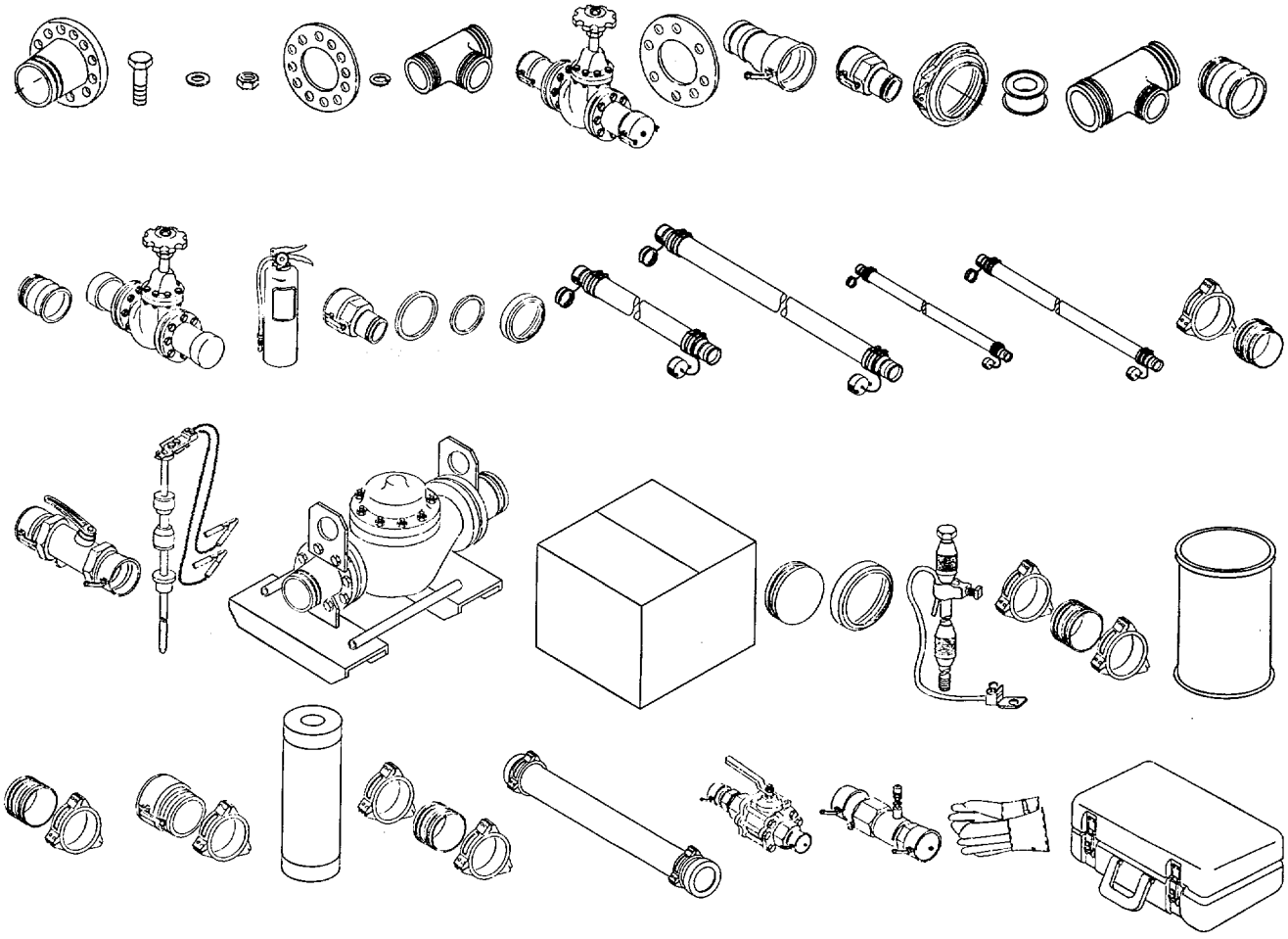


Figure 1-12. Interim Support Items List (ISIL) Fuel Unit Support Assembly

1-8. EQUIPMENT DATA

Filter Separator, 350 gpm (22 l/s), Frame Mounted, 4 in. (10 cm) ..... See TM 5-4330-211-12
Fire Suppression Equipment Set .....See TM 10-4210-235-13
Floodlight Set, Trailer Mounted ..... See TM 9-6230-211-14
Nozzle Assembly, Type D-..... See TM 104930-246-13&P
Pump Unit, Centrifugal Ded, 350 gpm (22 l/s), Type I, Style A . .....See TM 54320-226-14
or TM 10-4320-324-14
Pump Unit, Centrifugal Ded, Self Priming, 600 gpm(38 l/s) ..... See TM 5-4320-305-10
Tank, Fabric, Collapsible, 5,000 bbl (794 m3) and 50,000 gal (187,900 l) .....See TM 10-5430-219-12
Testing Kit, Petroleum Aviation Fuel, Contamination ..... See TM 10-6630-240-12&P
or TM 10-6630-218-10

Storage Capacities, Total:
Tank Farm Assemblies ..... 3,780,000 gal (14,205,240 1)
Tanks, Optional Configuration .....300,000 gal (1,127,400 1)
Tanks, Contaminated Fuel Module ..... 100,000 gal (375,8001)

Operating Pressures, Maximum Allowable:
Fuel Dispensing Assemblies .....75 psig (518 kPa)
Cam-Lock Fittings (Furnished With 5,000 bbl (794 m3) Tanks).....75 psig (518 kPa)
Suction Hoses .....100 psig (690 kPa)
Tanks, Fabric, Collapsible.....(Liquid Level Static Head) + 0.10 psig (0.7 kPa)
All Remaining Equipment ..... 150 psig (1035 kPa)

Flow Rates:
Receiving (Into Single Fuel Unit) .....800 gpm (50 1/s)
Discharge (From Single Fuel Unit Into Pipeline) .....600 gpm (38 1/s)
Dispensing (Through Single Fuel Dispensing Assembly
Using Two Parallel 350 gpm (22 l/s) Filter Separators) .....700 gpm (44 1/s)

Section III. PRINCIPLES OF OPERATION

1-9. GENERAL THEORY OF OPERATION.

A Tactical Petroleum Terminal (TPT) is a facility designed and packaged to be rapidly erected at most any location for receipt, storage, and dispensing of liquid fuels, specifically diesel, motor gasoline, and aviation jet fuel. Fuels can be received from a pipeline or tanker-trucks. The TPT can dispense fuels to tanker-trucks, 500 gallon (1879 1) collapsible drums, or return fuel to the pipeline for downstream distribution. The return fuel to pipeline feature can be adapted to feed hose line or pipeline connections to a nearby airport or another storage system. The facility can be rapidly disassembled and moved to another location or returned to an equipment storage facility.

1-10. TECHNICAL PRINCIPLES OF OPERATION.

Fuel from the associated pipeline system enters the Tactical Petroleum Terminal (TPT) through a strainer (I) and pressure regulating valve assembly (2). The incoming fuel is checked at the fuel sampling assembly (3) and if contaminated or mixed with any previously received fuel of a different type, it can be diverted to the contaminated fuel module (4). When sampling assures the operators of clean fuel, the appropriate valves are opened to route it to the fuel unit desired (group of three tank farm assemblies (5)), and the valves to the contaminated fuel module (4) are closed. When needed, fuel can also be received from the tanker-truck receipt manifolds (6). Incoming fuel quantities are measured by the meter (7) in the intake hose line to the fuel unit. By proper positioning of valves, the fuel can be routed to any tank in the fuel unit. Fuel is sent to the dispensing assembly (8) by the hose line pump assembly (9) through filter separator (10) to remove traces of water. The fuel can be sampled at the water detection adapter (11) to assure quality from the discharge of the filter separator (10). The dispensing assembly (8) is designed to load fuels into tanker-trucks or 500 gallon (1879 1) collapsible drums. If necessary, the TPT can discharge fuel to the associated pipeline system or hose line to a user facility. A meter (12) is provided to measure this flow. The optional tank configuration (13) can be used, in part or together, to supplement or replace a tank farm assembly (5) or fuel unit at the discretion of the operating authority.

1-10. TECHNICAL PRINCIPLES OF OPERATION. -continued

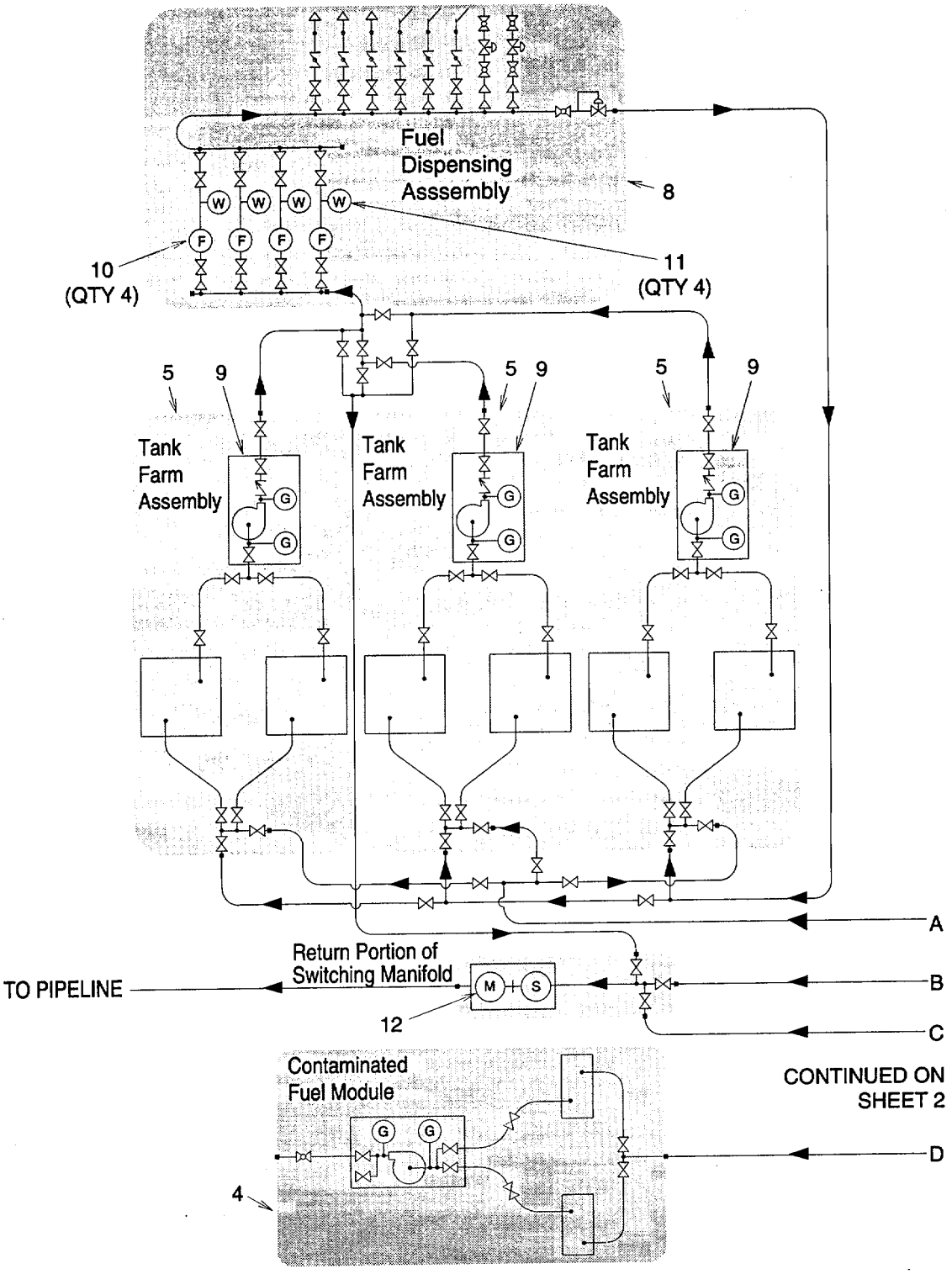


Figure 1-13. Tactical Petroleum Terminal Flow Diagram (Sheet 1 of 5)

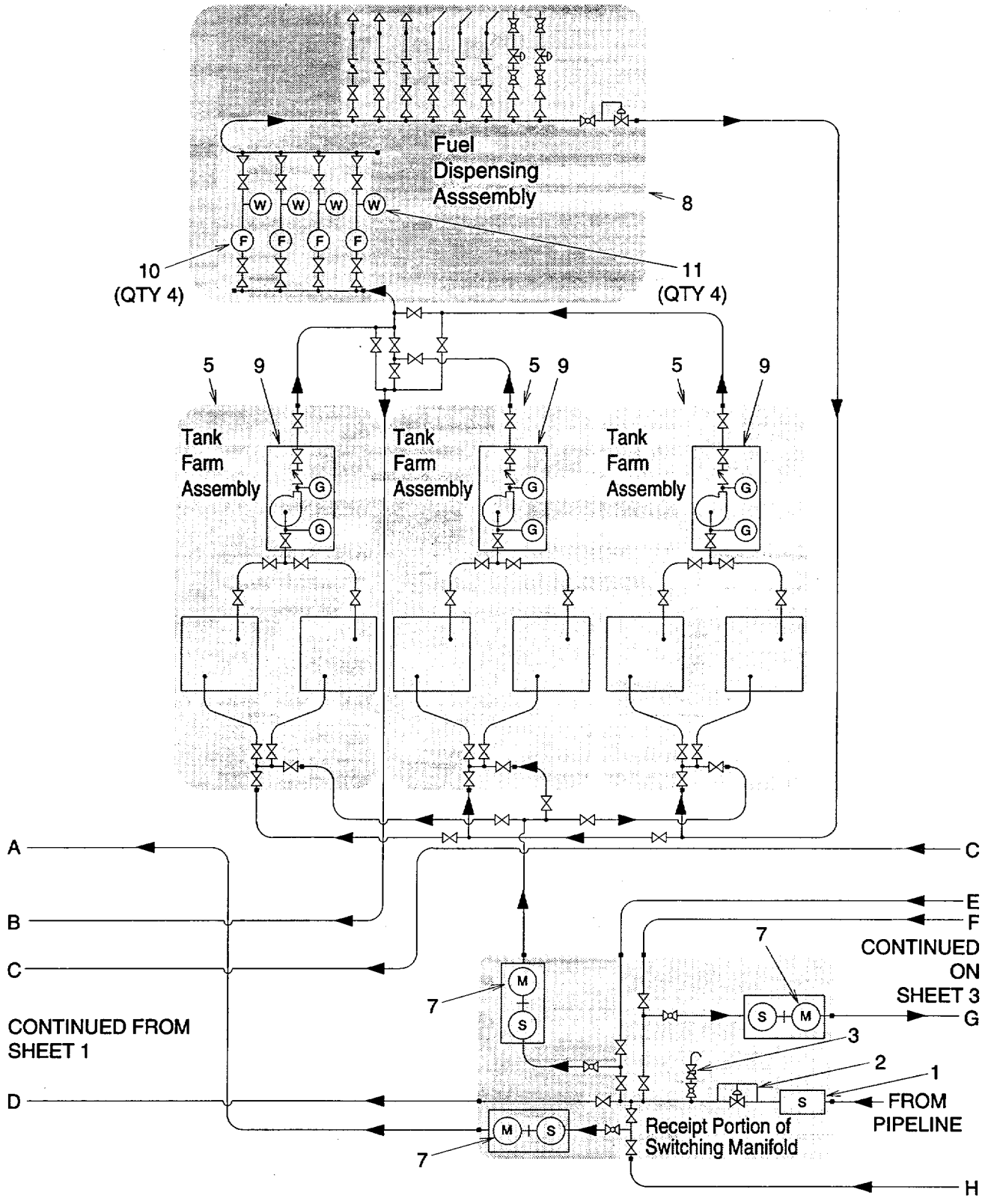


Figure 1-13. Tactical Petroleum Terminal Flow Diagram (Sheet 2 of 5)

1-10. TECHNICAL PRINCIPLES OF OPERATION. - continued

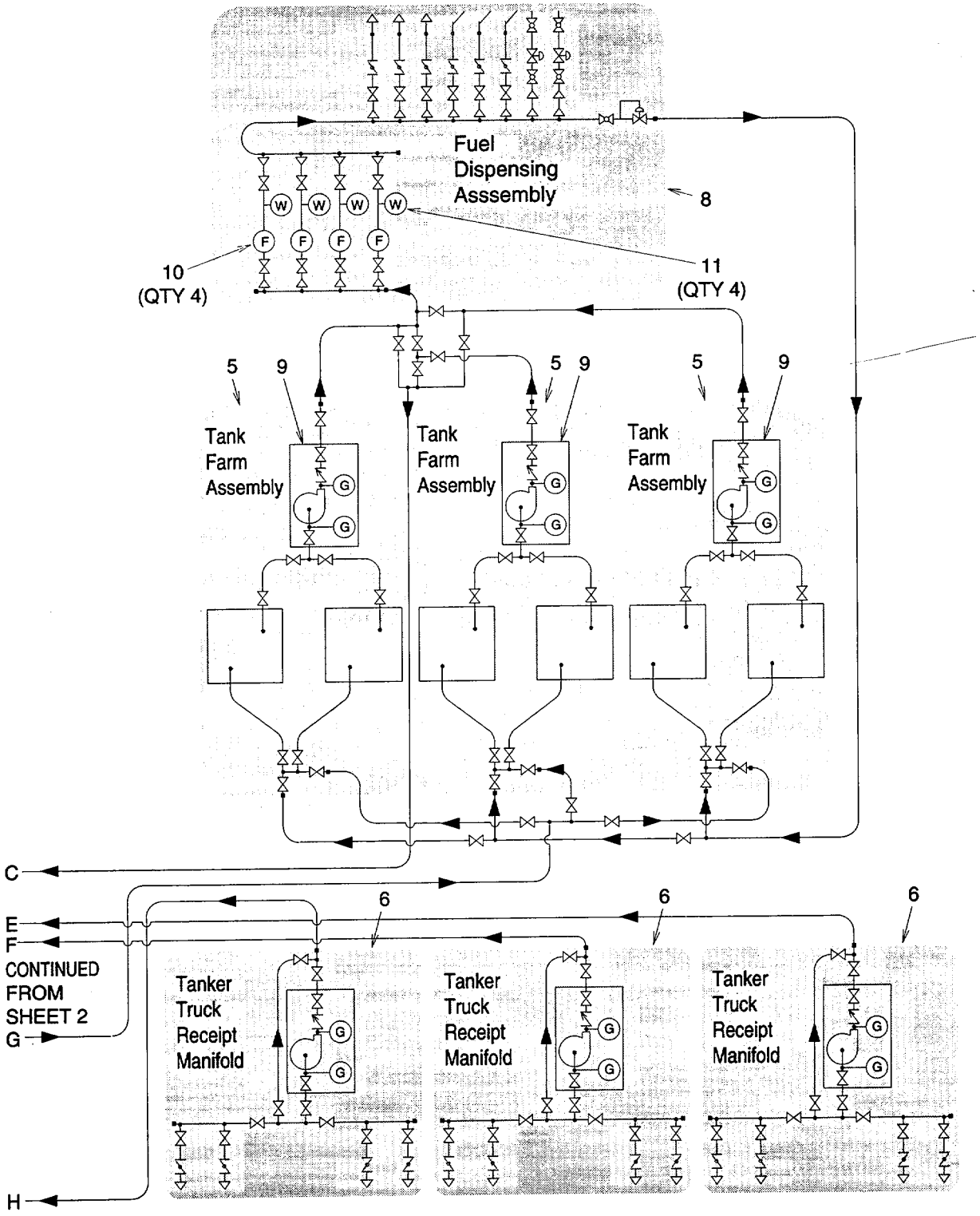


Figure 1-13. Tactical Petroleum Terminal Flow Diagram (Sheet 3 of 5)

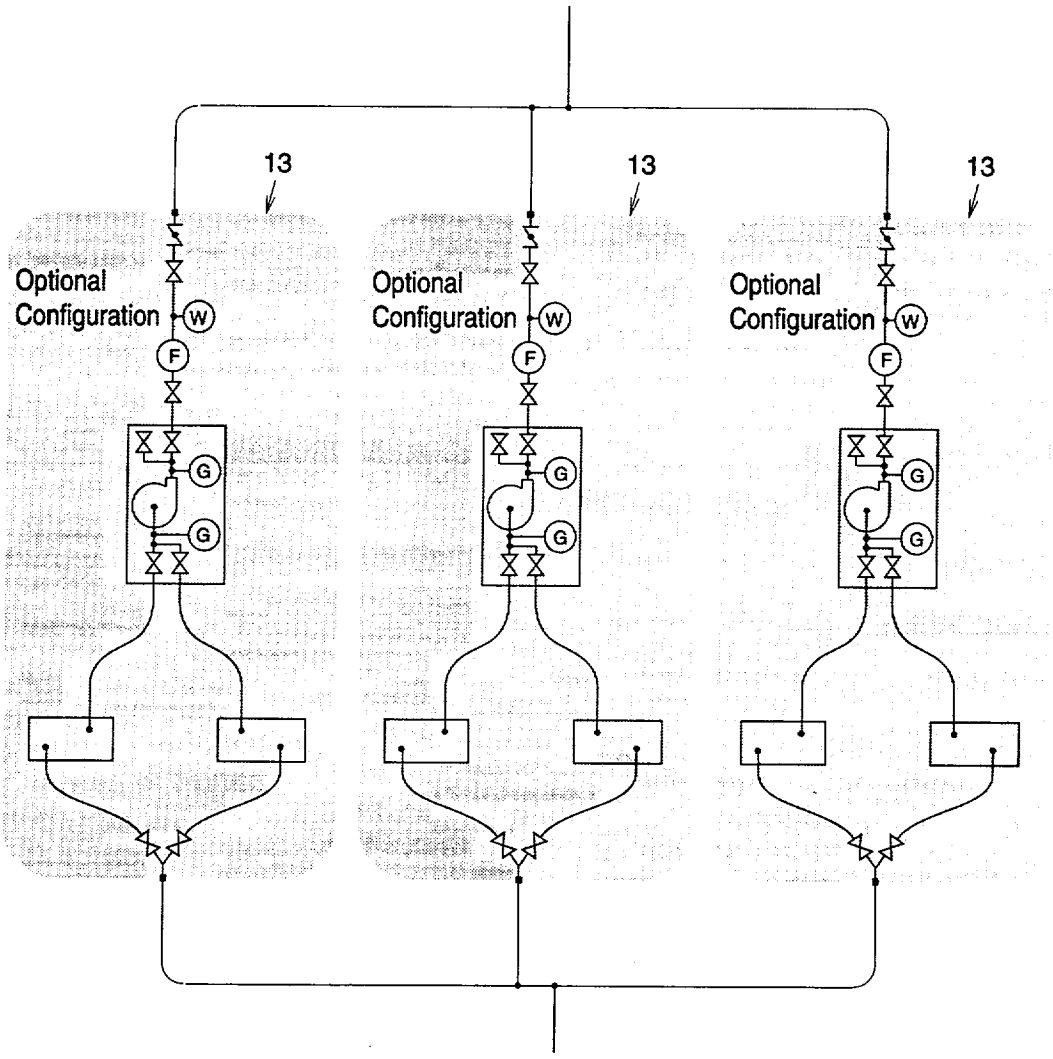


Figure 1-13. Tactical Petroleum Terminal Flow Diagram (Sheet 4 of 5)

1-10. TECHNICAL PRINCIPLES OF OPERATION. - continued

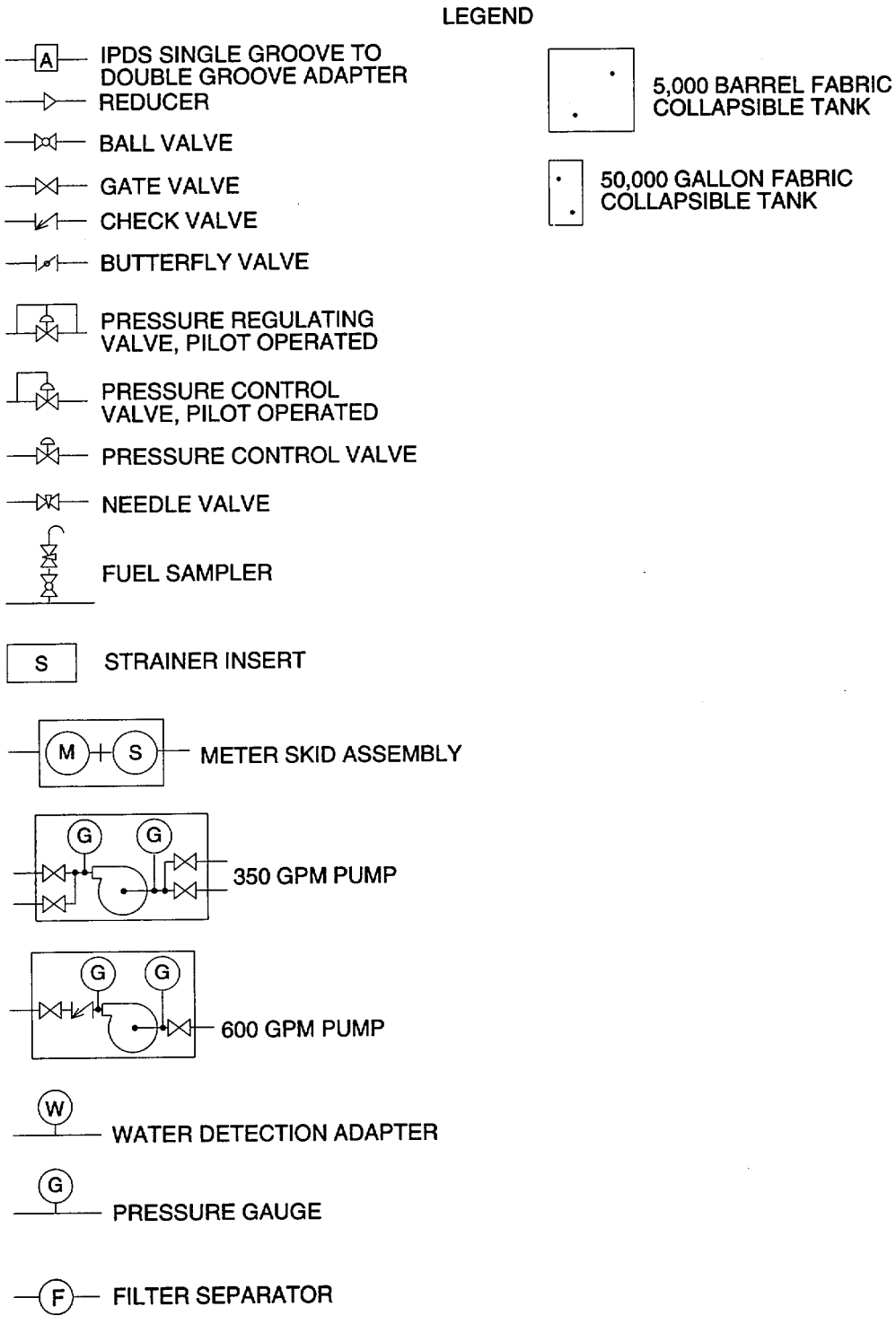


Figure 1-13. Tactical Petroleum Terminal Flow Diagram (Sheet 5 of 5)

CHAPTER 2
OPERATING INSTRUCTIONS

Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. GENERAL.

a. The following items are used throughout the Tactical Petroleum Terminal. The description and use of each is typical.

(1) Ball Valve. 3 in. Used to quickly control flow of fuel and provide secure shut off. Shown open (allow flow) and closed (block flow).

NOTE

Handle is offset and cannot be used to indicate position of valve. Arrow cast in handle can be used for valve position.

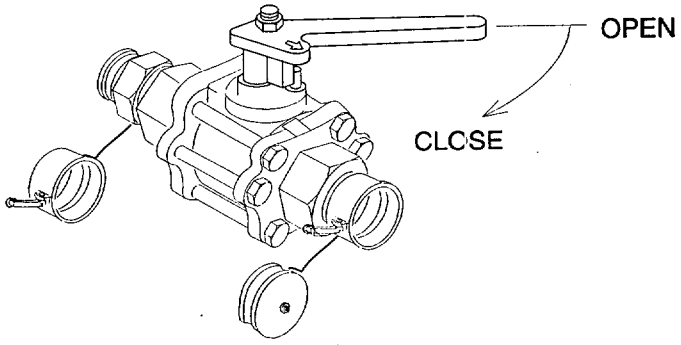


Figure 2-1. 3 Inch Ball Valve

(2) Gate Valve, 6 in. Used to control flow of fuel and isolate lines not in use. Turning handwheel counterclockwise opens valve (allow flow) and turning handwheel clockwise closes valve (block flow).

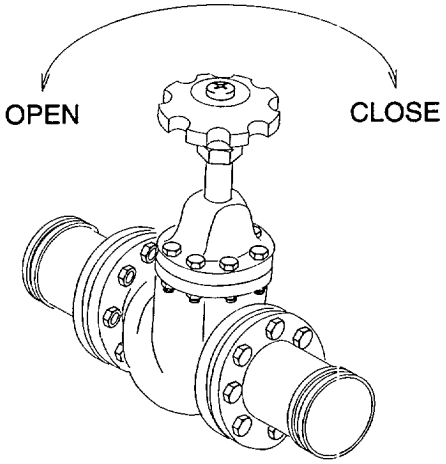


Figure 2-2. 6 Inch Gate Valve

(3) Ball Valve, 6 in. Used to quickly control flow of fuel and provide secure shut off. Shown open (allow flow) and closed (block flow).

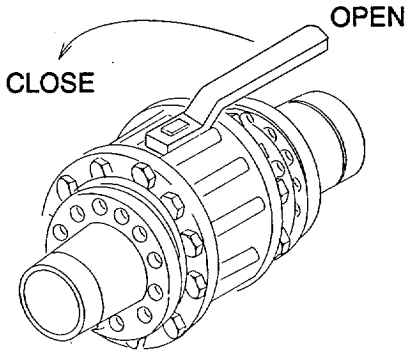


Figure 2-3. 6 Inch Ball Valve

(4) Meter, 6 in. Used to measure both the amount and flow rate of fuel passing through it. Numeral reset counter (1) indicates how many U.S. gallons have past since last reset and the flow rate indicator (2) continuously displays the flow rate in U.S. gallons per minute.

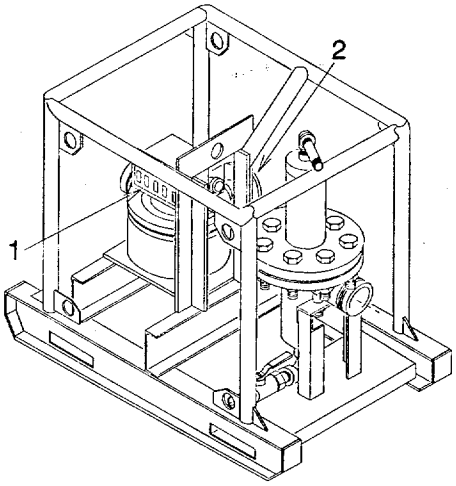


Figure 2-4. 6 Inch Meter

2-1. GENERAL. - continued

(5) Fuel Sampling Assembly. Used to draw samples of fuel flowing from the pipeline into the Tactical Petroleum Terminal to check the type of fuel coming in and to make spot checks of the fuel quality. The cylinders (1) are used to collect the fuel sample, and hydrometers (2) are used to check the specific gravity of the sample. A 1/2 inch ball valve (3) controls flow through the sampling assembly while the 1/2 inch needle valve (4) controls the flow of fuel into the collection cylinder.

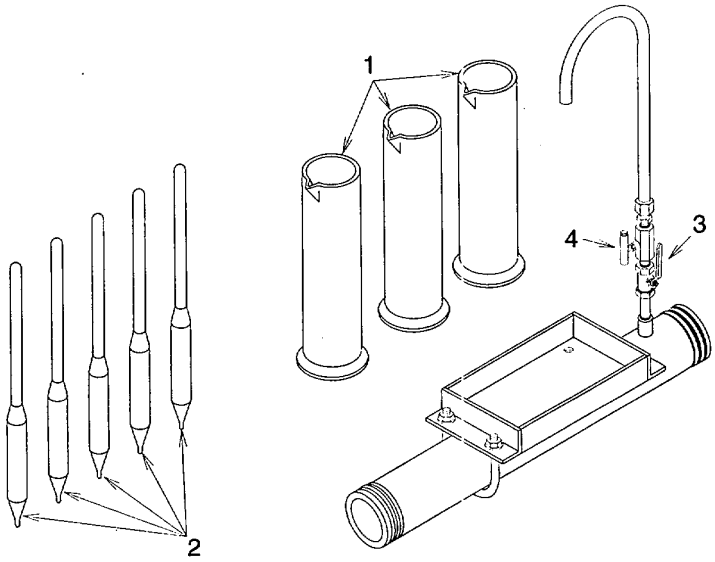


Figure 2-5. Fuel Sampling Assembly

(6) Pressure Regulating Valve Assembly. Used to reduce the high working pressure used in the pipeline to the lower working pressure used in the Tactical Petroleum Terminal. Valves and gauges are provided to adjust the regulator and monitor the pressure.

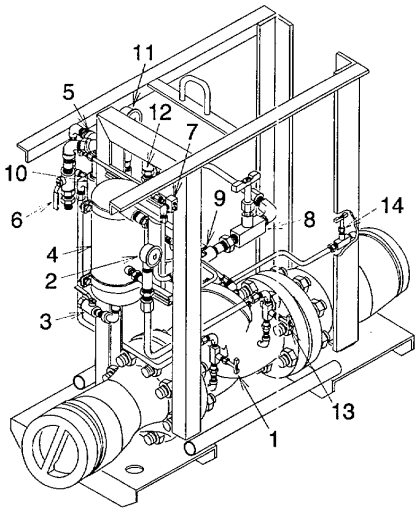


Figure 2-6. Pressure Regulating Valve Assembly

(a) Upstream Components.

1 The PILOT CIRCUIT INLET VALVE (1) is an upstream isolation or block needle valve and is always kept open while operating.

2 The UPSTREAM PRESSURE GAUGE (2) monitors the pressure on the upstream side of the pressure regulator.

3 The SEDIMENT TRAP DRAIN valve (3) is the upstream drain valve and is located at the bottom of the sediment trap (4).

4 The sediment trap (4) is used as a settling tank to remove solids from the fluid.

5 The WYE strainer (5) contains a 100 mesh screen which removes particles that were not removed by the sediment trap (4).

6 The AIR BLEED VALVE (6) is an upstream vent ball valve that when opened while operating, vents air out of the system while at the same time flushing out the WYE strainer (5).

7 The needle valve (7) with a 100 mesh strainer is a preset valve that should not be tampered with except for periodic strainer cleaning.

8 The upstream BACK PRESSURE PILOT BYPASS VALVE (8) bypasses the back pressure pilot valve and should not be open during operational conditions.

9 The upstream pilot or back pressure pilot valve (9) controls the pressure regulator based on the upstream pipeline conditions.

(b) Downstream Components.

1 The downstream pilot or back pressure pilot valve (10) controls the pressure regulator based on the downstream pipeline conditions.

2 The DOWNSTREAM PRESSURE GAGE (11) indicates the pressure on the downstream side of the pressure regulator.

3 The STRAINER VENT valve (12) is opened only to relieve the air out of the pressure regulator.

4 The DOWNSTREAM PILOT ISOLATION VALVE (13) is always kept open while operating the pressure regulator.

5 The PILOT CIRCUIT OUTLET VALVE (14) is the downstream isolation valve and is to be kept open while operating the pressure regulator.

NOTE

Upon pipeline startup, the upstream AIR BLEED VALVE (6) should be opened to ensure that all air is removed from the pressure regulator. The downstream STRAINER VENT valve (12) should also be opened to ensure that all air has been removed. Once a continuous flow of fluid from the vent valves has been noted and one is confident that all air has been removed from the pressure regulator, tightly close valves (6) and (12).

2-1. GENERAL. - continued

(7) Butterfly Valve, 4 in. Used to control flow of fuel by positioning valve between full open and full close. Shown open (allow flow) and closed (block flow).

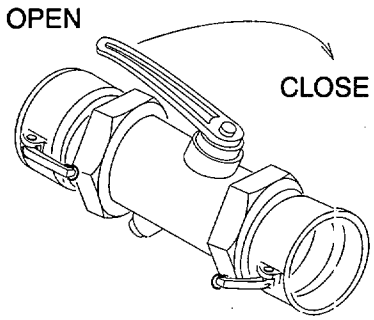


Figure 2-7. 4 Inch Butterfly Valve

(8) Gate Valve, 4 in. Used to control flow of fuel and isolate lines not in use. Turning handwheel counterclockwise opens valve (allow flow) and turning handwheel clockwise closes valve (block flow).

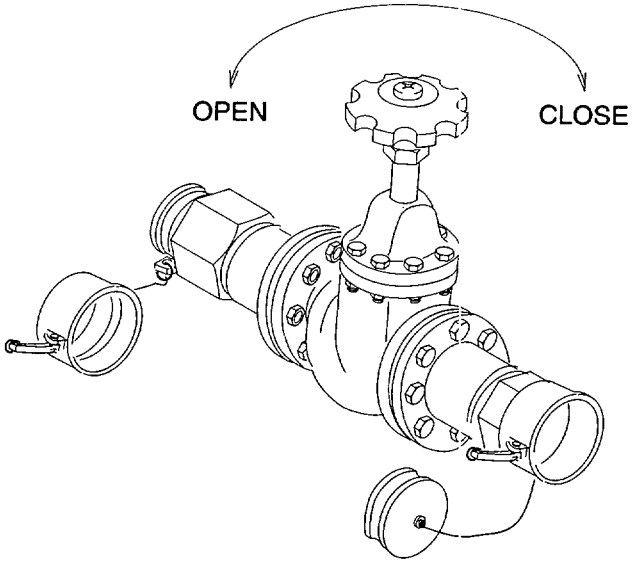


Figure 2-8. 4 Inch Gate Valve

(9) Ball Valve, 1-1/2 in. Used to quickly control flow of fuel and provide secure shut off. Shown open (allow flow) and closed (block flow).

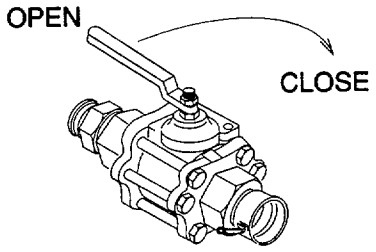


Figure 2-9. 1-1/2 Inch Ball Valve

(10) Water Detection Kit Adapter Assembly. Used with water detection kit to sample and monitor the fuel for presence of water.

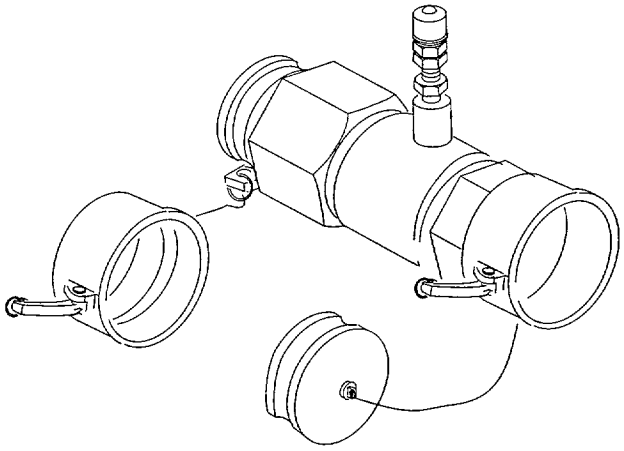


Figure 2-10. Water Detection Kit Adapter Assembly

2-1. GENERAL. - continued

b. The following items are used in the Tactical Petroleum Terminal but are covered by unique technical manuals. Description and use of operators controls and indicators are covered in the manuals listed.

(1) Fire Suppression Equipment Set. See TM 10-4210-235-13.

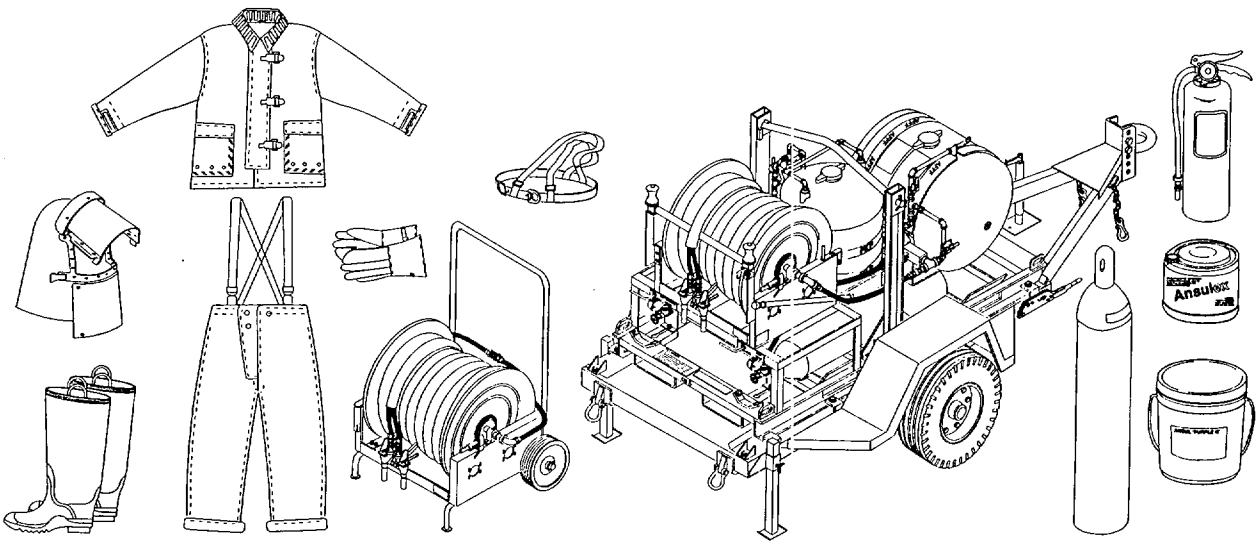


Figure 2-11. Fire Suppression Equipment Set

(2) Centrifugal Pump Unit, 350 gpm. See TM 5-4320-226-14 or TM 10-4320-324-14.

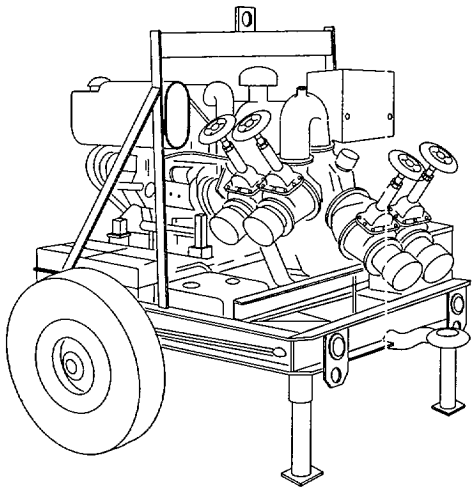


Figure 2-12. 350 gpm Centrifugal Pump

(3) Petroleum Testing Kit. See TM 10-6630-240-12&P or TM 10-6630-218-10.

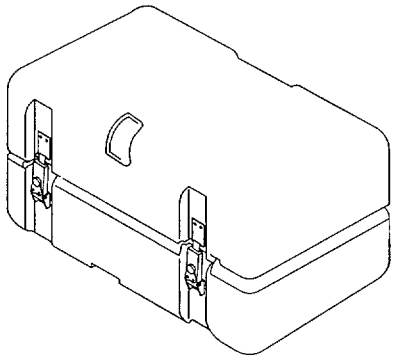


Figure 2-13. Petroleum Testing Kit

(4) Self Priming Centrifugal Pump Unit. 600 gpm. See TM 5-4320-305-10.

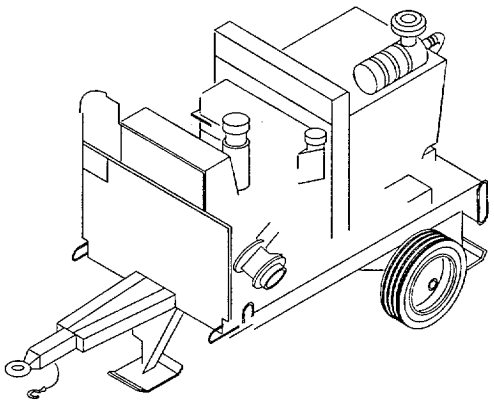


Figure 2-14. 600 gpm Self Priming Centrifugal Pump

(5) Nozzle Assembly, Type D-1. See TM 10-4930-246-13&P.

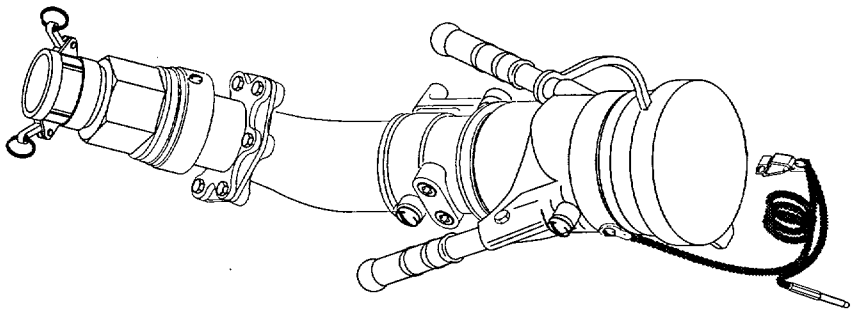


Figure 2-15. Type D-1 Nozzle Assembly

2-1. GENERAL. - continued

(6) Liquid Fuel Filter/Separator. See TM 5-4330-211-12 or TM 10-4330-235-13&P.

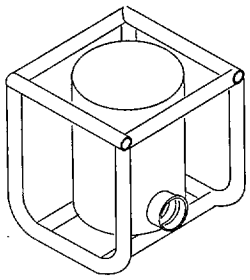


Figure 2-16. Liquid Fuel Filter/Separator

(7) Floodlight Set. See TM 9-6230-211-14.

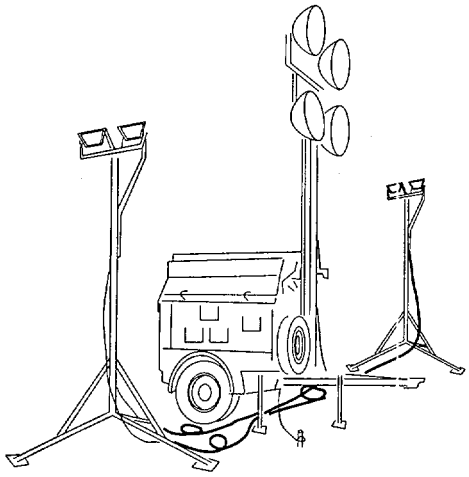


Figure 2-17. Floodlight Set

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

2-2. GENERAL.

Preventive Maintenance Checks and Services means systematic caring, inspection, and servicing of equipment to keep it in good condition and ready to use. As the operator, your mission is to:

(1) Be sure to perform your PMCS each time you operate the Tactical Petroleum Terminal.
(2) Do your "Before" PMCS just before you operate the equipment.
(3) Do your "During" PMCS while you operate the equipment.
(4) Do your "After" PMCS right after operating the equipment.
(5) Use DA Form 2404 (Equipment Inspection and Maintenance Worksheet) to record any faults that you discover before, during, or after use, unless you can fix the fault. You DO NOT need to record faults that you fix.

2-3. PMCS PROCEDURES.

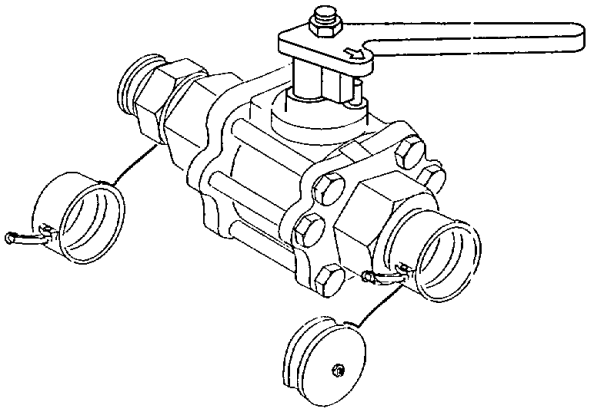
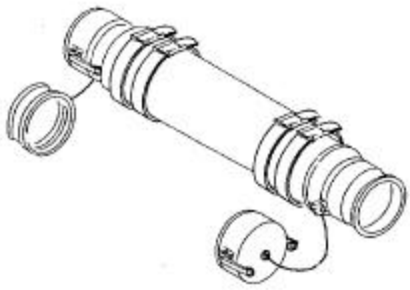
a. Your Preventive Maintenance Checks and Services, table 2-1, lists inspections and care required to keep your equipment in good operating condition.
b. The "Interval" column of table 2-1 tells you when to do a certain check or service.
c. The "Procedure" column of table 2-1 tells you how to do required checks and services.

NOTE

Terms "ready/available" and "mission capable" refer to same status: Equipment is on hand and ready to perform its mission. (See DA Pam 738-750.)

d. The "Not Fully Mission Capable If:" column in table 2-1 tells you when your equipment is nonmission capable and why it cannot be used.
e. For decals and instruction plates on the major components, see the following Technical Manuals:
(1) Fire Suppression Equipment, TM 10-4210-235-13.
(2) 350 GPM Pump Unit, TM 5-4320-226-14 or TM 10-4320-324-14.
(3) 50,000 Gal and 5,000 BBL Collapsible Fabric Tanks, TM 10-5430-219-12.
(4) Petroleum Aviation Fuel Contamination Testing Kit, TM 10-6630-240-12&P or TM 10-6630-218-10.
(5) 600 GPM Pump Unit, TM 5-4320-305-10.
(6) Type D-1 Nozzle Assembly, TM 10-4930-246-13&P.
(7) 350 GPM Frame Mounted Liquid Fuel Filter Separator, TM 5-4330-211-12 or TM 10-4330-235-13&P.
(8) Trailer Mounted Floodlight Set, TM 9-6230-211-14.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
1	Before	3 in. Quick Disconnect Ball Valve Assy	a Inspect for loose, broken, or missing handle. b. Inspect valve couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs. Valve stem sticks or binds. c. Rotate handle. Valve stem should turn freely.	Handle broken or missing. Coupling damaged. Gaskets damaged or missing.
				
2	Before	Hose Assemblies 4 in. x 25 ft, 4 in. x 12 ft, 1 in. x 25 ft, 1-1/2 in. x 25 ft	a Inspect hoses for cuts, tears, and deep abrasions. b. Inspect couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs.	Hose cut or torn. Coupling damaged. Gaskets damaged or missing.

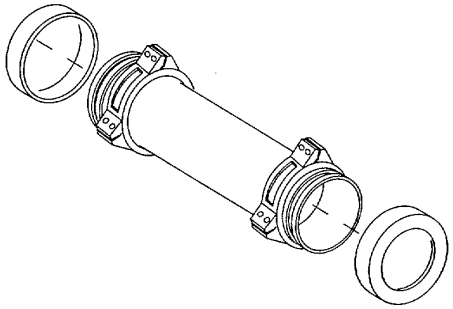
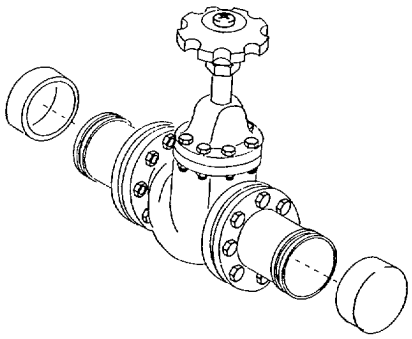
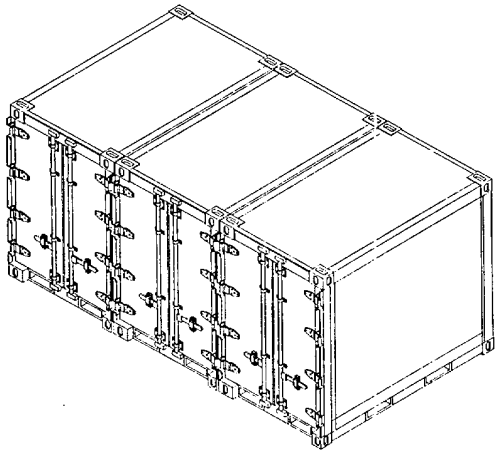
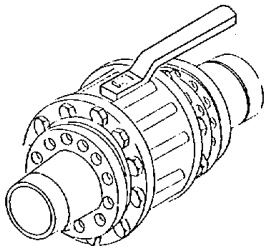
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
3	Before	Hose Assemblies 6 in. x 50 ft, 6 in. x 500 ft, 6 in. x 12 ft	a. Inspect hoses for cuts, tears, and deep abrasions. b. Inspect couplings for cracks and loose or missing hardware. c. Check for missing dust caps.	Hose cut or torn. Coupling damaged or missing.
				
4	Before	6 inch Gate Valve Assembly	a. Inspect for loose, broken, or missing hand wheel. b. Inspect valve couplings for cracks. c. Check for missing dust caps. d. Rotate hand wheel. Valve stem should turn freely. e. Check for loose or missing bolts and nuts.	Hand wheel broken or missing. Coupling damaged or missing. Valve stem sticks or binds. Hardware missing.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal- continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
5	Before	Shipping Containers	a. Check that doors are in place and that they close and seal properly. b. Lubricate door hinges. See Appendix F. c. Check exterior walls for punctures.	Doors missing or damaged to prevent latching and sealing. Walls damaged to allow entrance for foreign material or create shipping hazard.
6	Before	Hoseline Assembly Installation Tools	Check that tools are available and in good condition.	
				
7	Before	6 inch Ball Valve Assembly	a. Inspect for loose, broken or missing handle. b. Inspect valve couplings for cracks. c. Check for missing dust caps. d. Turn handle. Valve stem should turn freely. e. Check for loose or missing bolts and nuts.	Handle broken or missing. Coupling damaged or missing. Valve stem sticks or binds. Hardware missing.

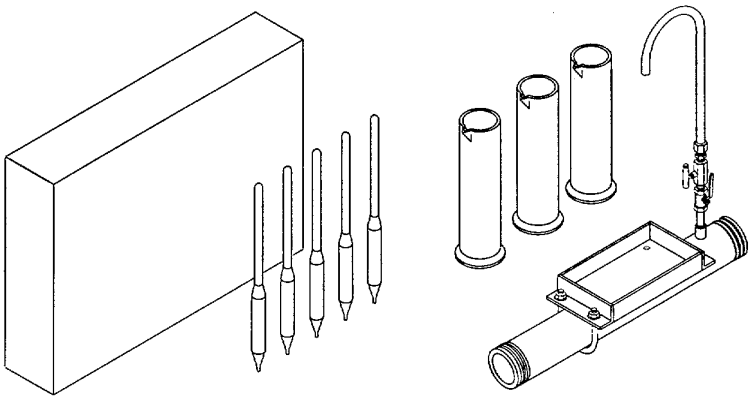
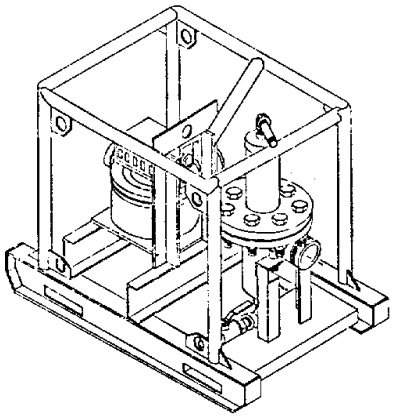
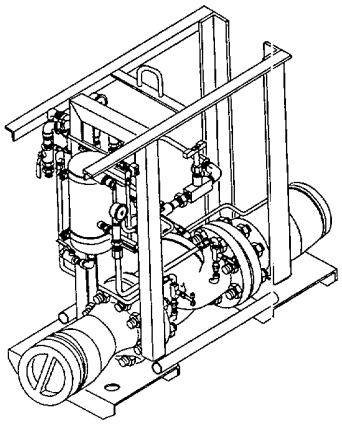
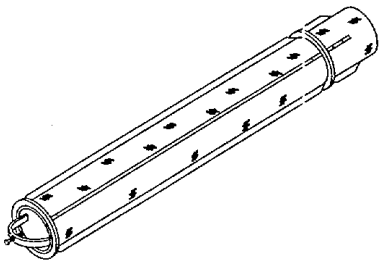
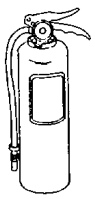
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
8	Before	Fuel Sampling Assembly	a. Check that hydrometers and test cylinders are not broken. b. Check that 1/2 inch needle valve and ball valve are in place and in good condition.	Hydrometers and test cylinders missing or broken. Valve missing or broken.
				
9	Before	6 inch 800 GPM Meter Skid Assy	a. Check meters and counter for general condition. b. Check for loose or missing hardware.	Meter or counter broken. Hardware missing.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal- continued

Item No.	Interval	Location / Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
10	Before	Skid Mounted Pressure Regulating Valve Assembly	a. Check general condition of all gages, valves and tubing. b. Check for loose or missing hardware.	Broken or missing parts. Hardware missing.
				
11	Before	Receive Barrel Inlet Strainer	Inspect for damage that would prevent installation, block flow or permit contaminates to enter fuel flow.	Damaged to prevent installation, block flow or permit contamination flow.
				
12	Before	Dry Chemical Fire Extinguisher	Check general condition and safe charge indicator.	Broken or low on charge.

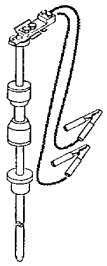
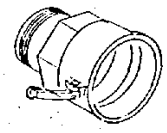
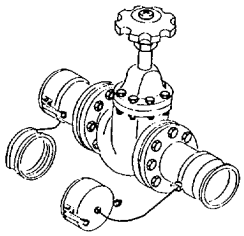
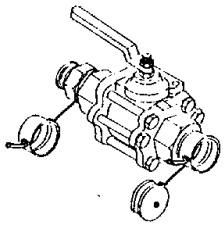
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
13	Before	Self Driving Ground Rods	Check general condition and for loose or missing cables and clamps.	Broken or missing cables or clamps.
				
14	Before	Female Coupling Adapter Assembly	a. Inspect fitting for cracks, breaks, and severe corrosion.	Cracked or severely corroded.
			b. Inspect coupling for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets.	Coupling damaged. Gasket damaged or missing.
				
15	Before	4 inch Butterfly Valve	a. Inspect for loose, broken, or missing handle.	Handle broken or missing.
			b. Inspect valve couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs.	Coupling damaged. Gaskets damaged or missing.
			c. Rotate handle. Valve stem should turn freely.	Valve stem sticks or binds.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal- continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
16	Before	4 inch Gate Valves	a. Inspect for loose, or missing hand wheel.	Hand wheel missing.
			b. Inspect valve couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs.	Coupling damaged. Gaskets damaged or missing.
			c. Rotate hand wheel. Valve stem should turn freely.	Valve stem sticks or binds.
			d. Check for loose or missing bolts and nuts.	Hardware missing.
				
17	Before	1-1/2 inch Ball Valves	a. Inspect for loose, or missing handle.	Handle missing.
			b. Inspect valve couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs.	Coupling damaged. Gaskets damaged or missing.
			c. Rotate handle. Valve stem should turn freely.	Valve stem sticks or binds.
			d. Check for loose or missing bolts and nuts.	Hardware missing.

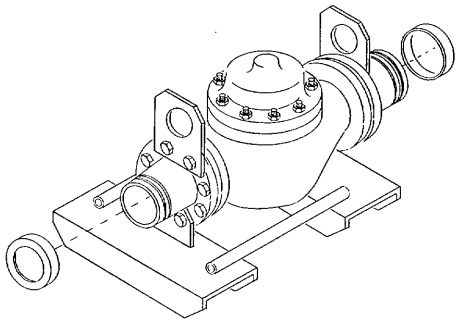
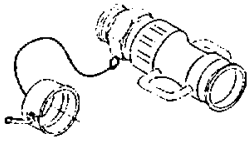
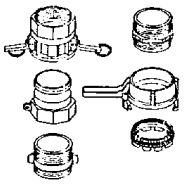
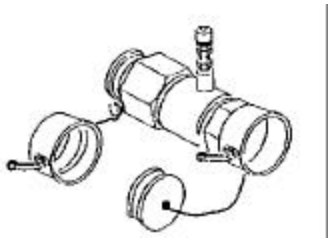
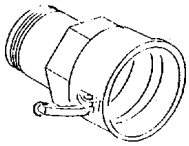
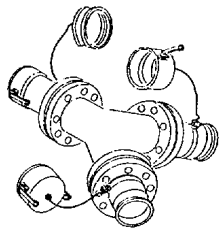
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
18	Before	6 inch Double Groove Pressure Control Valve Assembly	a. Check for missing dust caps. b. Inspect Couplings for cracks or obvious damage. c. Check for loose or missing hardware.	 Couplings cracked or damaged. Hardware missing.
				
19	Before	Dry-Break Coupling Assembly	Inspect couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs.	Coupling damaged. Gasket damaged or missing.
				
20	Before	NATO Tank Truck Adapter Coupling Set	Inspect couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing couplings gaskets.	Coupling damaged. Gaskets damaged or missing.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal- continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
21	Before	Water Detection Kit Adapter Assembly	a. Inspect couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing couplings gaskets. Check for missing dust caps and plugs. b. Check that probe assembly is in place and in good condition.	Coupling damaged. Gaskets damaged or missing. Probe assembly missing or damaged.
				
22	Before	Female Coupling Adapter Assy	Inspect couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing couplings gaskets.	Coupling damaged. Gaskets damaged or missing.
				
23	Before	Y Assemblies	a. Inspect Y fittings for cracks, breaks and severe corrosion. b. Inspect couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs. c. Inspect for leaks at couplings and flange gaskets.	Y cracked or severely corroded. Coupling damaged. Gasket damaged or missing. Y assembly leaks.

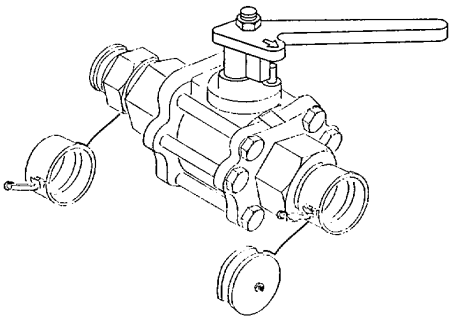
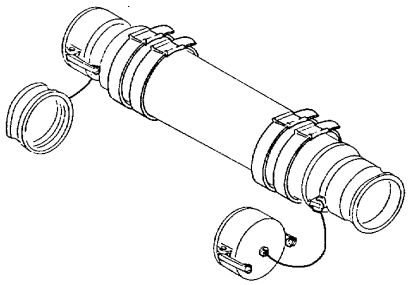
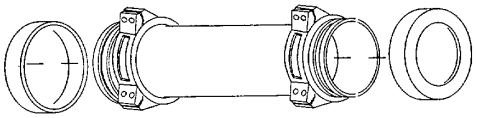
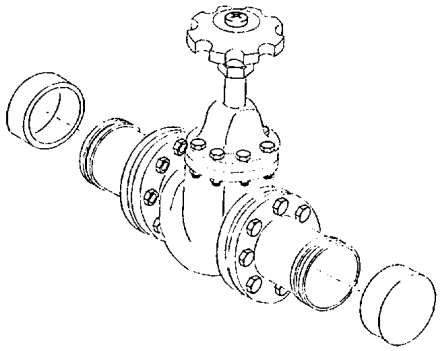
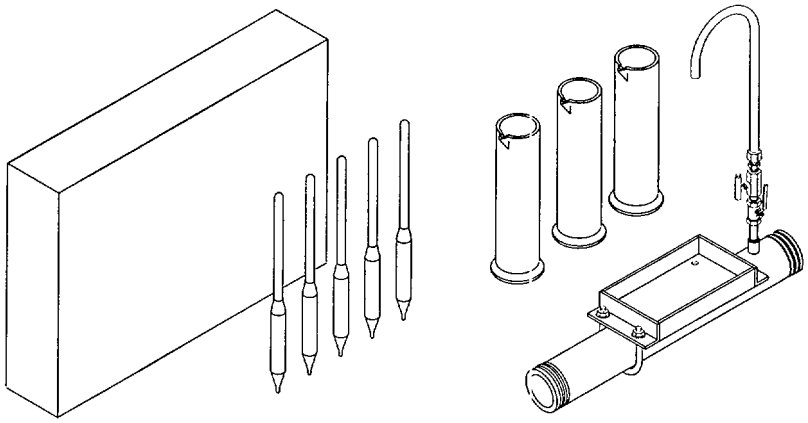
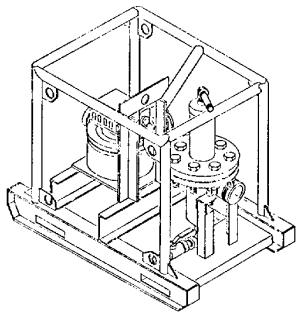
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
24	During	3 in. Quick Disconnect Ball Valve Assy	a. Inspect for loose, broken or missing handle.	Handle broken or missing.
			b. Inspect valve couplings for cracks and bent or broken locking arms.	Coupling damaged.
			c. Inspect valves for leaks.	Valve leaks.
				
25	During	Hose Assemblies 4 in. x 25 ft, 4 in. x 12 ft, 1 in. x 25 ft, 1-1/2 in. x 25 ft	a. Inspect hoses for cuts, tears, and deep abrasions.	Hose cut or torn.
			b. Inspect couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs.	Coupling damaged. Gaskets damaged or missing.
			c. Inspect hoses for leaks.	Hose leaks.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal- continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
26	During	Hose Assemblies 6 in. x 50 ft, 6 in. x 500 ft, 6 in. x 12 ft	a. Inspect hoses for cuts, tears, and deep abrasions. b. Inspect couplings for cracks and loose or missing hardware c. Inspect hoses for leaks.	Hose cut or torn. Coupling damaged or missing. Hose leaks.
				
27	During	6 in. Gate Valve Assembly	a. Inspect for loose, broken, or missing hand wheel. b. Inspect valve couplings for cracks. c. Rotate hand wheel. Valve stem should turn freely. d. Check for loose or missing bolts and nuts. e. Inspect valve stem, bonnet, and flange gaskets for leaks.	Hand wheel broken or missing. Coupling damaged or missing. Valve stem sticks or binds. Hardware missing. Valve leaks.

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
28	During	Hoseline Assembly Installation Tools	Check that tools are available and in good condition.	
				
29	During	6 inch Ball Valve Assembly	a. Inspect for loose, broken, or missing handle.	Handle broken or missing.
			b. Inspect valve couplings for cracks.	Coupling damaged or missing.
			c. Turn handle. Valve stem should turn freely.	Valve stem sticks or binds.
			d. Check for loose or missing bolts and nuts.	Hardware missing.
			e. Inspect valve stem, bonnet, and flange gaskets for leaks.	Valve leaks.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal- continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
30	During	Fuel Sampling Assembly	a. Check that hydrometers and test cylinders are not broken. b. Check that 1/2 inch needle valve and ball valve are in place and in good condition. c. Check for leaks.	Hydrometers and test cylinders missing or broken. Valve missing or broken. Leaks found.
				
31	During	6 inch 800 GPM Meter Skid Assy	a. Check meters and counter for general condition. b. Check for loose or missing hardware. c. Check for leaks.	Meter or counter broken. Hardware missing that would permit fuel leak. Leaks found.

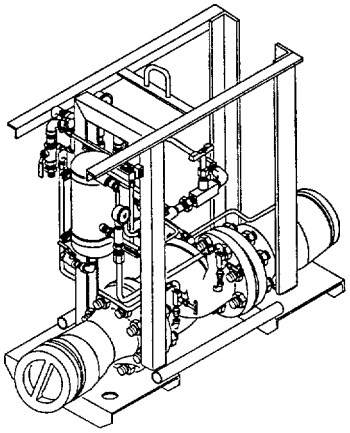
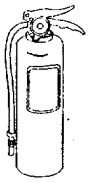
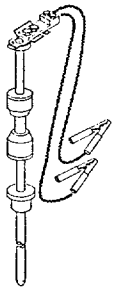
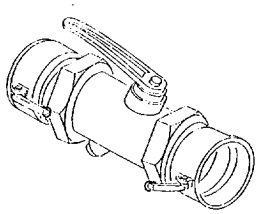
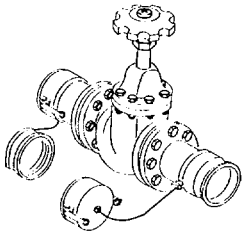
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
32	During	Skid Mounted Pressure Regulating Valve Assembly	a. Check general condition for all gages, valves and tubing. b. Check for loose or missing hardware. c. Check for leaks.	Broken or missing parts. Hardware missing. Leaks found.
				
33	During	Dry Chemical Fire Extinguisher	Check general condition and safe charge indicator.	Broken or low on charge.
				
34	During	Self Driving Ground Rods	Check general condition and for loose or missing cables and clamps.	Broken or missing cables or clamps.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal- continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
35	During	Female Coupling Adapter Assembly	a. Inspect fitting for cracks, breaks, and severe corrosion. b. Inspect couplings for cracks and bent or broken locking arms.	Cracked or severely corroded. Coupling damaged.
				
36	During	4 inch Butterfly Valve	a. Inspect for loose, broken, or missing handle. b. Inspect valve couplings for cracks and bent or broken locking arms. c. Inspect valve stem, bonnet, and flange gaskets for leak,:.	Handle broken or missing. Coupling damaged. Valve leaks.
				
37	During	4 inch Gate Valves	a. Inspect for loose, or missing hand wheel. b. Inspect valve couplings for cracks and bent or broken locking arms. c. Check for loose or missing bolts and nuts.	Hand wheel missing. Coupling dam aged. Hardware missing.

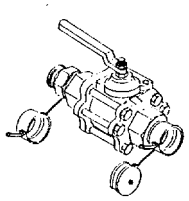
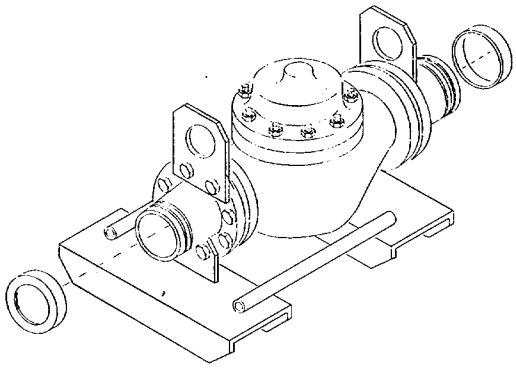
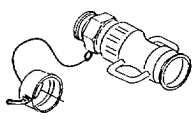
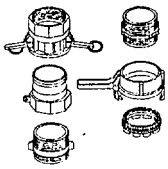
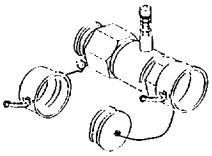
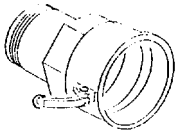
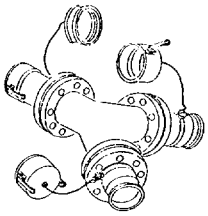
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
38	During	1-1/2 inch Ball Valves	a. Inspect for loose, or missing handle. b. Inspect valve couplings for cracks and bent or broken locking arms. c. Check for loose or missing bolts and nuts.	Handle missing. Coupling damaged. Hardware missing.
				
39	During	6 inch Double Groove Pressure Control Valve Assembly	a. Check for missing dust caps. b. Inspect couplings for cracks or obvious damage. c. Check for loose or missing hardware. d. Check for leaks.	 Couplings cracked or damaged. Hardware missing. Leaks found.
				
40	During	Dry-Break Coupling Assembly	Inspect couplings for cracks and bent or broken locking arms.	Coupling damaged.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal- continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
41	During	NATO Tank Truck Adapter Coupling Set	Inspect couplings for cracks and bent or broken locking aims.	Coupling damaged.
				
42	During	Water Detection Kit Adapter Assembly	a. Inspect couplings for cracks and bent or broken locking arms. b. Check that probe assembly is in place and in good condition.	Coupling damaged. Probe assembly missing or damaged.
				
43	During	Female Coupling Adapter Assy	Inspect couplings for cracks and bent or broken locking aims.	Coupling damaged.
				
44	During	Y Assemblies	a. Inspect Y fittings for cracks, breaks and severe corrosion. b. Inspect couplings for cracks and bent or broken locking arms. c. Inspect for leaks at couplings and flange gaskets.	Y cracked or severely corroded. Coupling damaged. Y assembly leaks.

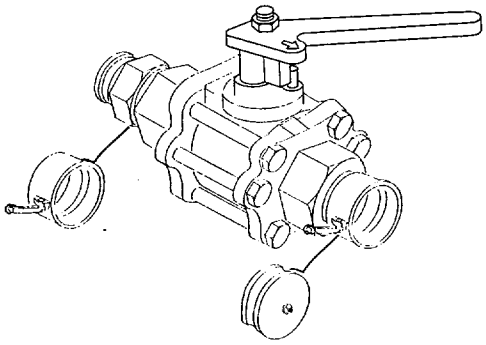
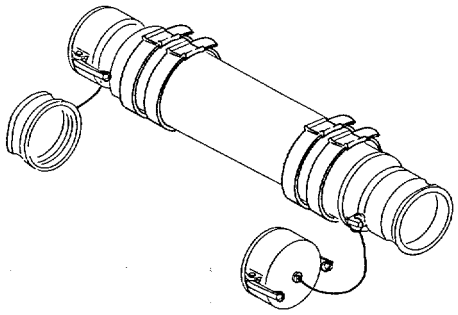
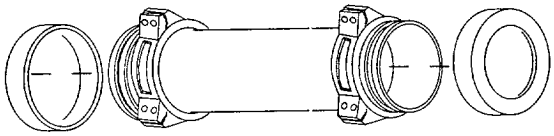
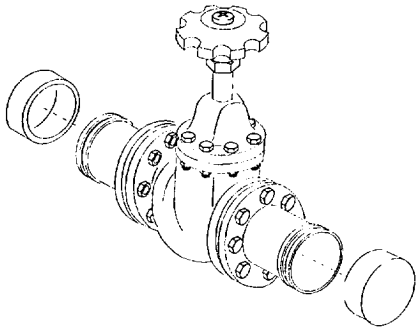
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
45	After	3 in. Quick Disconnect Ball Valve Assy	a. Inspect for loose, broken, or missing handle.	Handle broken or missing.
			b. Inspect valve couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs.	Coupling damaged. Gaskets damaged or missing.
			c. Rotate handle. Valve stem should turn freely.	Valve stem sticks or binds.
				
46	After	Hose Assemblies 4 in. x 25 ft, 4 in. x 12 ft, 1 in. x 25 ft, 1-1/2 in. x 25 ft	a. Inspect hoses for cuts, tears, and deep abrasions.	Hoses cut or torn.
			b. Inspect couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs.	Coupling damaged. Gaskets damaged or missing.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal- continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
47	After	Hose Assemblies 6 in. x 50 ft, 6 in. x 500 ft, 6 in. x 12 ft	a. Inspect hoses for cuts, tears, and deep abrasions.	Hose cut or torn.
			b. Inspect couplings for cracks and loose or missing hardware. Check for missing dust caps .	Coupling damaged or missing.
				
48	After	6 inch Gate Valve Assembly	a. Inspect for loose, broken or missing hand wheel.	Hand wheel broken or missing.
			b. Inspect valve couplings for cracks. Check for missing dust caps.	Coupling damaged or missing.
			c. Rotate hand wheel. Valve stem should turn freely.	Valve stem sticks or binds.
			d. Check for loose or missing bolts and nuts.	Hardware missing.

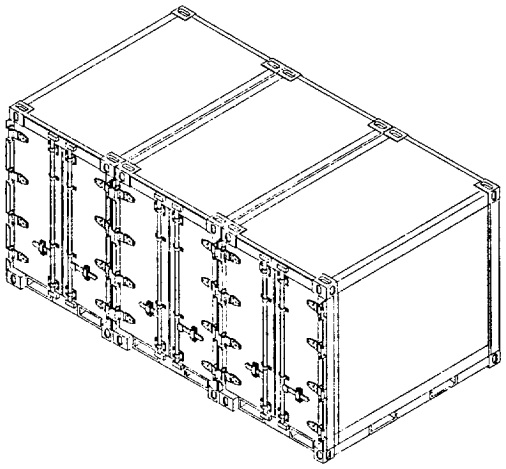
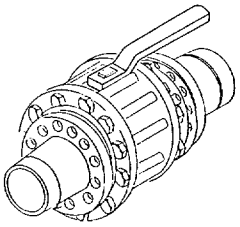
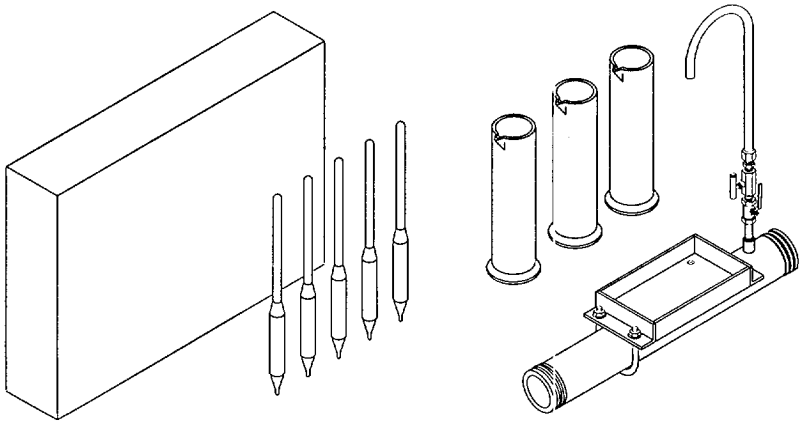
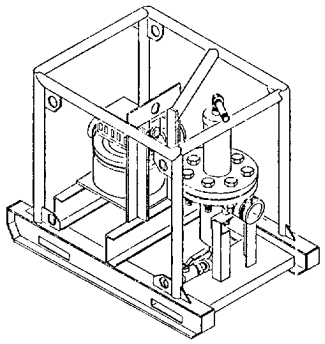
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
49	After	Shipping Containers	a. Check that doors are in place and that they close and seal properly. b. Lubricate door hinges. See Appendix F. c. Check exterior walls for punctures.	Doors missing or damaged to prevent latching and sealing. Walls damaged to allow entrance of foreign material or create shipping hazard.
50	After	Hoseline Assembly Installation Tools	a. Check that tools are available and in good condition.	
				
51	After	6 inch Ball Valve Assembly	a. Inspect for loose, broken, or missing handle. b. Inspect valve couplings for cracks. Check for missing dust caps. c. Turn handle. Valve stem should turn freely.	Handle broken or missing. Coupling damaged or missing. Valve stem sticks or binds.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal- continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
			d. Check for loose or missing bolts and nuts.	Hardware missing.
				
52	After	Fuel Sampling Assembly	a. Check that hydrometers and test cylinders are not broken. b. Check that 1/2 inch needle valve and ball valve are in place and in good condition.	Hydrometers and test cylinders missing or broken. Valve missing or broken.
				
53	After	6 inch 800 GPM Meter Skid Assy	a. Check meters and counter for general condition. b. Check for loose or missing hardware.	Meter or counter broken. Hardware missing.

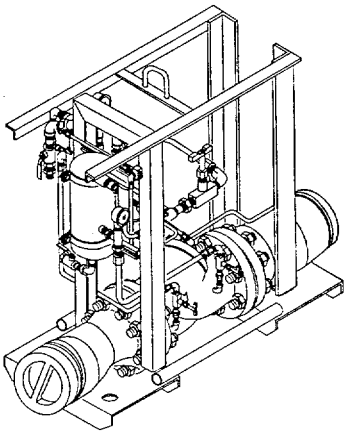
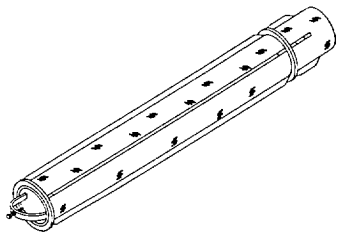
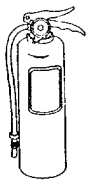
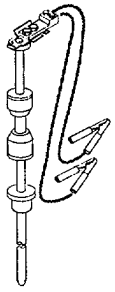
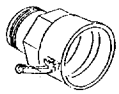
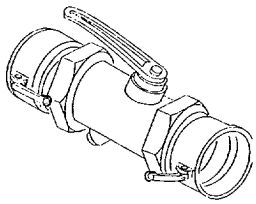
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
54	After	Skid Mounted Pressure Regulating Valve Assembly	a. Check general condition of all gages, valves and tubing. b. Check for loose or missing hardware.	Broken or missing parts. Hardware missing.
				
55	After	Receiver Barrel Inlet Strainer	Inspect for damage to strainer.	Strainer damaged to prevent installation, block flow or permit contaminates to enter fuel flow.
				
56	After	Dry Chemical Fire Extinguisher	Check general condition and safe charge indicator.	Broken or low on charge.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal- continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
57	After	Self Driving Ground Rod	Check general condition ;and for loose or missing cables and clamps.	Broken or missing cables or clamps.
				
58	After	Female Coupling Adapter Assembly	a. Inspect fitting for cracks, breaks, and severe corrosion. b. Inspect couplings for cracks and bent or broken locking; arms. Inspect for cut, torn or missing coupling gaskets.	Cracked or severely corroded. Coupling damaged. Gasket damaged or missing.
				
59	After	4 Inch Butterfly Valve	a. Inspect for loose, broken, or missing handle. b. Inspect valve couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs. c. Rotate handle. Valve :;tem should turn freely.	Handle broken or missing. Coupling damaged. Gaskets damaged or m issing. Valve stem sticks or binds.

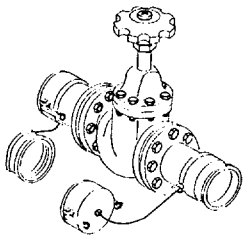
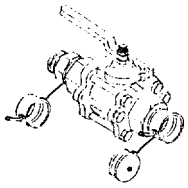
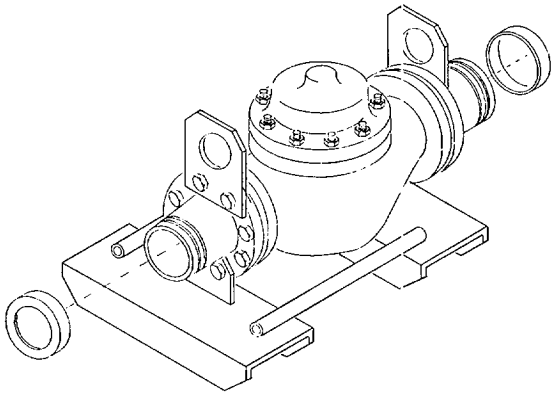
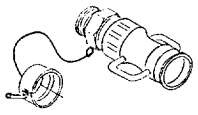
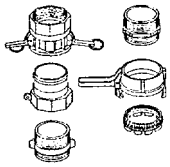
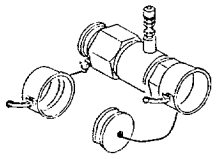
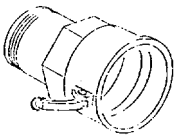
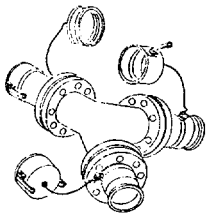
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
60	After	4 Inch Gate Valves	a. Inspect for loose, or missing hand wheel.	Hand wheel missing.
			b. Inspect valve couplings for cracks and bent or broken locking arms. Inspect for cut, tom or missing coupling gaskets. Check for missing dust caps and plugs.	Coupling damaged. Gaskets damaged or missing.
			c. Rotate hand wheel. Valve stem should turn freely.	Valve stem sticks or binds.
			d. Check for loose or missing bolts and nuts.	Hardware missing.
				
61	After	1-1/2 Inch Ball Valves	a. Inspect for loose, or missing handle.	Handle missing.
			b. Inspect valve couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs.	Coupling damaged. Gaskets damaged or missing.
			c. Rotate handle. Valve stem should turn freely.	Valve stem sticks or binds.
			d. Check for loose or missing bolts and nuts.	Hardware missing.

Table 2-1. Operator Preventive Maintenance Checks and Services for Tactical Petroleum Terminal- continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
62	After	6 Inch Double Groove Pressure Control Valve75 Assembly.	a. Check for missing dust caps. b. Inspect couplings for cracks or obvious damage. c. Check for loose or missing hardware.	 Couplings cracked or damaged. Hardware missing.
				
63	After	Dry-Break Coupling Assembly	Inspect couplings for cracks and bent or broken locking alms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs.	Coupling damaged. Gaskets damaged or missing.
				
64	After	NATO Tank Truck Adapter Coupling Set	Inspect couplings for cracks and bent or broken locking aims. Inspect for cut, torn or missing couplings gaskets.	Coupling damaged. Gaskets damaged or missing.

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
65	After	Water Detection Kit Adapter Assembly	a. Inspect couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing couplings gaskets. Check for missing dust caps and plugs. b. Check that probe assembly is in place and in good condition.	Coupling damaged. Gaskets damaged or missing. Probe assembly missing or damaged.
				
66	After	Female Coupling Adapter Assy	Inspect couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing couplings gaskets.	Coupling damaged. Gaskets damaged or missing.
				
67	After	Y Assemblies	a. Inspect Y fitting for cracks, breaks, and severe corrosion. b. Inspect couplings for cracks and bent or broken locking arms. Inspect for cut, torn or missing coupling gaskets. Check for missing dust caps and plugs.	Y cracked or severely corroded. Coupling damaged. Gasket damaged or missing.

Section III. OPERATION UNDER USUAL CONDITIONS

2-4. ASSEMBLY AND PREPARATION FOR USE.

The services of Unit Maintenance should be used for original unpacking, installation and preparation for use.

2-5. INITIAL ADJUSTMENTS AND CHECKS.

a. Inspect total system for obvious damage or installation problems.

b. Check that all valves are closed.

c. Perform the preventative maintenance checks and services listed in table 2-1.

d. Report any deficiencies to unit maintenance.

2-6. OPERATING PROCEDURES.

a. General Safety.

The following is a summary of general safe work practices that should be followed to avoid personnel injury and equipment damage. When operating specific equipment and systems, refer to applicable manuals for additional warnings and cautions.

WARNING

NO SMOKING

No smoking allowed within 50 ft. of any facility or device storing or handling petroleum fuels.

WARNING

MOVING PARTS

Engines and pumps have fast moving parts that can injure hands, feet etc. Take special care while in operation.

WARNING

HOT ENGINE PARTS

Engine parts, particularly the exhaust system can be very hot and cause severe burns. Do not touch until engine is shut down and cooled off. Avoid spilling fuel or oil on engine parts which could result in a fire.

WARNING

HOSE WHIP

Hose may tend to move rapidly or whip if not weighed down. Pressure changes can cause hose whip and injure personnel.

WARNING

SHUT VEHICLE ENGINES OFF WHEN FILLING VEHICLE WITH FUEL

Vehicle engines must be shut down when filling the vehicle with fuel to minimize the risk of fire or explosion.

WARNING

FUEL AIR MIXTURES

Any mixture of fuel vapor or fuel droplets with air is potentially explosive.

WARNING

LIQUID FUEL LEAKS

Promptly correct any fuel leakage that causes an accumulation of fuel on any surface. If it cannot be corrected safely while in operation, shut down and make corrections to stop the leak.

WARNING

LIQUID FUEL ACCUMULATION

The accumulation of liquid fuel, or hot lubricating oil is a fire hazard.

WARNING

FUME ACCUMULATION

When leaks or spills occur, there will be an accumulation of fumes producing a fire hazard. Clear unnecessary personnel from the area until the fumes have been dispersed.

WARNING

FUEL SATURATED SOIL

Fuel saturated soil is a fire hazard. Do not allow unnecessary personnel in the area.

2-6. OPERATING PROCEDURES. - continued

WARNING

MAJOR TANK SPILLS

Do not go inside the tank berm or firewall if a spill occurs until supervision approves entry.

WARNING

GROUNDING AND BONDING

To avoid fire or explosion, all equipment, devices, machinery, vehicles, hoses and piping must be grounded to avoid static electricity discharge. When loading or unloading tanker-trucks or any vehicles, make sure the fuel dispensing system and tanker-truck receipt manifold are bonded.

WARNING

FIRE SAFETY

Fire suppression equipment must be positioned at all known hazardous areas. Move fire suppression equipment to any source of fuel leak or spill.

WARNING

CLEAN OPERATING AREAS

Keep operating areas cleaned up and picked up. Remove any unnecessary equipment, trash, large rocks, etc. that can cause personnel injury. Dispose of oily rags in a closed metal container.

b. Specific Health Hazards While Working With Various Fuels. The following is a summary of health hazards and recommended action to be taken for the fuels involved in the TPT.

(1) Personnel must avoid prolonged or repeated breathing of fuel fumes. Use in well ventilated area. First aid consists of allowing the victim to breathe fresh air.

(2) Do not ingest fuel. If fuel is ingested, do not induce vomiting. Seek medical assistance immediately.

(3) Avoid prolonged or repeated contact with skin. First aid consists of washing skin and changing contaminated clothing.

(4) Avoid contact with eyes. If eyes are exposed, wash them out immediately with volumes of water. Seek medical assistance immediately.

(5) The pumps and lighting generators in this system are operated by diesel engines. Exhaust fumes can cause illness and death. Pump engines must not be operated in an enclosed area unless action has been taken to direct the fumes outside and all exhaust manifold leaks have been eliminated. Good ventilation in such an enclosure is mandatory.

(6) Hearing damage from engine noise is possible.

c. General Operating Information.

The standard TPT is designed to receive, store, and dispense any of three types of fuel; diesel, jet fuel, or motor gasoline. Fuels are received from an associated pipeline system or from tanker-trucks, or both, depending on specific site operating criteria. Fuels can be dispensed to tanker-trucks or 500 gallon collapsible drums. When the mission of the particular terminal calls for it, fuels can be discharged from storage to an associated pipeline or a user facility. See (figures 4-1 and 4-2) for typical TPT layouts. Note that these schematics do not necessarily indicate relative hoseline lengths and that layouts will vary in accordance with need, application, and terrain.

(1) Fuel from the associated pipeline system enters the switching manifold through a pressure regulating valve assembly.

(2) The fuel, if contaminated, can be diverted to the contaminated fuel module.

(3) When sampling assures the operators of clean specification fuel, open valves to the tank farm assembly and then close the valves to contaminated fuel module.

(4) When called for by the requirements for the specific TPT, fuel can also be received from the tanker-truck receipt manifolds. Incoming fuel quantities are measured by the meters in the intake hoselines to the fuel units.

(5) By proper positioning of valves, the fuel can be routed to any tank in the fuel unit.

(6) Fuel is sent to the dispensing assembly via the hoseline pump(s) through filter-separators to remove traces of water. The fuel is sampled at the discharge of the filter separators to assure quality.

(7) The dispensing assembly is designed to load fuels into tanker-trucks or 500 gallon collapsible drums. If called for by the mission of the specific TPT, the hoseline system can discharge fuel to an associated pipeline system or hoseline to a user facility. A meter is provided to measure this flow. If desired in a multiple TPT system, which may include extended and modified switching manifolds, the discharge hoseline system from each fuel unit can be tied back into appropriate hoselines to transfer fuel to another TPT.

(8) See (figure 1-13 sheet 4) for an optional tank configuration which can be used, in part or in total, to supplement the 5,000 bbl tanks as desired by the operating authority.

(9) If hoseline lengths or elevation differentials between modules deviate from the concepts of the layouts, notify operating authorities.

d. Fuel Quality Assurance.

Quality assurance is of utmost importance to the operation of the TPT. Firm quality checking procedures must be established to assure that the TPT receives, stores, and dispenses only fuels which meet U.S. Army standards. Refer to U.S. Army and other applicable military standards which include:

FM 10-18
Petroleum Terminal and Pipeline Operations

FM 10-70
Inspecting and Testing Petroleum Products

FM 10-72
Petroleum Testing Facilities: Laboratories and Kits

2-6. OPERATING PROCEDURES. - continued

e. Sample Points.

Normally, the quality of product shipped to the TPT has been proven at the, source and again upon arrival at the point where it is pumped to the associated pipeline feeding the TPT. Facilities at the TPT permit sample taking as follows:

(1) A sampling assembly (See figure 1-4) is installed in the header feeding the TPT switching manifold from the associated pipeline or other delivery system. The primary use of the sampling assembly is to check incoming fuel and establish the arrival of different specification fuel. It can also be used to spot sample and check the quality of incoming fuel.

(2) A sample point is located in the discharge line of each filter separator. The primary purpose of this sample point is to check the quality and make sure no water is carried over to the dispensing assembly.

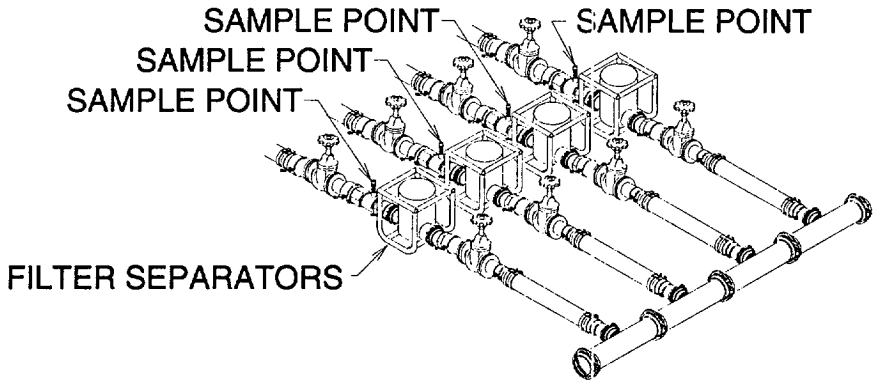


Figure 2-18. Fuel Sampling Points at Filter Separators

(3) There are no built in facilities to take composite samples from the fabric collapsible tanks. A bottom sample may be taken from the drain connection to check the accumulation of bottom sediment and water (BS & W).

f. Sampling.

(1) Care must be taken when drawing samples. This is particularly true when drawing a sample from a flowing line under pressure.

WARNING

FUEL SPLASHES AND SPILLS

Splashes and spills can cause eye injury and skin irritation. Wear face shield and approved gloves.

WARNING

FUEL SPILLS

Spills can result in saturated soil and cause a potential fire hazard.

WARNING

No smoking within 50 ft. of any sampling operation.

(2) When drawing samples, station a fire extinguisher near at hand.

(3) The sampling assembly should be operated as follows:

(a) Place container under the drain hole of the sampling table (1) to catch any spilled fuel.

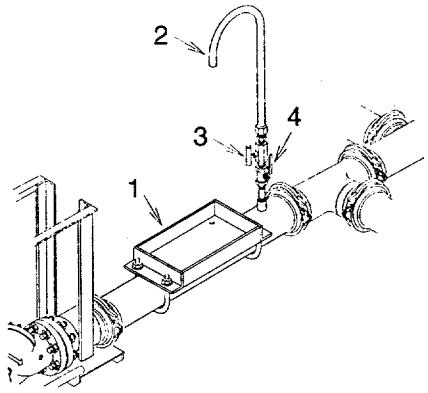


Figure 2-19. Fuel Sampling at Switching Manifold

(b) Place the sample bottle (or other container) under the gooseneck of the sampler (2).

(c) Check that needle valve (3) is closed.

(d) Open the ball valve (4).

(e) Slowly open the needle valve (3) to take sample.

2-6. OPERATING PROCEDURES. - continued

(f) Close the needle valve (3) and then the ball valve (4) when the sample has been taken.

(g) Contact your local environmental officer for guidance on how to properly dispose of contaminated fuel and/or soil in accordance with local regulations.

(4) Take a sample from the water detector kit adapter (1) downstream of the filter separators (2) in accordance with the instructions provided with the portable test kit.

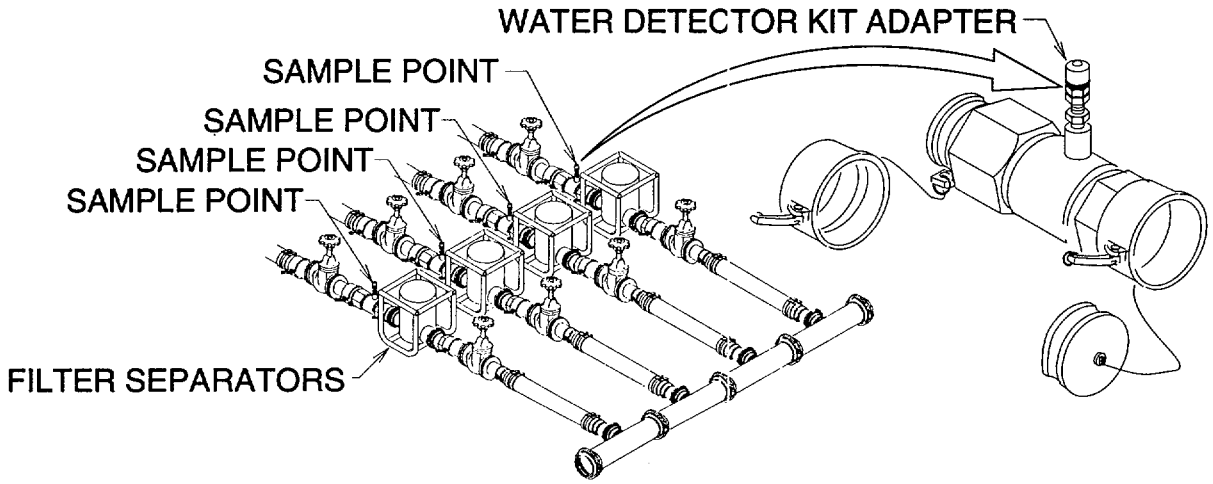


Figure 2-20. Water Detection 'Kit Adapter

(5) When taking a sample from a tank bottom drain, it is necessary to get inside the tank berm.

(a) Place a suitable waste fuel container under the tank bottom drain valve (1). Open valve and draw off sufficient fuel to make sure the drain hose has been flashed.

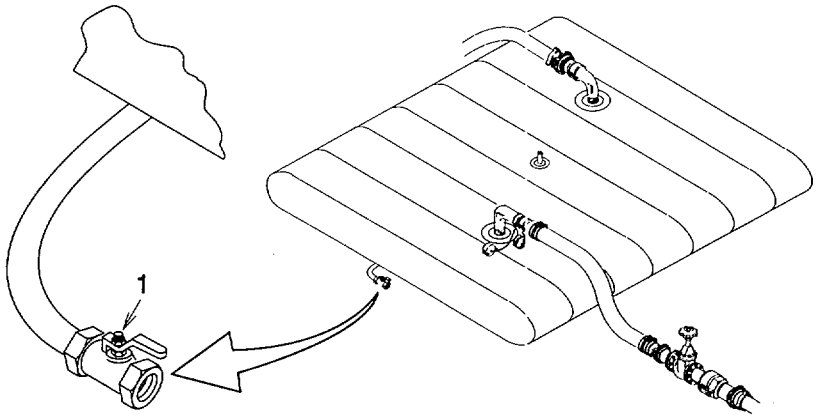


Figure 2-21. Tank Bottom Drain

(b) Close valve (1).

(c) Place sample container, furnished with portable test kit, under the valve (1).

(d) Open the valve partially to slowly fill the sample container. Close drain valve when filled.

(e) Properly dispose of waste fuel.

g. Test Equipment.

(1) Each TPT is furnished with a petroleum aviation fuel contamination testing kit.

(a) See TM 10-6630-240-12&P or TM 10-6630-218-10 for use of this kit.

(b) Instructions for using the kit are also on a placard attached inside the storage chest.

(c) The kit is capable of testing for particulate contaminants specific gravity (API standard) free water content.

(2) An extra set of hydrometers in ranges from API Gravity 290 to 810 are supplied with the fuel sampling assembly. See TM 10-6630-240-12&P or TM 10-6630-218-10 for hydrometer use.

(3) Laboratory facilities are not furnished for a TPT. The following laboratories are normally furnished to the operating area:

- Airmobile Petroleum Laboratory (NSN 6640-00-902-9711) On-site portable facility used to analyze fuel and oil for aircraft.
- Petroleum Base Laboratory (NSN 6640-00-303-4940) On-site portable facility used to analyze fuel and oil for ground equipment.

h. Sampling and Test Frequency.

Sampling and test frequency are determined by the service mission and specific operations of the particular TPT. It is recommended that a specific sampling and test program be set up for each particular TPT. The following are guidelines to assist in determining the sampling and testing requirements.

NOTE

The pipeline feeding the TPT may be used for multiple fuel service. When a new batch of fuel is shipped up the pipeline, the dispatcher will advise the operating supervision at the TPT of its estimated time of arrival. Between these batches is a section of co-mingling called the "interface".

(1) Sampling and Testing to Determine Cut. Testing will determine when interface has arrived and passed.

(a) Take samples at sampling assembly (figure 2-19) and test in accordance with portable test kit.

(b) Samples will be taken 30 minutes before the interface is scheduled to arrive and then at decreasing intervals down to 30 seconds until the change in characteristics indicate the arrival of the interface.

2-6. OPERATING PROCEDURES. - continued

(2) Sampling to Assure Quality to the Dispensing Assembly. Samples from the water detector kit adapter, downstream of each filter separator, are taken to assure that the filter separators are performing properly. Use portable testing kit to sample. It is recommended that samples be drawn and tested as follows:

(a) Once each four hours of operation of dispensing assembly.

(b) Three checks at 15 minute intervals after filter separator is first put in operation or whenever there has been a filter change or an upset in operations.

(3) Sampling from Tank Bottom Drain. It is recommended that samples be drawn and checked as follows:

(a) Once per week.

(b) Whenever there is suspicion of contamination by water or other contaminates.

(c) Prior to transferring tank contents elsewhere.

i. Use of Laboratory Facilities. It is recommended that the laboratory facilities noted in Paragraph 2-9, g., (3), (3) be used under the following circumstances:

(1) When the quality of a fuel is questioned.

(2) When a fuel cannot be classified.

(3) To assist in determining action to be taken with regards to the content of the contaminated fuel module.

(4) When a new batch of fuel is received from the associated pipeline.

(5) When a major transfer is planned between different TPT's or into the associated pipeline.

(6) When jet fuel has been in storage for 30 days or more without addition of fresh stock.

(7) All fuels in storage prior to any major drawdown on which vehicles or aircraft are dependent on the quality.

(8) Routinely check cross section of samples analyzed with the portable testing kit to assure proper use and accuracy of the portable testing kit.

j. Metering and Gauging. The meter skid assemblies are used to determine the quantity of fuel movement to and from the TPT. The range poles are used to determine the approximate inventory in the tanks and physically indicate a full tank. Metering and gauging systems are intended for operating control and are not intended for accounting purposes.

(1) Meter Skid Assemblies.

CAUTION

PURGING AIR THROUGH METER SKID ASSEMBLY

The positive displacement meter cannot be subjected to any substantial airflow without running the risk of overspeeding and ruining the meter. Fill rates should be kept under 50 gpm until the meter is flooded.

(a) There are four meter skid assemblies in the TPT system. Three are used to measure fuel into each fuel unit, and one is available to install in a common header returning fuel to the associated pipeline or user facility. To operate the meter for recording a fuel transfer:

1 Set the meter at zero or record the initial reading prior to the transfer. Do not reset the meter register while the meter is operating.

2 Instantaneous flow rates are read on the flow rate indicator during fuel transfer.

3 Read and record the reading at the completion of the transfer. The difference between the initial reading and the final reading is the amount of fuel transferred in U.S. gallons.

(b) The strainer is installed to protect the meter. A plugged strainer will cause excessive pressure drop. The strainer must be cleaned regularly.

(2) Range Poles.

(a) Range poles are installed at each 5000 bbl fabric collapsible tank to help prevent overfilling. If the range poles are installed as suggested in this manual, the following procedures apply.

1 The height of a 5,000 bbl tank is specified to be approximately 6 ft. 8 in. when it contains 5,000 bbl. The tank top should be touching the cord between the two range poles.

2 If the tank top is approximately 3 ft. 4 in. below the cord, the tank contains approximately 2,500 bbl.

(b) The position of and the tightness of the cord between the range poles should be checked routinely to assure that it is located 6 ft. 8 in. above the tank bottom (or some other fixed height specified by operating management). A small block of wood or a split ball at the center of the cord will help steady it and provide a good reference point.

2-6. OPERATING PROCEDURES. - continued

k. Pre-operating Inspection.

Any time the unit has been shut down for any extended period, a very thorough pre-operating inspection should take place. It is recommended that this inspection be guided by a check list that includes but is not limited to the following:

(1) All flanges and couplings closed and secure.

(2) All valves in closed position.

(3) Hoses lay properly with no kinks.

(4) Free ends of hoses weighted down with sand bags.

(5) All equipment grounded and bonded.

(6) Filter-separators have been checked and ready for operation.

(7) Pumps have been checked and ready for operation.

(8) Hoses lay properly on tank tops.

(9) Tank berms intact. Drain shut.

(10) Floodlights in place and operable.

(11) Water supply secure.

(12) Meters reset.

(13) Range poles properly in place.

(14) Fire suppression equipment in place and ready for use.

(15) First aid equipment intact.

(16) No smoking and other safety signs in place.

(17) Record keeping facility intact.

(18) Area free of trash and hazards.

(19) Roadways open.

(20) Operating personnel know their individual function.

(21) Communications system functional.

l. Fire Protection and Suppression.

(1) Prepare standard operating procedures in accordance with appropriate regulations and technical manuals.

(2) Application of Fire Extinguishers.

(a) The 20 lb dry chemical fire extinguishers in the TPT are for use on any type of fire including electrical fires and fuel fires.

(b) The wheel mounted dry chemical/AFFF fire extinguishers furnished with the TPT can be used on any type or size of fire in the TPT. It is not recommended that the AFFF portion be applied to electrical fires until the source of electric power has been eliminated. This extinguisher is particularly useful on burning liquid fuel surfaces. Flames are first extinguished with the dry chemical and then re-ignition is discouraged by application of the film forming foam.

(3) Fire Fighting Clothing. The fire fighting clothing should be kept under cover, out of the sun and dry. The location must be known to all operating personnel.

m. 5,000 Bbl Fabric Collapsible Tank Operation. (See figure 2-22.)

WARNING

OVERFILL OF FABRIC COLLAPSIBLE TANKS

Overfilling fabric collapsible tanks can cause a tank rupture.

CAUTION

TANK BERMS

Tank berms must be kept in good repair. The integrity of the berms is necessary to contain a tank spill and isolate the resultant fire hazard to contained area.

CAUTION

TANK HOSE CONNECTIONS

A cocked tank hose connection can cause a loss of suction to the associated pump. The pump will not operate properly if this occurs.

(1) See TM 10-5430-219-12 for detailed instructions on the 5,000 bbl fabric collapsible tanks.

(2) The tanks are filled by opening the appropriate valves. For example, open valve (1) on the tee assembly and either valves (2) or (3) as appropriate to fill tank (4).

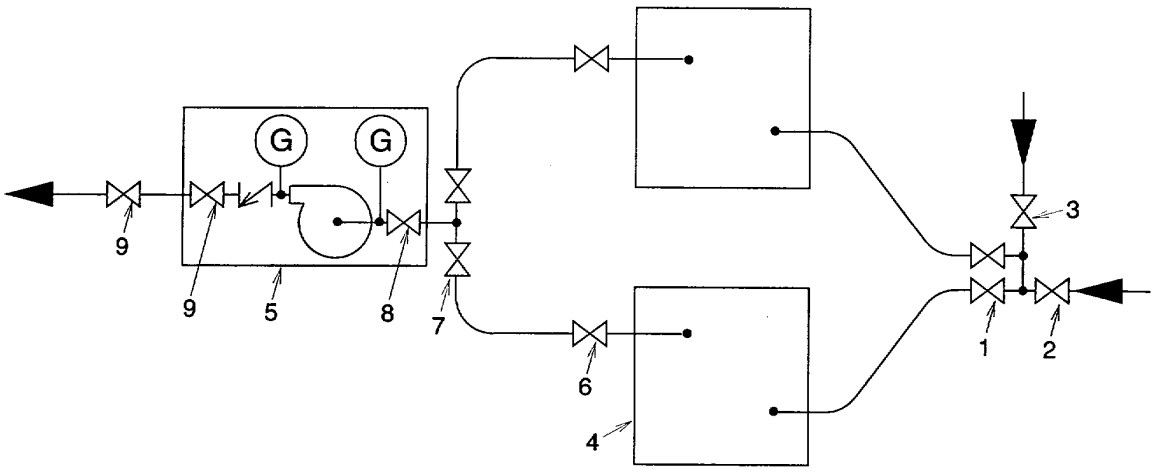


Figure 2-22. Typical 5,000 BBL Fabric Tank Operation

2-6. OPERATING PROCEDURES. - continued

(3) The tanks contents are drawn down by suction from the hoseline pumps (5) after opening the appropriate valves. For example, valves (6), (7), and (8), along with valves (9) in the discharge and downstream of (5) must be open to draw down tank (4) with the pump (5).

n. 50.000 Gallon Fabric Collapsible Tank Operation. (See figure 2-23.)

WARNING

OVERFILL OF FABRIC COLLAPSIBLE TANKS

Overfilling fabric collapsible tanks can caw se a tank rupture.

CAUTION

TANK BERMS

Tank berms must be kept in good repair. The integrity of the berms is necessary to contain a tank spill and isolate the resultant fire hazard to contained area.

CAUTION

TANK HOSE CONNECTIONS

A cocked tank hose connection can cause a loss of suction to the associated pump. The pump will not operate properly if this occurs.

(1) See TM 10-5430-219-12 for detailed instruction, on the 50,000 Gallon Fabric Collapsible tank.

(2) The tanks are filled by opening the appropriate valves. For example, open valves (I) and (2) to fill the contaminated fuel tank (3).

(3) The tank (3) is drawn down by suction from the operating transfer pump (4) after opening the appropriate valves, (5) or (6).

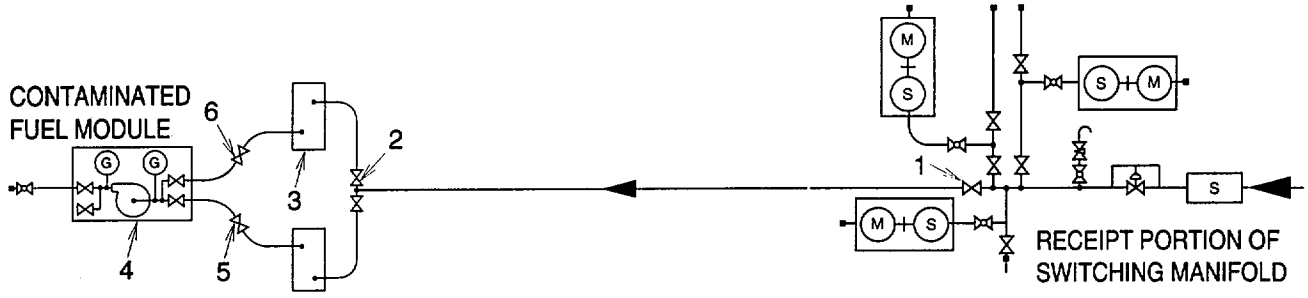


Figure 2-23. Typical 50,000 GAL Fabric Tank Operation

o. 600 GPM Hoseline Pump Operation.

CAUTION

DRY SUCTION

Do not leave a pump operating and unattended at any time. Continued operation with a dry suction can result in a pump failure.

CAUTION

OVERPRESSURE

Do not operate the pump at discharge pressures in excess of 150 psig. Equipment failure can result.

See TM 5-4320-305-10 for operating instructions for the 600 GPM hoseline pump.

p. 350 Gpm Transfer Pump.

CAUTION

DRY SUCTION

Do not leave a pump operating and unattended at any time. Continued operation with a dry suction can result in a pump failure.

CAUTION

OVERPRESSURE

Do not operate the pump at discharge pressures in excess of 150 psig. Equipment failure can result.

CAUTION

BACK FLOW

This pump does not have a built-in check valve. When the pump is shut down, flow through it must be prevented to avoid backflow and damage to equipment.

See TM 5-4320-226-14 or TM 10-4320-324-14 for operating instructions.

2-6. OPERATING PROCEDURES. - continued

CAUTION

FILTER SEPARATOR FAILURE

If the filter separator does not adequately clean the fuel, equipment failure can result.

CAUTION

FILTER/SEPARATOR ELEMENTS

When testing or operating any system with water, ensure that water is not introduced into the filter/separator assemblies that contain filter elements. Contact with water will make the elements unusable and they must be discarded. To ensure against inadvertent destruction of filter elements, remove them from the filter/separator assembly before testing or operating the system with water.

q. Filter Separator Operation. See TM 5-4330-211-12 or TM 10-z-330-235-13&P for operating instructions. Filter separators are rated at 350 gpm. If loading rates at the dispensing set are in excess of this, it will be necessary to operate four filter separators in parallel. The performance of the filter separator should be checked routinely.

r. Floodlight Sets.

WARNING

FLOODLIGHT SET FAILURE

Failure of the floodlight sets can result in unsafe operating conditions.

See TM 9-6230-211-14 for operating instructions.

s. Pressure Regulating and Control Valve Assemblies. The pressure regulating valve reduces the high working pressure within the pipeline to below the low working pressure within the TPT. If not functioning as intended, the operators are to notify Unit Maintenance for replacement. The system should not be operated without a properly functioning pressure regulator.

CAUTION

Equipment damage can result if downstream pressure exceeds 125 psig.

t. Commissioning. When all the equipment and systems have been installed, serviced, and inspected, the TPT is ready for commissioning. The term commissioning is meant to include purging air and initial line filling. Commissioning is not intended to include a complete fill of the storage tanks. The recommended steps to be taken are as follows:

(1) If the facility has just been completed and given a thorough inspection, it is not necessary to reinspect it. If, however, the unit has been in standby, a pre-operating inspection is necessary before commissioning.

(2) If the unit has been previously pressure tested, an additional pressure test is not necessary. If the pressure test was made with water, any water not removed in the dry out procedures will be driven to the 5,000 bbl tanks. Drain off the accumulated water from the tank bottoms.

(3) If the unit has not been previously pressure tested, and operating management chooses to test with fuel, this can be accomplished after the hoselines are filled.

(4) Because of the relatively low and variable feed rates, the preferred source of fuel and entrance pressure for purging the system is from tanker-trucks. The pipeline can be used if tanker-trucks are not available.

WARNING

VENT GASES DURING PURGE

The vent gases during purging operations may be a flammable mixture of fuel vapors and air. Special precautions to eliminate ignition sources in the area must be taken.

NOTE

The process of removing air from the system will cause a relatively high venting rate from the tank vents. The vent gas is likely to be flammable due to mixing with fuel vapors and droplets. Special precautions must be taken due to this condition.

(5) Purging. Remove air and contaminants from system.

CAUTION

INTERNAL DIRT AND WASTE

Internal dirt, rocks, construction waste, etc. can ruin operating equipment and cause operating failures. Eliminate such contaminants before commencing operations.

(6) A small amount of contaminants are expected and will be flushed from the system during normal purging operations. If a section of the system is excessively contaminated, it is recommended that this section must be disconnected and cleaned before purging operations commence.

NOTE

Restrict flow rates to under 200 gpm maximum during purging and line fill operations. High and turbulent rates will mix air with the fuel and extend the purging procedure. Low rates will also discourage the generation of static electrical charges.

(7) It is recommended that purging and initial line fill operations take place at flow rates between 50 and 200 gpm. Pressures should not exceed that required to attain these flow rates,

2-6. OPERATING PROCEDURES. - continued

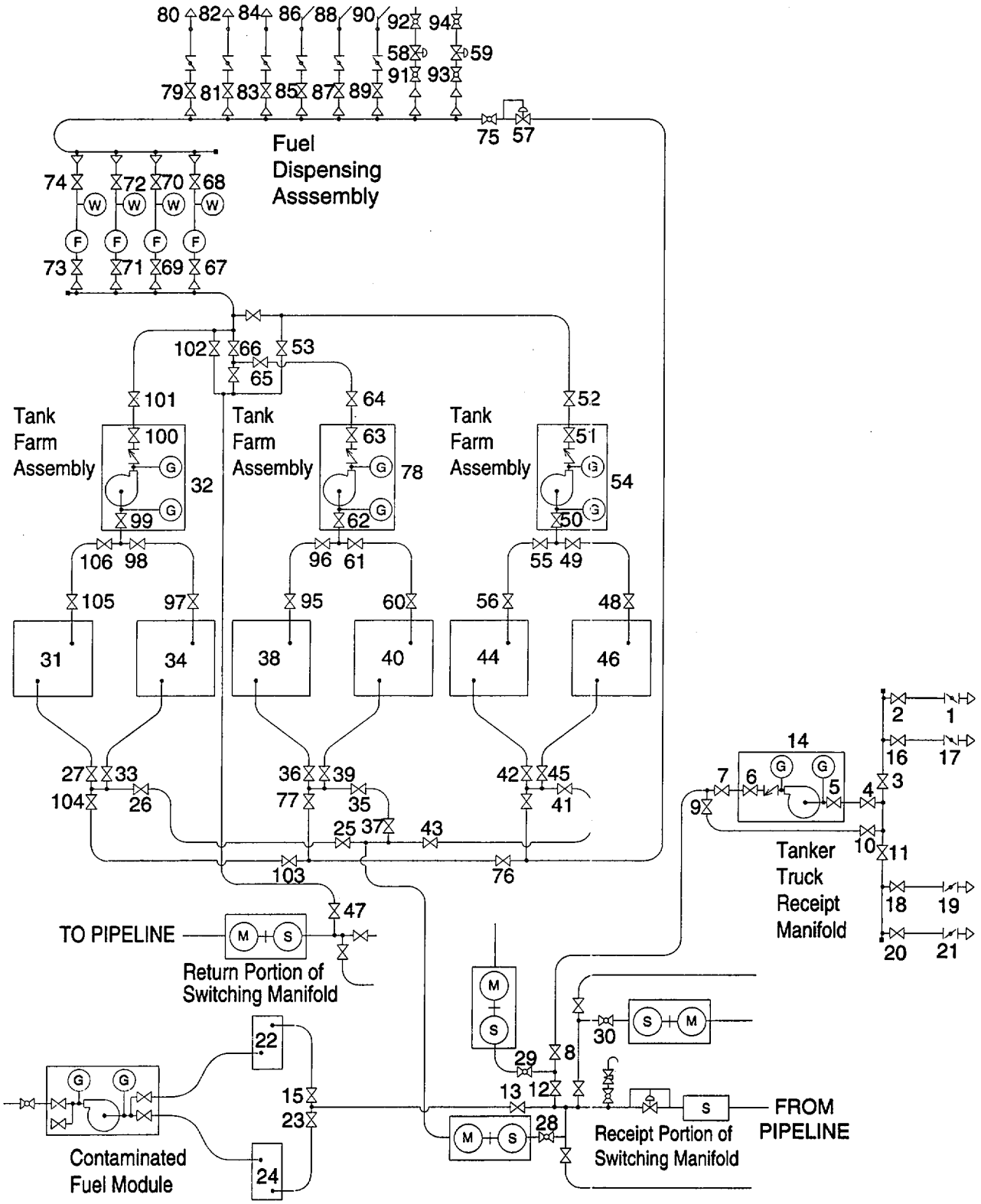


Figure 2-24. Commissioning Schematic

(8) When the TPT is to be used for multiple fuels, purge and fill each fuel unit individually to avoid any cross contamination.

(9) Purge and fill fuel unit as follows. (See figure 2-24.)

NOTE

Each fuel unit is purged and filled using the same procedures.

(a) Connect tanker-truck to receipt manifold at valve (1).

(b) Open valves (1), (2), (3), (4), (5), (6), (7); also open valves (8), (9), (10), and (11).

(c) Isolate the TPT from the pipeline by closing the first valve upstream of the switching manifold

(d) Purge and fill supply hoselines to the contaminated fuel module:

1 Open valves (12) and (13).

2 Start pump (14) and open valve (15) slowly. Place a container under coupling connected to valve (17). Open valves (16) and (17) until fuel comes out then close valves; this will purge air from line.

3 Repeat the procedure with valves (18), (19), (20), and (21).

4 Close valves (18), (19), (20), and (21).

5 Air and vapor will flow into tank (22) and through its vent.

6 When a steady flow of liquid can be heard and the venting rate has dropped, open valve (23) slowly and purge into tank (24). Close valve (15).

7 When a steady flow of liquid into tank (24) can be heard and the venting rate has dropped, close valves (13) and (12).

8 Stop the pump (14).

9 Close valve (23).

(e) Purge and fill supply lines.

1 Open valves (25), (26), and (27).

2 Start pump (14).

3 Open valve (12).

2-6. OPERATING PROCEDURES. - continued

CAUTION

PURGING OF METER SKID ASSEMBLY

Very low flow rates (approximately 50 gpm maximum) must be maintained during the purge and fill operation until air has been fully purged from the meter skid assembly and the upstream hose line. High airflow through the meter skid assembly may overspeed and ruin the meter.

4 Crack open (28) at the switching manifold very slowly. The switching manifold up to valves (28), (29), or (30) must be fully flooded and air free. After meter skid is flooded the valve should be slowly opened fully.

5 Air and vapor will flow to tank (31) and through its vent.

6 When a steady flow of fuel enters the tank (31) and the venting rate has dropped, allow approximately one to two feet of fuel to accumulate for upstream purging through pump (32). Open valve (33) and close valve (27).

7 When a steady flow of fuel enters the tank (34) and the venting rate has dropped, allow approximately two feet of fuel to accumulate in tank. Open valves (35) and (36) in preparation for the initial purge of the second tank farm (module) assembly.

8 Open valve (37) slowly and close valves (25), (26), and (33). Air will flow into tank (38) and through its vent.

9 When a steady flow of fuel enters the tank (38) and the venting rate has dropped, allow about two feet of fuel to accumulate in tank.

10 Open valve (39) and then close valve (36). When a steady flow of fuel enters tank (40) and the venting rate has dropped, allow about two feet of liquid to accumulate in tank.

11 Open valves (41) and (42). Slowly open valve (43,1 and purge into tank (44). Close valves (39), (35), and (37).

12 When a steady stream of fuel enters tank (44) and the venting rate has dropped, allow about two feet to accumulate in tank.

13 Open valve (45) slowly and close valve (42).

14 When a steady stream of fuel enters tank (46) and the venting rate has dropped, allow about two feet to accumulate in tank.

15 Shut down pump (14).

CAUTION

BLOCKED IN PRESSURE

Trapping high pressure between closed valves can damage equipment.

16 Close valves (1), (2), (4), (5), (10), (6), (7), (9), (8), (28), (43), (41), and (45).

(f) Purge and fill discharge lines from tanks (44) and (46).

1 Open valves (48), (49), (50), (51), (52), and (53).

2 Start pump (54) and operate at low discharge pressures but sufficient to cause flow. Slowly open valve (47).

3 Continue pumping until sure that the air from the line between valves (48) and (53) has passed valve (47).

4 Open valves (55) and (56), then close valves (48) and (49).

5 Continue pumping until sure that the air from the line between valves (56) and (55) has passed valve (47).

6 Shut down pump (54).

7 Close valves in the following sequence: (56), (55), (50), (51), (52), (53), and (47).

WARNING

FUEL SPLASH AND SPILL

Splashes and spills can cause eye injury and skin irritation. Wear face shield and approved gloves.

WARNING

GROUNDING AND BONDING

The system dispensing valve must be grounded and bonded to the receipt vessel prior to opening the vessel and dispensing fuel. Static electricity could cause a fire or explosion.

(g) Purge and fill the discharge lines of tanks (40) and (38), and the lines to and through the fuel dispensing system and back to the tank farm (module) assemblies. In preparation for the purge and fill of the fuel dispensing assembly, bring in a collapsible or open drum or deep container to catch the fuel from the dispensing valves.

2-6. OPERATING PROCEDURES. - continued

WARNING

FUEL SPLASH AND SPILL

Splashes and spills can cause eye injury and skin irritation. Wear face shield and approved gloves.

WARNING

HOSE WHIP

Hose may tend to move rapidly or whip if not weighed down. Pressure changes can cause hose whip and injure personnel.

1 Open valves (60) through (77).
2 Start pump (78) and operate at low discharge pressures but sufficient to cause flow. Slowly open valve (39).
3 Beginning with valves (79) and (80), open until fuel starts to flow. Then, close quickly. Repeat for the other valves (81) through (94).
4 After the initial purge and fill, notify unit maintenance to replace filter separator elements.
5 When fuel enters tank (40) and venting rates have dropped off, open valve (36) and close valve (39). Open valves (95) and (96). Close valves (60) and (61).
6 When fuel enters tank (38) and venting rates have dropped off, shut down pump (78).
7 Close valves in the following sequence: (95), (95), (62), (63), (65), (66), (77), and (36).

(h) Purge the discharge lines of fuel tanks (34) and (31).

1 Open valves (97), (98), (99), (100), (101), (102), (103), and (104).

2 Start pump (32) and operate at low discharge pressure but sufficient to cause flow. Slowly open valve (33).

3 When fuel enters tank (34) and venting rates have dropped off, open valves (105) and (106). Close valves (97) and (98).

4 Open valve (27) and close valve (33).

5 When fuel enters tank (31) and venting rates have: dropped off, shut down pump (32).

6 Close valves in the following sequence: (105), (106), (99), (100), (101), (102), (67), (68), (69),(70), (71), (72), (73), (74), (75), (76), (103), (104), and (27).

(i) Completion of Commissioning.

1 Make sure all valves in the system are closed to avoid operating error.

2 Take a sample of all tank drains for accumulation of water and contaminant (BS&W). Draw off any accumulation prior to routine operation.

3 Perform all "After" PMCS.

4 Transfer fuels as necessary when directed by operating management.

5 Record fuel inventory.

u. Fuel Transfers. (See figure 2-25.) Alternate fuel transfers may be conducted by changing the hoseline configuration with prior approval of the operating authority. Only one fuel unit section is shown. These instructions would apply to as many fuel units as are applicable.

WARNING

OVERFILLING FABRIC TANKS

Do not overfill the fabric collapsible tanks. A spill through the vent or possibly a rupture and major spill could result.

(1) Check that commissioning procedures have been completed.

CAUTION

To avoid damage to equipment:

- **Feed rates to the fuel unit should not exceed 800 GPM.**
- **Pressure at switching manifold (entry pressure) should not exceed 150 psig.**
- **Pump discharge pressure should not exceed 75 psig.**

NOTE

This procedure assumes that fuel is flowing from the associated pipeline to one of the fuel units.

(2) Divert off specification fuel to the contaminated fuel module as follows:

(a) Prior to the arrival of the interface, open valves (1) and (2).

(b) When the sample results indicate the interface has arrived, promptly open valve (3).

(c) Close any open valves (4) at the switching manifold.

2-6. OPERATING PROCEDURES. - continued

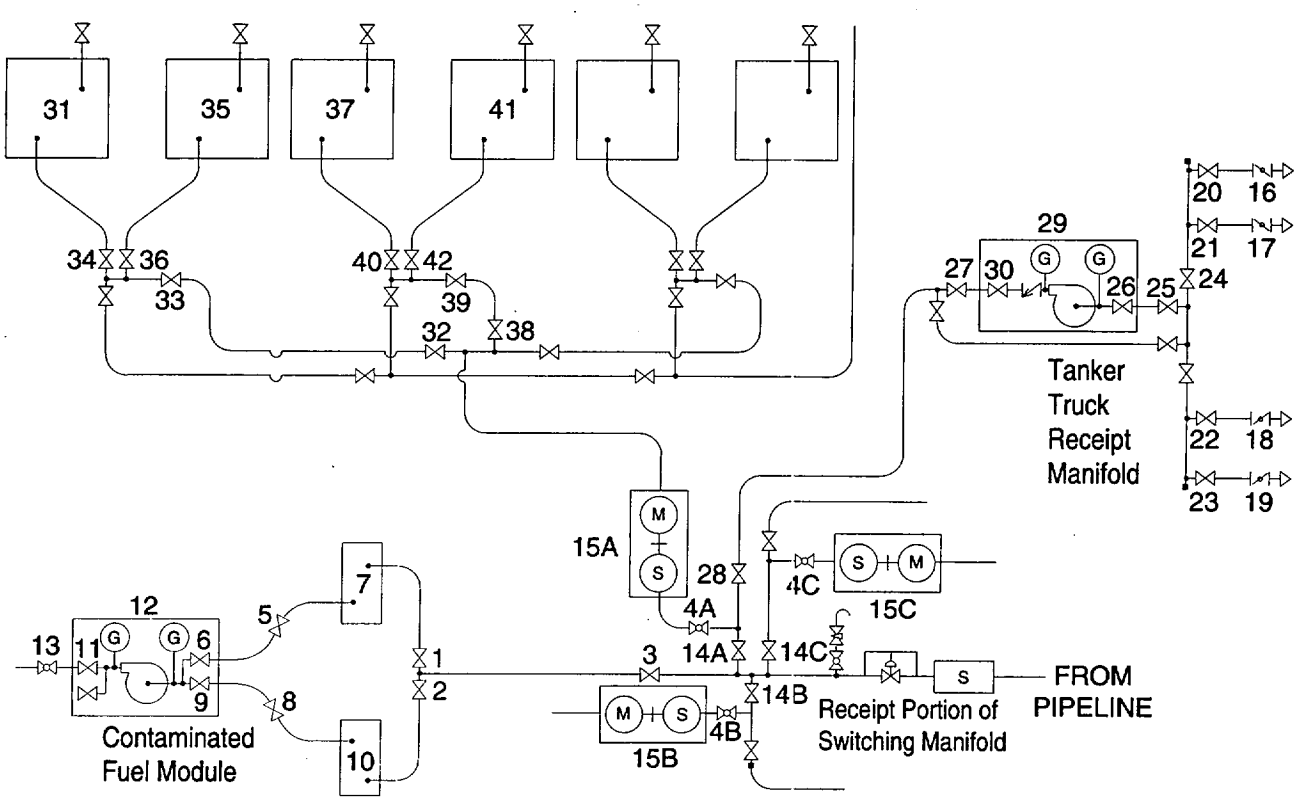


Figure 2-25. Fuel Transfer Schematic

(d) Empty the contaminated fuel tanks as follows:

1 Open valves (5) and (6) to pump out tank (7) or valves (8) and (9) to pump out tank (10).

2 Connect the 3-inch coupling to the tanker-truck.

3 Open valve (11).

4 Start the pump (12) and pull suction from the tank while opening valve (13).

5 When pump out is complete, close valve (13) and immediately shut down pump (12).

6 Close valves (5), (6), (8), and (9) as appropriate.

(3) Receive fuel from the pipeline as follows:

(a) Reset meter (15A), (15B), or (15C) as appropriate to zero or record the reading.

(b) Open valves in the hoseline route to appropriate tank.

1 To (31). Open 4A, (32), (33), and (34).

2 To (35). Open 4A, (32), (33), and (36).

3 To (37). Open 4A, (38), (39), and (40).

4 To (41). Open 4A, (38), (39), and (42).

(c) Open valve (4A), (4B), or (4C) and (14A), (14B), or (14C) to the appropriate meter skid assembly (15A), (15B), or (15C) and promptly close valve (3). Fuel will flow through the route selected.

(d) Close valves (1) and (2).

(4) Receive fuel from a tanker-truck as follows:

(a) Reset meter (15A), (15B), or (15C) as appropriate to zero or record the reading.

(b) Open valves in the hoseline route to appropriate tank.

1 To (31). Open 4A, (32), (33), and (34).

2 To (35). Open 4A, (32), (33), and (36).

3 To (37). Open 4A, (38), (39), and (40).

4 To (41). Open 4A, (38), (39), and (42).

(c) Connect the supply tanker-truck (or trucks) to the couplings outboard of valve (16), (17), (18), or (19).

(d) Open the appropriate valve (20), (21), (22), or (23).

(e) Open valves (24), (25), (26), (27), and (28).

(f) Start pump (29) and open valve (30).

WARNING

TANKER-TRUCK MOVEMENT

Do not allow truck to move away without disconnecting the hoseline. A spill could result.

(g) When the transfer is complete, shut down the pump (29) and close all valves. Disconnect the tanker-truck(s).

2-6. OPERATING PROCEDURES. - continued

(5) Discharge Fuel from a Tank Farm (Module) Assembly Through the Fuel Dispensing Assembly. (See figure 2-26.)

WARNING

DISPENSING ASSEMBLY OPERATING PRESSURE

Make certain that pressure control valves are functioning. High pressure can result in hose whip, splash back, and spills.

WARNING

GROUNDING AND BODING

The system dispensing valve must be grounded and bonded to the receipt vessel prior to opening the vessel and dispensing fuel. Static electricity could cause a fire or explosion.

WARNING

NO SMOKING

Enforce no smoking rules on all personnel, including drivers from outside the TPT.

WARNING

VEHICLE DISCONNECT

Make sure vehicles are disconnected from the dispensing assembly before moving.

WARNING

STOP VEHICLE ENGINES

Stop all vehicle engines while loading fuel.

(a) Establish which fuel tank has ample room to hold incoming fuel.

NOTE

- **The rate of discharge through the dispensing assembly is governed by a 6 inch pressure control valve which is set at 30 psig and is located in the recirculating line of the dispensing set. It is intended that the control valve keep the dispensing pressures at a maximum of 30 psig.**
- **There must be good communications between the dispensing operating supervisor and the pump operator.**

(b) Shut down feed pump when no fuel is to be dispensed.

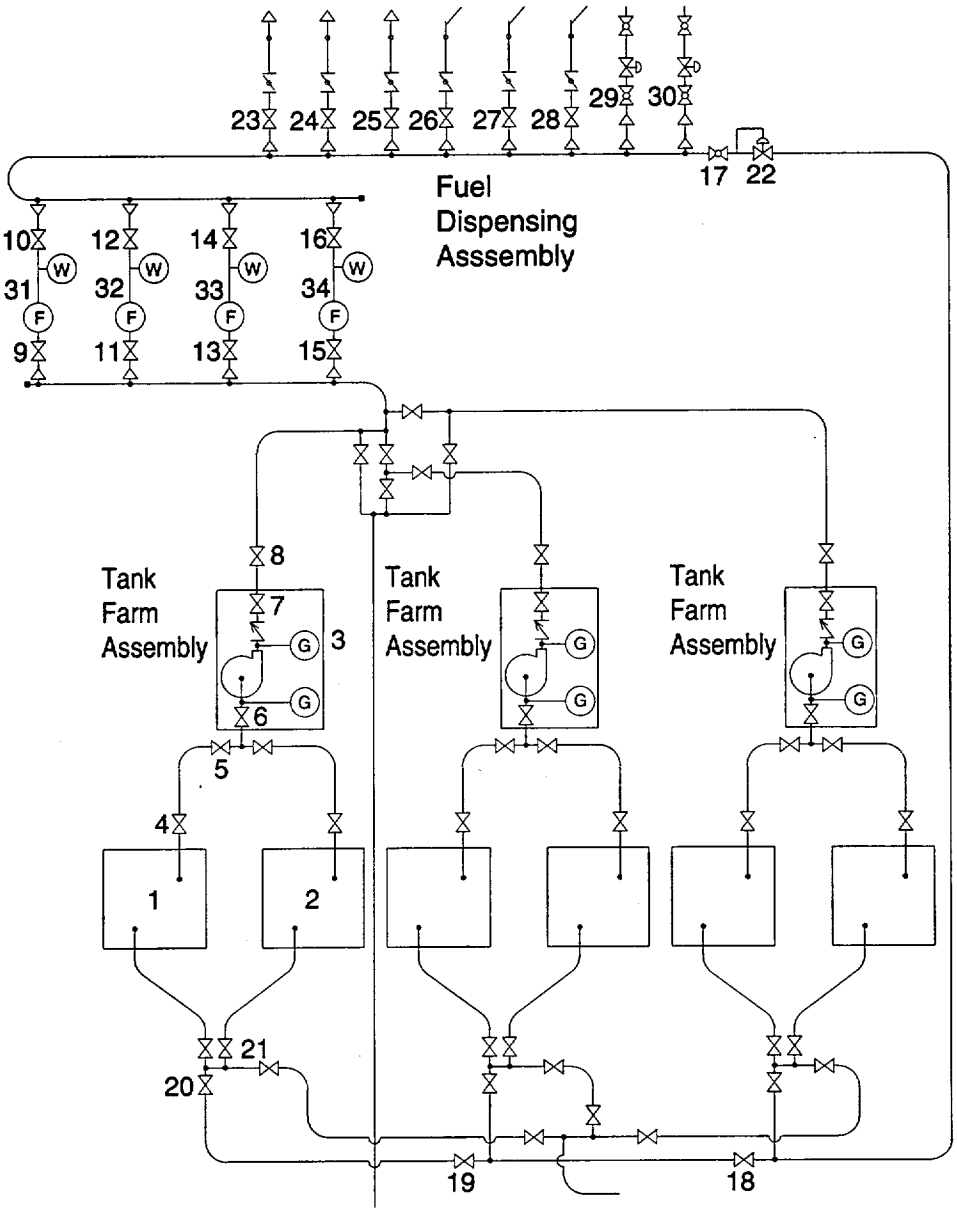


Figure 2-26. Fuel Discharge Schematic

2-6. OPERATING PROCEDURES. - continued

(c) The following describes the use of pump (3) to discharge fuel from tank (1) through the dispensing assembly and recirculate to tank (2).

1 Open valves (4) through (21). Check that there is a flow path open from pressure regulating valve (22) to a tank.

2 Connect the dispensing coupling (or couplings) to the tanker-truck(s) being loaded.

3 Start pump (3) and hold at a very low discharge pressure or in the idle position.

4 Open the appropriate valve(s) (23) through (30) leading to the dispensing hose coupling(s) being used.

5 Raise pump (3) discharge pressure as required to maintain 30 psig at the control valve (22). Under no conditions should the pump discharge pressure be allowed to exceed 75 psig. Surplus fuel, i.e. that is not dispensed, will flow to tank (2).

6 When loading is complete, close the valve nearest the coupling(s) (23) through (30). Disconnect the coupling(s).

7 Shut down pump (3).

8 The above instructions pass fuel through the filter separators (31) through (34). Under normal conditions two filter separators should be in service and loading rates limited to 700 gpm.

9 When no fuel is being drawn from the dispensing assembly, shut down the pump (3) in service.

CAUTION

Trapping high pressure between closed valves can damage equipment.

10 When fueling operations are complete or are to be secured for an extended period, close all valves beginning at furthest upstream point and continuing downstream.

(6) Transfer Fuel from a Tank Farm (Module) Assembly to the Associated Pipeline System. See (figure 2-27) to transfer fuel from the TPT to the associated pipeline, there must be no back pressure in the pipeline system that exceeds the 600 gpm hoseline pump's discharge head capability.

NOTE

The routing and procedures to transfer from any other tank would be the same except for the valve positions between the tank and the pump.

(a) Open valves (1), (2), (3), (4), (5), and (6).

(b) Record reading or reset meter (7).

(c) Start and operate pump (8) at low discharge pressure.

(d) Open valve (9) while increasing the discharge rate on pump (8).

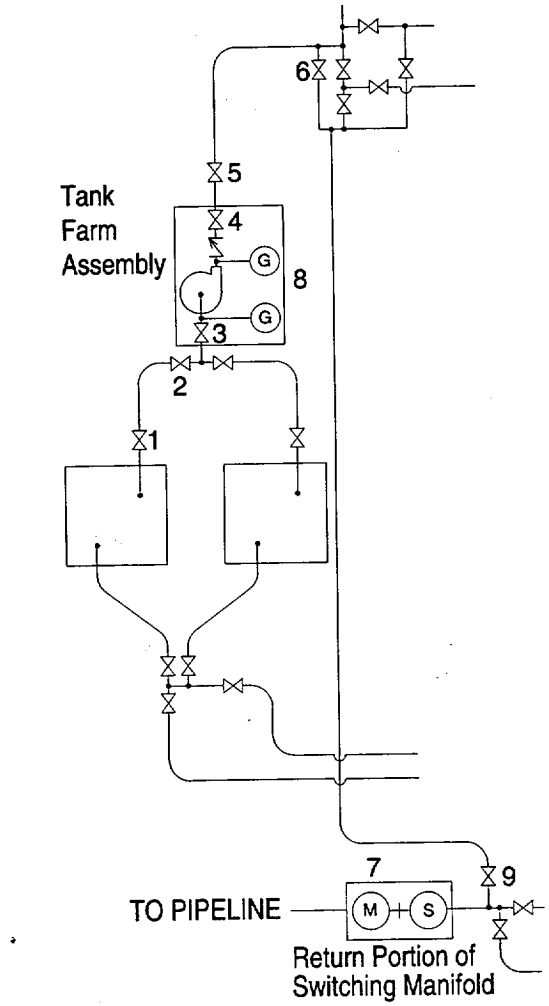


Figure 2-27. Fuel Transfer From Tank Farm to Associated Pipeline

CAUTION

BACK FLOW

Make sure there is no flow from pipeline system into the TPT to prevent overpressure.

(e) When transfer is complete, close valve (9) and promptly shut down pump (8).

(f) Record meter (7) reading.

CAUTION

Trapping high pressure between closed valves can damage equipment.

(g) Close all valves beginning at furthest upstream point and continuing downstream.

2-6. OPERATING PROCEDURES. - continued

v. Depressurizing and Draining System. After the TPT is commissioned and placed in operation it will be necessary from time to time to depressurize and drain various parts of the system for maintenance or disassembly. Throughout the operating and maintenance instructions of the manual, the reader is warned to depressurize the system before breaking (opening) flanges, couplings, and other closures. This is to avoid spills or sprays of fuel that can injure personnel or cause a fire hazard. The following describes procedures recommended for depressurization and draining.

WARNING

PRESSURIZED SYSTEM

Do not break (open) any flanges or open any couplings until the system is depressurized at that location. Injury can result.

(1) A system is generally depressurized by opening the valves in the line of flow leading to a fabric collapsible tank. The valves upstream of the section to be depressurized are left closed.

(2) Individual pieces of equipment such as the strainer in the meter skid assembly, the filter separators, and the hose line pumps have individual vents and drains. After the system has been depressurized, or that piece of equipment blocked in, the vents and drains on the equipment should be opened before that particular item is worked on. This will assure depressurizing of the particular item.

(3) The fuel dispensing assembly or the optional tanker-truck unloading system can be depressurized by opening the valves in the flow path to the tanker-truck after the associated pump has been shut down and blocked in.

(4) Close valves in the applicable flow line that is furthest upstream (closest to the source of fuel under pressure) be closed first and sequentially followed by the closing of the valves downstream. This will avoid the block in of fuel under pressure and thus enhance the safety of the system. A line closed off in this manner will be depressurized.

(5) When a system, or a portion of a system, must be drained for maintenance, it must be depressurized first. Obtain appropriate containers to hold the drained fuel for disposal. The Closure at the lowest point should be opened first and the hose drained into the container(s). A closure at the highest point should be opened to allow complete drainage.

2-7. DECALS AND INSTRUCTION PLATES.

Instruction plates are used to advise the operator of proper procedures. Stencils provide additional operating information and cautions to be observed during use of the equipment. Decals and instruction plates appear on major assemblies of the Tactical Petroleum Terminal.

a. For decals and instruction plates on the major components, see the following Technical Manuals:

(1) Fire Suppression Equipment	TM 10-4210-235-13
(2) 350 GPM Pump Unit	TM 5-4320-226-14 or TM 10-4320-324-14
(3) 50,000 Gal and 5,000 BBL Collapsible Fabric Tanks	TM 10-5430-219-12
(4) Petroleum Aviation Fuel Contamination Testing Kit	TM 10-6630-240-12&P or TM 10-6630-218-10
(5) 600 GPM Pump Unit	TM 5-4320-305-10
(6) Type D-1 Nozzle Assembly	TM 10-4930-246-13&P
(7) 350 GPM Frame Mounted Liquid Fuel Filter Separator	TM 5-4330-211-12 or TM 10-4330-235-13&P
(8) Trailer Mounted Floodlight Set	TM 9-6230-211-14

b. It is recommended that consideration be given to marking hoselines and pipelines with color-coded bands and direction of flow arrows as described in MIL-STD-161. Care must be taken to correct the marking if the service of a marked section of hose is changed.

c. Observe flow marking and component identification established for each installation.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-8. SPECIAL PRECAUTIONS ON MAJOR EQUIPMENT.

All major equipment items have specific technical manuals that must be referred to for the special precautions recommended for the equipment. This section supplements that information but does not replace it. The following manuals are to be referred to:

Fire Suppression Equipment	TM 104210-235-13
350 GPM Pump Unit	TM 5-4320-226-14 or TM 10-4320-324-14
50,000 Gal and 5,000 BBL Collapsible Fabric Tanks	TM 10-5430-219-12
Petroleum Aviation Fuel Contamination Testing Kit	TM 10-6630-240-12&P or TM 10-6630-218-10
600 GPM Pump Unit	TM 5-4320-305-10
Type D-1 Nozzle Assembly	TM 10-4930-246-13&P
350 GPM Frame Mounted Liquid Fuel Filter Separator	TM 5-4330-211-12 or TM 10-4330-235-13&P
Trailer Mounted Floodlight Set	TM 9-6230-211-14

2-9. EXTREME COLD.

WARNING

Avoid touching metal surfaces with bare hands. Personal injury can result from freezing.

a. If equipment is shut down for any period of time, drain water off prior to freezing. Special attention should be given to:

(1) Pump casings
(2) Filter separators
(3) Meter skid assemblies
(4) Tank bottoms
(5) Tank vents and drains

b. Routinely remove snow and ice from:

(1) Tank tops
(2) Meter skids
(3) Filter separator assemblies
(4) Pumps and engines
(5) Floodlight sets
(6) Fire fighting equipment

c. Engine Crankcases. Block heaters may be in engine crankcases if available. These can be operated off the floodlight set generators. If block heaters cannot be utilized, run the engines routinely. Block heaters are not part of the TPT supply.

d. Hoselines and Electrical wires and cables. If extremely cold, the hoselines, wires and cables may become stiff and more brittle. Special care should be taken not to bend too sharply or drive over them in this condition.

e. To help prevent snow accumulations in operating areas and on equipment under blowing snow conditions, it is recommended that snow fences be erected at appropriate locations.

f. Gasket material will be stiffer and more brittle. Take care not to install gaskets that have been damaged.

g. When not in use, spread tarpaulins over the equipment to keep snow off. The tarps must be removed before beginning operations. Tarpaulins are not part of the TPT supply.

h. Remove snow accumulations in areas of operation and vehicle traffic.

i. Spread sand and salt (or another agent) in icy areas, particularly around operating equipment and in the fuel dispensing areas. Avoid putting salt on any equipment, particularly aluminum equipment.

2-10. EXTREME HEAT.

a. Fuels, particularly motor gasoline and JP4, will vaporize more readily. This can result in more fuel vapors escaping from tank vents. Special care must be taken to avoid vent fires.

b. In extreme heat, fuels that are in storage will give off a lot of vapor and possibly go off specification. The gravity should be checked before dispensing for use.

c. Engine operating temperatures must be watched closely. Make sure cooling systems are clean and operating efficiently.

2-11. EXTREME DUSTY, SANDY OR SALT AIR ENVIRONMENT.

a. Regularly remove accumulations of sand and dust from equipment and within tank berms.

b. Make sure dust caps on tank vents are closed unless tank is actually venting.

c. Special care must be taken to avoid dust or sand accumulations in engine cooling systems. Clean out routinely.

d. When loading tanker-trucks or other containers, make sure no sand or dust enters the tank.

e. Take special care to avoid dust or sand accumulations on moving parts.

f. Special care must be taken when opening any equipment for maintenance. Do not allow dust or sand to enter it. If it does, clean it out carefully. Do not leave equipment standing open.

g. The erection of snow fences (or equal) in appropriate locations will help avoid dust or sand accumulations on equipment.

h. If conditions are very extreme, issue goggles and dust respirators to personnel.

i. When possible keep equipment covered and protective caps in place when not in use.

2-12. EMERGENCY PROCEDURES.

Operators and operating management must be well acquainted with the safety warnings and cautions noted throughout this manual. They must also be well acquainted with the fire prevention and fire suppression procedures and equipment. In spite of proper operating and maintenance procedures and the diligent observation of all safety and fire prevention measures, emergency conditions may occur. In all situations the safety of personnel must be considered. Some of the possible emergency conditions that could occur and the recommended operating action under those conditions are discussed below. The actions noted are listed in the anticipated normal order. Deviation from this order may be appropriate for a particular situation. Not all situations can be anticipated, and judgment in the field is required.

a. Fire.

(1) Immediately shut off flow of fuel to the area. If pump is involved, shut it down if possible.

(2) Route fire fighting equipment and personnel to the area and begin extinguishing the fire. When under control, stand by.

(3) Evacuate personnel not involved in the fire or critical to operations.

(4) Remove any fuel accumulations that caused the fire or may reignite.

(5) Determine the cause of the fire and correct.

b. Hoseline Break or Serious Leak.

(1) Shut down any transfer taking place in that hoseline.

(2) Route fire fighting equipment and personnel to the leak area. Extinguish any fire and stand by.

(3) Block in the hoseline in the section having the leak. Depressure if under pressure. Drain the hoseline in that segment.

(4) Move the hoseline away from the spill area.

(5) Isolate the spill and clean it up.

c. Fabric Tank Rupture or Serious Leak.

(1) Shut down any pumping into that tank.

(2) Route fire fighting equipment and personnel to the tank location. Extinguish any fire and stand by.

(3) Start pumping out of the tank to another, a safe distance from the ruptured tank. Empty the ruptured tank.

(4) Check the integrity of the berm. Correct to the extent it is safe to do so. If the berm has broken out or is leaking seriously, create earthen dams around drainage to isolate.

(5) Pump out any accumulated fuel inside the berm and/or dam.

(6) Replace the tank if necessary or notify unit maintenance for repair.

d. Break or Serious Leak on a Pump.

(1) Shut down.

(2) Close the block valves on each side of break.

(3) Bring in fire fighting equipment and personnel. If there is a fire, extinguish it and stand by.

(4) Clean up the spill.

(5) Determine the cause of the break and notify unit maintenance.

e. Serious Spill Due to Operating Error.

(1) Immediately shut down the pump or pumps supplying the spill. Shut off valves nearest to spill that can be closed safely.

(2) Move fire fighting equipment and personnel to the area of the spill. Extinguish any fire and stand by.

(3) Clean up the spill. Educate the person(s) responsible for the spill and restart operations.

f. Overflowing Tank.

(1) Shut down pumping into that tank.

(2) Route fire fighting equipment and personnel to the tank area. If a fire results, put it out and stand by.

(3) Begin pumping out of the overflowing tank bringing the level down to an acceptable point.

(4) Pump out any accumulated fuel inside the berm.

(5) Inspect tank for damage.

(6) Return tank to service if not damaged.

g. Critical Situations.

The following are some of the critical situations that can result in emergency conditions.

(1) Coupling or flange leaks. Determine cause and have corrected.

(2) Fuel accumulations - clean up immediately.

(3) Hot running pump - take out of service and notify unit maintenance.

(4) Valve gland leaks. Notify unit maintenance.

(5) Valve or equipment cracks. Notify unit maintenance.

(6) Over-filled tank - pump off surplus immediately.

2-13. NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) DECONTAMINATION.

NOTE

Detailed decon procedures can be found in: FM 3-3, FM 3-4, and FM 3-5.

a General: The following emergency procedures can be performed until field NBC decon facilities are available.

b. Emergency Procedures: If NBC attack is known or suspected, mask at once and continue mission. If outside, follow decon procedures below to avoid taking contamination into controlled area. Do not unmask until told to do so.

(1) Nuclear decontamination: Brush fallout from skin, clothing, and equipment with available brushes, rags, and tree branches. Wash skin and have radiation check made as soon as tactical situation permits.

(2) Biological decontamination: Remain masked and continue mission until told to unmask.

(3) Chemical detection and decontamination:

WARNING

Some decontamination sprays can cause personal injury and should not be used on personnel.

(a) Contact your local chemical detachment or unit for proper use of decontamination equipment.

(b) If exposure to liquid agent is known or suspected, clean exposed skin, clothing, personal gear, and equipment, in that order, using M258A1 kit. Use the buddy system. Wash exposed skin and thoroughly decontaminate as soon as tactical situation permits.

(c) Use M8 paper from the M256 Chemical Agent Detector Kit or M9 paper to determine if liquid agent is present on the equipment.

(d) If the M8 or M9 paper indicated that liquid chemical agent is present on the equipment, use the NBCM11 decon apparatus for decon equipment.

CHAPTER 3
OPERATOR MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

Lubrication instructions are in appendix F of this TM. All lubrication instructions are mandatory.

Section II. OPERATOR TROUBLESHOOTING PROCEDURES

3-1. GENERAL.

The branching logic tree diagrams list common malfunctions that you may find with your equipment. Follow the instructions given in the order they appear.

The branching logic tree diagrams cannot list all the malfunctions that may occur, all the steps to find the fault, or all the corrective actions needed to correct the fault. If the equipment is not listed or corrective actions taken do not correct the fault, notify your supervisor.

For troubleshooting of the following major components see the appropriate individual technical manual.

COMPONENT	TECHNICAL MANUAL
Fire Suppression Equipment	TM 10-4210-235-13
350 GPM Pump Unit	TM 5-4320-266-14 or TM 10-4320-324-14
50,000 Gal and 5,000 BBL Collapsible Fabric Tanks	TM 10-5430-219-12
Petroleum Aviation Fuel Contamination Testing Kit	TM 10-6630-240-12&P or TM 10-6630-218-10
600 GPM Pump Unit	TM 5-4320-305-10
Type D-1 Nozzle Assembly	TM 10-4930-246-13&P
350 GPM Frame Mounted Liquid Fuel Filter Separator	TM 5-4430-211-12 or TM 10-4330-235-13&P
Trailer Mounted Floodlight Set .	TM 9-6230-211-14

3-2. USE OF MALFUNCTION INDEX.

a. This malfunction index lists common malfunctions that you may find with your equipment. Perform the tests, inspections, and corrective actions in the order they appear in the table.

b. This index cannot list all the malfunctions that may occur, all the tests and inspections needed to find the fault, or all the corrective actions needed to correct the fault. If the equipment malfunction is not listed or actions listed do not correct the fault, notify your supervisor.

MALFUNCTION INDEX

3-3. ANY TYPE OF LEAKAGE EVIDENT.

a. Immediately shut off flow to the area.

b. Shut down any operations in the immediate area.

c. Route fire fighting equipment to the area.

d. Notify supervisor.

3-4. STRONG FUEL FUMES.

WARNING

Strong fumes may be explosive and possibly dangerous to the eyes and respiratory system. Warn personnel that must be in the area. Get unnecessary personnel out of the area.

a. Do not operate equipment in the area until the source has been located, the cause corrected, and the fumes have been dissipated.

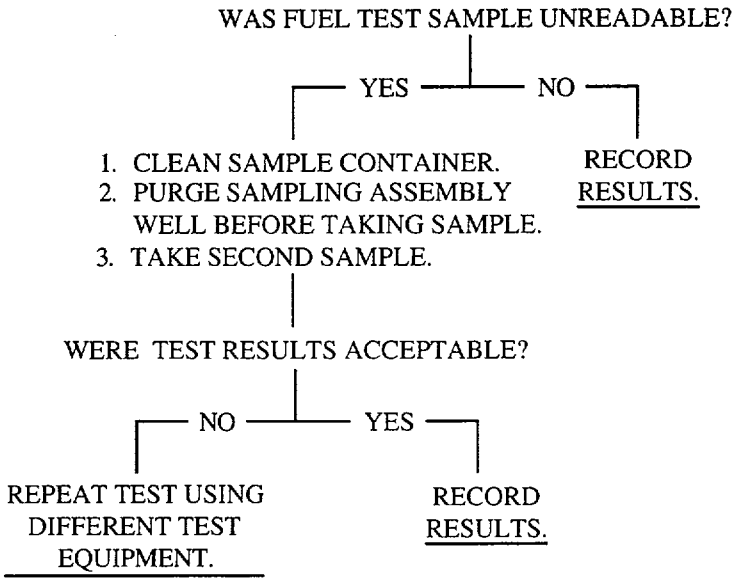
b. When an area of strong fumes is found, get fire suppression equipment into the immediate area. Locate source and eliminate it.

3-5. STATIC SPARK NOTED AT FUEL DISPENSING NOZZLE.

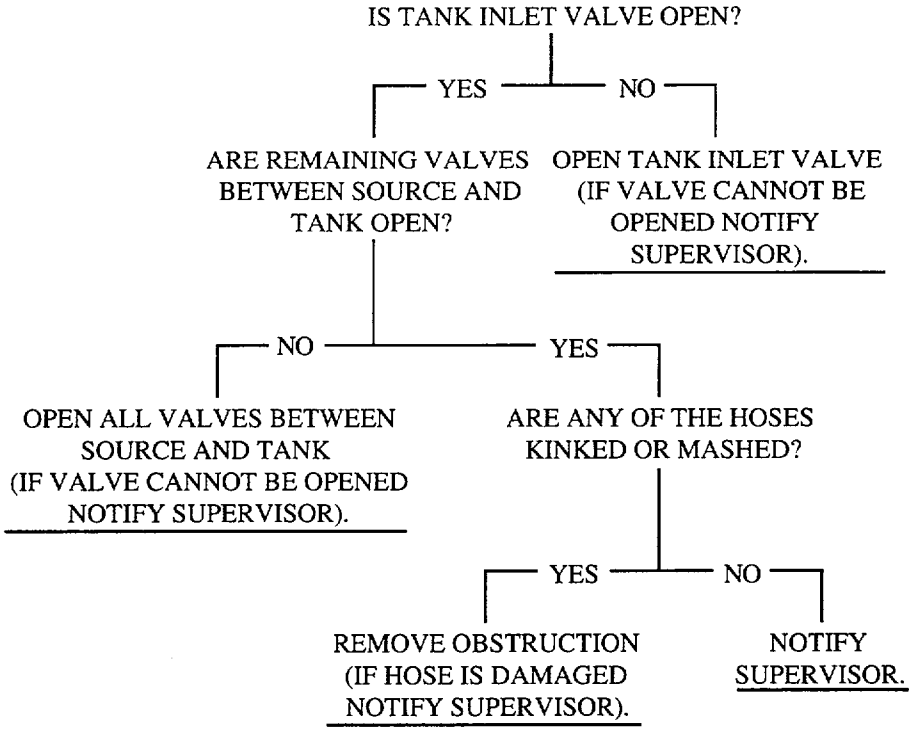
a. Stop dispensing operation immediately.

b. Notify supervisor.

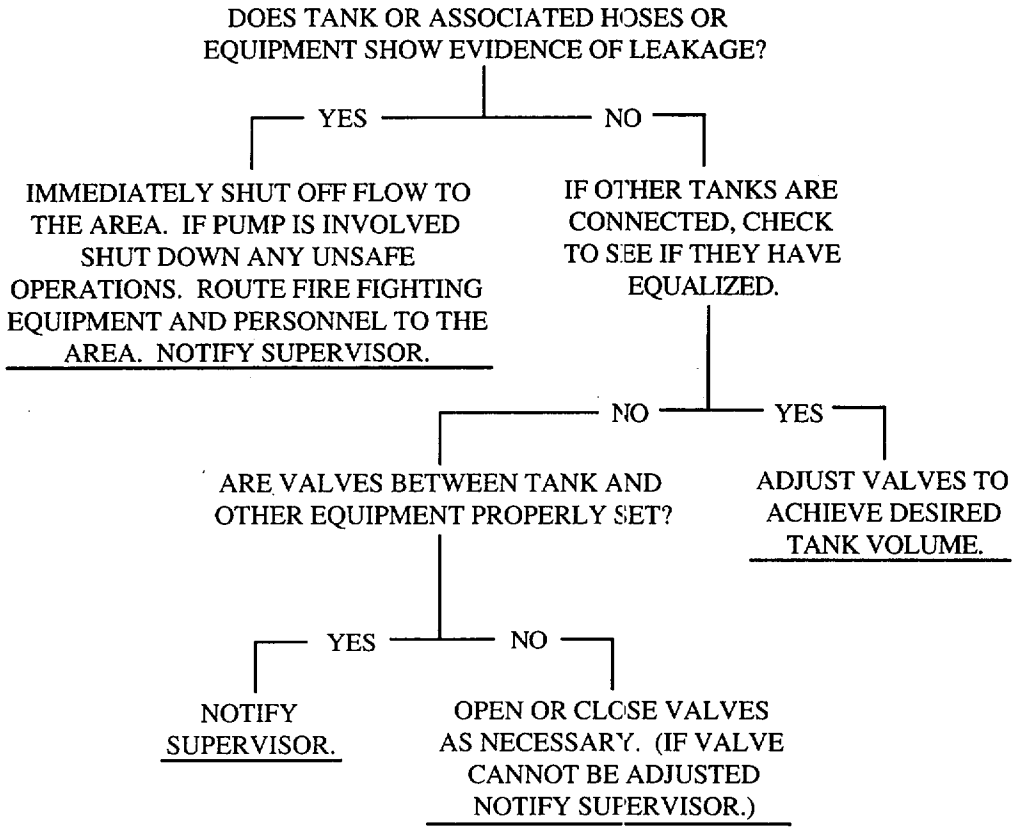
3-6. UNREASONABLE FUEL TEST SAMPLE.



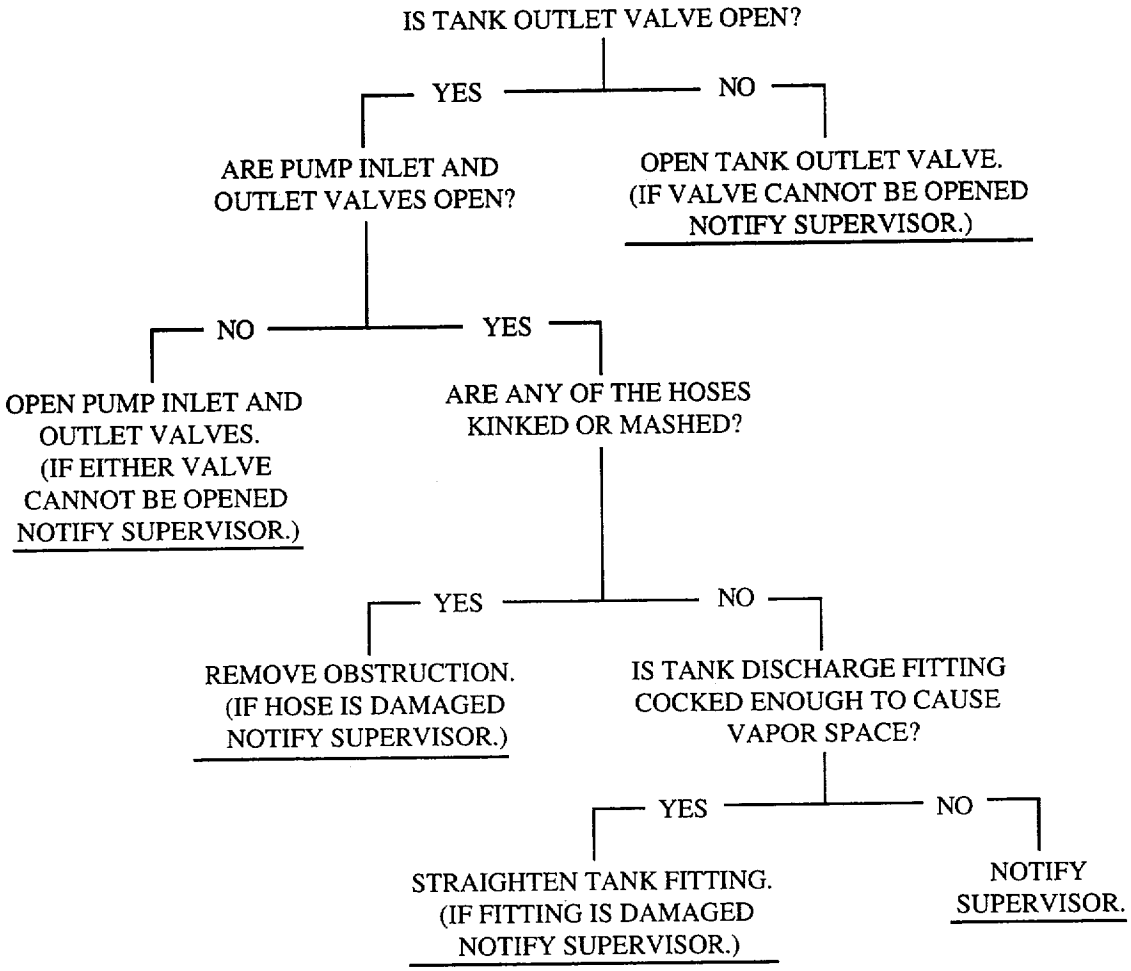
3-7. FLOW NOT ENTERING TANK.



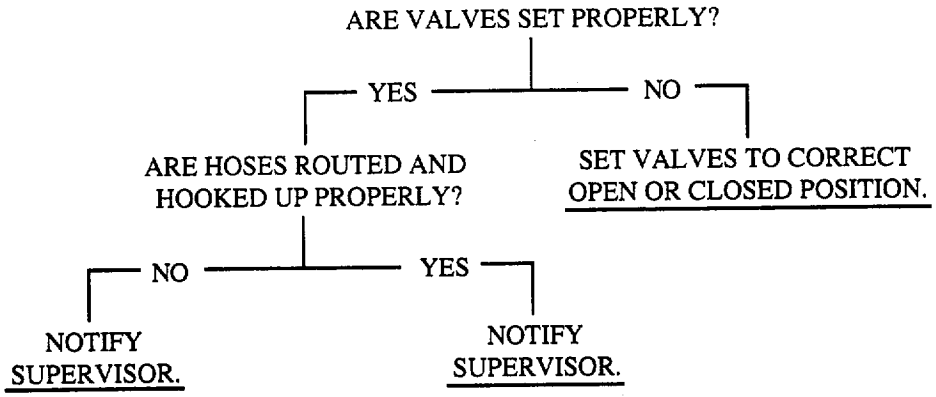
3-8. UNEXPECTED TANK VOLUME CHANGE.



3-9. FLOW NOT LEAVING TANK.

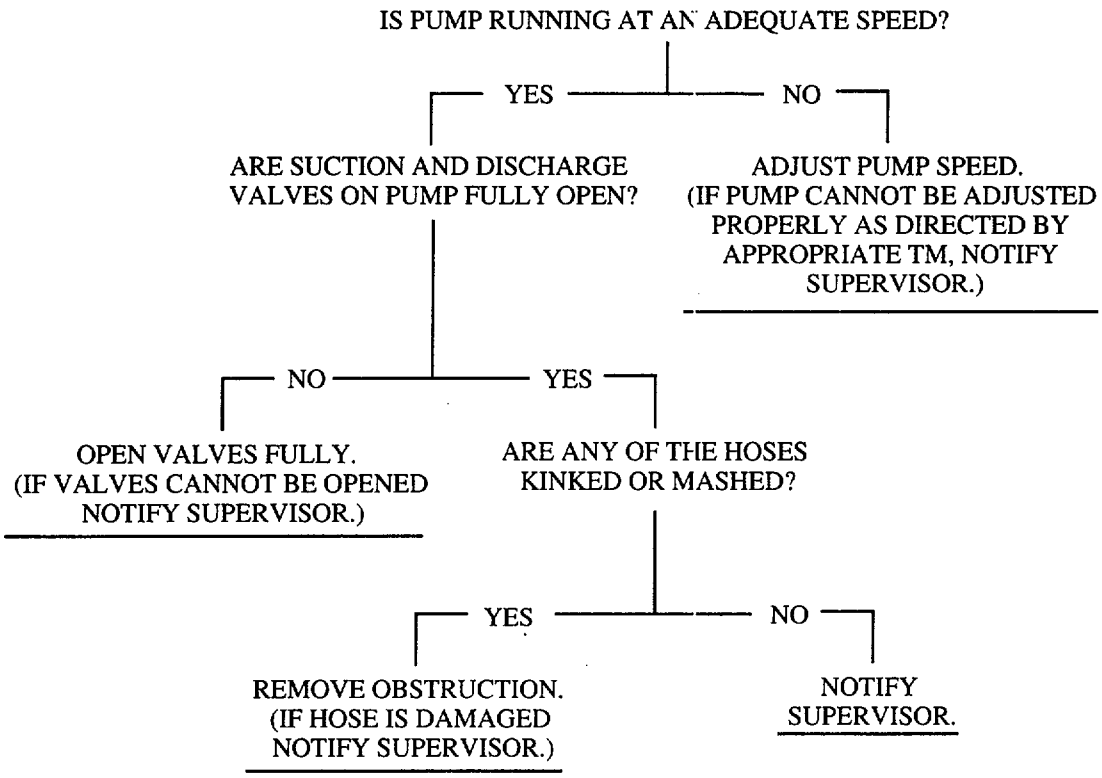


3-10. FLOW TO OR FROM WRONG TANK.



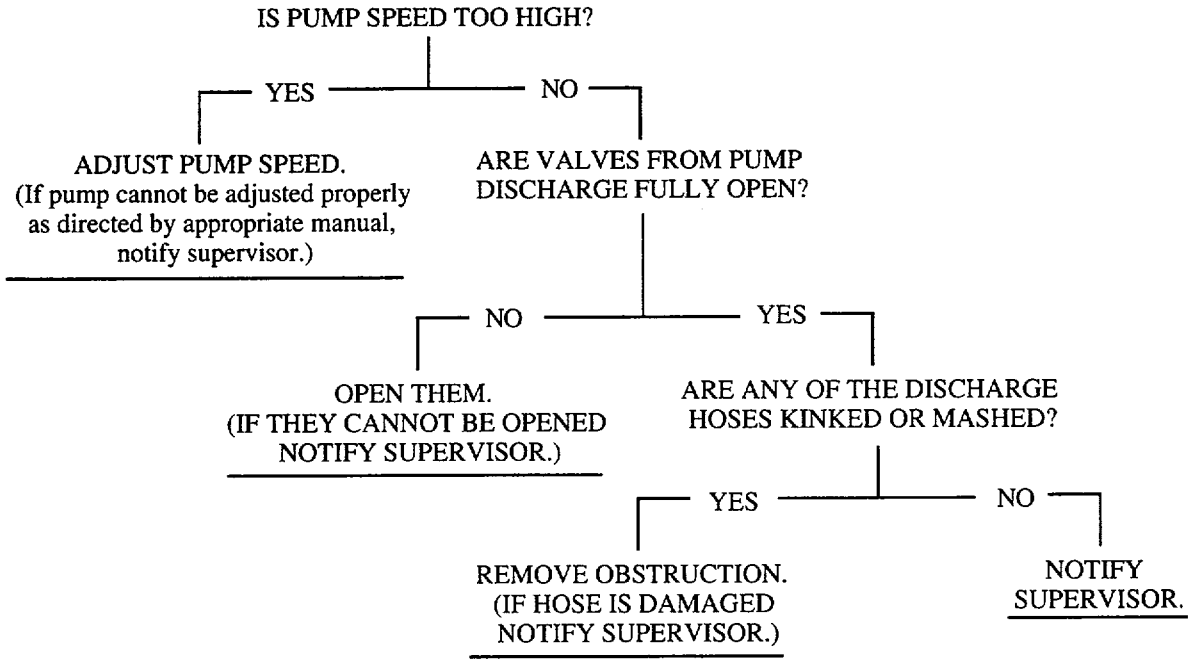
3-11. LOW PUMP DISCHARGE PRESSURE.

See appropriate TM for correct pump pressure.

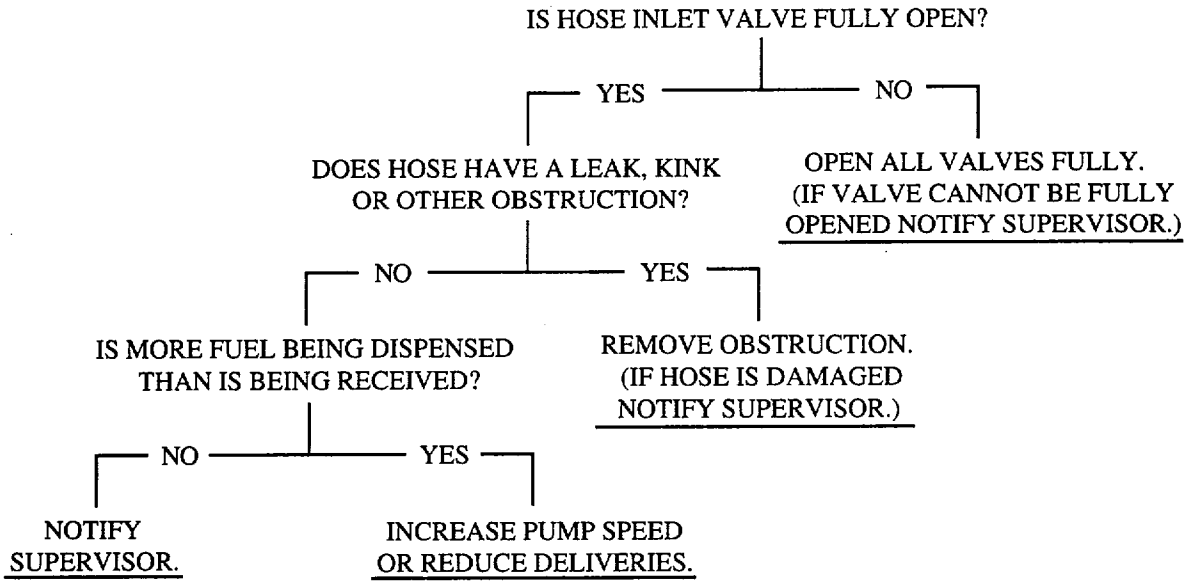


3-12. HIGH PUMP DISCHARGE PRESSURE.

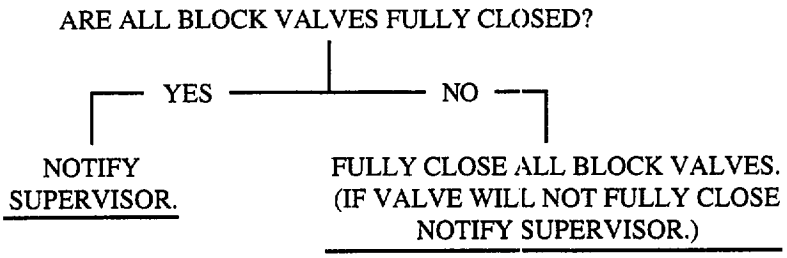
See appropriate TM for correct pump pressure.



3-13. LOW PRESSURE AT FUEL DISPENSING ASSEMBLY.



3-14. UNEXPECTED BACK FLOW.



Section III. OPERATOR MAINTENANCE PROCEDURES.

3-15. COMPONENT MAINTENANCE.

Operator maintenance is limited to the inspection of items outlined in para 2-7, PMCS Procedures. Replacement of defective components requires the services of unit maintenance. Refer to the following manuals for additional operator maintenance requirements.

COMPONENT	TECHNICAL MANUAL
Fire Suppression Equipment	TM 10-4210-235-13
350 GPM Pump Unit	TM 5-4320-266-14 or TM 10-4320-324-14
50,000 Gal and 5,000 BBL Collapsible Fabric Tanks	TM 10-5430-219-12
Petroleum Aviation Fuel Contamination Testing Kit	TM 10-6630-240-12&P or TM 10-6630-218-10
600 GPM Pump Unit	TM 5-4320-305-10
Type D-1 Nozzle Assembly	TM 10-4930-246-13&P
350 GPM Frame Mounted Liquid Fuel Filter Separator	TM 5-4330-211-12 or TM 10-4330-235-13&P
Trailer Mounted Floodlight Set	TM 9-6230-211-14

CHAPTER 4
UNIT MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

Lubrication instructions are in Appendix F of this TM. All lubrication instructions are mandatory.

Section II. REPAIR PARTS, TOOLS, SPECIAL TOOLS, TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT

Repair parts are listed and illustrated in the Repair Parts and Special Tools List TM 10-3835-231-23P. Mandatory replacement parts are listed in Appendix I, Mandatory Replacement Parts List.

Tools and test equipment requirements are listed in Appendix B, Maintenance Allocation Chart. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970 as applicable to your unit.

No special tools, test, measurement and diagnostic equipment, or support equipment is required for maintenance of this equipment.

Section III. SERVICE UPON RECEIPT

4-1. UNLOADING.

Various components of the TPT are packaged in containers designed for reuse. Care should be-taken to avoid container damage.

(1) Remove all blocking and tiedowns that may have been used to secure the container to the carrier.

WARNING

Do not allow items to swing while suspended from a lifting device. Failure to observe warning may result in injury to personnel and damage to equipment.

CAUTION

Use care in handling equipment to avoid damage. If an overhead lifting device must be used, use an appropriate sling so that the weight of the item is borne by the base of the shipping container.

(2) Use a forklift truck or other suitable material handling equipment to remove the packaged items from the carriers.

4-2. UNPACKING.

a. Container Identification.

(1) Containers are identified externally by the markings on the container door as well as packing lists in a waterproof packet attached to the outside. Packing lists and other documentation are also inside the container, but the external identification system is such that the container need not be opened until component is required.

(2) All containers for material used in the TPT are marked with a wide heavy black bordered triangle. The identification markings are located in the upper left section of the two long sides of the container and on one end.

(3) In addition to the triangle, there is a series of identification, shipping, and original source information which describes the contents of the container.

b. Equipment Requirements. Material handling equipment (forklift with sling) is required to remove equipment from shipping container and placement of equipment where it is to be located and opened.

c. Placement of Containers.

(1) Place containers as close as possible to where the component will be located. This necessitates quick recognition of the contents in each container.

(2) Place the fabric, collapsible tanks in their shipping containers in the berms or close to the berms. This also applies to placement of the 350 GPM and 600 GPM pumping assemblies.

d. Remove packing material and store it in a safe place for reuse.

4-3. RECEIVING INSPECTION.

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report damage on SF 364, Report of Discrepancy.

b. Check the equipment against the packing slip to see if shipment is complete. Report all discrepancies in accordance with instructions of DA Pam 738-750 or DA Pam 738-751 as applicable.

4-4. ASSEMBLY AND PREPARATION FOR USE.

a. Site Selection.

Factors that are to be considered are:

(a) Relationship to primary source of supply.

(b) Hydraulics of pipeline to terminal.

(c) TPT site size. See figure 4-1 and 4-2 for two examples of typical TPT layouts. The layouts include suggested arrangements of equipment. The objective in any equipment arrangement is to provide for efficiency and safety in operations. The TPT should be arranged for maximum spacing between tank farm modules and fuel units. This will provide for the highest level of safety for the equipment and the operating personnel. In many locations, due to terrain or operational situations, the layout may have to differ substantially from that shown. Actual layouts are at the discretion of the installing and operating authority in each case. In a relatively secure area or when property available is limited, it will be appropriate to arrange the system with much closer spacing between fuel units and equipment. It is not necessary to lay out tanks in a straight line. Security demands or terrain may dictate otherwise.

(d) Road access. There should be a limited number of entry points into the TPT area, with each entry point having a control or checkpoint to monitor and route traffic in and out of the area. A road capable of supporting two-way tanker-truck traffic should run along the perimeter of the TPT site, giving access to each fuel unit's fuel dispensing assembly. In the area of the fuel dispensing assemblies, the roadway should be widened to a minimum of 40 feet. Traffic control measures should be made to route through traffic away from the fuel dispensing area. Similar fuel handling areas are necessary for the contaminated fuel module and the tanker truck receipt manifolds. If possible, the site should be located relatively near existing road systems capable of carrying the traffic involved. There must be access to that road system or construct a new road connecting the existing road system.

(e) Suitability of Terrain. The site selected should be reasonably level and well drained at least in the areas in which the individual storage, loading and unloading of equipment is planned. Consideration should be given to the amount of earth moving work required. The less, the better. Low and swampy areas should be avoided. It should be as free as possible from heavy obstructions such as large rocks and trees.

(f) Water Availability. If possible, there should be water available or obtainable at the site. The operation must have water available for safety reasons even if it must be hauled in. Water must be available for the charging of the dry chemical/AFFF wheel mounted fire extinguisher. Its availability is also desirable for general fire protection and personnel safety.

(g) Local Population. The site should be well away from local population concentrations.

4-4. ASSEMBLY AND PREPARATION FOR USE. - continue

NOTE
LOCATIONS OF COMPONENTS ARE AT DISCRETION OF OPERATING AUTHORITY.

LEGEND

• FLOODLIGHT SET
¦ WHEEL MOUNTED FIRE EXTINGUISHER

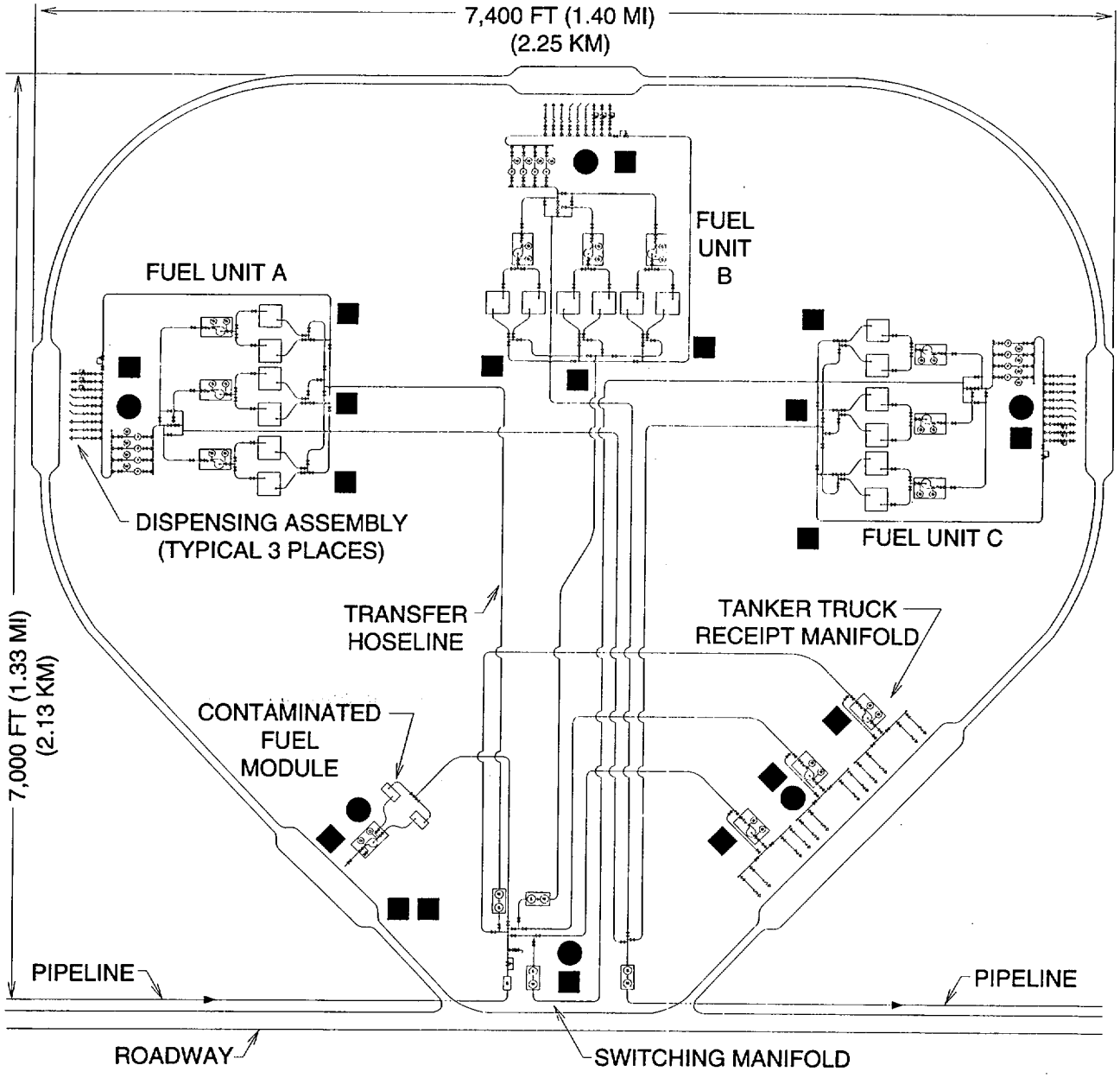


Figure 4-1. Typical Wide Spaced TPT Layout

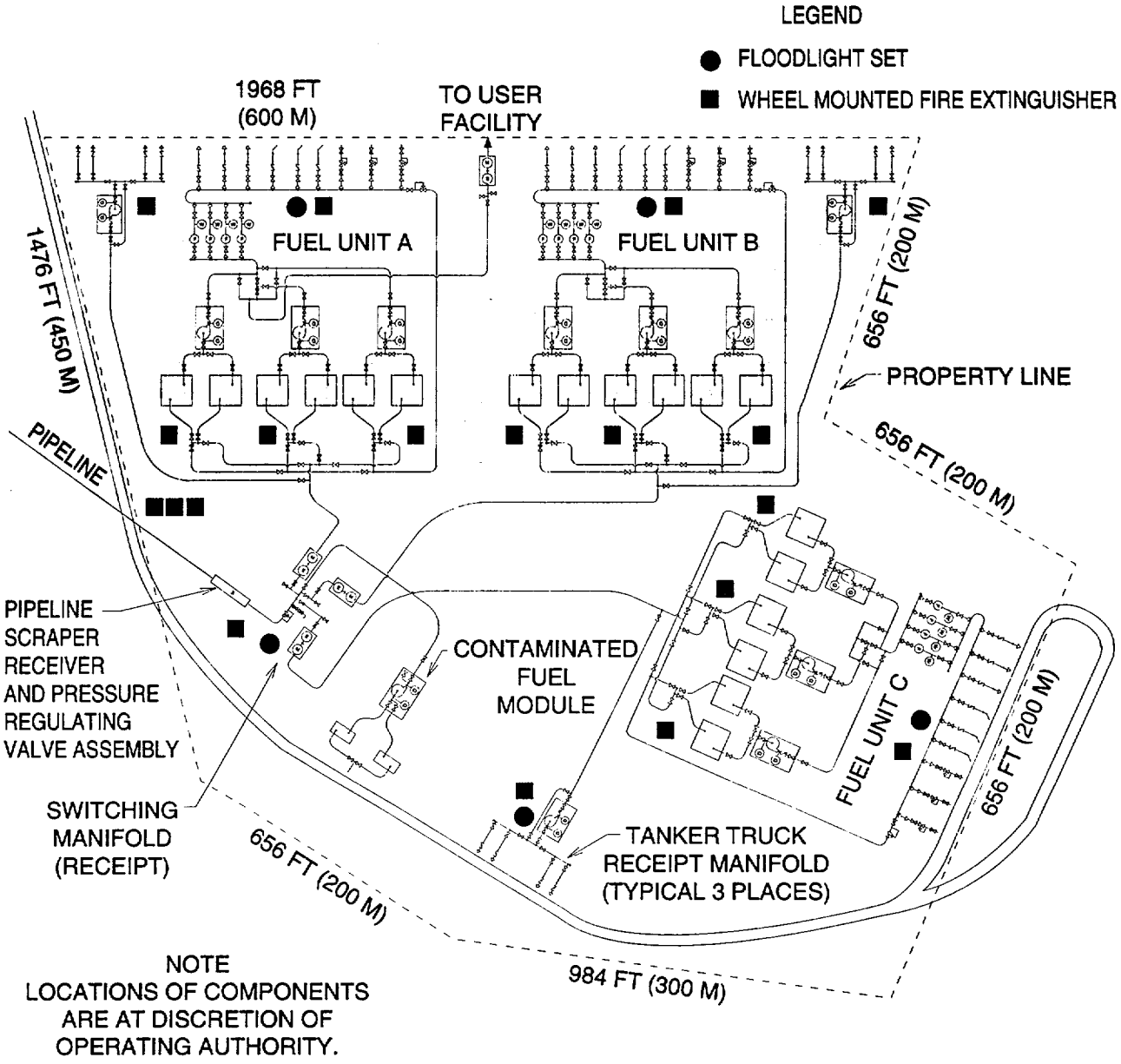


Figure 4-2. Typical Close Spaced TPT Layout

4-4. ASSEMBLY AND PREPARATION FOR USE. - continued

b. Plot plan. The following procedure for field plot plan preparation is recommended.

(1) After the site has been selected, a preliminary plot plan should be made that shows all the major equipment and system locations, including tanks, pumps, floodlight sets, fire suppression equipment, fuel dispensing areas, tanker truck receipt areas, and the access roads.

(2) After the primary cuts and fills have been made so that firm knowledge of the characteristics of the site is available, and before the earthwork on tank sites, berms, and roadways is started, the preliminary plot plan should be reviewed, corrected as necessary, to a final plot plan on which equipment locations are firm. Final roadwork, tank pad and berm construction must be based on this final plot plan.

c. Site Preparation and earthwork.

(1) General site preparation. Final site selection and subsequently site preparation and earthwork must be based on the plot plan. Because the site will probably not be ideal, there must be some give and take between the plot plan and site preparation results. The following procedures are recommended.

(a) Cut an access road to the site unless one already exists

(b) Site preparation work should be based on a grading plan that minimizes cuts and fills operations even if the plan is roughly prepared in the field. The plan should be based on actual on-site elevations and survey, observation of obstructions, and knowledge of the types of soils that appear to be present.

(c) Stake out the area that must be cleared, marking where the major components will be located. Cut, grub out, doze, or if necessary, blast out major obstructions, i.e., trees, bush, large rocks and boulders, buildings, etc.

(d) It is only necessary to clear and grade the areas where a. fuel unit will be located, transfer systems installed, roadways built, and loading and unloading facilities installed. There must be good drainage from the site.

(e) To the extent possible, cuts and fills should be planned and executed such that the volume of cut soils roughly equals the required fill for low spots, tank berms, and roadways. Excavation of ground site for the purpose of forming the required tank berms and roadways can be converted into a reserve water storage bin.

(f) In preparing the grading plan and executing the cut and fill, the major equipment, most particularly the 5000 bbl tanks, should be set on virgin or cut soils, if possible, rather than on fill.

(g) If it is required that tanks be located on a filled area, the fill must be compacted as it is placed. Compacting after a deep fill has little effect.

(h) When extensive fill is required, the slopes must be such as to prevent slides and minimize erosion. As a rule, there should be no slopes greater than 2:1 (approximately 25°) in sandy or loamy soils.

(2) Primary roadways. Primary roadways must be fully compacted, have good drainage, and to the extent possible, have at least a surface of gravel or crushed rock. Each side of the road should have an adequate ditch to provide good drainage. Drainage culverts should be placed as required. The road, swale, ditches, and drain culvert requirements will vary with site conditions and anticipated rainfall. Figure 4-1 shows a desirable road layout for a widely spread TPT. Figure 4-2 shows a desirable road layout for a close spaced TPT. Roadways must be constructed to permit ready access to all areas for installation, operation, fuel loading and unloading, and fire fighting.

(3) Secondary roadways. Secondary roadways within the TPT must be provided to allow movement of material handling equipment, pumps, fire suppression equipment, and maintenance access. Under-road culverts are to be installed as necessary. The hoseline suspension kit may also be used to allow vehicles to drive under the hoseline. Access must be
provided to the pumps and each tank berm.

(4) Tank Pad and Berm Construction. Proper tank pad and berm construction are most important to provide for tank operation and protection from spill or a fire resulting from the spill. (See figure 4-3, 4-4, and 4-5.) Sites for tanks and their berms should be carefully selected, giving consideration to space, terrain, soil consistency, and accessibility.

(a) Berms are normally constructed of earth from the surrounding area. The more impermeable the soil the better, such as high clay content is desirable to avoid leakage and keep the berm in shape. Adding some rock and gravel will tend to avoid washout.

(b) Tank pads are preferably constructed of a loamy or clay soil containing some sand so that a smooth area can be graded and hold its shape. (See figure 4-5.) The longest slope should be approximately 1° (degree) from horizontal. Other shorter slopes will be greater. The low point should be where the tank drain will end up when the tank is unrolled. A small ditch and a basin for the tank drain line and drain valve can be excavated by hand at the time the tank is unrolled. The low point described is to permit maximum pump out of the tank and drainage through the drain line. The base of the tank pad area must be virgin soil, cut soil, or well compacted. To avoid damage to the tank bottom sticks, stones, or sharp objects must be removed prior to installing the tank.

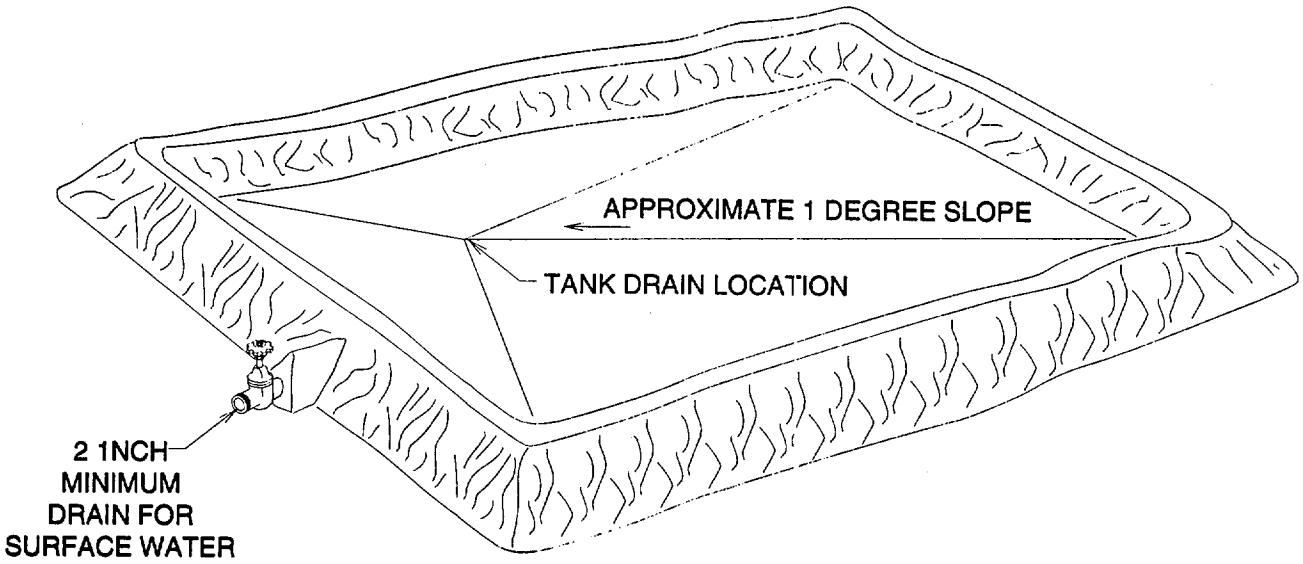
(c) Tank berms are constructed as shown on figures 4-3 and 4-4. They may be constructed before, after, or simultaneously with tank pad construction, depending on job conditions. In any case, it is necessary that the tank pad be cleared of any rocks, clumps, etc, that roll on during berm construction. It is recommended that tank pad rough grading be completed before berm construction. The preferred materials are soils containing a fairly high clay content to hold shape and provides sealing. The berm should be compacted as it is constructed.

(d) Berms may be constructed of sandbags if site conditions preclude earth construction, however, sandbag berms will not hold a tank spill very well unless action is taken to seal the gaps between bag ends. Heavy clay packing between joints will help. Nevertheless considerable leakage can take place. Sandbags are supplied with the TPT.

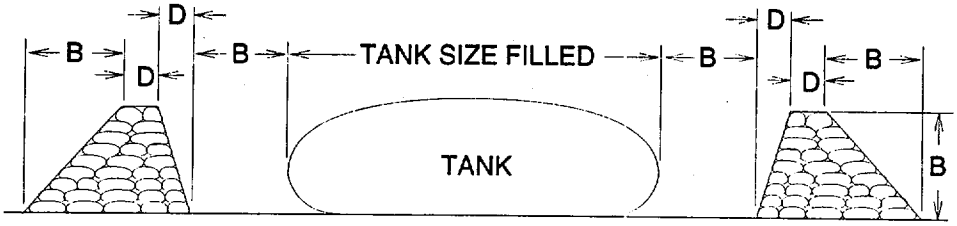
(e) To install a berm drain, hand cut a trench in the first layer of the berm. Lay the drain line in the trench and cover. Finish constructing the berm. Install valve on drain line and be sure valve is closed.

(f) If the installation authority decides to install construction grade polyethylene sealing sheets, they should be installed after the pad and berm are completed. After the joints of the sheeting are sealed, a light layer of soil (without rocks) may be spread to protect the sheeting and hold it in place.

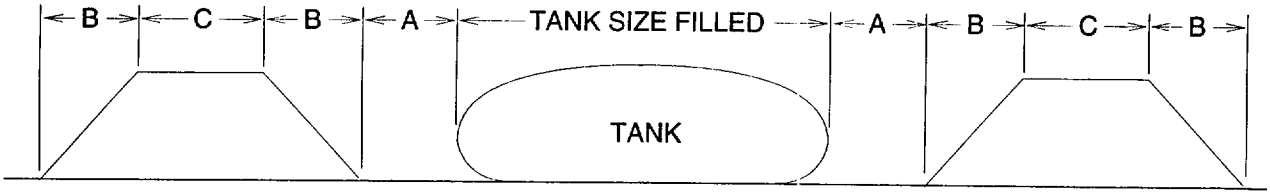
4-4. ASSEMBLY AND PREPARATION FOR USE. - continued



PLAN



TYPICAL BERM CROSS SECTION
SAND BAGS

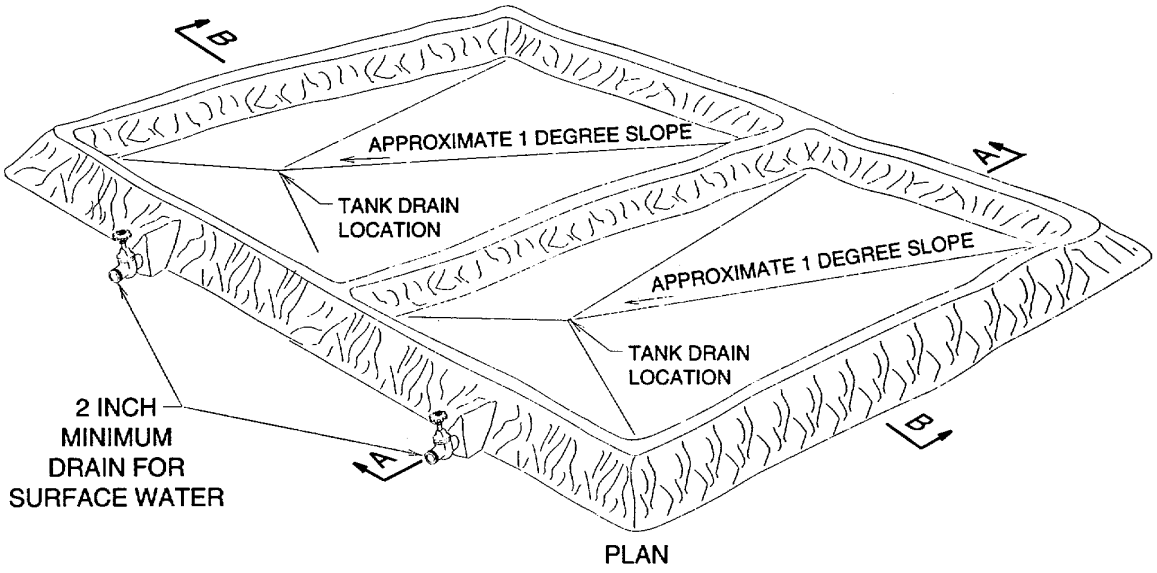


TYPICAL BERM CROSS SECTION
SOIL

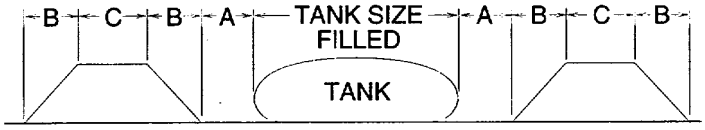
SCHEDULE

TANK SIZE FILLED	A	B	C	D
5,000 BBL 66'-0" (20.12M) X 66'-0" (20.12M)	4'-0" (1.22M)	5'-6" (1.68M)	5'-0" (1.52M)	1'-0" (.31M)
50,000 GAL 24'-0" (7.32M) X 64'-0" (19.5M)	3'-0" (.92M)	4'-6" (1.37M)	5'-0" (1.52M)	1'-0" (.31M)

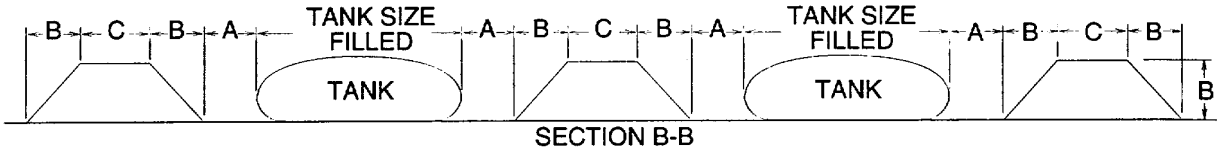
Figure 4-3. Independent Tank Berm



PLAN

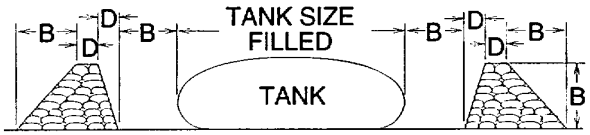


SECTION A-A

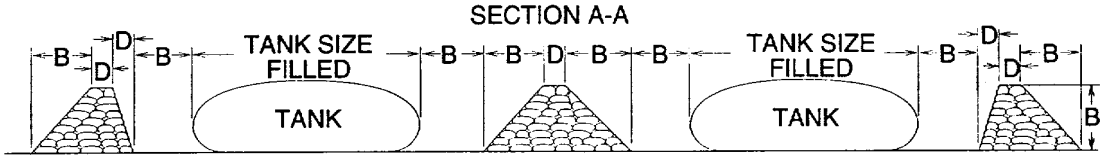


SECTION B-B

TYPICAL BERM CROSS SECTION (SOIL)



SECTION A-A



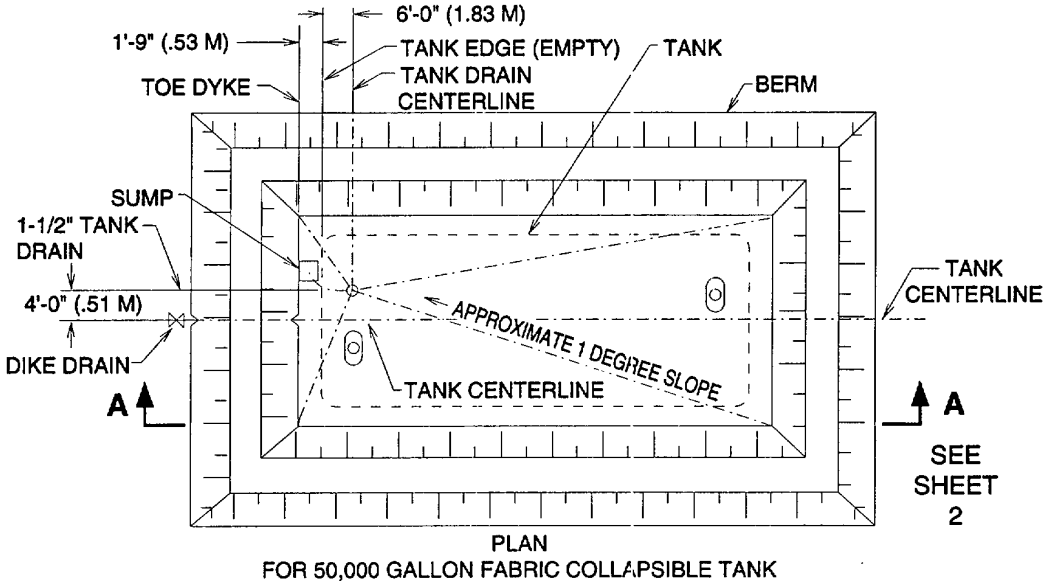
SECTION B-B

TYPICAL BERM CROSS SECTION (SAND BAGS)

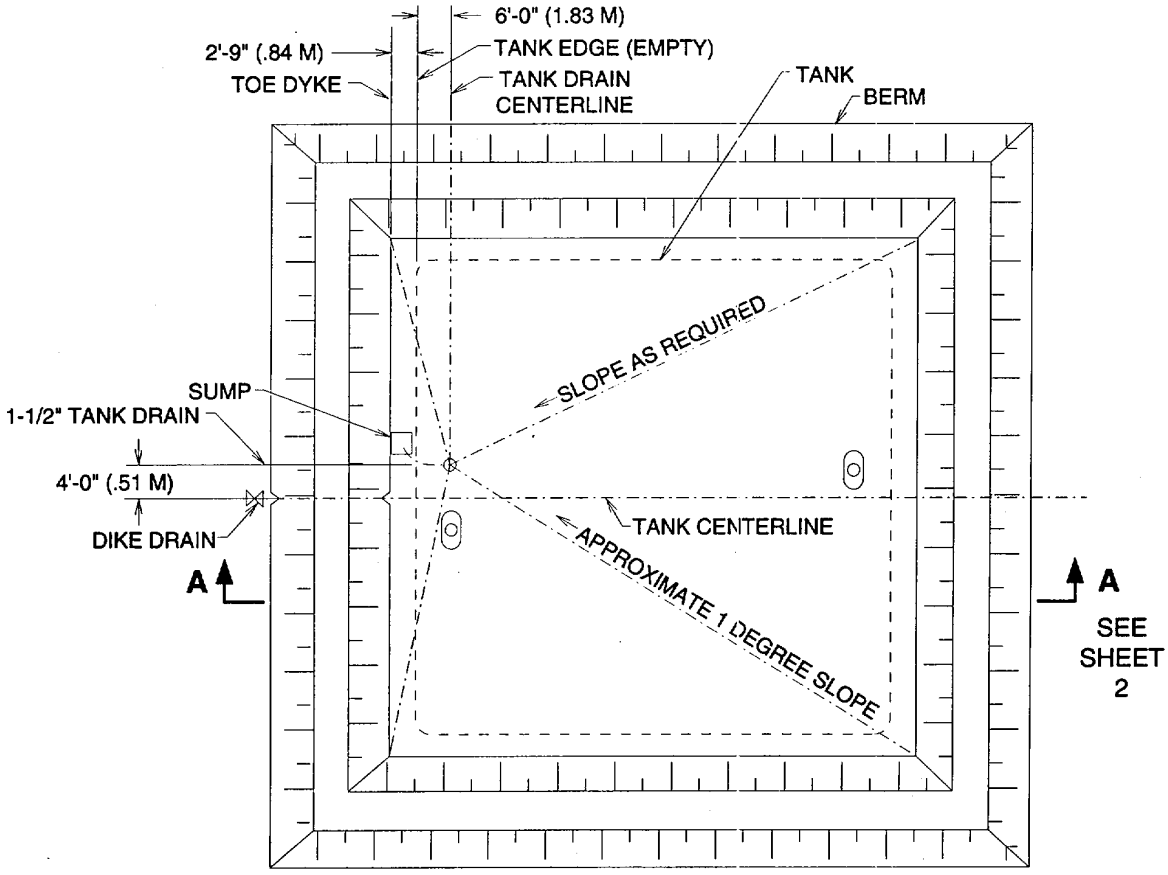
SCHEDULE				
TANK SIZE FILLED	A	B	C	D
5,000 BBL 66'-0" (20.12M) X 66'-0" (20.12M)	4'-0" (1.22M)	5'-6" (1.68M)	5'-0" (1.52M)	1'-0" (.31M)
50,000 GAL 24'-0" (7.32M) X 64'-0" (19.5M)	3'-0" (.92M)	4'-6" (1.37M)	1'-0" (.31M)	1'-0" (.31M)

Figure 4-4. Shared Tank Berm

4-4. ASSEMBLY AND PREPARATION FOR USE. - continued

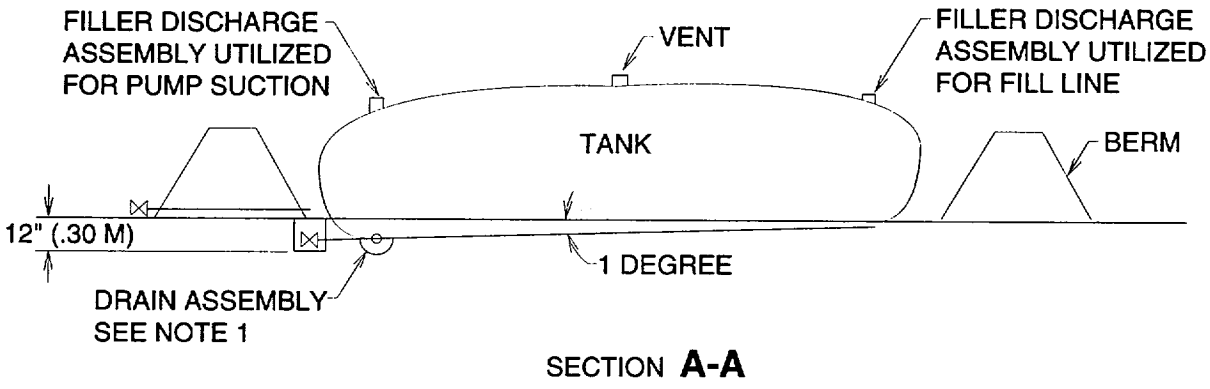


PLAN
FOR 50,000 GALLON FABRIC COLLAPSIBLE TANK



PLAN
FOR 5,000 BBL FABRIC COLLAPSIBLE TANK

Figure 4-5. Tank Pad (Sheet 1 of 2)



NOTE

1. **REMOVE ENOUGH SOIL AT DRAIN FITTING LOCATION AND ON ROUTE OF TANK DRAIN HOSE TO AVOID DEFORMATION OF TANK BOTTOM. A 18" X 18" X 12" (.46 M X .46 M X .31 M) SUMP WILL BE NECESSARY FOR DRAIN VALVE ACCESS.**

2. **TANK PAD MUST BE FREE SMOOTH AND FREE OF ROCKS AND SHARP OBJECTS.**

Figure 4-5. Tank Pad (Sheet 2 of 2)

4-4. ASSEMBLY AND PREPARATION FOR USE. - continued

(g) Tank pads and berms may be lined with a heavy gauge plastic sheeting if soil permeability is a problem at a particular site. Construction grade low-density polyethylene preferably with a fiber net molded in, is acceptable. Care must be taken to adequately overlap and, if possible, seal the joints. Low-density polyethylene can be heat sealed at the joints if time and site conditions permit it prior to the arrival of fuel to the area. Another acceptable method of seal is to tape the joint with two to four-inch self-adhering plastic tape. A light earths or sands fills over the liner, particularly over the tank pad is recommended. If a drain line penetrating the berm is used, a section of the liner must be pierced and tied tightly with synthetic cord around the drain pipe or other wise sealed so as to avoid washout or leakage at this point. Plastic self-adhering tape, overlapping the liner and the drainpipe may also be used. Sealing tape and plastic sheeting are not supplied with the TPT.

(h) For certain environmentally sensitive situations, a prefabricated polyethylene berm liner may be procured as authorized by the Government. They are not part of the TPT supply under NSN 3835-01-288-4604. These liners are described as follows:

- Berm Liner, Size 4, 50,000 gal
  NSN 5430-01-237-3661

- Berm Liner, Size 5, 5,000 bbl
  NSN 5430-01-237-3657

CAUTION

To prevent tank damage, tank pads must be free of rocks, sticks, and sharp objects.

CAUTION

Berm drain valve must be in the closed position and opened only to drain the basin when necessary. Failure to do so may result in a fuel spill escaping the berm.

CAUTION

Do not install fabric collapsible tanks on a slope in excess of 3°. They may tend to creep in the direction of the slope causing tank damage.

(i) 5,000 Barrel Tank Berms. The dimensions of a 5,000 bbl. fabric collapsible tank are:

- Dry: 68 ft. 6 in. x 68 ft. 6 in.
- Filled: 6 ft. 8 in. X 66 ft. X 66 ft

The minimum dimensions of the berm should be:

- From toe of berm to tank wall when filled, 4 ft.
- Berm height, to contain full tank with 1 ft freeboard, 5 ft. 6 in.

(j) 50,000 Gallon Tank Berms. The dimensions of a 50,000-gallon fabric collapsible tank are

- Dry: 26 ft. X 66 ft.
- Filled: 5 ft. X 8 in. X 24 ft, x 64 ft.

The minimum dimensions of the berm should be:

- From toe of berm to tank wall when filled, 3 ft.
- Berm height, to contain full tank with 1 ft. Freeboard, 4 ft. 6 in.

(k) Berm Basin Drain. To provide a drain for the basin formed by the berms, a 2-inch or larger pipe with a gate valve (used pipe and valves of any rating are acceptable) on the outside end may be installed in the bottom of the berm at the lowest end of the tank pad (see figure 4-3 and 4-4). The valve must be normally closed and opened only to drain water from the berm area. If a drain is not installed, the basin inside the berms may have to be pumped from time to time, depending on the permeability of the soils and whether or not a sealing liner is installed. Drainpipe and valves are not supplied with the TPT.

(1) For additional information on collapsible fabric tanks, see TM 10-5430-219-12.

(5) Pads for Other Equipment.

(a) To the extent possible, all operating equipment should be set on virgin or cut soils rather than fill. If a filled area cannot be avoided, it must be well compacted. This is particularly important for the pumps, fire suppression equipment, and floodlight sets.

(b) The areas on which equipment is placed should be covered with a 4-6 inch layer of coarse gravel or crushed rock. The gravel or crushed rock should extend out and around the equipment for several feet. This will provide a high and dry area from which to operate and maintain the equipment.

(c) The same practice of placing coarse gravel or crushed rock at and around often-operated valve stations is recommended as well.

d. Fire Suppression Equipment. A wheel-mounted fire extinguisher should be located near each tank berm, at each fuel dispensing assembly, at each tanker-truck receipt assembly, and at the contaminated fuel module. Extra units should be stationed at a central point ready for use anywhere in the TPT. Covered shelters or containers for housing the fire fighting clothing and extra fire fighting supplies should be provided at central, easily accessible locations around the TPT. The 20-lb. hand-held fire extinguishers should be distributed and located at each pump, floodlight set, fuel dispensing area, and other operating areas at the discretion of operating supervision. Personnel must be aware of the location of all fire fighting equipment at all times in order to prevent confusion in an emergency. Readily place visible signs flagging the locations of fire extinguishers.

e. The Floodlight sets. These should be placed to give light to fuel dispensing areas, fuel receipts areas, and heavy operating areas around the pumps and switching manifold.

f. Tank Farm (Module) Assembly Layouts.

(1) Due to varying site conditions and operational requirements, a single typical layout for the tank farm modules in a TPT cannot be stipulated. Modifications will need to be made by the installation group in the field as necessary.

(2) The most important information to consider is the relative spacing between major components in the tank farm modules. Distances shown are from a common starting point (i.e., the edge of a 5,000 bbl collapsible tank). By beginning with the tank locations, the rest of the layout is defined, although some variation will occur due to uneven terrain, obstacles (such as large rocks or trees), and small differences in the length of the hose sections. If layout changes are made, it is most important that the valve logic of the system remain unchanged from that shown. If relationship between valves is changed, the operating instructions provided in this manual must be changed accordingly, and all operating personnel must be notified.

4-4. ASSEMBLY AND PREPARATION FOR USE. - continued

(3) The location of the 5,000 bbl tanks and their berms are controlling factors in selecting a TPT site and layout. If pairs of tanks must have a common berm wall, a cleared and leveled area approximately 215 ft. X 115 ft. is required for each pair of tanks. (If sandbags are used to construct the berm, the area is approximately 190 ft. X 100 ft.) If the tanks have individual berms, the area required for the tank/berm measures approximately 115 ft. X 115 ft. (approximately 100 ft. X 100 ft. if sandbags are used).

(4) Besides selection of level ground, another important factor in choosing tank location is the elevation of the %' tank relative to the rest of the module. To allow for high vapor pressure, fuels, it is preferable to keep the tank bottom and pump pad at about the same level to maximize suction head available to the pump. If it is necessary to install a module on a sloping terrain, it is best for safety reasons to install the tanks on the lower side of the slope to avoid flooding the pump operating area with fuel in the event of a tank and berm break. The pump pad should not be more than two feet higher than the tank pad or it may be difficult to pump the tank dry when required.

g. Contaminated Fuel Module Layout.

(1) The contaminated fuel module will be located between the associated pipeline and the switching manifold within the TPT (see figures 4-1 and 4-2, TPT Overall Layouts).

(2) The two 50,000 gallons collapsible fabric tanks will each requires a level area approximately 60 ft. X 100 ft. (46 ft. X 86 ft. if sandbags are used) for the tank/berm location, if the installation authority chooses to have them with separate berms. If the two tanks are installed within a common berm, an area of approximately 105 ft. X 100 ft. (96 ft. X 87 ft., if sandbags are used) is required.

(3) Space must be provided for the 350 gpm transfer pump used with the contaminated fuel module.

(4) Road access must be provided to the contaminated fuel module to allow tanker-trucks to load the contents of the 50,000-gallon tanks as required. A graded area 40 ft. wide x approximately 100 ft. long is recommended.

h. Fuel Dispensing Assembly Layout. The fuel dispensing assembly is approximately 525 ft. long. It is recommended that a section at least 50 ft. wide and 600 ft. long be graded for the fuel dispensing assembly itself. An area alongside 120 ft. wide x approximately 700 ft. long should be graded for vehicle traffic and parking while loading.

i. Tanker-Truck Receipt Manifold Layout.

(1) The tanker-truck receipt manifold may be located off one side of the switching manifold, or next to the fuel dispensing assembly.

(2) A 6-inch hoseline from the transfer hoseline assembly is used to connect the tanker-truck receipt manifold to the switching manifold. The use of the hoseline gives considerable flexibility to the exact location of the receipt manifold in the TPT.

(3) An important factor in choosing the exact side for the tanker-truck receipt manifold is road access, since it is probable that much heavy truck traffic will occur in this area of the TPT. A graded area 120 ft. wide x approximately 700 ft. long is recommended.

j. 50.000 Gallon Tank TPT Optional Configuration Layout.

(1) Included in a complete TPT are up to six 50,000-gallon fabric collapsible tanks and the necessary valves, hose and fittings to connect them. The bank of tanks can be used to replace or supplement the 5,000-bbl tanks in a fuel module or under some conditions in a completely separate area.

(2) Each pair of 50,000-gallon tanks will require a leveled area approximately 105 ft. X 100 ft. (96 ft. X 87 ft. if sandbags are used).

(3) If less than six tanks are required at a particular location, the layout can be modified as necessary.

k. Installation and Assembly of Equipment.

(1) Typical installation illustrations are provided. It is recommended that the reader first become well acquainted with these illustrations and then refers to them as necessary.

WARNING

Safety Precautions.

- **Allow no smoking within 50 ft. of any facility or device storing or handling petroleum fuels. Erect "No Smoking" signs to this effect.**
- **Make sure hoselines are disconnected from vehicles at unloading stations before vehicle is moved.**
- **All equipment, devices, machinery, hoses and piping must be grounded and bonded to avoid static electricity discharge. When unloading tanker-trucks or any vehicles, make sure the tanker-truck receipt manifold is grounded. Connect the bonding strap to the vehicle frame.**
- **Ensure all pressure regulating equipment is properly installed. Over pressuring the TPT system can result in a serious failure, causing personnel injury and fire.**
- **Pump engine parts, particularly the exhaust system can be very hot and cause severe burns. Do not touch until engine is shut down and cooled off. Avoid spilling fuel or oil on hot engine parts as this could result in a fire.**
- **The accumulation of liquid fuel, or hot lubricating oil is a fire hazard. Wipe and wash down such areas or surfaces promptly. Dispose of any wiping rags in an area removed from the fuel storage or handling areas. Apply no smoking rules within 50 feet of any fuel accumulation.**
- **In addition to being potentially explosive, hydrocarbon fumes are dangerous to a person's respiratory system and can cause illness and potentially death. Certain weather may amplify the accumulation of fumes. Persons who must enter areas suspected of fumes must wear goggles and breathing devices. If not absolutely necessary to enter such an area for overriding safety reasons, the areas should be cleared of fumes' first. Always have other personnel standing by to assist the person who must enter the area.**

4-4. ASSEMBLY AND PREPARATION FOR USE. - continued

WARNING

Safety Precautions.

- **When leaks or spills occur, there may be an accumulation of fumes that present a fire hazard. This is particularly true if the facility is located in a low-lying area or during certain atmospheric conditions. Make sure-fire suppression equipment is available. Clear personnel from the area until the fumes have been dispersed.**
- **Fuel saturated soil is a fire hazard. The soil must be removed to prevent possible injury to personnel.**
- **Promptly correct any petroleum product leakage that causes an accumulation of fuel on any surface. If it cannot be corrected safely while in operation shut down and make corrections to stop the leak.**
- **Keep operating areas cleaned up and picked up. Remove any unnecessary equipment, trash, large rocks, etc. Such obstacles can be tripped over during the rush of operation and cause injury.**
- **Consider cut, scored or badly deformed hose to be unsuitable for service. Broken or leaking hose must be de-pressured, repaired, or replaced immediately. Failure to do so can result in a severe fire hazard.**

(2) It is recommended that major equipment be installed first, followed by major fittings and valve assemblies, and then by the interconnecting hoselines. The transfer hoselines can be laid as soon as the location of the switching manifold is established. The sequence of unpacking and installation will be determined by the overall installation of the TPT. Adjustments will have to be made to match the terrain.

(3) Equipment Requirements. Earth moving equipment is required to construct and repair fuel tank berms.

CAUTION

INTERNAL CLEANLINESS

Foreign materials in the system will obstruct fuel flow and cause damage to equipment.

(4) Internal cleanliness in the installation of all equipment, valves, fittings and hoses cannot be overemphasized. Sand, rocks, rags, tools, clothing, etc., left inside will end up blocking fuel flow or damaging equipment. Action must be taken to avoid the entry of dirt and contaminants. Leave protective caps and plugs in place until ready to make a connection. Just prior to closing a joint, inspect the parts being assembled and remove any foreign material by flushing or swabbing out.

l. The following installation/assembly instructions are provided as a guideline; they may be modified depending upon local operational requirements.

Para	Component
4-5	Fire Suppression Equipment
4-7	Contaminated Fuel Module
4-8	Switching Manifold
4-9	Tank Farm Assembly
4-10	Range Pole Installation
4-11	Fuel Dispensing Assembly
4-12	Tanker-Truck Receipt Manifold
4-13	50,000 Gallon Tank TPT Optional Configuration
4-14	Transfer Hoseline
4-15	Nestable Culverts
4-16	Floodlight Sets
4-17	Hoseline Suspension Set
4-18	Area Cleanup and Corrective Painting
4-19	Final Inspection of Assembled Items

4-5. FIRE SUPPRESSION EQUIPMENT.

Check out, service, and install the fire suppression equipment in accordance with TM 104120-235-13 and specific instruction of operating management.

a. The wheel-mounted dry chemical/AFFF units should be located such that they can be readily put into service at the fuel storage units, fuel dispensing sets, the switching manifold, the contaminated fuel module and the tanker-truck off loading area. See TM 10-4120-253-13 for instructions on the dry chemical AFFF unit. See (figures 4-1 and 4-2) for recommended locations of the wheel-mounted dry chemical/AFFF units.

b. It is recommended that one 20 lb fire extinguisher be placed near each pump, floodlight, and loading spot. Placement of the extra extinguishers not specifically located should be placed according to the direct operating authority.

NOTE

- **Thoroughly check out all fire suppression equipment when placed in the unit. Extinguishing equipment must be charged and in working order. Clothing must be clean and in good condition.**

- **Clearly mark storage areas for fire suppression equipment and educate all personnel on its location and use prior to bringing flammable fuels to any part of the system.**

4-6. INSTALLATION OF SAFETY AND NO SMOKING SIGNS.

Prepare and install appropriate safety and no smoking signs at locations designated by operating management for the specific site. The following criterion is recommended:

a. No smoking within 50 ft. of any system or equipment containing flammable fuels. Set up "No Smoking" signs.

b. Set up "No Smoking" signs around fuel dispensing and fuel receipt area.

4-6. INSTALLATION OF SAFETY AND NO SMOKING SIGNS. - continued

c. To minimize the threat of smokers, create a well-marked "Smoking Permitted" area well away from the facilities and make that the only area in which smoking is permitted.

d. Set up "Shut Engine Off' signs at fuel dispensing and receiving areas.

e. Set up "Disconnect Hose before Moving Vehicle" signs at dispensing and receiving areas.

f. Place the following safety signs at appropriate locations:

- Danger - Hot Surfaces" - at pump engines.
- Danger - Moving Parts" - at pump and engines.
- Danger - Wear Goggles and Gloves" - at sampling position.
- Watch Your Step" - in congested areas.

4-7. CONTAMINATED FUEL MODULE ASSEMBLY.

a Locate and install 2 each 50,000 gallon collapsible fabric tanks (1) (see figure 4-6). See para 4-4 and TM 10-5430-219-12. Be sure that elbows, hoses, and valves supplied with tanks are installed.

WARNING

GROUNDING AND BONDING

Pumps must be grounded at time of installation to prevent explosion or fire.

CAUTION

Install pump as far away from the tanks it serves without bridging the suction hose or deforming the tank top. Pump engine and exhaust fumes are hot and distance from tanks enhances safety.

b. Prepare 350 GPM pump (2) for use in accordance with TM 5-4320-226-14 or TM 10-4320-324-14 as applicable. Observe all warnings and cautions.

c. Connect 2 each 6-inch x 4-inch reducers (3) to tank (1) elbows.

d. Check that quick disconnect gaskets (4) are in place and connect 2 each Cam-lock adapter (5).

NOTE

Liberally apply petrolatum to the gasket and the inside surface of coupling clamp to prevent pinching during installation. Then, pull the coupling gasket over one grooved end of each mating joint. Ensure gasket is properly positioned over full circumference of sealing surfaces. Position coupling clamp over gasket. While maintaining alignment of mating parts, lock coupling, lamp securely.

e. Connect 4 each 6-inch x 50-foot hose assemblies (7) using coupling clamps (6).

f. Install 2 each gate valve (8) using coupling clamps (6).

g. Connect gate valves (8) to tee (9) using coupling clamps (6).

h. Connect remaining 6-inch x 50-foot hose (7) to tee (9) using coupling clamp (6).

i. Connect 4 each (total of eight) 4-inch x 12 feet Cam-lock hoses (10) from tanks (1) to suction side of pump (2).

j. Connect 2 each 4 inch x 25 feet Cam-lock hoses (11) to discharge side of pump (2).

k. Check that quick disconnect gasket (12) are in place and install 4 inch x 3-inch reducer (13) and 3 inch ball valve (14).

l. Place 2 each drip pan (15), absorbent oil material (16) and storage drum (17) where they will be available for use if needed.

m. Inspect all connections to verify correct installation of flanges, coupling gaskets, clamps, and security of Camlock devices.

4-7. CONTAMINATED FUEL MODULE ASSEMBLY. - continued

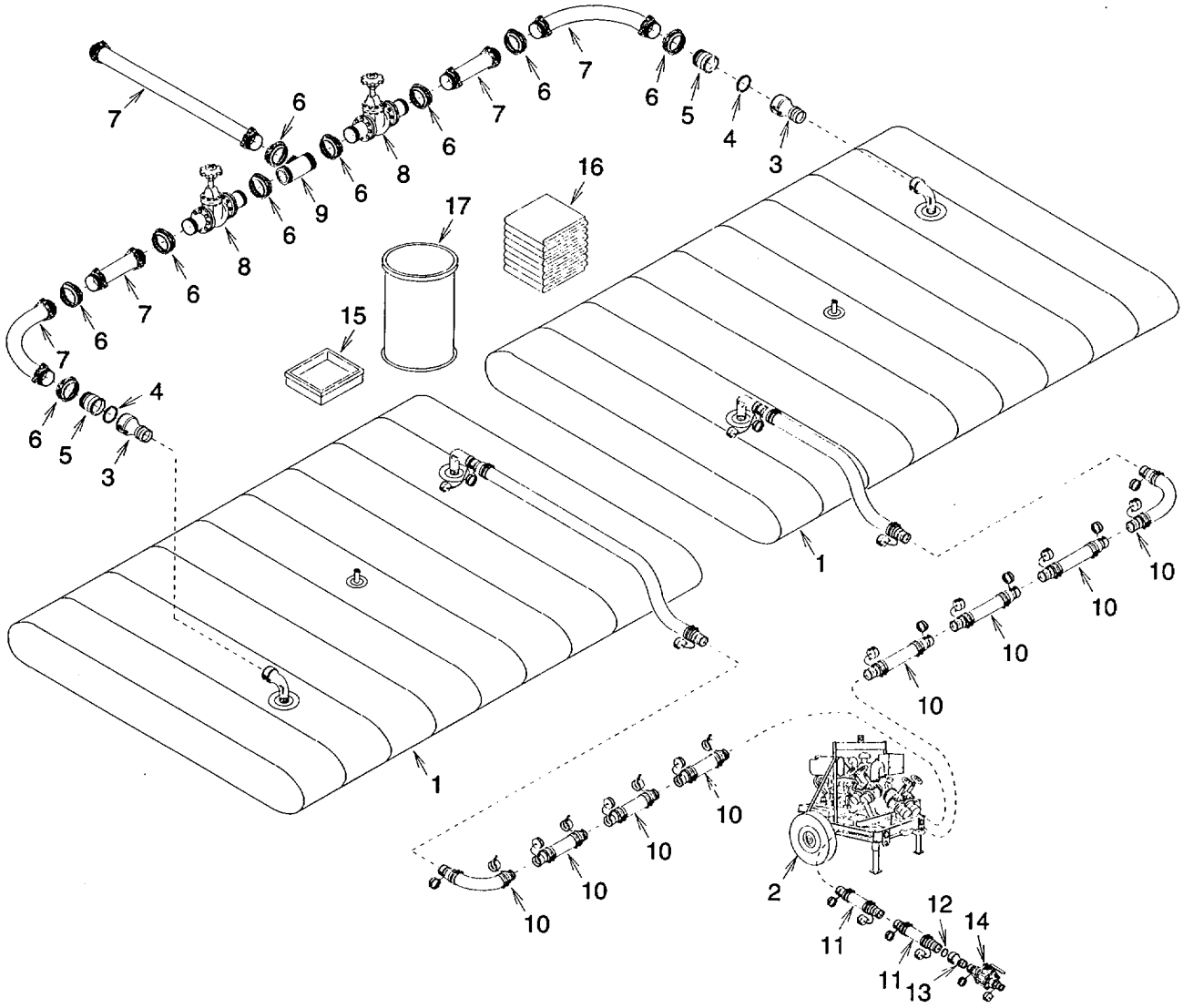


Figure 4-6. Contaminated Fuel Module

4-8. SWITCHING MANIFOLD ASSEMBLY.

The switching manifold (figure 4-7) controls the flow of fuel into the fuel units or the contaminated fuel module from the pipeline. Fuel may be directed into any of the three fuel units within the TPT. Fuel cannot be transferred from a fuel unit to the contaminated fuel module or to a tanker-truck receipt manifold. A single switching manifold may connect two or more TPT's under some conditions. In the case of systems involving the installation of multiple TPT's, fuel can be transferred from one TPT to another TPT through the pipeline and switching manifold. Ideally, the switching manifold should be as compact as possible.

a. Position containers containing 6-inch aluminum tees, 6-inch gate valves, 6-inch sampling assembly, 6-inch ball valves, hose assemblies, meter skid assemblies, and pressure regulating valve assembly near their respective installation sites as indicated.

b. Remove tees, valves, hoseline, pressure regulating valve assembly, sampling assembly, meter skid assemblies, adapters, coupling clamps, and coupling gaskets from containers.

c. Inspect all items for damage, cleanliness, and quantities required.

NOTE

Liberally apply petrolatum to the gasket and the inside surface of coupling clamp to prevent pinching during installation. Then, pull the coupling gasket over one grooved end of each mating joint. Ensure gasket is properly positioned over full circumference of sealing surfaces. Position coupling clamp over gasket. While maintaining alignment of mating parts, lock coupling clamp securely.

d. Connect 6-inch tees (2) together to form the configuration shown using coupling clamps (1).

e. Connect gate valves (3) and ball valve assemblies (4) to tees (2) using coupling clamps (1).

f. Connect discharge hoses (5) between ball valves (4) and meter strainer assemblies (6). Also, between the tee (2) and meter strainer on the return manifold using coupling clamps (1).

g. Connect fuel sampling assembly (7) to tee (2) using coupling clamps (1). In some cases hose may be in between the sampling assembly and the switching manifold.

h. Install pressure regulating valve assembly (8) in the pipeline using coupling clamps (1) to the switching manifold, upstream of the fuel sampling assembly or as directed by the operating authority. Six-inch IPDS single groove pipe is supplied by the associated pipeline. If the system does not involve an associated pipeline, the feed line (hose or pipe) can be tied directly into the pressure regulator (8) and all downstream conduit can be hoseline.

4-8. SWITCHING MANIFOLD ASSEMBLY. - continued

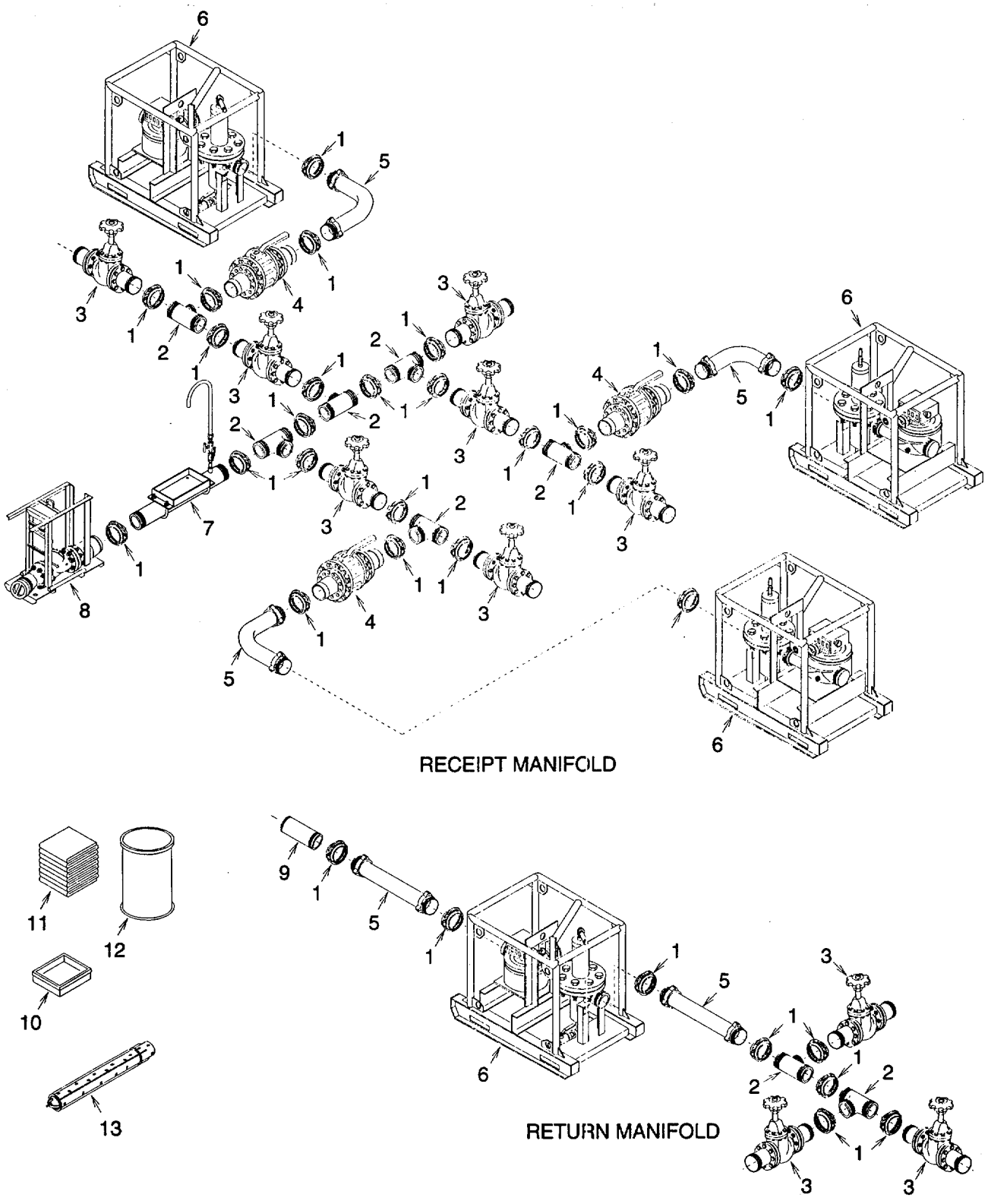


Figure 4-7. Switching ManiFold

WARNING

Equipment must be grounded and bonded at time of installation to prevent explosion and fire.

CAUTION

Equipment damage can result if down stream pressure exceeds 125 psig.

i. On the return manifold, connect discharge hose (5) between outlet side of meter strainer (6) and single to double-groove adapter (9) using coupling clamps (1).

j. Place 4 each drip pan (10), 2 each absorbent oil material (11) and 2 each storage drum (12) where they will be available for use if needed.

k. Inspect all connections to verify correct installation of flanges, coupling gasket, clamps, and security of Cam-lock devices.

4-9. TANK FARM ASSEMBLY.

NOTE

The following assembly instructions apply to one tank farm assembly. There are 3 tank farm assemblies for each fuel unit and 9 total for a TPT.

a. Locate and install 2 each 5,000 BBL collapsible fabric tanks (1) (figure 4-8). Be sure that elbows, hoses, and valves supplied with tanks are installed.

b. Position containers storing the remaining components near their respective installation sites near the fabric collapsible tanks (1).

c. Remove remaining components from containers.

d. Inspect all items for damage, cleanliness, and quantities required.

WARNING

GROUNDING AND BONDING

Pumps must be grounded and bonded at time of installation to prevent explosion or fire.

CAUTION

Install pumps as far away from the tanks as possible. The suction hose should lie on the ground without strain on the tank or pump. Pump engines and exhaust fumes are hot and distance from the tank will enhance safety.

e. Prepare 600 GPM pump (2) for use in accordance with TM 5-4320-305-10. Observe all warnings and cautions.

4-9. TANK FARM ASSEMBLY. - continued

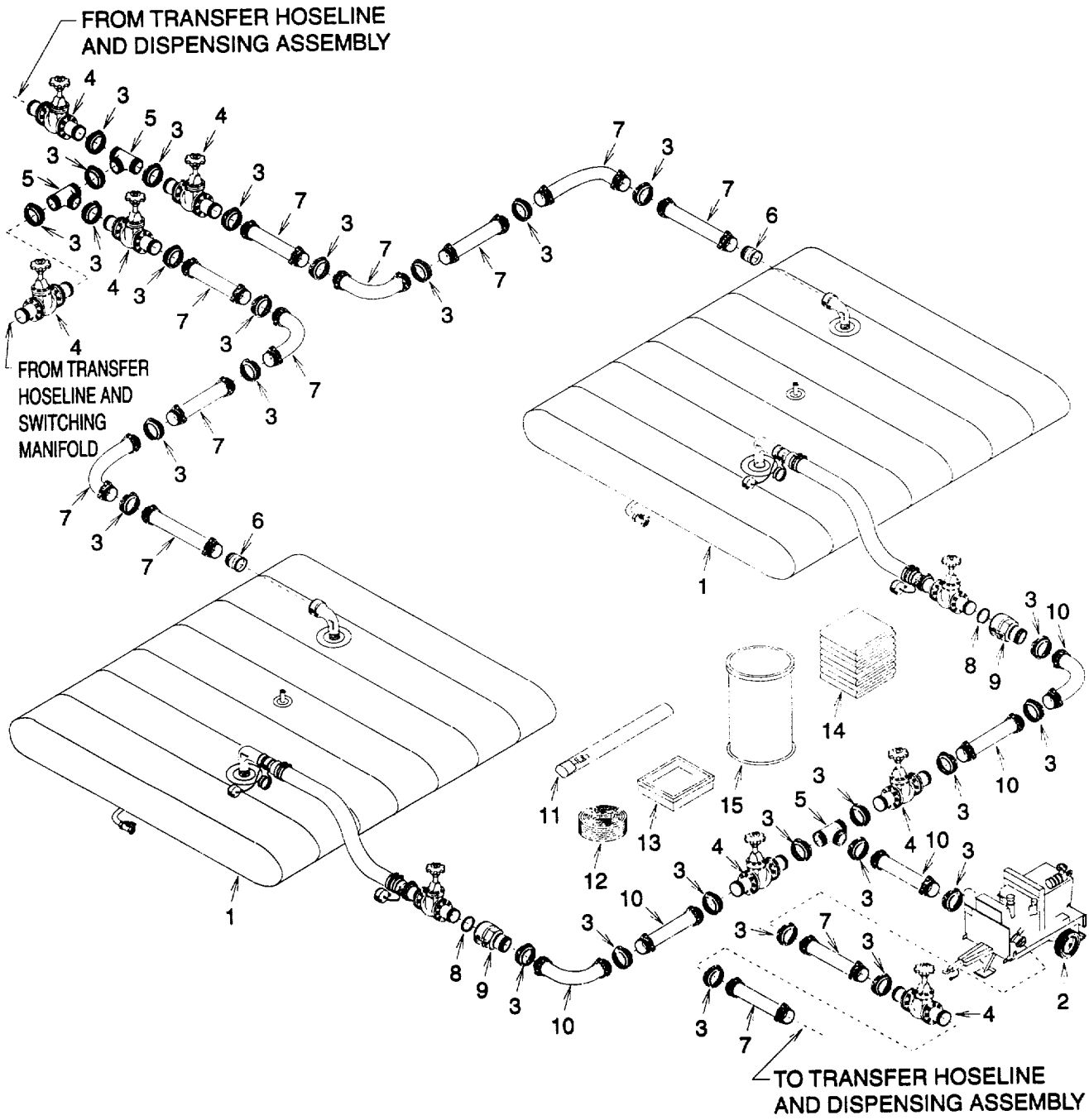


Figure 4-8. Tank Farm Assembly

CAUTION

INTERNAL CLANLINESS

Make sure all hoselines, fittings and valves are clean internally. Foreign materials may disrupt operations and damage equipment.

NOTE

Liberally apply petroleum to the gasgest and the inside surfacres of coupling gasket over one prevent pinching during installation. Then, pull the coupling gasket over one grooved end of each mating joint. Ensure gasket is properly positioned over full circumference of sealing surfaces. Position coupling clamp over gasket. While mainting alignment of mating parts, lock coupling clamp securely.

f. Align mating surfaces of gate valves (4), tees (5), and coupling clamps (3) and assembles valve tee combinations as shown.

g. Connect 2 inch Cam-lock adapter (6) to tank (1) elbows.

h. Connect 6 inch x 50-foot hose assemblies (7) between adapters (6) and valves (4) using coupling clamps (3).

i. Check that gasket (8) are in place and connect 2 each female coupling adapters (9) to tank (1) valves.

j. Connect 6 inch x 12-foot hose assemblies (10) between female coupling adpters (9) and valves (4) and tee (5) and pump (2) using coupling clamps (3).

k. Connect 6 inch x 50-foot hose assembly (7) to outlet side of pump (2) using clamp (3).

l. Connect gate valve (4) and 6 inch x 50-ft hose assembly (7) to end of above hose using coupling clamp (3).

m. Place 4 teach range poles (11), nylon cord (12), 1 each drop pan (13), absorbent oil material (14) and storage drum (15) where they will be available for use if needed.

4-10. RANGE POLE INSTALLTION.

Install range poles and cords accross all 5000 bbl tanks. (see figure 4-9).

a. A range pole consists of two sections of steel tubing. The assembled length is 6-1/2 feet, including a hardened steel point permanently fastened to the lower end. A spring catch locks the two sections together.

b. The range poles are used to roughly gauge and estimate the fuel quantity in the fabric collapsible tanks in the TPT. Two poles are supplied for each 5,000 bbl tank. They are set in the berms on opposite sides of the tank and a cord is stretched across the thank. The level of the cord can be set as bets suits the operator, however, it is recommended the level be set at the full height of the thank, i.e., 6 feet 8 inches from the pad.

c. It is recommended that a ball or other object be mounted on the cord at the center of the thank. Stakes and guy lines may be added to eliminate sag in cord.

4-10. RANGE POLE INSTALLATION. - continued

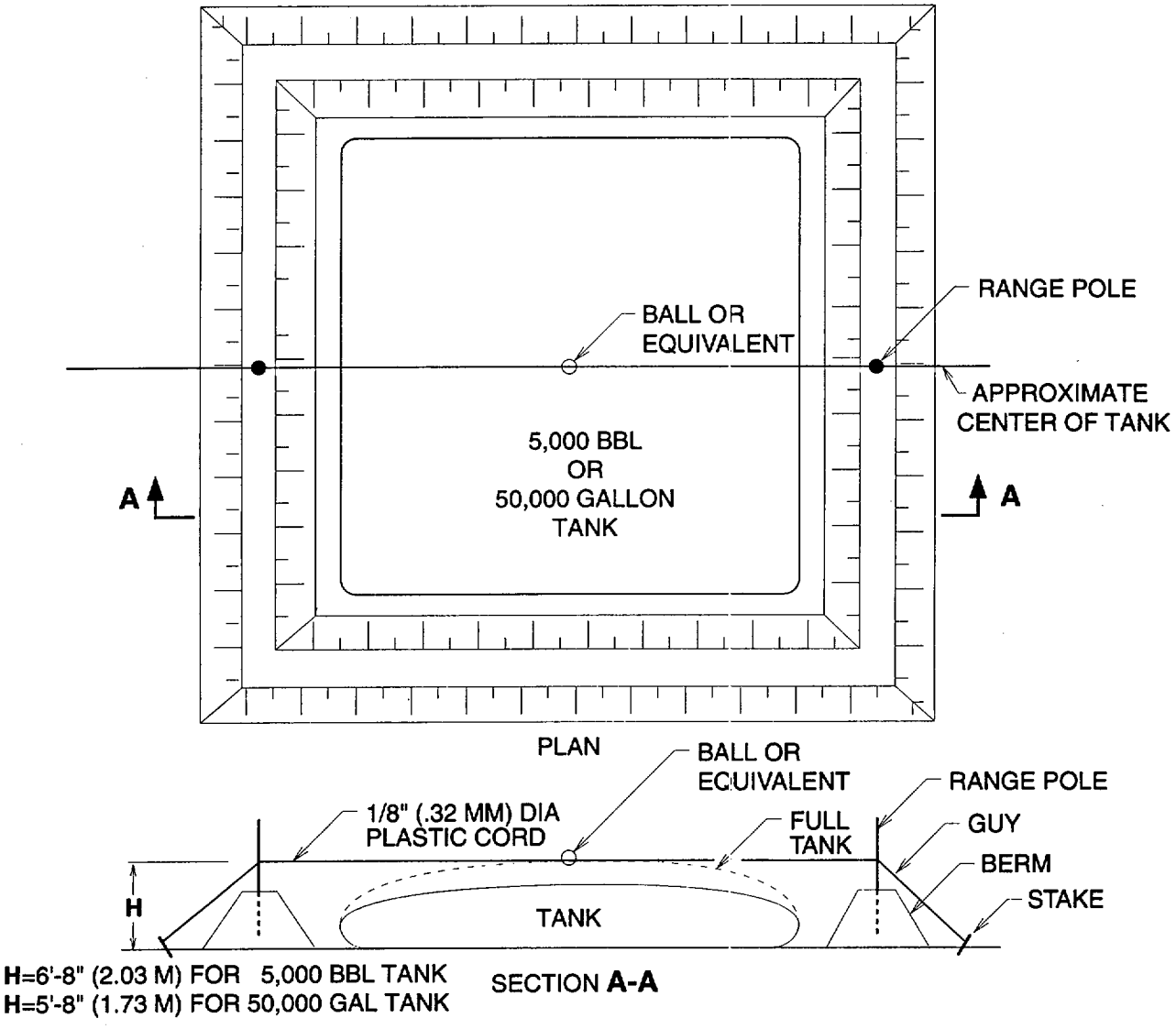


Figure 4-9. Use of Range Poles for Approximate Tank Gauging

4-11. FUEL DISPENSING ASSEMBLY.

CAUTION

INTERNAL CLEANLINESS

Make sure all hoselines, fittings and valves are clean internally. Foreign materials may disrupt operations and damage equipment.

NOTE

The following assembly instructions apply to one Fuel Dispensing Assembly. There is one Fuel Dispensing Assembly for each Fuel Unit, for a total of three for a TPT.

a. Inspect all items for damage, cleanliness and quantities required.

b. Determine the approximate location and layout of the dispensing area per established plot plan.

NOTE

Liberally apply petrolatum to the gasket and the inside surface of coupling clamp to prevent pinching during installation. Then, pull the coupling gasket over one grooved end of each mating joint. Ensure gasket is properly positioned over full circumference of sealing surfaces. Position coupling clamp over gasket. While maintaining alignment of mating parts, lock coupling clamp securely.

c. Align mating surfaces of 6 x 6 x 4 tees (1) (figure 4-10), 6 inch x 50 foot hose assemblies (2), 6 inch ball valves (3), 6 inch pressure control valve (4), and 6 inch cap (5). Join these items using coupling clamps (6).

d. To assemble the 4 inch dispensing hoses:

(1) Connect 4 inch gate valves (7), to tees (1) using couplings (8), gaskets, (9), and coupling clamps (10).

(2) Connect 4 inch x 25 foot Cam-lock hoses (11) to gate valves (7).

(3) Connect 4 inch Cam-lock butterfly valve (12) to hose (11).

e. Determine dispensing device combination from the following and connect them to butterfly valves (12):

(1) 4 inch male x 3 inch female Cam-lock reducer (13) and gasket (14).

(2) D-1 nozzle assembly (15) and adapter (16).

(3) Dry break coupling assembly (17) and dry break tanker truck adapter (18).

(4) NATO tank truck adapter coupling set (19).

(5) NATO rail tanker coupling (20).

4-11. FUEL DISPENSING ASSEMBLY. - continued

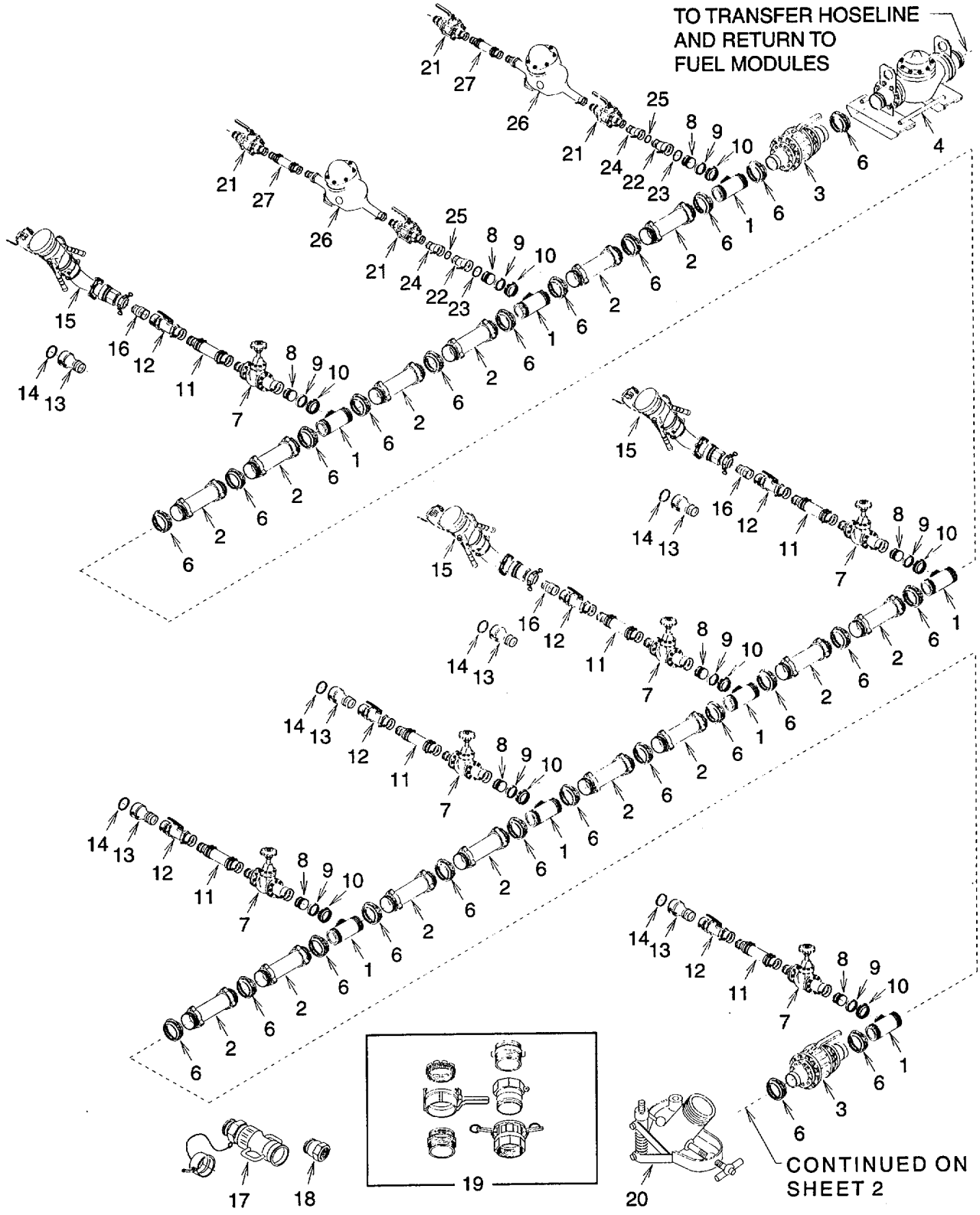


Figure 4-10. Fuel Dispensing Assembly (Sheet 1 of 2)

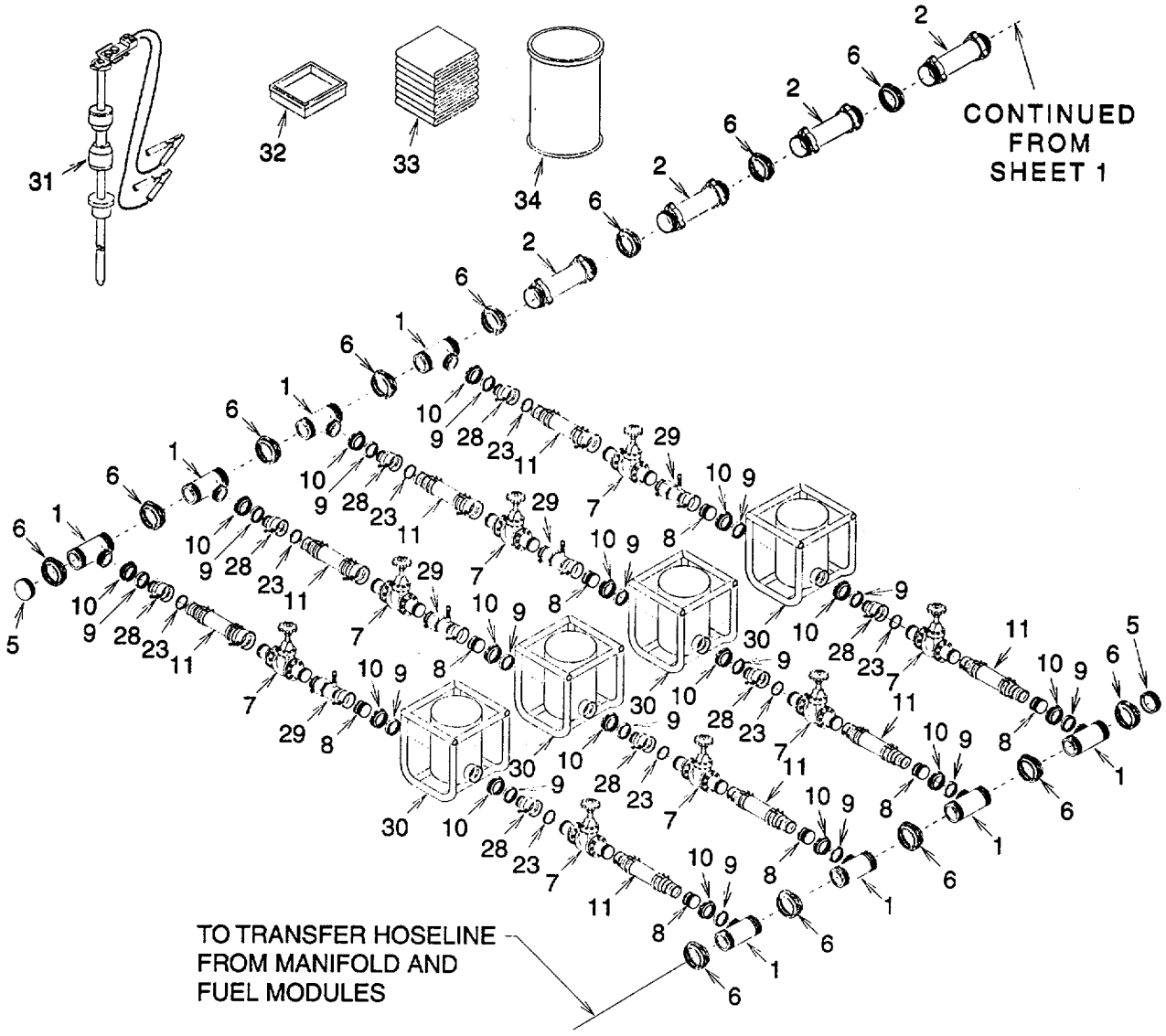


Figure 4-10. Fuel Dispensing Assembly (Sheet 2 of 2)

4-11. FUEL DISPENSING ASSEMBLY. - continued

f. To assemble the 1-1/2 inch dispensing hoses:

(1) Connect 1-1/2 inch ball valves (21) to tees (1) using couplings (8) gaskets (9) coupling clamps (10) 4 inch female x 2 inch male reducers (22) and gaskets (23) and 2 inch female x 1-1/2 inch male reducers (24) and gasket (25).

(2) Connect 1-1/2 inch pressure control valves (26) to ball valves (21).

(3) Connect 1-1/2 inch x 25 foot hose assemblies (27) to pressure control valve (26).

(4) Connect remaining 1-1/2 inch ball valves (21) to end of hoses (27).

g. To assemble the 4 inch filter separator and water detection kit lines:

(1) Connect 4 inch x 25 foot hoses (11) Cam-lock to tees (1) t: sing coupling clamps (10), gaskets (9), coupling adapters (28) and gaskets (23).

(2) Connect 4 inch gate valves (7) to hoses (11).

(3) Connect water detection kit adapter (29) to gate valve (7).

(4) Install, service, and prepare the filter separators (30) in accordance with TM 5-4330-211-12.

(5) Connect filter separators (30) to water detection kit adapters (29) using couplings (8), gaskets (9), and coupling clamps (10).

(6) Connect 4 inch gate valves (7) to filter separators (30) using coupling damps (10), gaskets (9), coupling adapters (28) and gaskets (23).

(7) Connect 4 inch x 25 foot hoses (11) Cam-lock to gate valves (7).

(8) Connect hoses (11) to tees (1) using couplings (8), gaskets (9), and coupling clamps (10).

h. Locate and install ground rod (31).

i. Place 8 each drip pans (32), 2 each oil absorbent material (33), and 2 each storage drums (34) where they will be available for use when needed.

4-12. TANKER-TRUCK RECEIPT MANIFOLD.

CAUTION

INTERNAL CLEANLINESS

Make sure all hoselines, fittings and valves are clean internally. Foreign materials may disrupt operations and damage equipment.

NOTE

The following assembly instructions apply to one tanker-truck receipt manifold. There is one tanker-truck receipt manifold for each fuel unit, for a total of three for each TPT.

a. Inspect all items for damage, cleanliness and quantities required.

NOTE

The tanker-truck receipt manifolds should be installed only under the direction of operations management.

b. Determine the approximate location and layout of the dispensing area in accordance with the plot plan.

NOTE

Liberally apply petrolatum to the gasket and the inside surface of coupling clamp to prevent pinching during installation. Then, pull the coupling gasket over one grooved end of each mating joint. Ensure gasket is properly positioned over full circumference of sealing surfaces. Position coupling clamp over gasket. While maintaining alignment of mating parts, lock coupling clamp securely.

c. Align mating surfaces of 6 x 6 x 4 tees (1) (figure 4-11), 6 inch x 12 foot hose assemblies (2), 6 inch gate valves (3), 6 x 6 x 6 tees (4), 6 inch caps (5), and 6 inch x 50 foot hose assemblies (6). Join these items using coupling clamps (7).

4-12. TANKER-TRUCK RECEIPT MANIFOLD, - continued

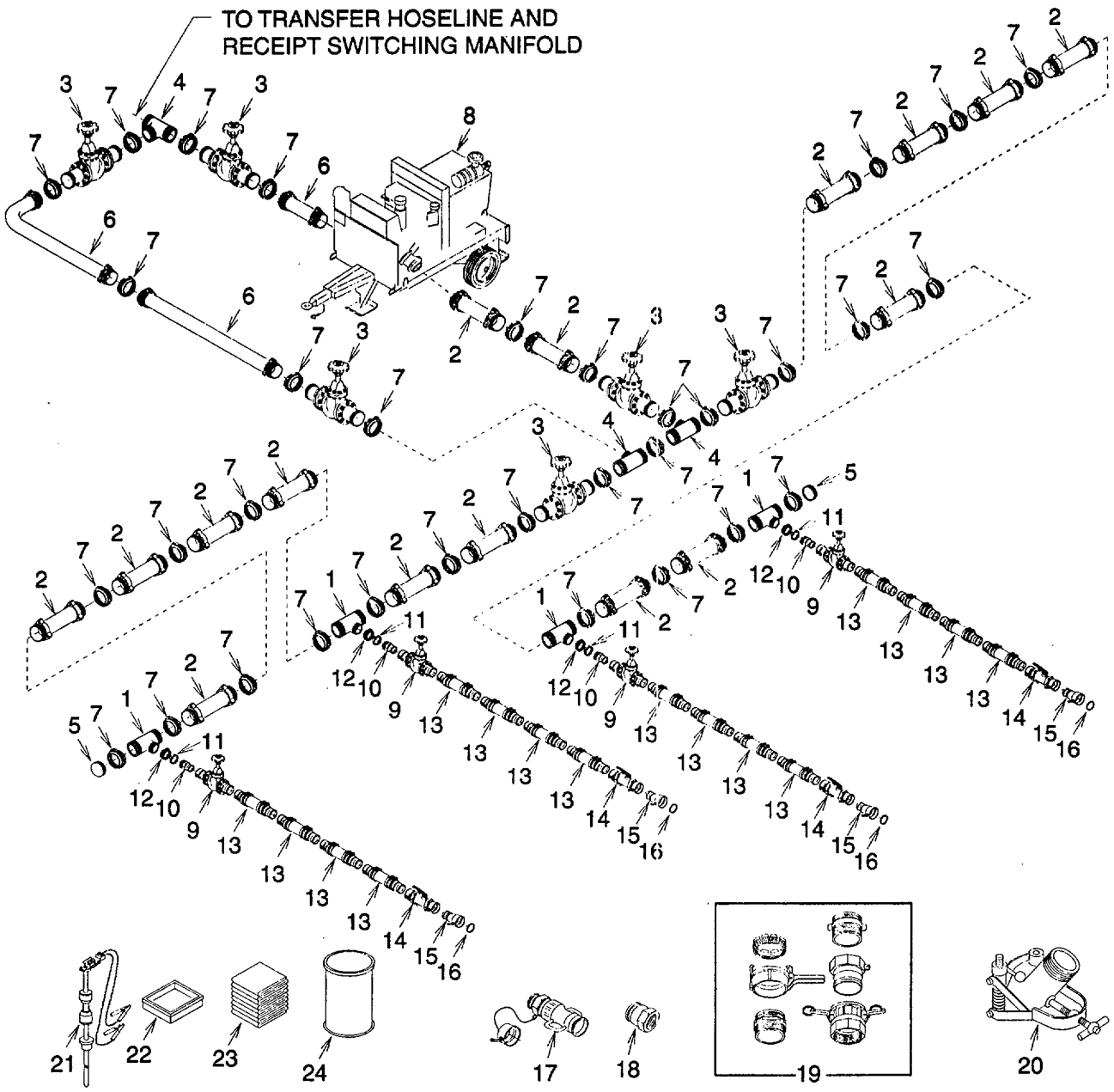


Figure 4-11. Tanker-Truck Receipt Manifold

WARNING

GROUNDING AND BONDING

Pumps must be grounded and bonded at time of installation to prevent explosion or fire.

CAUTION

Install pumps as far away from receipt area and tanks as possible. Pump engines and exhaust fumes are hot and distance from the receipt area and tanks will enhance safety.

d. Prepare 600 GPM pump (8) for use in accordance with TM 5-4320-305-14, observe all warnings and cautions.

NOTE

To determine discharge and suction fittings on pump see TM 5-4320-305-14.

e. Connect 6 inch x 50 foot hose assembly (6) to discharge side of pump (8).

f. Connect 6 inch x 12 foot hose (2) to suction side of pump (8).

g. Assemble the four receipt hoses as follows:

(1) Connect the 4 inch gate valves (9) to 6 x 6 x 4 inch tees (1) using adapter couplings (10), gaskets (11) and 4 inch coupling clamps (12).

(2) Connect 4 each, 4 inch x 12 foot hose assemblies (13) Cam-lock to gate valves (9).

(3) Connect 4 inch butterfly valves (14) to end of last hose (13).

(4) Connect 4 inch male x 3 inch female Cam-lock reducer (15) and gasket (16) to butterfly valve (14).

h. Determine alternate receipt connection device combination from the following and connect them to butterfly valves (14): (1) Dry break coupling assembly (17) and dry-break tanker truck adapters (18).

(2) NATO tank truck adapter coupling set (19).

(3) NATO rail tanker coupling (20).

i. Locate and install ground rods (21).

j. Place 5 each drip pan (22), 2 each oil absorbent material (23), and 2 each storage drum (24) where they will be available for use when needed.

4-13. 50,000 GALLON TANK TPT OPTIONAL CONFIGURATION.

CAUTION

INTERNAL CLEANLINESS

Make sure all hoselines, fittings and valves are clean internally. Foreign materials may disrupt operations and damage equipment.

NOTE

- **The following assembly instructions apply to ore 50,000 Gallon Tank TPT Optional Configuration. There is one 50,000 Gallon Tank TPT Optional Configuration for each Fuel Unit and three total for l TPT.**
- **The optional tank configuration should be installed only if required by operations management.**

a. Inspect all items for damage, cleanliness and quantities required.

b. Locate and install 2 each 50,000 gallon collapsible fabric tanks (1) (see figure 4-12). Be sure that elbows, hoses, and valves supplied with tanks are installed.

WARNING

GROUNDING AND BONDING

Pumps must be grounded and bonded at time of installation to prevent explosion or fire.

CAUTION

Install pump as far away from the tanks it serves without bridging the suction hose or deforming the tank top. Pump engine and exhaust fumes are hot and distance from tanks enhances safety.

c. Prepare 350 GPM pump (2) for use in accordance with TM 5-4320-226-14 or TM 10-4320-324-14 as applicable. Observe all warnings and cautions.

d. Connect the 4 inch x 25 foot hose assemblies (3) Cam-lock , gate valves (4), and Y assemblies to the tank (1) elbows.

NOTE

To determine discharge and suction fittings on pump see TM 5-4320-226-14 or TM 10-4320-324-14.

e. Connect the 4 inch x 12 foot hose assemblies (6) Cam-lock between the tanks (1) and suction side of pump (2).

f. Connect a 4 inch x 25 foot hose assembly (3) Cam-lock to the discharge side of pump (2) outlet.

g. Connect gate valve (4) to end of hose assembly (3).

h. Connect coupling adapters (7) and gasket (8) to gate valve (4).

i. Install, service, and prepare the filter separators (9) in accordance with TM 5-4330-211-12 or TM 10-4330-235-13&P.

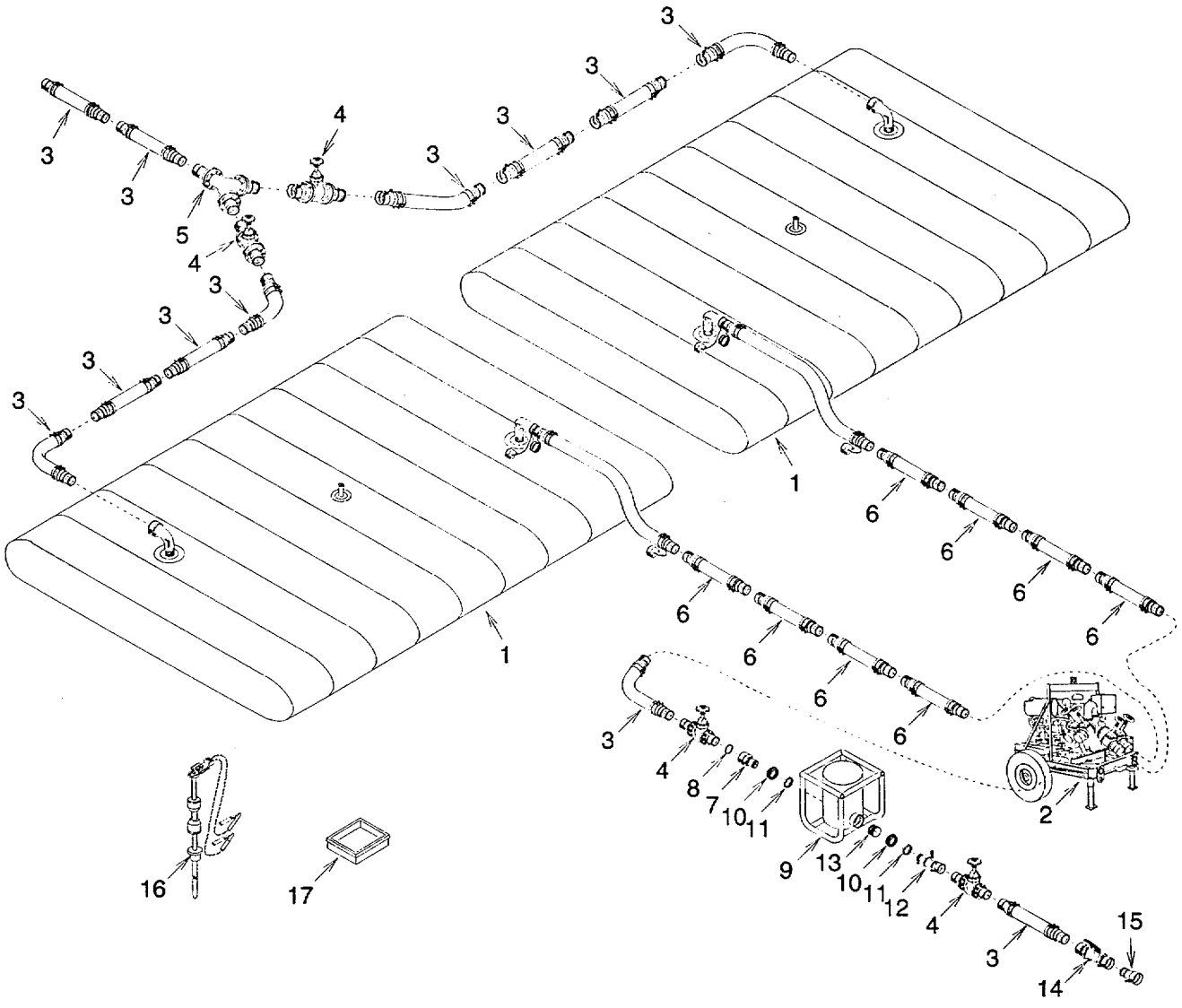


Figure 4-12. 50,000 Gallon Tank TPT Optional Configuration

4-13. 50,000 GALLON TANK TPT OPTIONAL CONFIGURATION. - continued

NOTE

Liberally apply petrolatum to the gasket and the inside surface of coupling clamp to prevent pinching during installation. Then, pull the coupling gasket over one grooved end of each mating joint. Ensure gasket is properly positioned over full circumference of sealing surfaces. Position coupling clamp over gasket. While maintaining alignment of mating parts, lock coupling clamp securely.

j. Connect the filter separator (9) using coupling clamp (10) and. gasket (11).

k. Connect the water detection kit adapter (12) to the filter separator (9) using quick disconnect coupling (13) clamp (10) and gasket (11).

l. Connect remaining gate valve (4), 4 inch x 25 foot hose assembly (3) Cam-lock, butterfly valve (14) and 4 inch x 3 inch reducer (15).

m. Locate and install ground rod (16).

n. Place drip pan (17) where it will be available when needed.

4-14. TRANSFER HOSELINE.

The transfer hoseline assembly is used to connect the tank farm assemblies, switching manifold, fuel dispensing assemblies, and tanker-truck receipt manifolds into an operational TPT.

NOTE

- **There are four transfer hoseline assemblies in a TP1T. (One per pipeline connection assembly and one in each of the three fuel units.)**

- **Fuel from the pipeline enters the switching manifold and with proper positioning of valves, fuel is routed through transfer hoseline .o any fuel unit. Fuel is stored in fuel units and then transferred through the transfer hoseline assembly by the 600 GPM hoseline pump to the fuel dispensing assembly or back to a pipeline.**

a. The 6 inch x 500 hose assemblies are supplied in shipping and storage containers.

b. Position containers storing 6-inch tees and gate valve assemblies near their respective installation sites as indicated in (figure 4-13).

c. Remove necessary quantities of 6-inch aluminum tees, 6-inch aluminum gate valve assemblies, coupling clamps, and coupling gaskets from containers.

d. Inspect all items for damage, cleanliness, and quantities required.

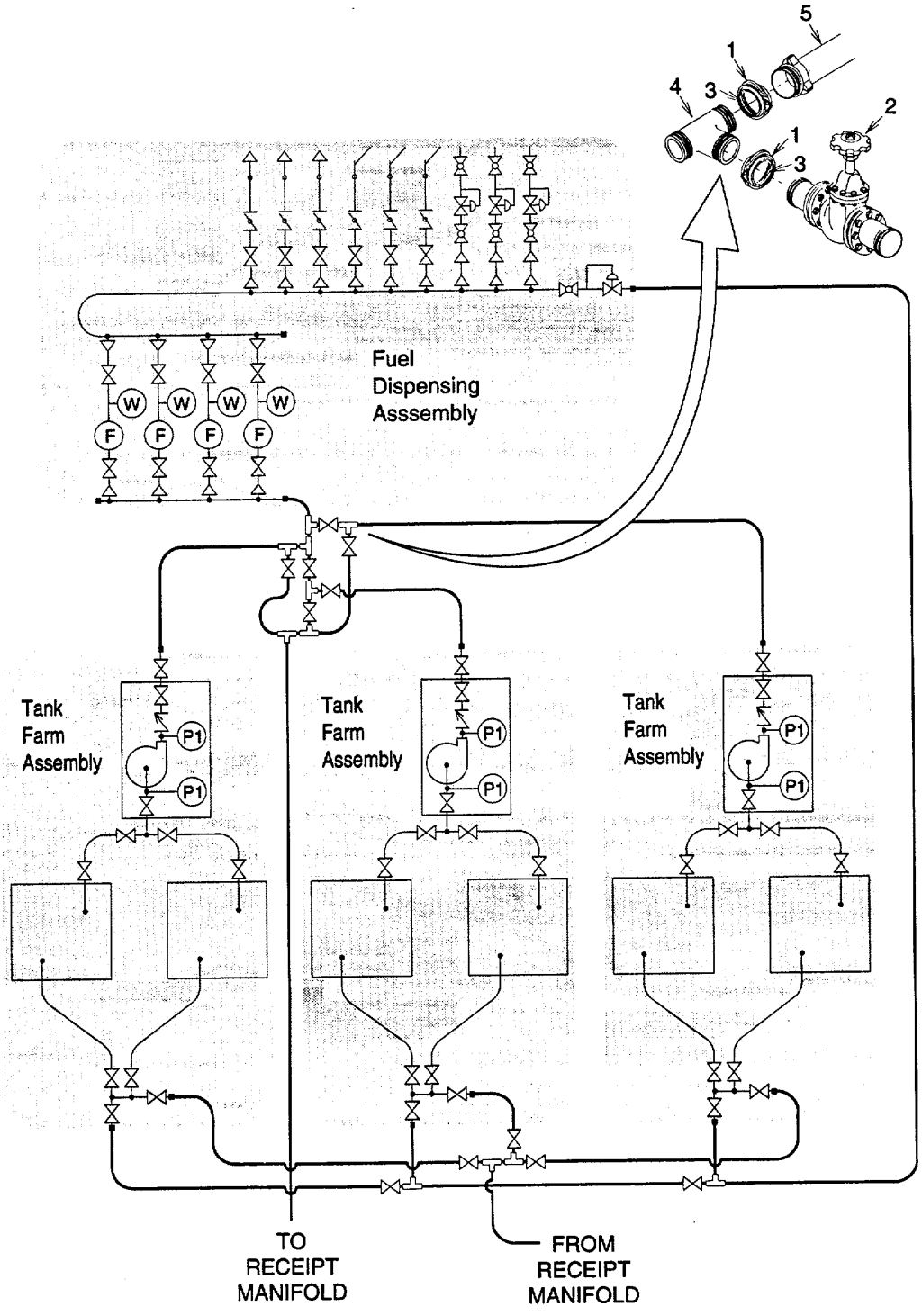


Figure 4-13. Transfer Hoseline Typical Valve and Tee Arrangement

4-14. TRANSFER HOSELINE. - continued

NOTE

Liberally apply petrolatum to the gasket and the inside surface of coupling clamp to prevent pinching during installation. Then, pull the coupling gasket over one grooved end of each mating joint. Ensure gasket is properly positioned over full circumference of sealing surfaces. Position coupling clamp over gasket. While maintaining alignment of mating parts, lock coupling ,:lamp securely.

e. Tighten coupling clamps (1) to gate valves (2), being careful not to damage the gasket (3).

f. Connect gate valves (2) to tees (4).

g. Connect transfer hoseline (quantity as required) between tees (4.) and receipt manifold assemblies. See (figures 4-1 and 4-2) for typical layouts for remainder of transfer hoseline interconnecting hose.

4-15. NESTABLE CULVERTS.

a. Nestable culverts are 12-inch corrugated culvert pipe, through which hose can be routed and thus protected from traffic weight, and other effects which might cause hose damage. They can also be used in other places, such as protecting the hose from rock, or from ballast and cinders under a railroad spur. The culverts are part of the fuel unit support assembly.

CAUTION

Hoselines can be easily damaged by vehicles crossing them. Be sure well covered culverts are installed where traffic is expected. Do not permit vehicles to cross unprotected hose.

b. Install culverts at road crossings where hoselines cross under an area where vehicle traffic is planned. Erect signs stating, "Danger, Hoseline Crossing".

4-16. FLOODLIGHT SETS.

WARNING

GROUNDING AND BONDING

Ground and bond equipment at time of installation to prevent explosion or fire.

NOTE

Installation of Floodlights early in the erection program is necessary to permit work at night.

a. Service, install, and prepare the floodlight sets for operation in accordance with TM 9-6230-211-14. Observe all warnings and cautions.

b. A floodlight set is a wheel-mounted diesel engine-driven generator with an integrally mounted telescoping tower carrying four high intensity lamps capable of lighting up to 7.5 acres.

c. The six units are to be installed as determined by operating management for the particular TPT site. Particular attention should be given to the lighting of fuel dispensing areas, around the pumps and the switching manifold. Suggested locations are shown on (figures 4-1 and 4-2).

4-17. HOSELINE SUSPENSION SET.

Install suspension sets at road crossings, small streams, and other areas where a nestable culvert may not be used. Crossings must provide clearance from flood stages. Each hoseline suspension kit provides adequate material for one 200 foot wide crossing or two shorter crossings. Materials for the construction of towers (timber, bolts, nails, etc.) are not included in the kit and must be obtained locally. (See figure 4-14.)

NOTE

- **Materials for the construction of towers (timbers, bolts, nails, etc.) are not included in the kit and must be obtained locally.**
- **Anchor stakes must be driven into the ground with the open side of the V toward the direction of pull to obtain maximum holding strength.**

a. Suspension Towers. When constructing suspension towers for spans up to 75 feet, short towers constructed of 4x4 timber or similar material can be utilized as long as adequate clearance is ensured. For spans over 75 feet, towers must be constructed of 6x8 timber or similar material to provide adequate clearance and strength. Naturally occurring trees along the hoseline route may be used as towers provided there is adequate clearance. Trees must be a minimum of 10 inches in diameter, sound, and well rooted. All suspension towers shall be anchored by guy-lines to anchor stakes provided in the suspension kit. When constructing tripod suspension towers, (see figure 4-14), position one leg of each tower toward the other with the remaining two legs angled backward and toward either side of the first leg. This will provide maximum strength and stability.

b. Cable and Hoseline. Install cable and hoseline as follows:

(1) Drive anchor stake into the ground approximately 15 feet from each tower in line with both towers. Stake should protrude from ground approximately 6 inches. Use the driving head to drive stakes.

(2) Hang a pulley block from each tower and thread wire rope through pulley on near side.

(3) Pull wire rope across stream or obstruction.

4-17. HOSELINE SUSPENSION SET. - continued

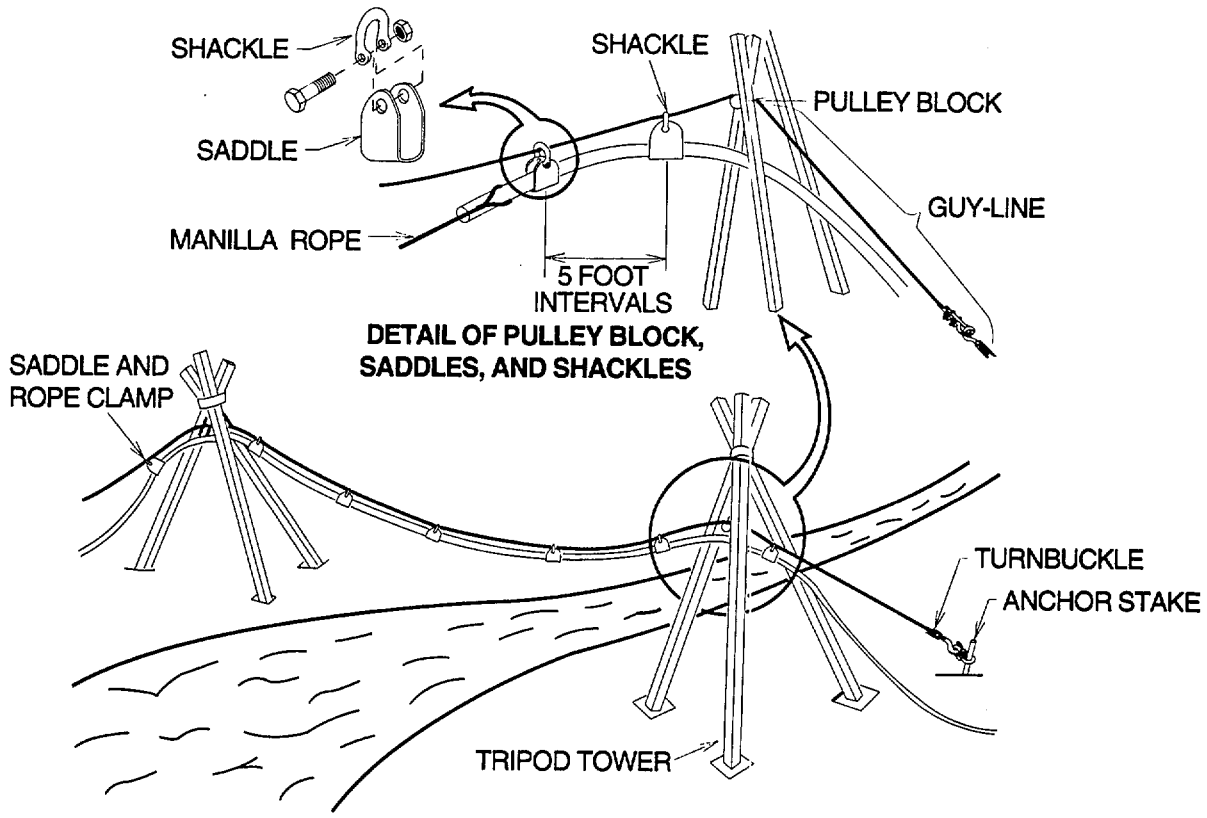


Figure 4-14. Suspension Kit Installation

(4) Thread wire rope through pulley block on far side. The hand hoist provided in the suspension kit can be used to apply initial tension to the cable.

(5) Make a loop of wire rope approximately 6 inches from one rope end and insert thimble into loop (figure 4-15).

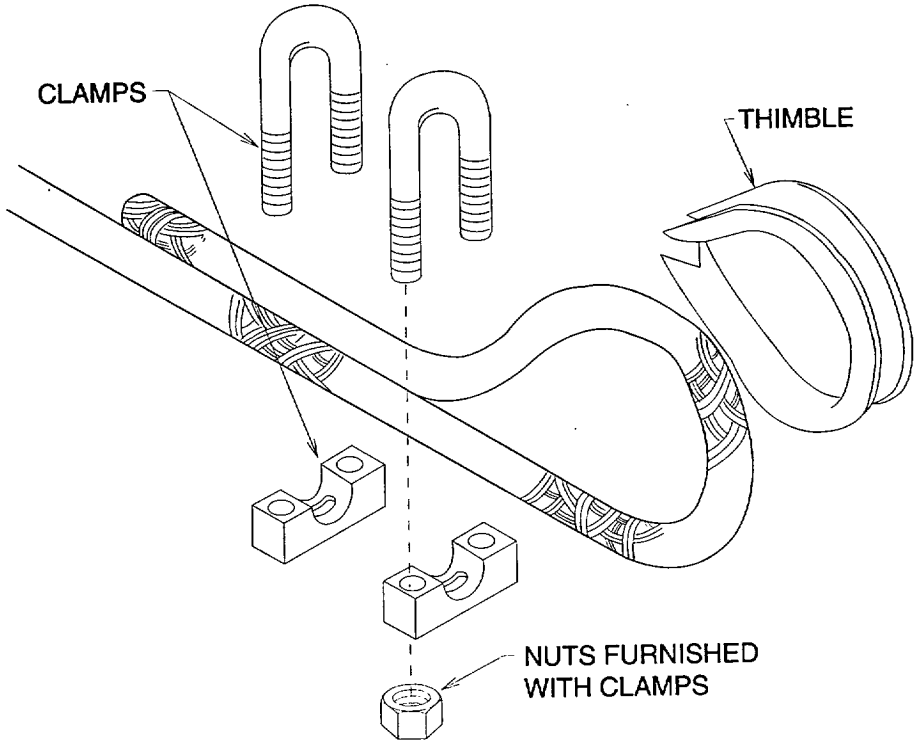


Figure 4-15. Installing Wire Rope Clamps

(6) Secure wire rope with two clamps.

(7) Unscrew turnbuckle so that it is nearly fully extended. This will allow for turnbuckle adjustment to take up wire rope sag (figure 4-16).

(8) Attach turnbuckle to wire rope at one end and engage stake with turnbuckle hook at the other end.

(9) Repeat steps (e) through (h) for opposite end of wire rope.

(10) Use turnbuckles to adjust sag in wire rope with no load to within limits shown in (figure 4-17).

(11) Place shackle on wire rope, lift hose end, wrap saddle around hose, and attach to shackle. Tie manila rope to leading end of hoseline (figure 4-14).

(12) As saddles are applied and secured, use the manila rope to pull hoseline across the stream, gap, or obstruction. Saddles will travel along wire rope, providing support for hoseline.

(13) When hoseline is in place, use three or more clamps (depending upon need) to secure shackles to wire rope to prevent an accumulation of slack in center of span.

(14) After hoseline is filled use turnbuckles to adjust sag to within the limits (see figure 4-17).

4-17. HOSELINE SUSPENSION SET. - continued

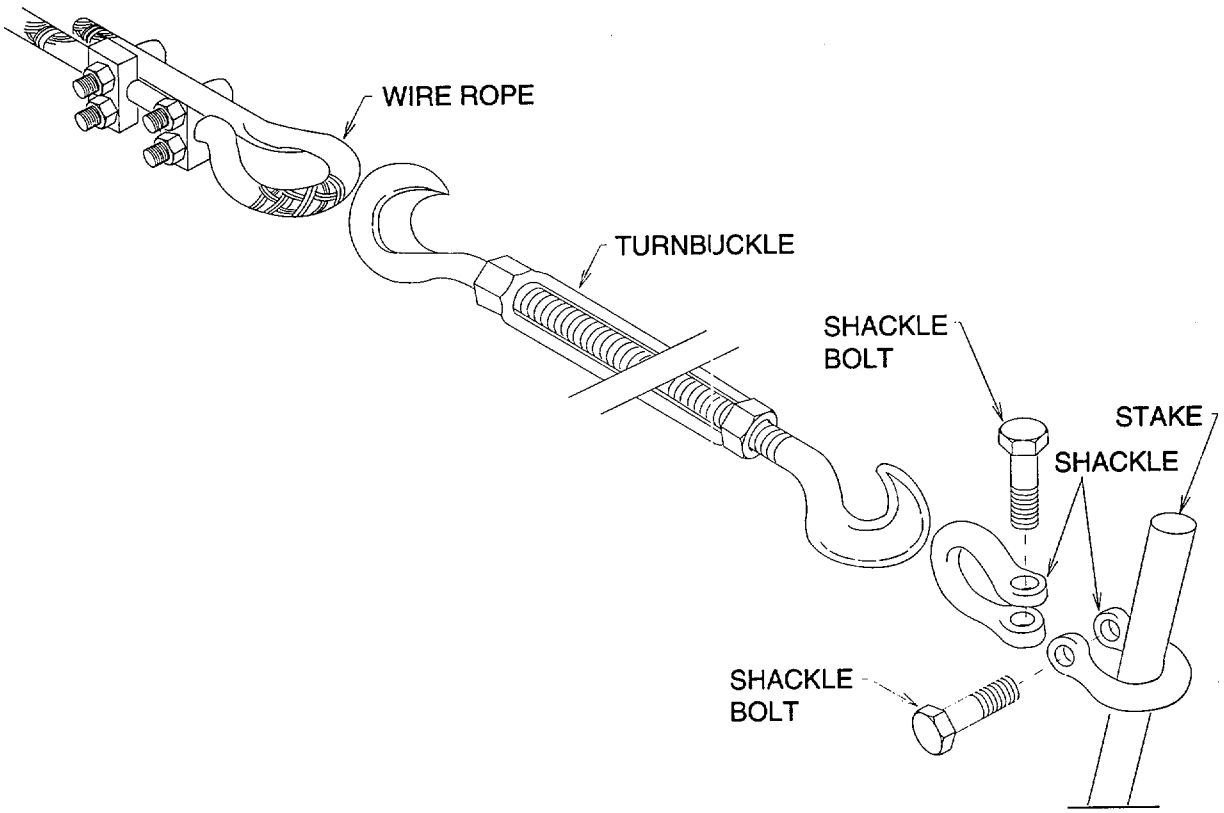
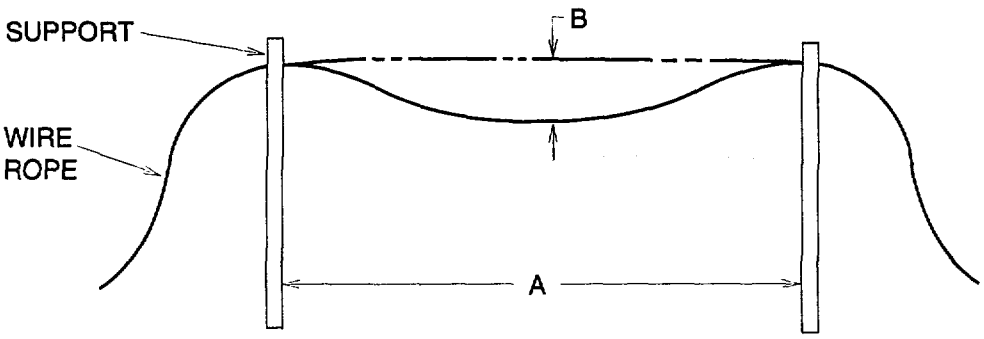


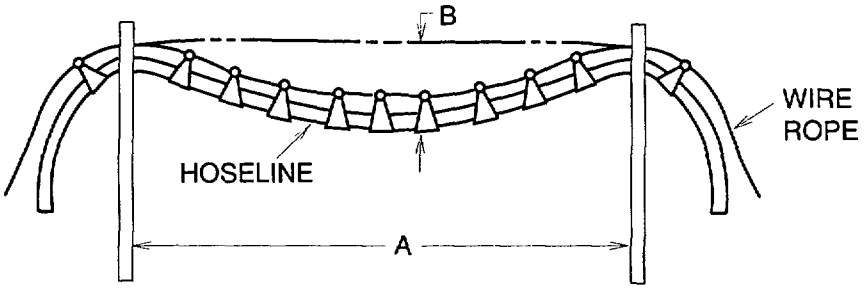
Figure 4-16. Stake and Turnbuckle Installation



Span distance		Maximum sag	
Dimension A		Dimension B	
feet	meters	feet (approx)	meters (approx)
25	7.62	1.5	.457
50	15.24	3.0	.914
75	22.86	4.5	1.372
100	30.48	6.5	1.981
150	45.72	9.5	2.896
200	60.96	13.0	3.962

Note
Maximum sag limits (Dimensions B) are based on 6% of the span distance (Dimension A) and are applicaple to a wire rope installed minus the hoseline.

Maximum Allowable Wire Rope Sag



Span distance		Maximum sag	
Dimension A		Dimension B	
feet	meters	feet	meters
25	7.62	2.25	.686
50	15.24	4.50	1.372
75	22.86	6.75	2.057
100	30.48	9.00	2.743
150	45.72	13.50	4.115
200	60.96	18.00	5.486

Note
Maximum sag limits (Dimensions B) are based on 6% of the span distance (Dimension A) and are applicaple to a hoseline filled with water.

Maximum Allowable Hoseline Sag

Figure 4-17. Maximum Allowable Sag

4-18. AREA CLEANUP AND CORRECTIVE PAINTING.

a. The area must be cleaned up by the installation crew prior to commencing operations. Remove all construction dregs, obstructions, boxes, etc. Unused materials, hose, fittings, etc., should be stored in a specific area for future use. All caps, plugs, etc., should be boxed and marked for use.

b. Touch up or paint all metal parts having finish damage or not previously painted in accordance with TM 43-0139.

4-19. FINAL INSPECTION OF ASSEMBLED ITEMS.

It is important to perform final inspection using a checklist arranged using the following as a guideline:

a. Check integrity and height of tank berms. Check that drain valves are closed.

b. Check location and operability of Floodlights. Check grounding.

c. Check that fabric collapsible tanks are properly laid down.

d. Check location and operability of pumps. Check grounding.

e. Check flow direction of meter skid assemblies.

f. Check flow directions of filter-separator and that test adapters are installed.

g. Check hoselines, valves, and fittings: All couplings closed, flanges tight, valve packing glands tight, valves in operable position and closed. No sharp bends, proper lay on tank tops, sandbags on free ends and bends subject to whip, and the general condition of the hoseline.

h. Check sampling assembly location. Check for tight joints and closed valves.

i. Check that fire suppression equipment is charged, ready to operate, and in proper location.

j. Check that safety and no smoking signs are readable and in place.

k. Review pressure test results and evidence of corrective action.

l. Check that road crossing protection (culverts and suspension device) are in place where needed.

m. Check range poles for proper installation with cross cord at correct height.

n. Check that corrective painting is complete.

o. Check that equipment identification markings are correct and adequate.

p. Check that portable fuel testing kit is intact.

q. Clean up area adequately.

r. Correct the faults found in inspection/re-inspect. Do not proceed with operations until all points affecting the integrity and safety of the system are corrected.

4-20. INITIAL ADJUSTMENTS, CHECKS AND SELF TESTS.

It is recommended that the TPT system, particularly the hose systems, be pressure tested before it is placed in operation. The purpose of the test is to prove the integrity of the system, by locating leaks, blockages, and installation faults. The purpose is not to prove the strength of materials; therefore, test pressures are limited to the maximum design operating pressure. A complete test is recommended; however, it is understood that some deviation may be required due to specific site conditions and immediate operating needs. The extent of pressure testing and the test media used is up to the operating authority.

a. Test Medium.

(1) Tests can be conducted with one of three different test mediums; air, water, or fuel. The medium used is dependent on the conditions at the specific site and installation/operations management decision. From a safety standpoint, a water test is the safest; however it has certain disadvantages, such as removing all water from the system. Air test should not be conducted at pressure in excess of the 50 psig and, therefore, cannot be used to locate leaks that occur at higher pressures. A fuel test can be handled safely if care is taken. This method will save time and is considered adequate.

(2) After the test medium has been decided and the line to be tested is filled, bring the test pressures up and hold long enough to thoroughly inspect the system for leaks and faults. The test pressure is then taken off the system and the leaks and faults corrected. The system must be re-tested after these corrections are made.

b. Maximum Test Pressures.

(1) General. Testing is for locating leaks, loose connections, blockage in system and flaws in construction. Testing will prove the integrity of the facility prior to regular operation. The test pressures listed under (3), (4), and (5), are below maximum pressures. The operating authority may designate lower pressures at their option.

(2) Fabric Collapsible Tanks. No pressure is allowed other than static liquid head plus 0.10 psig. Make sure tank vent is open and clear. The tanks may be filled to approximately 85 percent design capacity, with fuel. All inlet and outlet valves must be closed. Inspect for leaks. If any leaks develop, the tank must be emptied and repaired, tank refilled and inspected for leaks.

NOTE

If a section connected to a suction hose is being tested to higher pressure, the suction hose must be isolated from the tank and tested separately.

(3) Suction hose maximum test pressures are:

With water	100 psig
With fuel	100 psig
With air	50 psig

(4) Four-inch and smaller discharge hose, valves and fittings test pressures are:

With water	150 psig
With fuel	150 psig
With air	50 psig

(5) Six-inch pump discharge and transfer hose, valves and fittings test pressures are:

With water	150 psig
With fuel	150 psig
With air	50 psig

4-20. INITIAL ADJUSTMENTS, CHECKS AND SELF TESTS. - continued

NOTE

Certain fittings are rated at 75 psig maximum. These items are not to be exposed to test pressure above 75 psig. They can be isolated or removed during the test.

c. Test Pressure Source. Test pressure can be supplied from any source capable of holding the test pressures. The 600 gpm hoseline pump is suitable for testing with water or fuel. An air compressor must be available to proceed with an air pressure test.

CAUTION

Under no conditions are the fabric collapsible tanks to be subject to the air test pressures. Remove all connecting hoses to tanks to prevent this. Entry of air to the fabric tanks can exceed the tanks venting capacity, inflate, and possibly rupture the tank.

NOTE

All test media incompatible with the particular fuel service designated for the system tested, must be drained from the system before it is placed in service.

d. Preparations for Testing. The following actions should be taken to insure that the test runs smoothly.

(1) Be certain that there are sufficient gaskets, repair equipment, etc. available.

(2) Have caps and plugs available to blank off section under test. Valves in the system may be used to isolate hose sections as necessary.

(3) When testing with fuel:

(a) Locate fire suppression equipment near the testing area, and be sure that it is in operating condition (when testing with fuel).

(b) Make sure to have a tank vehicle and drums available, in case a section has to be drained (when testing with fuel).

(c) See that shovels and materials to dig and line a pit are al the test site in case there is a break and spill (when testing with fuel).

(4) After all the TPT equipment, hose, valves, and fittings are physically connected, there should be a meeting of all responsible personnel connected with the testing program. Each phase of the test plan including a communication plan shall be discussed and reviewed. Prior to filling a section for test, a final check should be made to verify the following:

(a) All valves are in proper position for filling.

(b) All hoses, valves and fittings connections are tight. Valve packing glands tight.

(c) Pumps are in good working condition.

e. Fuel Test Procedure.

(1) Adjust valves so that fuel can be pumped through the section being tested to exhausting air.

(2) Slowly pump fuel into the system, not to exceed a flow rate of 200 gpm. When all air is evacuated, discharge valves should be closed, the section should be filled with fuel and the pump should be stopped.

(3) Check all connections for leaks.

(4) Start the pump and raise pressure to 25 psi, stop the pump, check for leaks, and check gauges.

(5) If no leaks are found and gauges are okay, start pump and raise pressure to selected test pressure.

(6) Stop pump, check for leaks, and hold the test pressures for a period long enough to inspect the entire system under test.

(7) If leaks are found, relieve pressure, drain leaking section, and make repairs, adjustments, or replacements as necessary. Retest after repairs are made.

Section IV. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-21. GENERAL.

Preventive Maintenance Checks and Services means systematic caring, inspection, and servicing of equipment to keep it in good condition and ready to use. As the operator, your mission is to:

(1) Be sure to perform your PMCS each time you use the Tactical Petroleum Terminal.

(2) Do your "Daily" PMCS once a day.

(3) Do your "Weekly" PMCS once a week.

(4) Use DA Form 2404 (Equipment Inspection and Maintenance Worksheet) to record any faults that you discover before, during, or after use, unless you can fix the fault. You DO NOT need to record faults that you fix.

4-22. PMCS PROCEDURES.

a. Your Preventive Maintenance Checks and Services, table 4-1, lists inspections and care required to keep your equipment in good operating condition.

b. The "Interval" column of table 4-1 tells you when to do a certain check or service.

c. The "Procedure" column of table 4-1 tells you how to do required checks and services.

NOTE
Terms "ready/available" and "mission capable" refer to same status: Equipment is on hand and ready to perform its mission. (See DA Pam 738-750.)

d. The "Not Fully Mission Capable If:" column in table 4-1 tells you when your equipment is non-mission capable and why it cannot be used.

e. For decals and instruction plates on the major components, see the following Technical Manuals:

(1) Fire Suppression Equipment, TM 10-4210-235-13

(2) 350 GPM Pump Unit, TM 5-4320-226-14 or TM 10-4320-324-14

(3) 50,000 Gal and 5,000 BBL Collapsible Fabric Tanks, TM 10-5430-219-12

(4) Petroleum Aviation Fuel Contamination Testing Kit, TM 10-6630-240-12&P or TM 10-6630-218-10

(5) 600 GPM Pump Unit, TM 5-4320-305-10

(6) Type D-1 Nozzle Assembly, TM 10-4930-246-13&P

(7) 350 GPM Frame Mounted Liquid Fuel Filter Separator, TM 5-4330-211-12 or TM 10-4330-235-13&P

(8) Trailer Mounted Floodlight Set, TM 9-6230-211-14

Table 4-1. Unit Preventive Maintenance Checks and Services for Tactical Petroleum Terminal

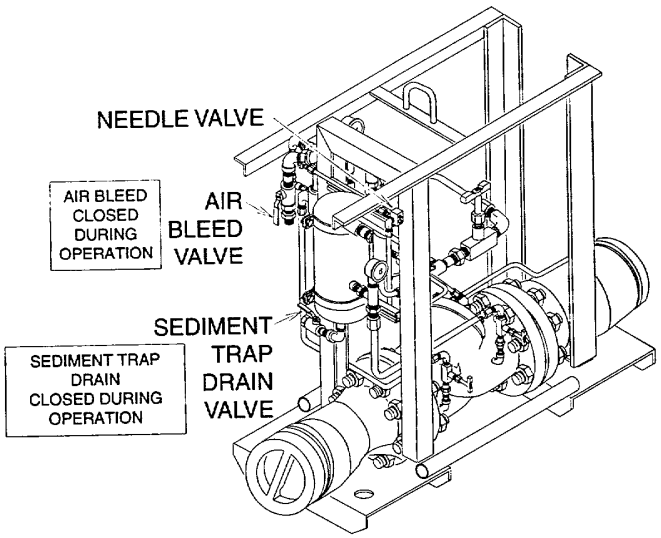
Item No.	Interval	Location / Item to Check/Service	Procedure	Not Fully Mission Capable if:
1	Daily	Pressure Regulator Strainers	a. Place a container under the SEDIMENT TRAP DRAIN and open the valve to dump excess debris from the bottom of sediment trap.	Drain inoperable.
			b. Check the condition of the fluid upstream of the WYE Strainer by placing a container under the AIR BLEED valve outlet and collecting a small amount of fluid. If the fluid appears dirty the WYE Strainer must be cleaned. **NOTE** **If WYE Strainer needs frequent cleaning or the response time of the main pressure regulator cylinder valve starts to slow down the integral strainer in the needle valve should also be cleaned.**	Fluid excessively dirty.
				
2	Weekly	Complete System	Check for leaks.	Leak found.
3	Weekly	Grounding System	Check for broken ground cables or damaged ground rods.	Any damage that would not allow a good ground.

Table 4-1. Unit Preventive Maintenance Checks and Services for Tactical Petroleum Terminal - continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
4	Weekly	Roadways, Tank Berms, and Drainage	Inspect for erosion and general condition.	Any problems that would cause unsafe operation or damage to other equipment.
5	Weekly	Nestable Culverts and Suspension Devices	Check that culverts and suspension devices are in place and in good condition.	Any problem that would cause unsafe operation or damage to hoses or other equipment.
6	Weekly	6 inch 800 GPM Meter Skid Assembly	Clean filter. a. Remove the head bolts and lift the entire head with the air eliminator off and set it down such that the seating surfaces do not get dirty. **WARNING** **Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in a well ventilated area.** b. Pull the basket up and out, empty any debris in the basket and flush the basket clean using solvent (Appendix E, Item 2). c. Clean any debris from inside the body and mating flange surfaces with solvent (Appendix E, Item 2). d. Reinstall basket and secure the head.	Strainer basket broken or badly deformed.

Section V. UNIT TROUBLESHOOTING PROCEDURES

4-23. GENERAL.

The branching logic tree diagrams list common malfunctions that you may find with your equipment. Follow the instructions given in the order they appear.

The branching logic tree diagrams cannot list all the malfunctions that may occur, all the steps needed to find the fault, or all the corrective actions needed to correct the fault. If the equipment malfunction is not listed or corrective actions taken do not correct the fault, notify your supervisor.

For troubleshooting of the following major components see the appropriate individual technical manual.

Fire Suppression Equipment, TM 10-4210-235-13

350 GPM Pump Unit, TM 5-4320-226-14 or TM 10-4320-324-14

50,000 Gal and 5,000 BBL Collapsible Fabric Tanks, TM 10-5430-219-12

Petroleum Aviation Fuel Contamination Test Kit, TM 10-6630-240-12&P or TM 10-6630-218-10

600 GPM Pump Unit, TM 5-4320-305-10

Type D-1 Nozzle Assembly, TM 10-4930-246-13&P

350 GPM Frame Mounted Liquid Fuel Filter Separator, TM 5-4330-211-12 or TM 10-4330-235-13&P

Trailer Mounted Floodlight Set, TM 9-6230-211-14

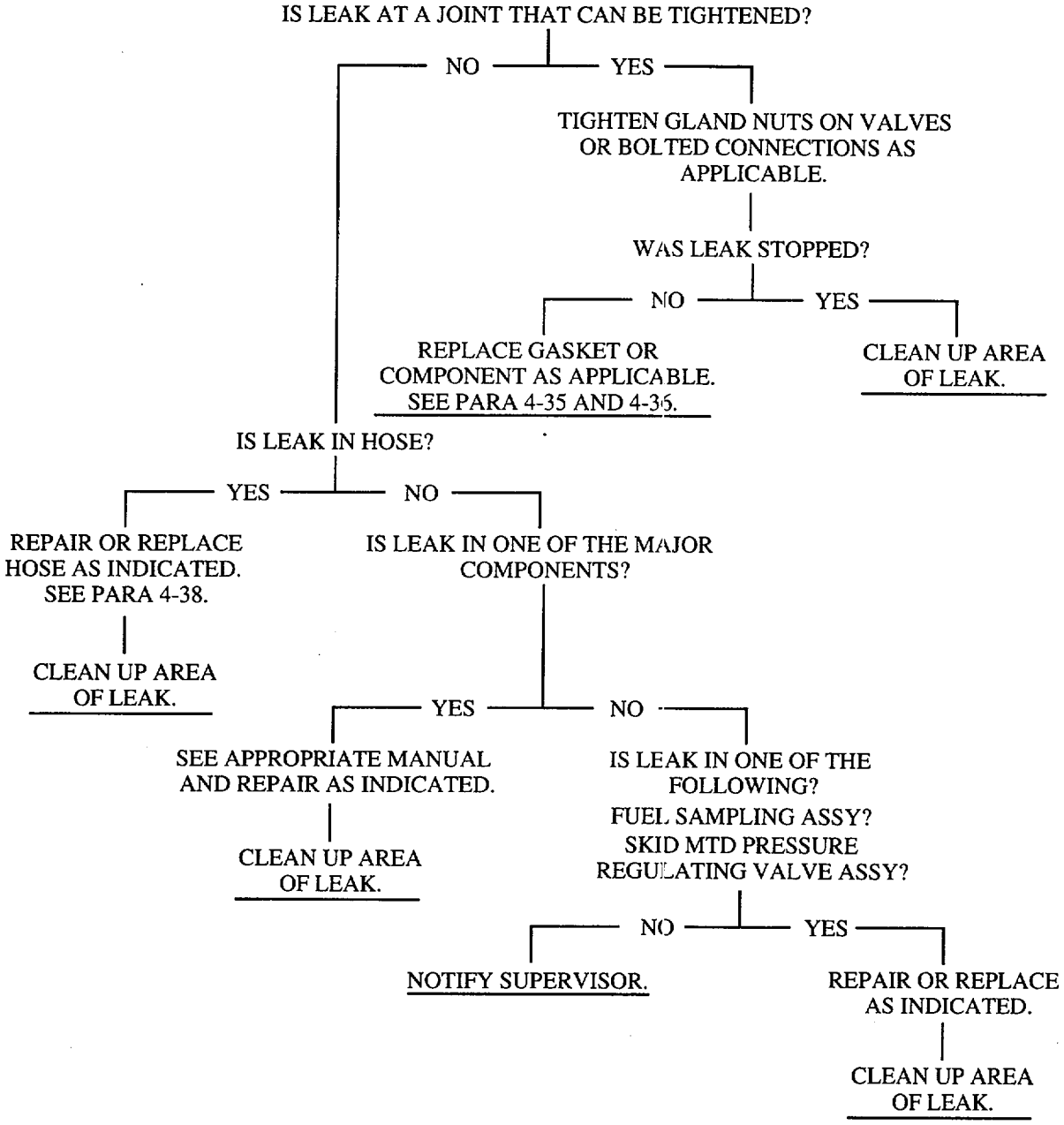
MALFUNCTION INDEX

4-24. ANY TYPE OF LEAKAGE EVIDENT.

WARNING

FUEL LEAKAGE

Immediately shut off flow to the area. Shut down any operations in immediate area. Route fire fighting equipment to the area.

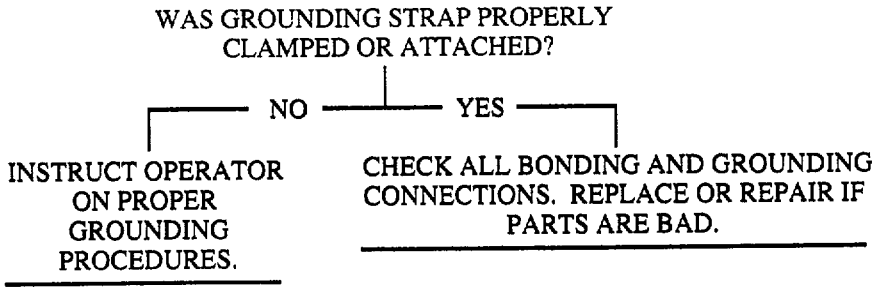


4-25. STATIC SPARK NOTED AT FUEL DISPENSING NOZZLE.

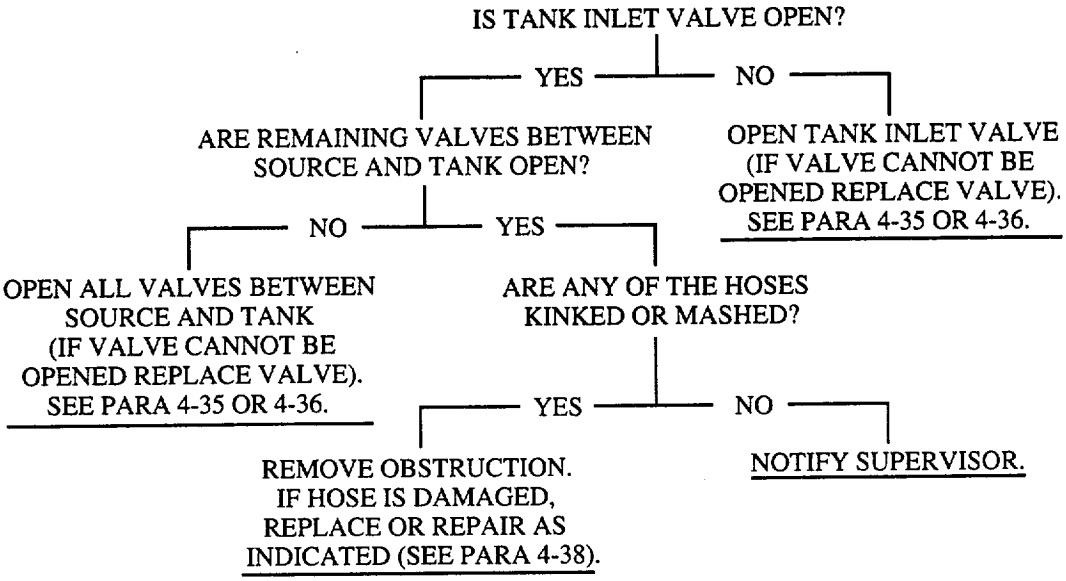
WARNING

STATIC SPARKS

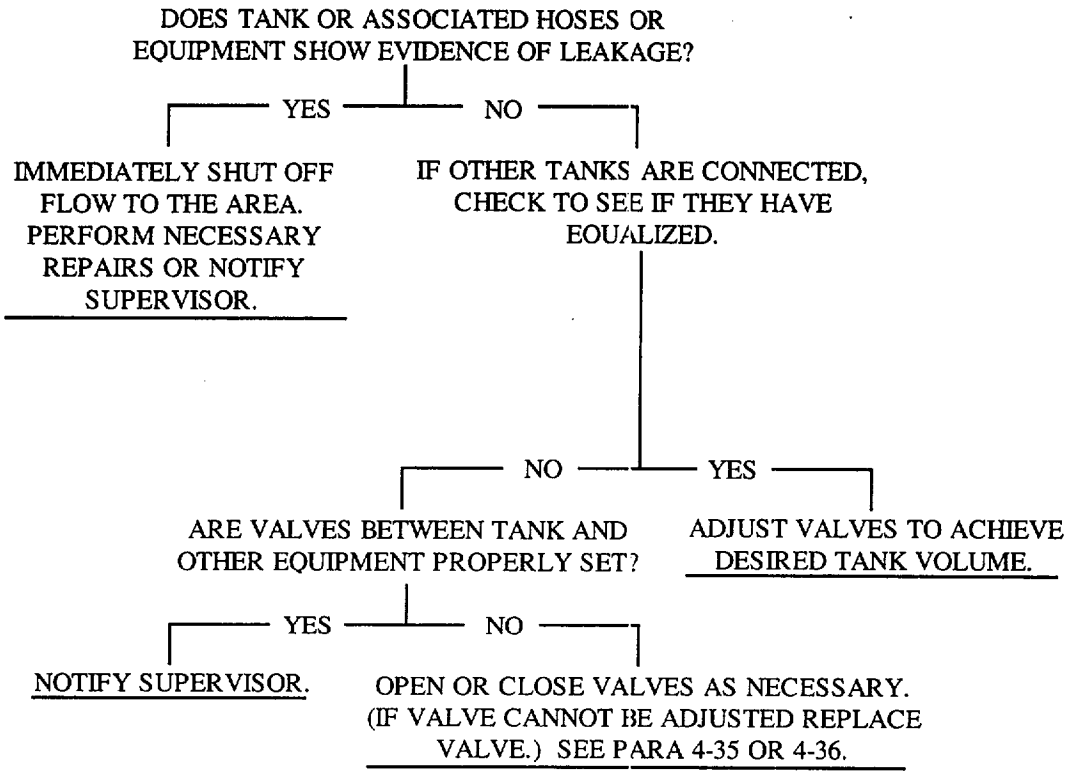
If static sparking is noted, cease operations immediately. Fire or explosion can result.



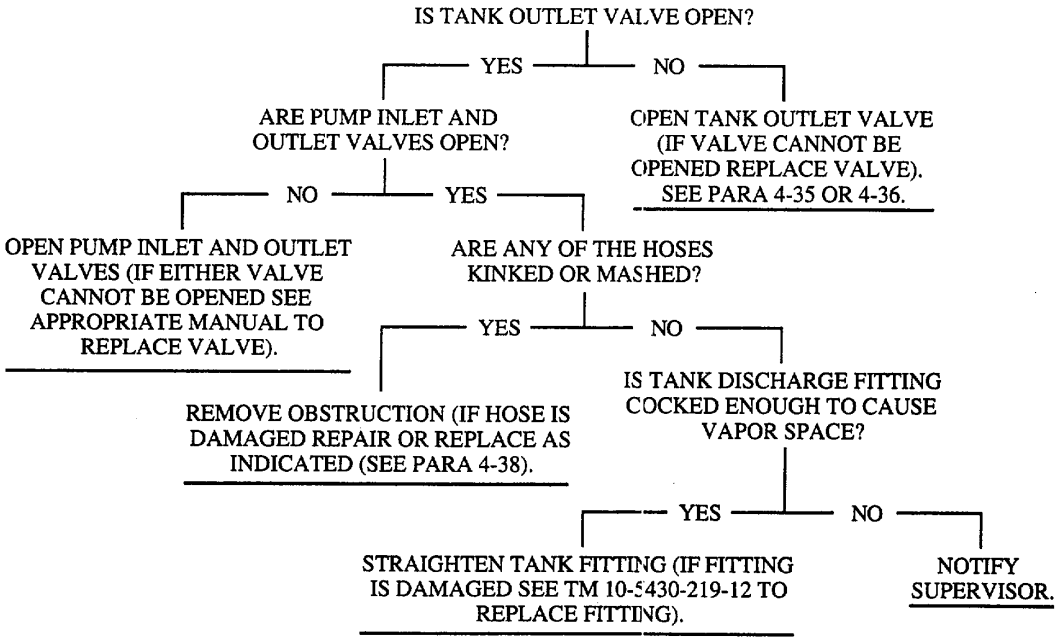
4-26. FLOW NOT ENTERING TANK.



4-27. UNEXPECTED TANK VOLUME CHANGE.

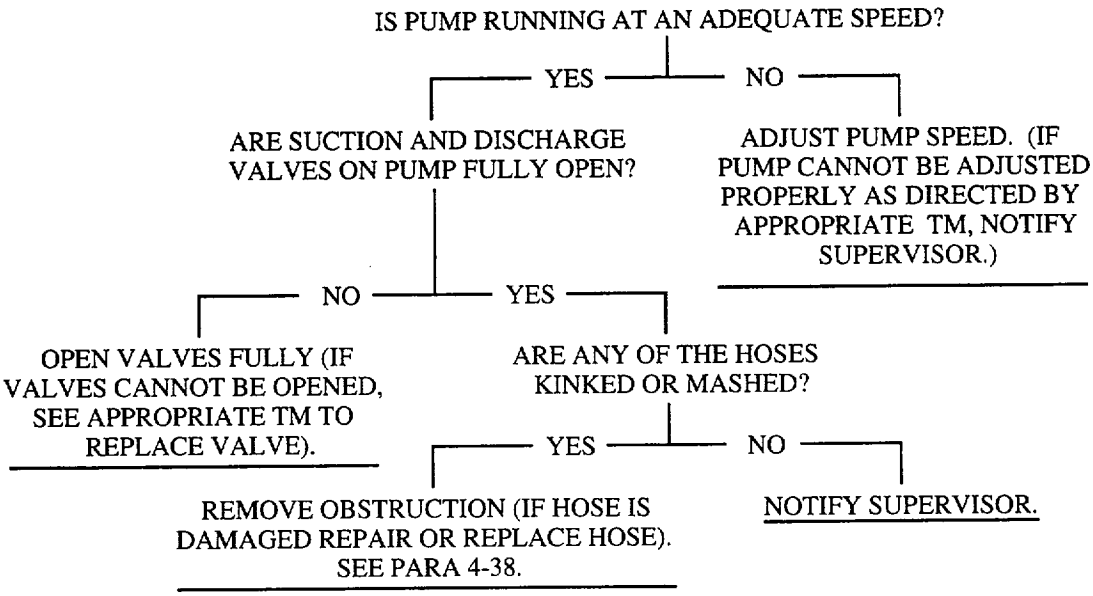


4-28. FLOW NOT LEAVING TANK.



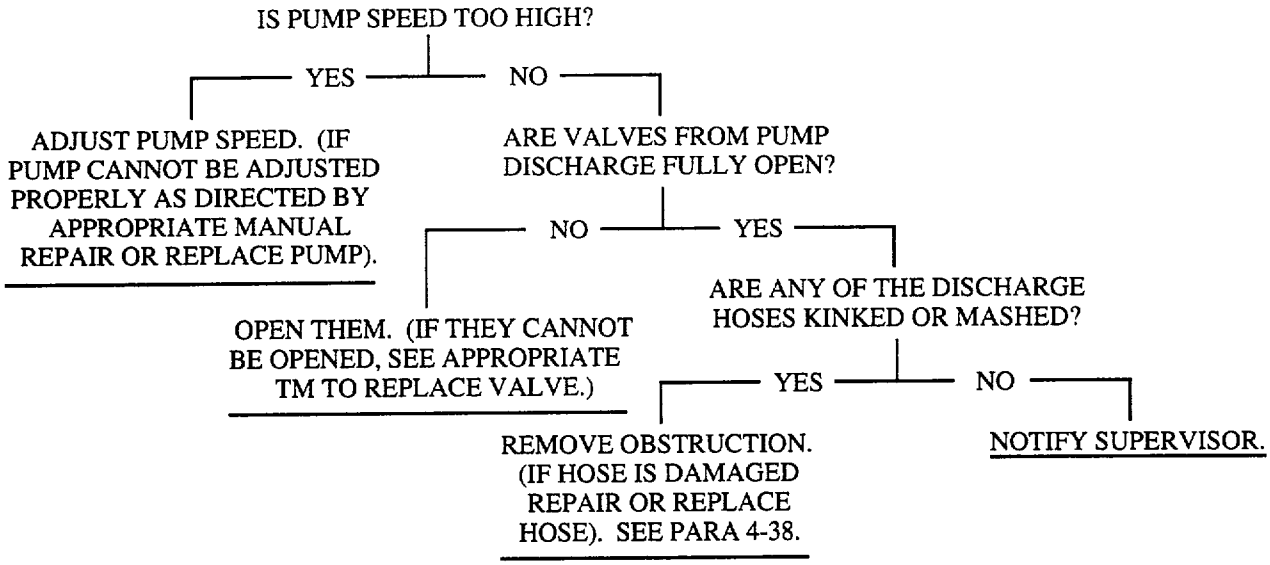
4-29. LOW PUMP DISCHARGE PRESSURE.

See appropriate TM for correct pump pressures.

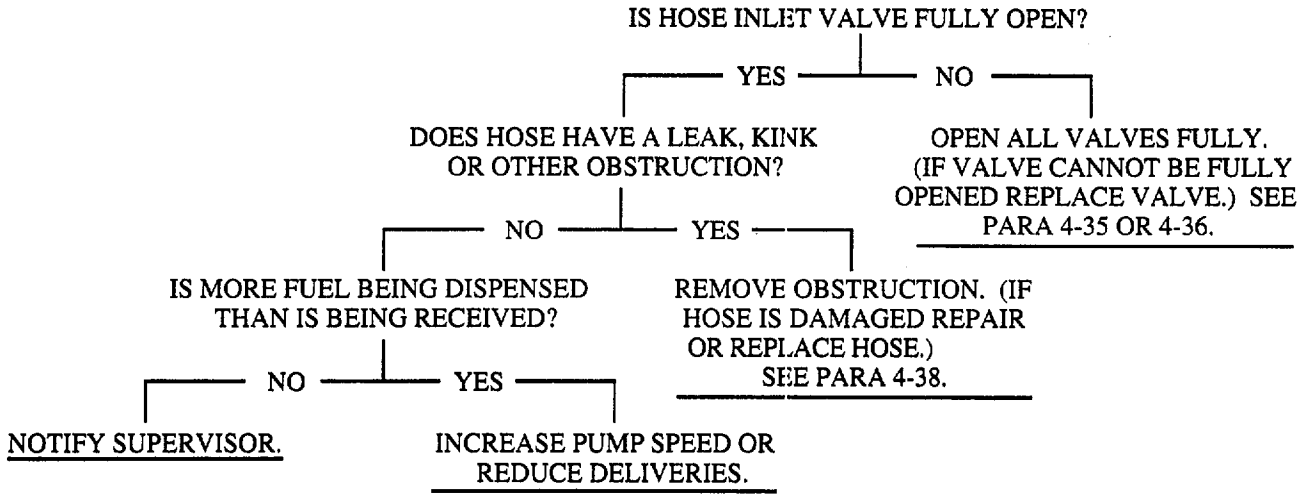


4-30. HIGH PUMP DISCHARGE PRESSURE.

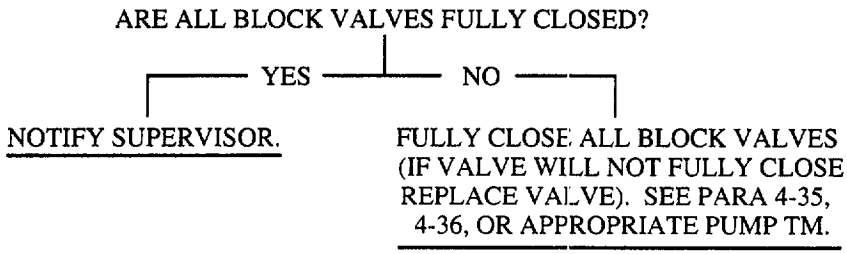
See appropriate TM for correct pump pressures.



4-31. LOW PRESSURE AT FUEL DISPENSING ASSEMBLY.



4-32. UNEXPECTED BACK FLOW.



Section VI. UNIT MAINTENANCE PROCEDURES

4-33. GENERAL.

The procedures in this section have been arranged in the order in which the items appear in the unit (O) maintenance level column on the Maintenance Allocation Chart (MAC) which is provided in Appendix B. Step-by-step procedures have been provided for all action authorized to be performed by unit maintenance in the order in which they appear on the MAC.

4-34. DE-PRESSURIZING AND DRAINING BEFORE MAINTENANCE REMOVAL OF COMPONENTS.

WARNING

DE-PRESSURIZE AND DRAIN FUEL

Before disconnecting or opening any equipment or system, be sure to de-pressurize and drain it first. Serious personnel injury and fire hazards can result if you do not.

WARNING

FUEL SPLASHES AND SPILLS

Splashes and spills can cause eye injury and skin irritation. Wear face shield ad approved gloves.

WARNING

FUEL SPILLS

Spills can result in saturated soil and cause a potential fire hazard.

a. A system is generally de-pressurized by opening the valves in the line of flow leading to a fabric collapsible tank. The valves upstream of the section to be de-pressurized are left closed.

b. Individual pieces of equipment such as the strainer in the meter strainer assembly, the filter separators, and the hose line pumps have individual vents and drains. After the system has been de-pressurized, or that piece of equipment blocked in, the vents and drains on the equipment should be opened before that particular item is worked on. This will assure de-pressurizing of the particular item.

c. The fuel dispensing assembly or the optional tanker-truck unloading system can be de-pressurized by opening the valves in the flow path to the tanker-truck after the associated pump has been shut down and blocked in.

d. When a fuel transfer has been completed the valve in the applicable flow line that is furthest upstream (closest to the source of fuel under pressure) should be closed first and sequentially followed by the closing of the valves downstream. This will avoid the block in of fuel under pressure and thus enhance the safety of the system. A line closed off in this manner will be de-pressurized.

e. When a system, or a portion of a system, must be drained for maintenance the system must be de-pressurized first. Arrangements should be made for containers to hold the drained fuel for subsequent disposal. The closure(s) (flanges or couplings) at the lowest point(s) should then be opened first and the hose drained into the container(s). A closure at the highest point should then be opened to allow complete drainage.

NOTE
For disposal of contaminated fuel refer to FM 10-69.

4-35. REMOVAL AND INSTALLATION OF COMPONENTS WITH QUICK DISCONNECT FITTINGS.

This task consists of: a. Removal b. Installation

INITIAL SETUP

Material/Parts	Equipment Condition
Rags (Appendix E, Item 4).	System de-pressurized and drained. (See para 4-34.)

This paragraph applies to the following components:

3 inch Ball Valve Assembly
4 inch x 25 ft Hose Assembly
4 inch x 12 ft Hose Assembly
1 inch x 25 ft Hose Assembly
Female Coupling Adapter Assembly (6 inch)
Male Coupling Adapter Assembly (4 inch)
4 inch Butterfly Valve Assembly
4 inch Gate Valve
1-1/2 inch Ball Valve Assembly
1-1/2 inch x 25 foot Hose Assembly
Coupling Assembly, Dry Break
NATO Tank Truck Adapter Coupling Set
Water Detection Kit Adapter Assembly
4 inch "Y" Assembly
Filter Separator Assembly
Male Coupling Adapter Assembly (6 inch)

WARNING

FUEL SPILLS

Spills can result in saturated soil and cause a potential fire hazard.

a. Removal.

(1) Release cam arms (1).

(2) Carefully pull fittings apart.

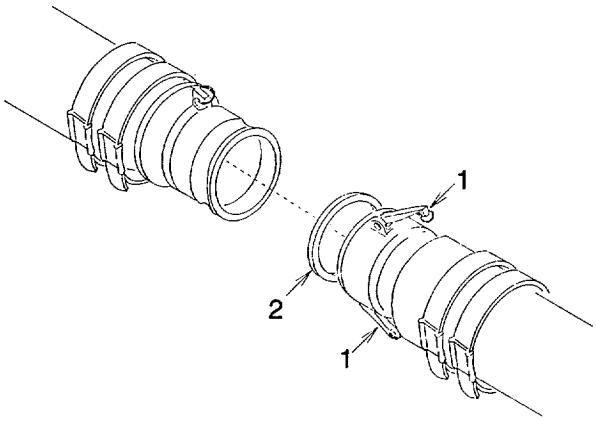


Figure 4-18. Quick Disconnect Fittings

b. Installation.

(1) Check condition of gasket (2). Replace if damaged.

(2) Wipe fittings with clean rag.

(3) Slip fittings together and close cam arms (1).

4-36. REMOVAL AND INSTALLATION OF COMPONENTS WVITH DOUBLE GROOVE CONNECTION FITTINGS.

This task covers: a. Removal b. Installation

INITIAL SETUP

Material/Parts	Equipment Condition
Rags (Appendix E, Item 4).	System de-pressurized and drained. (See para 4-34.)
Petrolatum (Appendix E, Item 5).	

This paragraph applies to the following components:

6 inch x 50 ft Hose Assembly
6 inch Gate Valve Assembly
6 inch x 500 ft Hose Assembly
6 inch Ball Valve Assembly
Fuel Sampling Assembly
Pressure Regulating Valve Assembly
6 inch x 12 ft Hose Assembly
Female Coupling Adapter Assembly (6 inch)
Female Coupling Adapter Assembly (4 inch)
6 inch Pressure Control Valve Assembly
Male Coupling Adapter Assembly (6 inch)
Meter Skid Assembly

WARNING

FUEL SPILLS

Spills can result in saturated soil and cause a potential fire hazard.

a. Removal.

(1) Release coupling handle (1).

(2) Carefully pull fittings apart.

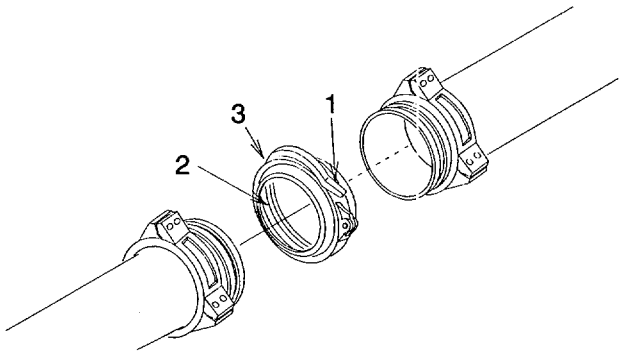


Figure 4-19. Double Groove Connection Fittings

b. Installation.

NOTE

Liberally apply petrolatum to the gasket and the inside surface of coupling clamps when they are installed. This will help avoid pinching the gasket when the clamp is closed.

(1) Slip gasket (2) in place on one end to be coupled.

(2) Slip second end to be coupled in to place and support square with first coupling joint.

(3) Center gasket (2) over grooved ends.

(4) Place coupling (3) over gasket (2) and close coupling handle (1).

4-37. PRESSURE REGULATING VALVE ASSEMBLY REMOVAL AND INSTALLATION.

INITIAL SETUP

Tools	Equipment Condition
Tool Kit, General Mechanics (Appendix B, Section III, Item 1).	System de-pressurized and drained. (See para 4-34.)

WARNING

FUEL SPILLS

Spills can result in saturated soil and cause a potential fire hazard.

The pressure regulating valve assembly is secured by single groove fittings. Although the pressure regulating valve assembly is a TPT component, the single groove fittings must be removed and installed by pipeline maintenance personnel.

4-38. HOSE REPAIR.

This task covers:	Repair

INITIAL SETUP

Tools	Equipment Condition
Tool Kit, General Mechanics (Appendix B, Section III, Item 1).	System de-pressurized and drained. (See para 4-34.)

WARNING

FUEL SPILLS

Spills can result in saturated soil and cause a potential fire hazard.

a. See U.S. Army manuals TM 5-343 and FM 10-69 for additional instructions on hose repair.

b. Three part menders are provided for repair of 4 and 6 inch hoses.

(1) Cut hose (1) to be repaired at least 3 inches back from the visible rupture or tears.

(2) Slip hose (1) ends onto mender (2).

(3) Install one three part clamp (3) on each hose (1) and mender (2) end.

(4) Install six each screws (4), flat washers (5), and nuts (6).

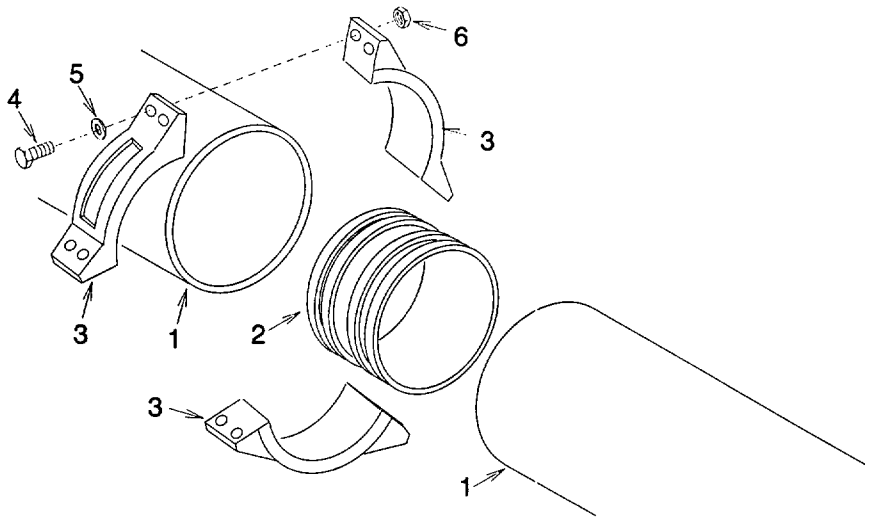


Figure 4-20. Adapter Clamp

4-39. SELF DRIVING GROUND ROD REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools

Tool Kit, General Mechanics (Appendix B, Section III, Item 1).

a. Removal.

(1) Remove grounding/bonding clips (1) from equipment.

(2) Use sliding weight (2) to hammer ground rod assembly (3) out of the ground.

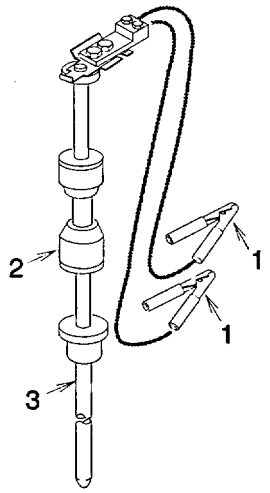


Figure 4-21. Self Driving Ground Rod Assembly

b. Installation.

(1) Drive ground rod assembly (3) into the ground using the sliding weight (2).

(2) Attach clips (1) to equipment as necessary for bonding/grounding.

4-40. HOSELINE SUSPENSION SET REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools

Tool Kit, General Mechanics (Appendix B, Section III, Item 1).

NOTE

Disassemble only to extent necessary for repair.

a. Disassembly.

(1) Unhook wire rope ends from turnbuckle.

(2) Remove nuts, clamps, and thimble.

(3) Pull wire rope from shackles.

(4) Unhook turnbuckle from shackle.

(5) Remove two shackle bolts, shackle, and anchor stake.

(6) Remove nut, shackle bolt, shackle, and saddle.

b. Repair. Replace damaged components only to extent necessary fir repair.

c. Assembly.

(1) Install cable and hoseline as follows:

(a) Drive anchor stake into the ground approximately 15 feet from each tower in line with both towers. Take should protrude from ground approximately 6 inches. Use the driving head to drive stakes (figure 4-21).

(b) Hang a pulley block from each tower and thread wire rope through pulley on near side.

(c) Pull wire rope across stream or obstruction.

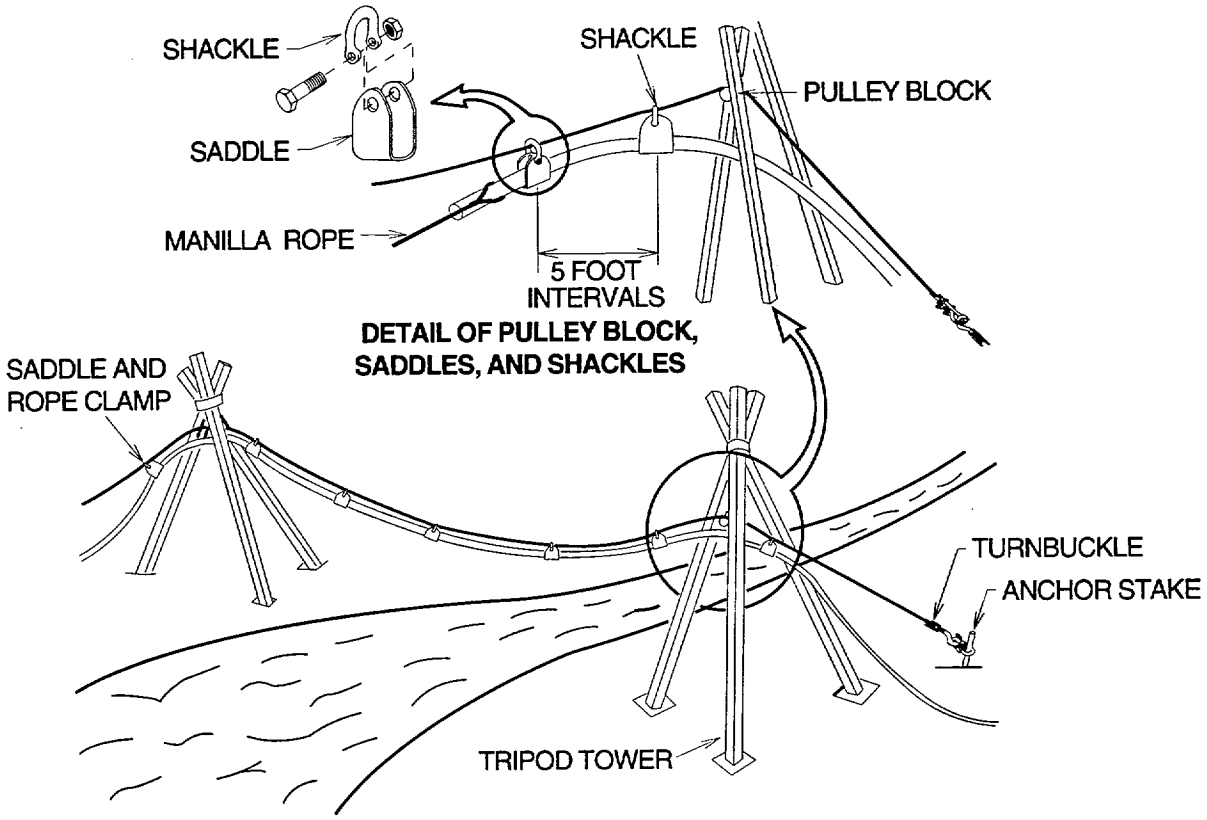


Figure 4-22. Suspension Kit Installation

(d) Thread wire rope through pulley block on far side. The hand hoist provided in the suspension kit can be used to apply initial tension to the cable.

(e) Make a loop of the wire rope approximately 6 inches from one rope end and insert thimble into loop (figure 4-22).

4-40. HOSELINE SUSPENSION SET REPAIR. - continued

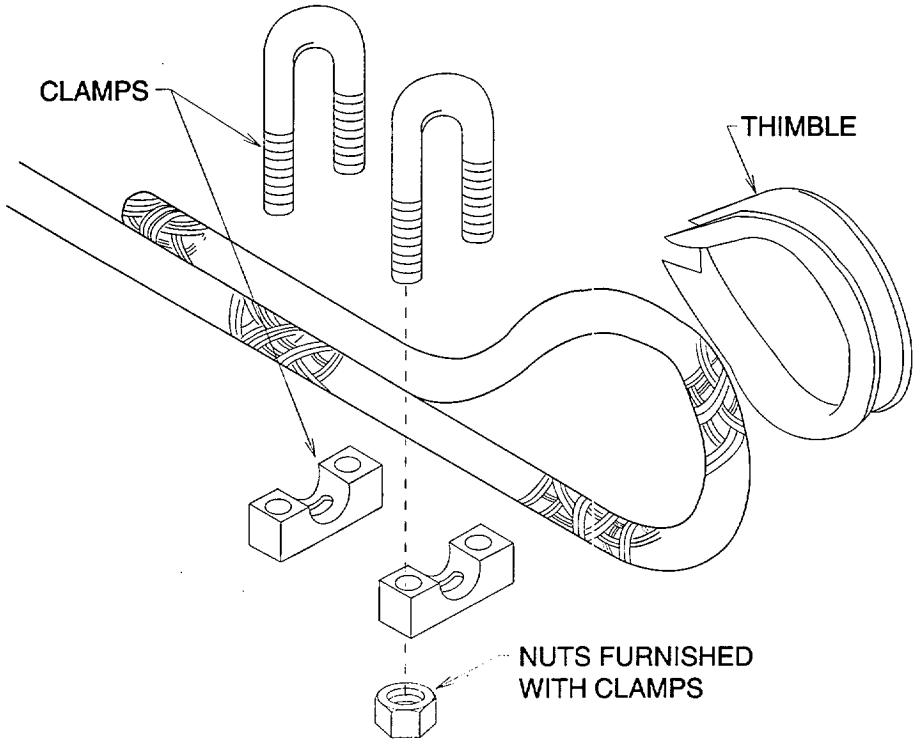


Figure 4-23. Installing Wire Rope Clamps

(f) Secure wire rope with two clamps.

(g) Unscrew turnbuckle so that it is nearly fully extended This will allow for turnbuckle adjustment to take up wire rope sag.

NOTE

If the crossing is very wide, initial tension on the cable can be created by the hand hoist provided in the suspension kit. After initial tension is achieved, connect the cable with the turnbuckles in the nearly fully extended condition in accordance with step (e). This will enable maximum adjustment of the turnbuckles for reducing the sag in the cable after the hoseline is filled with water.

(h) Attach turnbuckle to wire rope at one end and engage slake with turnbuckle hook at the other end (figure 4-23).

(i) Attach opposite end of wire rope exactly as in steps (e) through (h).

(j) Use turnbuckles to adjust sag in wire rope with no load to within limits.

(k) Place shackle on wire rope, lift hose end, wrap saddle around hose, and attach to shackle. Tie manila rope to leading end of hoseline.

(l) As saddles are applied and secured, use the manila rope to pull hoseline across the stream, gap, or obstruction. Saddles will travel along wire rope, providing support for hoseline.

(m) When hoseline is in place, use three or more clamps (depending upon need) to secure shackles to wire rope to prevent an accumulation of slack in center of span.

(n) After hoseline is filled use turnbuckles to adjust sag to within the limits. (See figure 4-24.)

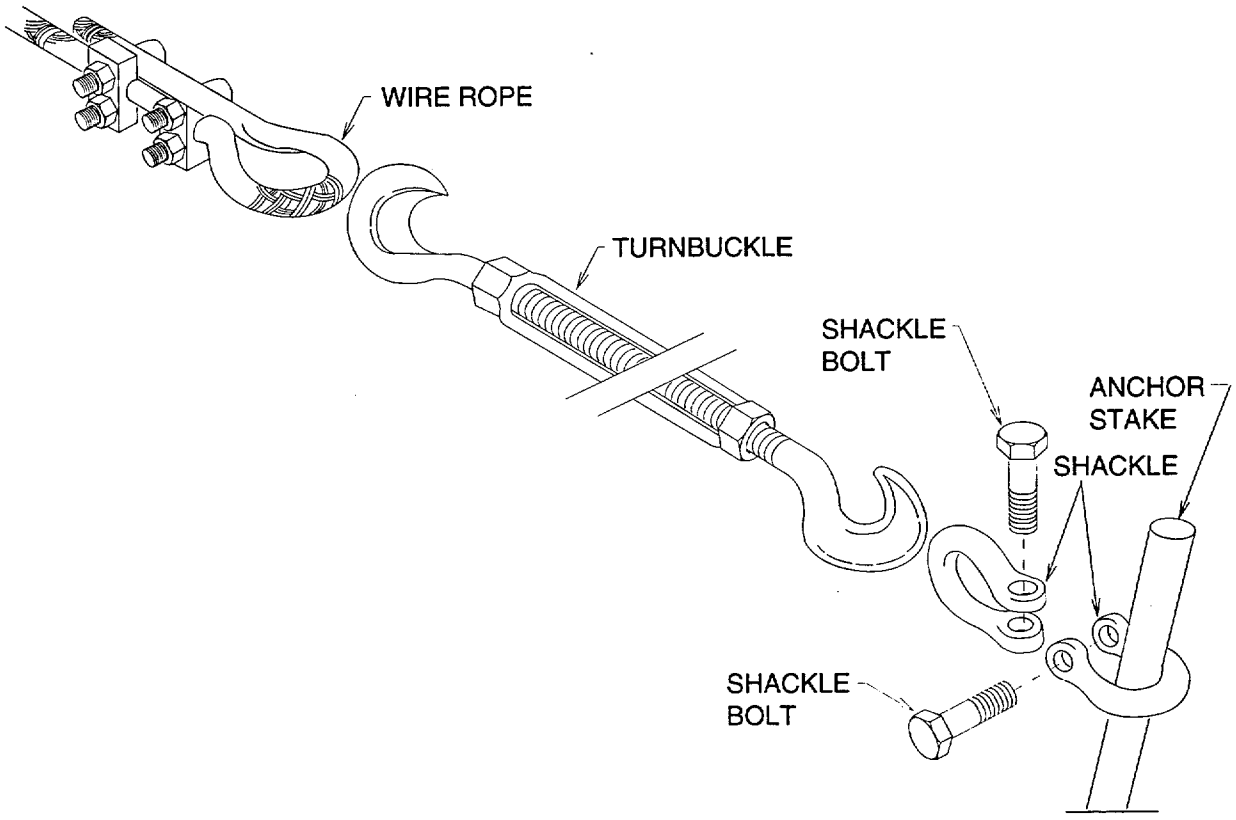
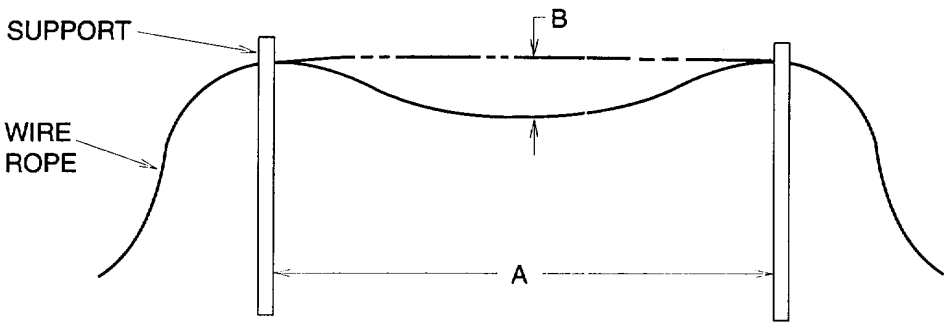


Figure 4-24. Stake and Turnbuckle Installation

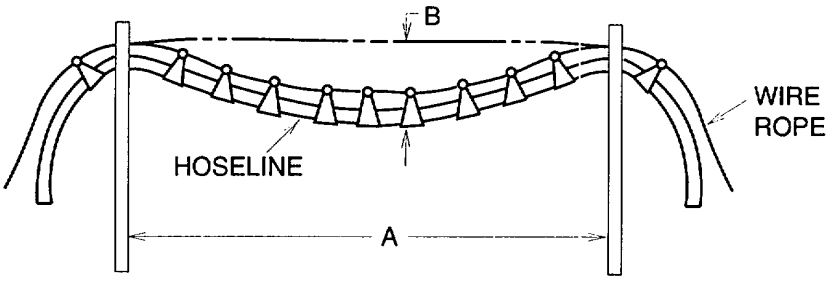
4-40. HOSELINE SUSPENSION SET REPAIR. - continued



Span distance		Maximum sag	
Dimension A		Dimension B	
feet	meters	feet (approx)	meters (approx)
25	7.62	1.5	.457
50	15.24	3.0	.914
75	22.86	4.5	1.372
100	30.48	6.5	1.981
150	45.72	9.5	2.896
200	60.96	13.0	3.962

Note
Maximum sag limits (Dimensions B) are based on 6% of the span distance (Dimension A) and are applicaple to a wire rope installed minus the hoseline.

Maximum Allowable Wire Rope Sag



Span distance		Maximum sag	
Dimension A		Dimension B	
feet	meters	feet	meters
25	7.62	2.25	.686
50	15.24	4.50	1.372
75	22.86	6.75	2.057
100	30.48	9.00	2.743
150	45.72	13.50	4.115
200	60.96	18.00	5.486

Note
Maximum sag limits (Dimensions B) are based on 6% of the span distance (Dimension A) and are applicaple to a hoseline filled with water.

Maximum Allowable Hoseline Sag

Figure 4-25. Maximum Allowable Sag

4-41. 4 INCH "Y" ASSEMBLY REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools

Tool Kit, General Mechanics (Appendix B, Section III, Item 1).

Material/Parts

Lock washer (24 each) (Appendix I, Item 4).
Gaskets (3 each) (Appendix I, Item 5)-

Equipment Condition

"Y" assembly removed. (See para 4-35.)

NOTE

Disassemble only to extent necessary for repair.

a. Disassembly.

(1) Release cam arms and pull plug (1) and caps (2) away from couplings (3) and (4).

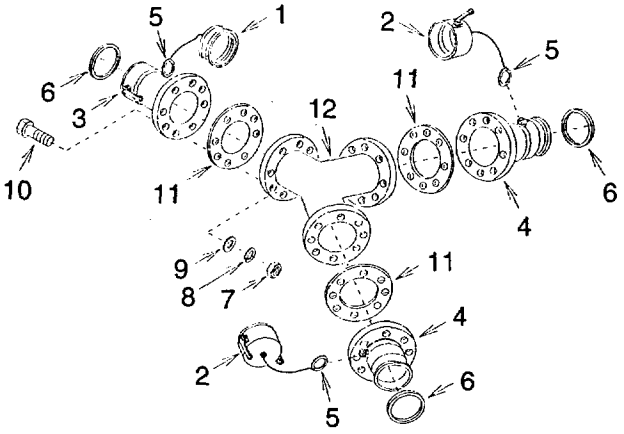


Figure 4-26. 4 Inch Cam-lock MxMxF "Y" Assembly

(2) Remove key rings (5), caps (2) and plug (1).

(3) Remove gaskets (6) from caps (2) and connector (3).

(4) Remove 24 each nuts (7), lock washers (8), flat washers (9), cap screws (10), couplings (3) and (4), and gaskets (11). Discard lock washers and gaskets.

4-41. 4 INCH "Y" ASSEMBLY REPAIR. - continued

b. Repair. Replace all defective parts only to extent necessary for repair.

c. Assembly.

(1) Install new gasket (11), couplings (3) and (4), cap screws (10), flat washers (9), new lock washers (8) and nuts (7) on flanged "Y" (12). Hand tighten hardware only.

(2) Torque flange cap screws to 24 ft-lbs as follows:

(a) Tighten to 75% of required torque in a progressive crisscross pattern to uniformly compress the gasket.

(b) Repeat the pattern to 100% of required torque.

(3) Install gaskets (6) into coupling (3) and caps (2).

(4) Attach caps (2) and plug (1) with key rings (5).

(5) Place plug (1) and caps (2) in position and close cam arms.

Section VII. PREPARATION FOR STORAGE OR SHIPMENT

This section provides information and criteria for the disassembly and preparation for storage and/or shipment of the TPT equipment. The instructions in this manual are general and cannot repeat all the detail found in other applicable technical manuals and the military specifications and standards for preservation and packing details. Serious attention must be given to proper disassembly, preservation, and repacking. The following procedures assume that a clean and organized area has been assigned for final inspection, preservation, and packing.

4-42. PREPARATION FOR STORAGE.

WARNING

PRESSURIZED SYSTEM

Do not break (open) any flanges or open any couplings until the system is de-pressurized at that location. Injury and fuel spills can result.

NOTE

For disposal of contaminated fuel refer to FM 10-69.

a. De-pressurizing and Draining System. (See para 4-34.)

The entire TPT hoseline system should be pumped and drained to the fabric collapsible tanks to the extent possible. The fuel in the tanks can then be pumped to tanker-trucks for disposal as called for by the operating authority.

b. Disassembly and Cleaning. The following guidelines are for the disassembly and cleaning of the system and each type of equipment.

(1) The thoroughness of the cleaning program is essential whether the equipment is to be stored or reused in the near future at another location.

(2) It is important that all equipment be identified for both the repacking program and for the benefit of the next user. Equipment that can be readily identified by the packer need not be marked at the time of disassembly, however, the various fittings, valves, and hoselines should be tagged at the time of disassembly so that the packing personnel have no problem in identifying the item and marking it in a more permanent manner.

(3) At the option of the operating authority, some of the cleaning described below may be conducted at the inspection, preservation, and packing area.

4-42. PREPARATION FOR STORAGE. - continued

WARNING

To avoid explosion or fire, use only explosion-proof electrical equipment and enforce "no smoking" rules in and around all areas in which tanks and other equipment are being cleaned.

CAUTION

CLEAN AND DRY

All equipment must be clean and dry prior to preservation and packing. Water will result in corrosion, mildew, and general deterioration, depending on the materials of construction. Fuel left in the equipment may be a fire hazard during transportation and storage. Dirt and debris can cause corrosion and can damage equipment.

(4) Drain, Dry, and Disassemble the Fabric Collapsible Tanks.

WARNING

FUEL SPILLS

Spills can result in saturated soil and cause a potential fire hazard.

(a) After the tank has been pumped as dry as possible, remove the hoselines and fittings from the tank except for the bottom drain.

(b) Roll the tank up toward the bottom drain. If equipment and manpower are available to do so, the end of the tank can be lifted to cause flow toward the drain in lieu of rolling it up. Draw off the accumulated fuel through the drain valve into a sump or other suitable container which can be pumped dry later.

(c) Lay the tank out flat again. Flush the tank out with water and detergent followed by a clean water rinse. Pump the contaminated water to a disposal sum) or tanker-truck as best suits the local situation. Repeat this process until the flush water is free of fuel. Drain as much water as possible from the tank.

(d) Remove the tank from the pad and berm and place it in a clean area. Clean the tank thoroughly on the outside.

WARNING

Death or serious injury may result from exposure to toxic or flammable vapors, or insufficient oxygen, inside petroleum tanks. Do not enter a tank unless the atmosphere inside has been tested by technically qualified safety or health personnel to determine acceptable entry conditions.

WARNING

If any fuel, fuel vapor, or sludge remains in the tank, or an oxygen deficiency exists, the tank must be treated as a "permit-required confined space". No one may enter a permit-required confined space without approval from qualified safety or health personnel, and without required protective clothing and equipment, rescue and emergency service, safety equipment, training, standby personnel, and written permit. If an explosive atmosphere exists within the tank, the tank presents an immediate hazard to safety, and must not be entered under any circumstances. Death or serious injury may result if these precautions are not followed.

(e) Inflate the tank with a low pressure air blower (maximum air pressure 0.1 psig). Continue to ventilate until dry. It may be necessary to swab out the tank to completely remove the water (and/or some fuel) in an expeditious way.

(f) Roll up and transport tank to an inspection, preservation, and packing area.

(g) See TM 10-5430-219-12 for further information on the fabric collapsible tanks and their disassembly and preparation for storage and shipment.

(5) Disassemble, Drain, and Dry Hoselines.

NOTE

- **All hoselines must be completely dry inside and clean on the outside before capping and before repacking.**

- **It is recommended that all hoselines be tagged with identification at the disassembly site prior to transporting them to the inspection and packing area.**

(a) Disassemble hoselines. (See para 4-35 and 4-36 as applicable.)

(b) Suction Hoselines. The suction hoselines should be drained into containers or a sump. Then they are to be flushed thoroughly with water and blown or swabbed dry. The sections should then be capped, cleaned externally, and transported to the inspection and packing area.

(c) Discharge Hoselines. All 6-inch hoselines are to be drained, flushed with water, dried, capped, and transported to the inspection and packing area. Use the displacement and evacuation kit in accordance with the following instructions

4-42. PREPARATION FOR STORAGE. - continued

NOTE

To avoid double handling, it is recommended that the 6-inch transfer hoseline be thoroughly inspected as it is cleaned and stored. This will avoid having to remove the hoseline again at the inspection and preservation area.

(d) Use of the Displacement and Evacuation Kit. The displacement and evacuation kit is used for removal of fuel and evacuation of the small residual quantity of fuel, vapor, and any air within the hoseline section. The hoseline section must be completely free of any fluid or air. When the hoseline section has been evacuated, collapsed, and capped, it is ready for packing. The displacement and evacuation kit consists of the following:

ITEM NO.	QTY	DESCRIPTION
1.	1	Ball Inlet Assembly
2.	1	Ball Receiver Assembly
3.	2	Displacement Ball
4.	8	6 inch Coupling
5.	24	Grooved End Fitting Cap
6.	1	Ejector
7.	1	Coupling Clamp Tool
8.	1	1 inch Ball Valve:
9.	2	1 inch NPT Quick Disconnect Half Coupling
10.	1	6 inch Pipe Coupling
11.	1	3/4 inch NPT Quick Disconnect Half Coupling
12.	1	Storage Chest

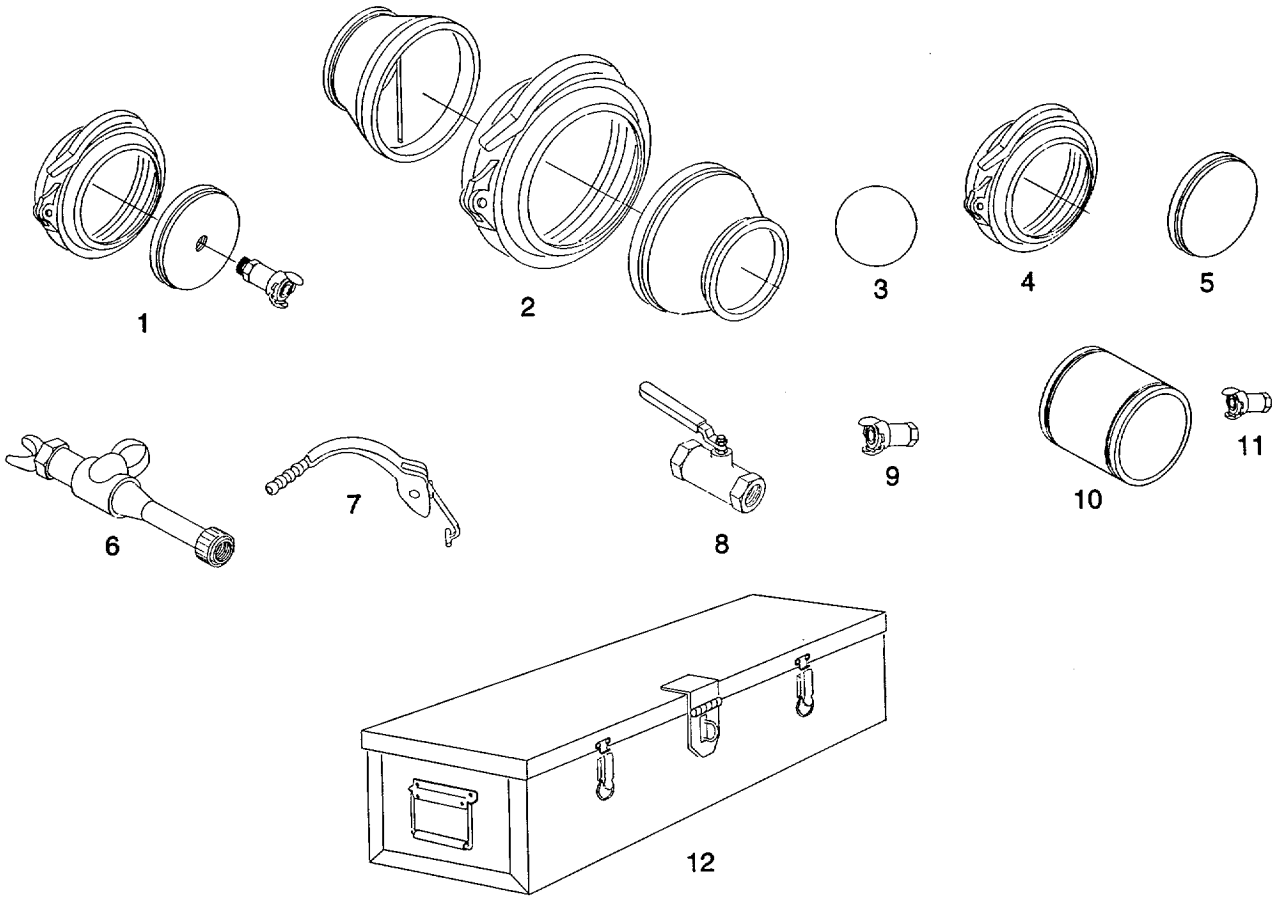


Figure 4-27. Displacement and Evacuation Kit 6 Inch Hoseline

4-42. PREPARATION FOR STORAGE. - continued

WARNING

Because of potential for fire and/or explosion, the following safety regulations must be followed:

- **There shall be no smoking allowed within 100 feet of the displacement and evacuation operations. Smoking shall be restricted to those areas designated as safe smoking areas.**
- **Fuel spills must be cleaned up promptly. Use an absorbent material and dispose of the used material at a designated location.**
- **Fuel saturated soil is a fire hazard. Access to spill areas should be restricted until appropriate action is taken and cleanup is complete.**

(e) Fuel Displacement. Fuel displacement will proceed from a hoseline pump, switching manifold or tanker truck receipt manifold and proceed down-line to the designated tank module or tanker-truck. Fuel may also be removed from the hoseline by gravity if you have a tanker-truck to receive the displaced fuel. Do not use water to displace fuel from the hoseline system. The following steps should be used:

1. Install a hose clamp per (figure 4-27)(hose clamps ere supplied as part of hoseline installation and repair assembly) near the hose double groove adapter from which the hoseline system starts. This will be near the coupling which attaches the hoseline to the pump, switching manifold, or tanker-truck receipt manifold.

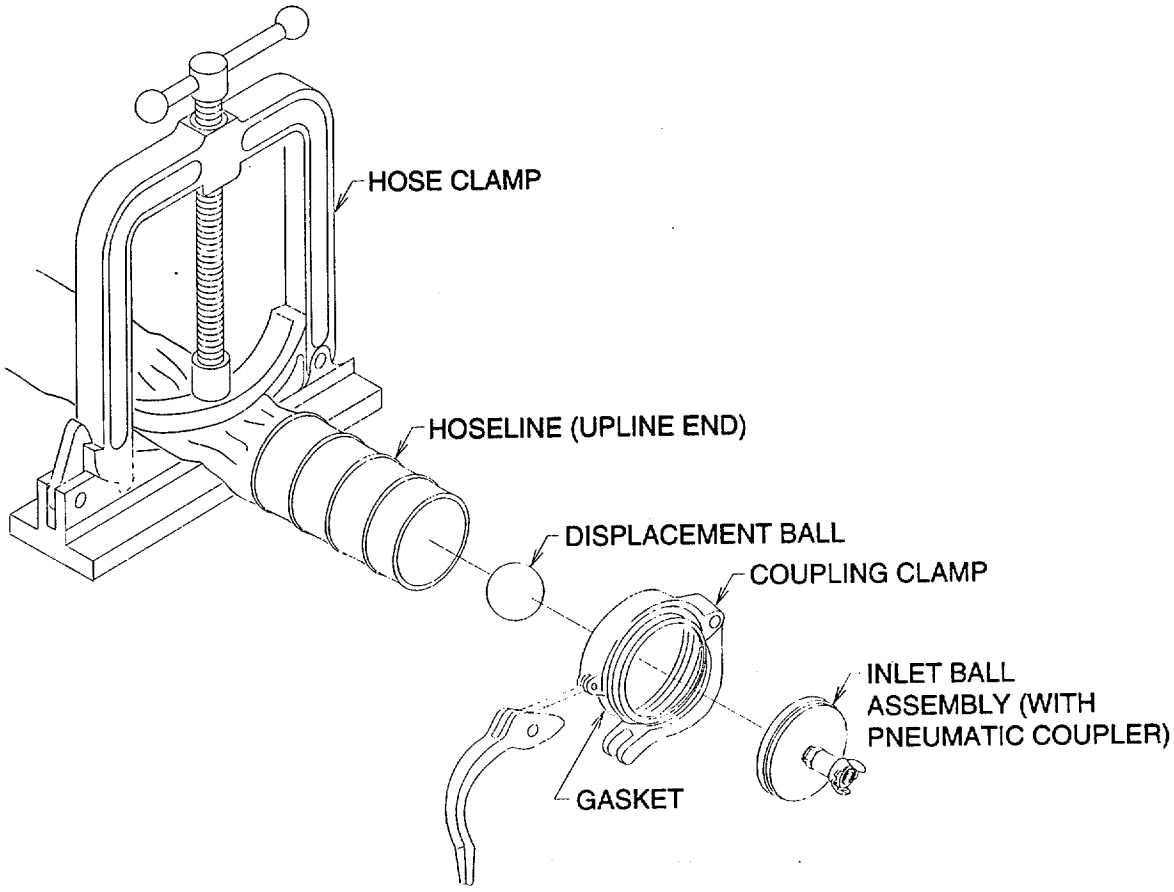


Figure 4-28. Evacuation Process View 1

2 Disconnect the hoseline from the assembly or facility from which it originates. This is done by removing the coupling clamp. (See figure 4-23.)

3 Slide the gasket away from the center position between grooved fittings. Separate the hoseline from the facility and remove the gasket.

4 Place the displacement ball inside the end of hoseline adapter.

5 Connect the inlet ball with pneumatic coupler to the hoseline and where the displacement ball was installed.

4-42. PREPARATION FOR STORAGE. - continued

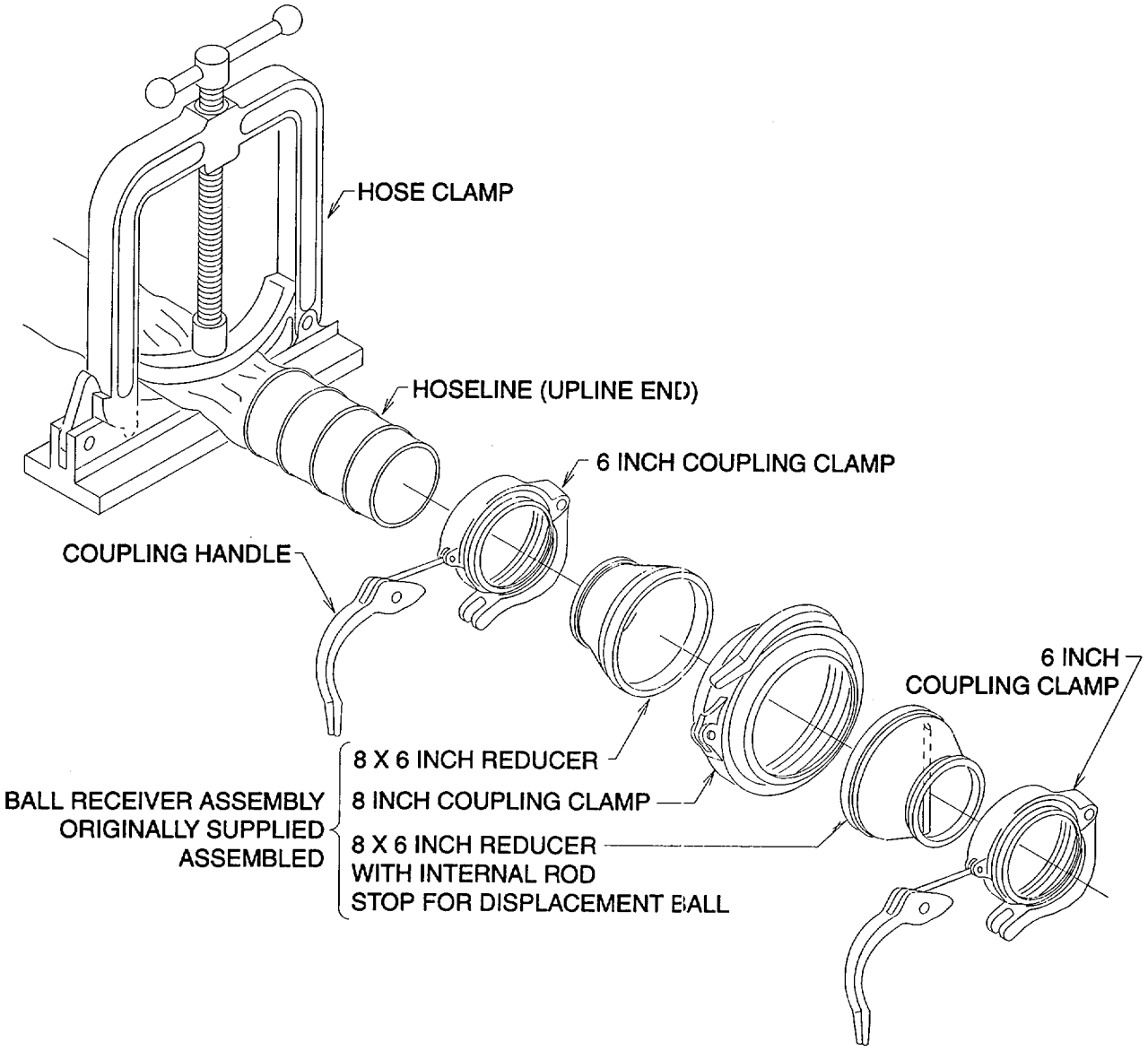


Figure 4-29. Evacuation Process View 2

6 Assemble a ball receiver assembly consisting of two 8 x 6-inch reducers, one 8-inch coupling clamp and one 8-inch gasket. This is done by aligning the 8-inch ends of the reducers, installing the 8-inch gasket and fitting, and closing the snap-lock coupling halves over the joined ends of the reducers.

7 Determine the hoseline connector location at which the ball receiver is to be installed.

8 Use the hose clamps, as required, to disconnect the hoseline segments and install the ball receiver in the hoseline at the determined field location. Align the 6-inch end of the reducer without the internal rod stop toward the end with the displacement ball in it. Install a coupling clamp over the joined grooved ends.

9 Align the 6-inch end of the reducer with the internal rod stop with the next hoseline segment. Install a coupling clamp over the joined double grooved ends, thereby connecting the receiver assembly to the next hoseline segment.

10 Release the hose clamps installed in Step 8 by loosening the screw handle.

11 Attach the air compressor hose to the ball inlet assembly. Release the hose clamp installed near the ball inlet assembly. Start the air compressor and inject compressed air into the ball inlet assembly installed in Step 5. Air pressure of 20 to 25 pounds per square inch (psi) is usually required to move the displacement ball at a satisfactory rate along the hoseline. The air compressor should be run until the ball is observed entering the ball inlet assembly. A sound will be heard when the ball reaches the ball receiver. If the ball gets stuck, straighten kinks in the line. Be observant to ensure that the hose does not become over-pressured.

12 After the ball has entered the ball receiver assembly, stop the air compressor and clamp down the hose clamp on the downstream side of the ball receiver assembly. Uncouple and remove the ball receiver from its location and the hose clamps from the evacuated hose segment.

(f) Air and Fuel Vapor. After the displacement ball has moved completely through the hoseline, you must still remove the small remaining quantity of fuel, fuel vapor, and air from the hoseline section per the following procedures.

WARNING

Ensure area is clear of smokers and all open flame or sparking devices. Fuel vapors and air are very explosive.

1 Using the attached upstream air compressor inject compressed air into the evacuated hose segment for at least 10 minutes, thereby blowing out any remaining fuel or fuel vapors. Air pressure of 20 to 25 pounds per square inch (psi) may be required.

4-42. PREPARATION FOR STORAGE. - continued

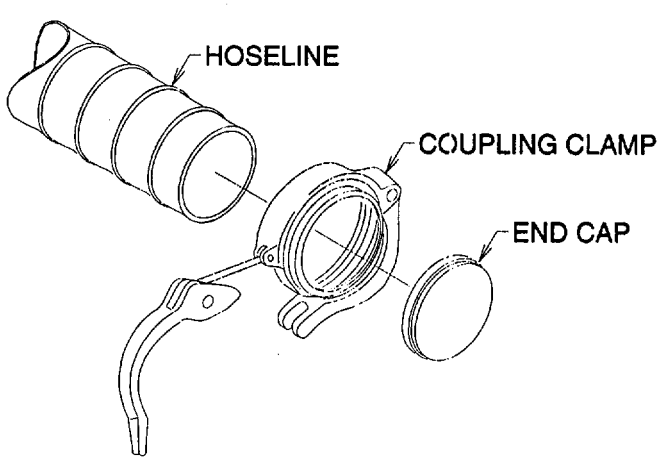


Figure 4-30. Evacuation Process View 3

2 After the fuel vapors have been removed, install an airtight cap on the open end of the hose. (See figure 4-29.) If you do not have a cap, you can seal the hose by bending it back on itself several times and tying the hose securely.

3 Go to the beginning of the hoseline section and disconnect the air compressor hose from the ball inlet assembly. (See figure 4-28.)

4 Attach the suction of the air ejector to the ball inlet assembly.

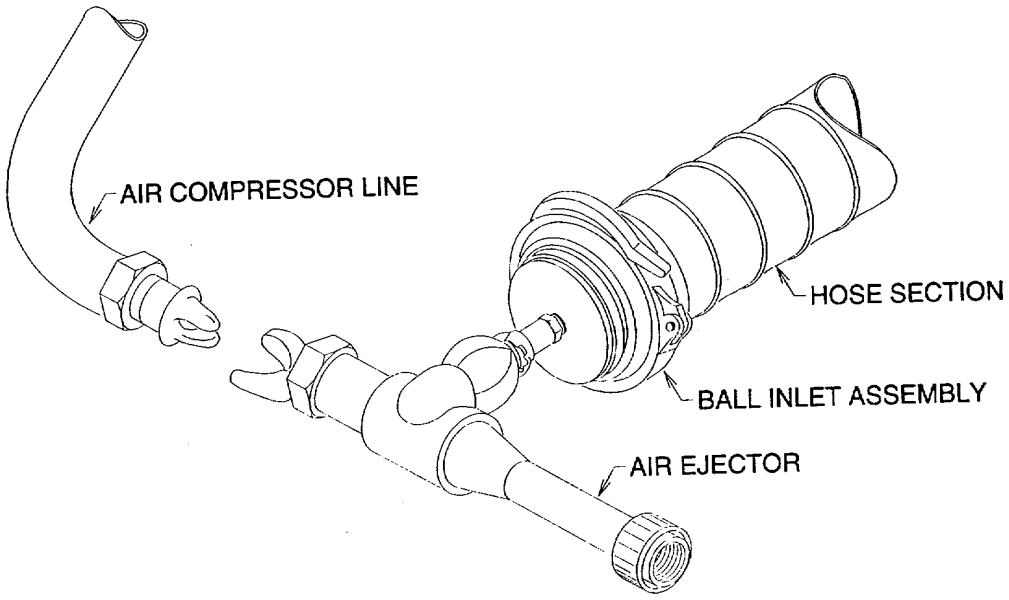


Figure 4-31. Evacuation Process View 4

WARNING

Be very cautious when evacuating fuel vapors. Fuel vapor and air are an explosive mixture.

5 Put the compressor hose on the inlet side of the ejector. Start the air compressor and inject compressed air into the ejector. This creates a vacuum and draws any remaining fuel vapor and air from the hoseline and expels it from the exhaust end of the ejector assembly.

6 Operate the ejector about 10 minutes for each 1,000 feet of hose. When the hose flattens to a ribbon like form, stop the air compressor, fold back the end of the hose and tie securely.

7 Remove the ball inlet assembly and air ejector.

8 Install the end cap on the collapsed hoseline to prevent hose from expanding before it is packed into the flaking box.

9 When a hoseline length has been evacuated, collapsed, and capped, it is ready for packing.

(g) Four-inch hoselines are to be drained, flushed with water, dried, capped, and transported to the inspection and packing area. The displacement and evacuation kit normally furnished with the 4-inch hoseline outfit (TO&E) can be used for this purpose.

(h) Hoselines smaller than 4-inch must be drained, flushed, and dried without the benefit of a displacement and evacuation kit.

(6) Aluminum Fittings. Aluminum fittings (tees, elbows, nipples, adapters, etc.) are to be swabbed clean and dry. Fittings should be tagged at the time of removal to aid identification during repacking. Box fittings and transported to the final inspection and packing area.

4-42. PREPARATION FOR STORAGE. - continued

(7) Coupling Clamps and Gaskets.

(a) Coupling clamps are to be swabbed clean and dry. Box coupling clamps and transport to the inspection, preservation, and packing area.

(b) The gaskets are to be wiped clean and bagged or boxed for inspection and classification prior to packing. Gaskets that are obviously not usable under any circumstances should be disposed of immediately.

(8) Valves and Valve Assemblies. Drain, clean, and dry valve:; and valve assemblies. Transport to the inspection and packing area.

(9) Pressure Regulating Valve Assemblies, Pressure Control Valve Assemblies. These items are to be fully drained and swabbed clean and dry inside and outside. The control and pilot manifolding must be thoroughly drained. Blowing through the vents will aid in doing this. They are then transported to the inspection, preservation, and repacking area.

(10) Meter Skid Assemblies (Meter/Strainer Assemblies). These: items must be drained and swabbed dry externally. They are then transported to the inspection, preservation, and packing area.

(11) Pumps and Engines. Pumps are removed from the system end thoroughly drained. Do not drain the engine crankcase or fuel tank at this time. The equipment may be washed down externally and dried so long as no water is allowed inside the equipment. See technical manual TM 5-4320-305-10 for the 600 gpm hoseline pumps and TM 5-4320-226-14 or TM 10-4320-324-14 for the 350 GPM pumps for detail on preparation for storage. The pumps are then transported to the inspection, preservation, and packing area.

(12) Floodlight Sets. The floodlight sets are to be disassembled, cleaned, and transported to the inspection, preservation, and packing area after they are no longer required in the disassembly program. Wash down equipment and thoroughly dry. (See TM 9-6230-211-14.)

(13) Fire Suppression Equipment. (See TM 10-4210-235-13.)

(a) Fire suppression equipment should be cleaned and removed from the TPT site only after all fuel carrying equipment has been drained and removed from the site and the site vacated.

(b) Wash down and thoroughly dry all fire fighting equipment.

(c) Fire fighting clothing should be brushed or wiped off. It can be washed off but must be completely dried.

(14) Miscellaneous Equipment. All miscellaneous equipment is to be swabbed clean and dry, tagged, and transported to the inspection, preservation, and packing area. External water wash of some equipment is permissible if there is no chance of getting water inside the equipment.

c. Inspection and Preservation. The inspection and preservation program must be well-organized and in a location where the equipment can be kept in good condition until it is packed and ready for storage or shipment. The operating authority may decide to perform certain parts of the cleaning program at this final inspection location or certain parts of inspection and preservation at the TPT site at their option.

(1) The primary purpose of the inspection before preservation action is to locate and note faults or missing items in the equipment so that the next user or storage activity is aware of what must be done to bring the equipment up to a usable level established by the proper authority. Usually it is not expected that any major repair or replacement work will be accomplished at the operational area sites. Minor repair work such as tightening fasteners, removing corrosion before preservation, etc. should be done before preservation and packing. Other work required must be listed for action by the designated storage point or the next user as the case may be. Equipment that cannot be used should not be shipped to a user facility, but should be passed up through maintenance channels for disposition.

(2) Another inspection should take place after preservation action has been taken.

CAUTION

The essence of proper preservation of all equipment is that it must be clean, free of corrosion products, and dry, with no exceptions. Moisture or standing water cannot be permitted. Painted equipment should be touched up or repainted before packing.

(3) Fabric Collapsible Tanks. (See TM 10-5430-219-12.)

(a) If cleaning and drying has been conducted properly, there should be no further work required on the fabric tanks themselves. If they are not dry and clean inside and outside, additional work may be required.

(b) The tanks are to be thoroughly inspected for flaws or faults prior to packing.

(c) The valves, fittings, and hoselines that are part of the tank supply are to be treated as described in TM 10-5430-219-12.

(4) Hoseline Assemblies.

(a) All hoseline assemblies are to be inspected for damage prior to repacking. They must be clean and dry inside and out. Faults are to be listed. Minor faults should be repaired before packing. Hoseline assembly ends are to be sealed or capped. End fittings are to be coated with a preservative compound.

(b) Check that transfer hoselines contained in storage containers are dry, when in doubt, the hoselines should be removed and thoroughly dried.

(5) Aluminum Fittings.

(a) Aluminum fittings are to be inspected for damage and cleanliness. They must be dry.

(b) Aluminum surfaces do not require preservative coatings. Other metals associated with the fitting must be painted in accordance with TM 43-0139.

(6) Coupling Clamps and Gaskets.

(a) Coupling clamps are to be inspected for damage and cleanliness. If damaged, dispose of properly.

(b) Coupling clamps are to be cleaned of rust and painted in accordance with TM 43-0139 if necessary before packing.

(c) Damaged gaskets should be disposed of properly.

(7) Valves and Valve Assemblies.

(a) All valves and valve assemblies should be inspected thoroughly. Any required repair work should be routed through the proper maintenance channels or an order for replacement placed as best suits the situation.

(b) The valves are to be thoroughly clean and dry inside and out. Valve packing glands are to be loosened prior to preservation. Particular attention must be paid to coating the glands and bushings. External machined surfaces such as valve stems are to be coated with a preservative. Valve bodies that require paint are to be painted in accordance with TM 43-0139 after removing any corrosion. Seal or cap valve assembly pipe nozzles. Make the end seals as air tight as possible.

(8) Pressure Regulating Valve Assemblies, Pressure Control Valve Assemblies.

(a) Disassemble the pressure regulating valve only enough to inspect. Make certain the unit has no standing water or condensation internally before preservation. Seal or cap off at the nozzles to prevent entrance of water and minimize air circulation. Close off the vents tightly.

(b) Paint in accordance with TM 43-0139 as appropriate to the external surfaces.

(9) Meter Skid Assemblies (Meter Strainer Assemblies).

(a) Inspect the unit through the nozzles. Be sure there is no water present. If water is present, dry it out. If there is no corrosion, proceed with preservation. If corrosion is apparent, pass the unit through maintenance channels for overhaul or disposition.

(b) Seal or cap off at the nozzles. Air tightness is important.

(c) Paint in accordance with TM 43-139 the external parts as appropriate.

(10) Pumps and Engines. Proceed with preservation in accordance with technical manuals TM 5-4320-305-10 for the 600 gpm hoseline pump and TM 5-4320-226-14 or TM 10-4320-324-14 for the 350 gpm transfer pump

(11) Floodlight Sets. Proceed with preservation in accordance with technical manual TM 9-6320-211-14.

(12) Fire Suppression Equipment. Proceed with preservation in accordance with technical manual TM 10-4210-235-13.

(13) Miscellaneous Equipment. Thoroughly inspect. Make any minor repairs necessary. Pass damaged equipment through appropriate maintenance authority for disposition. Lubricate, and paint in accordance with TM 43-0139 as applicable.

4-43. PREPARATION FOR SHIPMENT.

All equipment is to be identified, packed, and stored in containers in accordance with the approved packing plan and the Packing/Marking Plan for the Area involved. The following are points that must be covered in the identification and repacking program.

NOTE

Equipment shipments must be properly identified, marked or tagged for the benefit of the recipient. Containers must have external markings in accordance with the Packing/Marking Plan. The recipient must be made aware of any deviation.

a. The packing plan is an identification system for containers and an inventory of what is required. If any equipment is missing, it must be located or action must be taken to replace it. Notify receiving party promptly that equipment is missing and what action has been taken to replace it. Information on such faults should be over-packed with the shipment.

b. The equipment should be repacked in the same containers in which it was originally received unless damaged beyond repair. If the container is damaged, it should be passed through maintenance channels for repair or replacement.

c. Each piece of equipment going into a container should be clearly indicated with a tag or markings showing the abbreviated name of the item and the NSN. Small items are easier to lose and/or identify than the large items; therefore, the marking of these items is important.

d. Equipment must be protected and packaged in the container in such a way that it will not be damaged during shipment.

e. A packing list must be on both the outside and inside of the container and should be the same as the original or match the packing plan. If an item is missing, it must be clearly marked as missing but should still be on the list.

f. The identification markings on the outside of the container must be the same as the original markings. If revised due to shortages, this will show up in the packing list. Shipping and installation instructions are all based on certain container numbers of certain content.

g. Be sure action is taken, and that the appropriate maintenance authorities are notified, of any equipment that is missing or damaged at the time of shipment.

h. Do not ship unserviceable equipment to a user unless arrangements are made ahead of time for the user to make corrections. Such shipment should be fully authorized.

i. Pack all the technical manuals available on the equipment with the equipment to which it applies.

CHAPTER 5
DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, TOOLS, SPECIAL TOOLS, TEST MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT

5-1. COMMON TOOLS AND EQUIPMENT.

For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) CTA 50-970 as applicable to your unit.

5-2. SPECIAL TOOLS.

The following special tools are required for direct support maintenance. Use of these tools is described in Section III of this chapter.

	Name	Cage	Part No.
•	Sealer, Steel Strap	(70847)	C001
•	Adapter, Banding	(70847)	J050

5-3. REPAIR PARTS.

a. Mandatory replacement parts are listed in Appendix I of this manual.

b. Repair parts are listed and illustrated in TM 10-3835-231-23P.

Section II. DIRECT SUPPORT TROUBLESHOOTING PROCEDURES

Direct support troubleshooting is not required.

Section III. DIRECT SUPPORT MAINTENANCE PROCEDURES

The procedures in this section have been arranged in the order in which the items appear in the direct support (F) maintenance level column on the Maintenance Allocation Chart (MAC) which is provided in Appendix B. Step-by-step procedures have been provided for all actions authorized to be performed by direct support maintenance in the order in which they appear on the MAC.

5-4. HOSE REPAIR (HOSES WITH BAND TYPE CLAMPS).

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools

Tool Kit, General Mechanics (Appendix B, Section III, Item 1).
Sealer, Steel Strap (TM 10-3835-231-23P, Fig 21, Item 1).
Adapter Banding (TM 10-3835-231-23P, Fig 21, Item 2).

Material/Parts

Petrolatum (Appendix E, Item 5).
Band-It Type Clamps Sizes 1 Inch (Appendix I, Item 1).
Band-It Type Clamps Sizes 1 1/2 Inch (Appendix I, Item 2).
Band-It Type Clamps Sizes 4 Inch (Appendix I, Item 3).

Equipment Condition

Hose assembly removed. (See para 4-37.)

NOTE

Disassemble only to extent necessary for repair.

a. Disassembly.

(1) Release cam arms and pull plug (1) and cap (2) away from couplings (3) and (4).

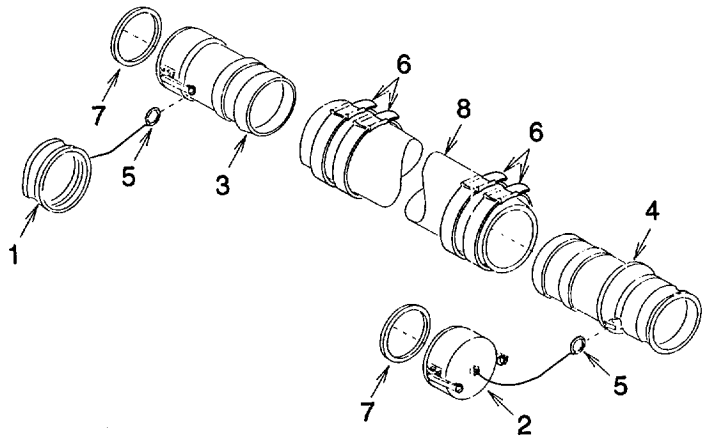


Figure 5-1. Banded Hose Assemblies

5-4. HOSE REPAIR (HOSES WITH BAND TYPE CLAMPS) - continued

(2) Remove key rings (5).

(3) Cut band clamps (6).

(4) Remove gaskets (7) from coupling (3) and cap (2).

(5) Remove couplings (3) and (4) from hose (8).

b. Repair. Replace all defective parts to extent necessary for repair.

c. Assembly.

(1) Coat hose connector ends (3) and (4) with petrolatum to ease installation and insert connectors into hose (8).

(2) Place "Heavy Duty Jr Adapter" tool on nose of the "Band-It" tool.

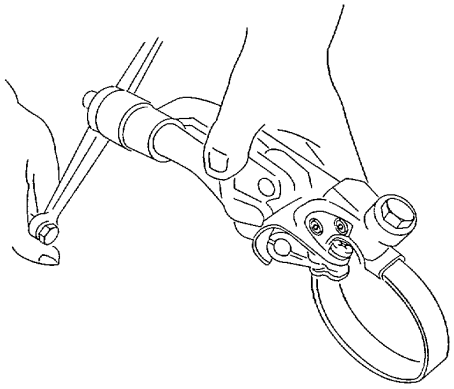


Figure 5-2. Band Clamp Tool Setup

(3) Position as shown and tighten two set screws. End of screw should not extend beyond bottom of screw block.

(4) Insert clamp tail into adapter nose and grip tail end with gripper lever.

(5) Insert hose in clamp. Tension clamp by turning tool handle.

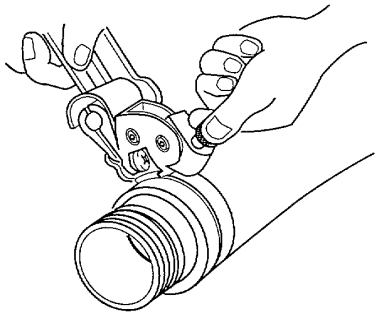


Figure 5-3. Tool Tensioning

5-4. HOSE REPAIR (HOSES WITH BAND TYPE CLAMPS) - continued

(6) When sufficiently tensioned, roll tool over hose, backing off tension handle 1/4 to 1/2 turn only. This will vary depending on the clamp size. Do this until shear hook engages buckle edge.

(7) Tighten knurled nut by hand securing buckle tightly between edge of hook and nose of adapter.

(8) Place ratchet wrench on hex nut.

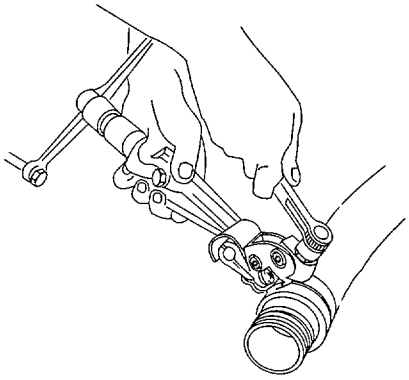


Figure 5-4. Final Band Installation

(9) Operate wrench clockwise until band is sheared.

(10) Install remaining clamps.

(11) Install gaskets (7) into coupling (3) and cap (2). (See Fig 5-2.)

(12) Attach cap (2) and plug (1) with key ring (5).

(13) Place plug (1) and cap (2) in position and close cam arms.

5-5. HOSE REPAIR (HOSES WITH THREE PART CLAMPS).

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools
Tool Kit, General Mechanics (Appendix B, Section III, Item 1).

Material/Parts
Petrolatum (Appendix E, Item 5).

Equipment Condition
Hose assembly removed. (See para 4-36.)

NOTE

Disassemble only to extent necessary for repair

a. Disassembly.

(1) Remove plastic caps (1).

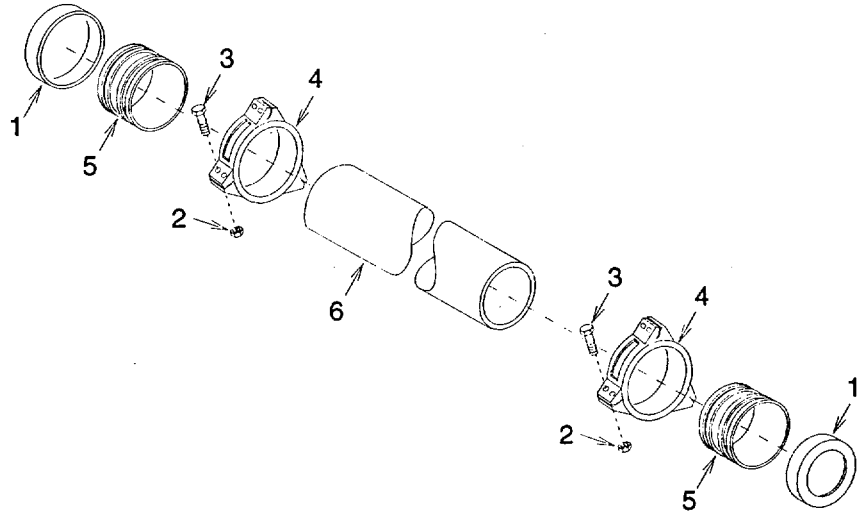


Figure 5-5. Hose Assemblies with Three Part Clamps

(2) Remove nuts (2), and screws (3) from clamp (4).

(3) Remove clamp (4) and adapters (5) from hose (6).

b. Repair. Replace all defective parts.

c. Assembly.

(1) Coat hose connection ends of adapter (5) with petrolatum to ease installation and insert adapter into hose (6).

(2) Install three part clamps (4), screws (3), and nuts (2).

(3) Place plastic caps (1) on adapters (5).

5-6. FUEL SAMPLING ASSEMBLY REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools

Tool Kit, General Mechanics (Appendix B, Section III, Item 1).

Material/Parts

Antisieze Tape (Appendix E, Item 6).

Equipment Condition

Fuel Sampling assembly removed. (See para 4-36.)

NOTE

Disassemble only to the extent necessary for repair.

a. Disassembly.

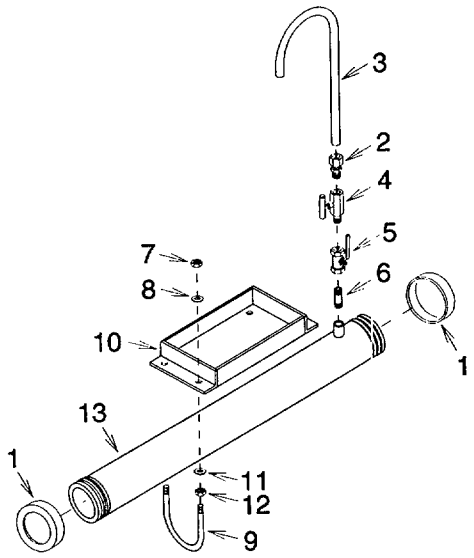


Figure 5-6. Fuel Sampling Assembly

(1) Remove plastic caps (1).

(2) Loosen nut on compression fitting (2) and remove tube (3).

(3) Remove compression fitting (2), needle valve (4), ball valve (5) and pipe nipple (6).

(4) Remove four each nuts (7), flat washers (8), two U-bolts (9) and sampling table (10).

(5) Remove four each flat washers (11) and nuts (12).

5-6. FUEL SAMPLING ASSEMBLY REPAIR. - continued

b. Repair. Replace all defective parts to extent necessary for repair.

c. Assembly.

(1) Install four each nuts (12) and flat washers (11) on U-bolts (9).

(2) Secure sampling table (10) to sampling pipe (13) with two each U-bolts (9) and four each flat washers (8) and nuts (7).

(3) Apply antisieze tape to male pipe threads prior to installation.

(4) Install pipe nipple (6) ball valve (5) needle valve (4) and compression fitting (2).

(5) Insert tube (3) into compression fitting (2) and center over sampling table (10).

(6) Tighten compression fitting (2) nut.

(7) Install plastic caps (1).

5-7. METER SKID ASSEMBLY REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools

Tool Kit, General Mechanics (Appendix B, Section III, Item 1).

Material/Parts

Antisieze Tape (Appendix E, Item 6).
Lock washers (3 each) (Appendix I, Item 6).
Petrolatum (Appendix E, Item 5).

Equipment Condition

Meter skid assembly removed. (See para 4-36.)

NOTE

Disassemble only to the extent necessary for repair.

a. Disassembly.

(1) Remove plastic caps (1).

(2) Remove four screws (2), separate meter (3) body halves and remove tachometer flow meter (4).

(3) Remove three each caps screws (5), lock washers (6), and flat washers (7). Discard lock washers.

(4) Release coupling (8) handle and remove meter (3) and coupling.

(5) Release quick disconnect coupling (9) cam arms and remove hose assembly (10).

(6) Remove quick disconnect coupling (9), ball valve (11), pipe nipple (12), and street elbow (13).

(7) Remove hose clamp (14) and hose (15).

(8) Remove combination nipple (16), pipe nipple (17) and street elbow (18).

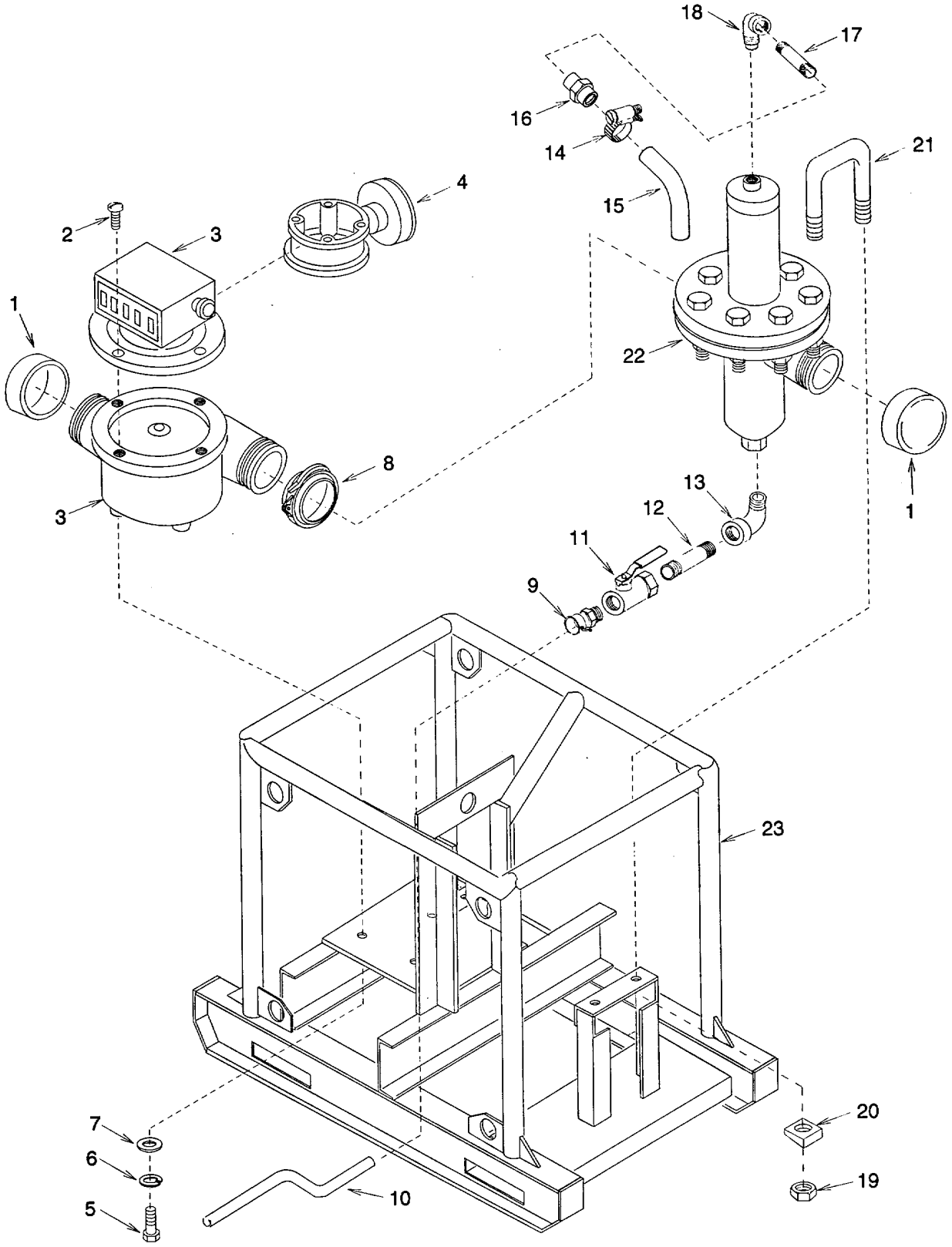


Figure 5-7. Meter Skid Assembly 6 inch 800 GPM

5-7. METER SKID ASSEMBLY REPAIR. - continued

(9) Remove four each hex nuts (19) and bevel washers (20) and two each U-bolts (21).

(10) Lift strainer (22) from skid (23).

b. Repair. Replace all defective parts.

c. Assembly.

(1) Place strainer (22) on skid (23) and secure with two each U-bolts (21) and four each bevel washers (20) and nuts (19).

(2) Wrap male pipe threads with antisieze tape and install street elbow (18), pipe nipple (17), and combination nipple (16).

(3) Place hose (15) on end of combination nipple (16) and secure with clamp (14).

(4) Wrap male pipe thread with antisieze tape and install street elbow (13), pipe nipple (12), ball valve (11) and quick disconnect coupling (9).

(5) Place hose assembly (10) into quick disconnect coupling (9) and close cam arms.

NOTE

Liberally apply petrolatum to the gasket and the inside surface of coupling clamps when they are installed. This will help avoid pinching the gasket when the clamp is closed.

(6) Slip coupling (8) gasket in place on strainer (22).

(7) Slip meter (3) into place and support square with strainer (22) coupling joint.

(8) Place coupling (8) over gasket and close coupling handle.

(9) Secure meter (3) to skid (23) with three each cap screws (5), new lock washers (6) and flat washers (7).

(10) Place tachometer flow meter (4) between meter (3) body halves and secure with four screws (2).

(11) Install plastic caps (1).

5-8. WATER DETECTION KIT ADAPTER ASSEMBLY REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools

Tool Kit, General Mechanics (Appendix B, Section III, Item 1).

Material/Parts

Antisieze Tape (Appendix E, Item 6).

Equipment Condition

Adapter assembly removed. (See para 4-35.)

NOTE

Disassemble only to extent necessary for repair.

a. Disassembly.

(1) Release cam arms and pull plug (1) and cap (2) away from couplings (3) and (4).

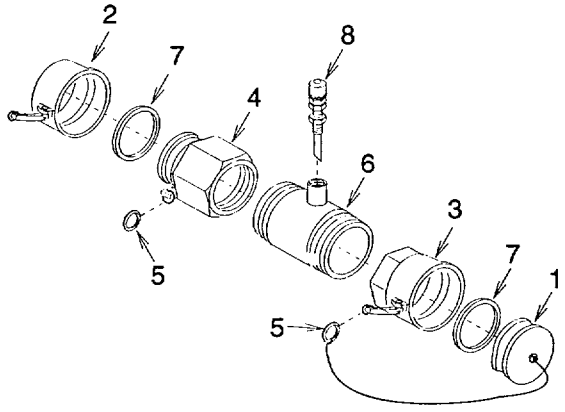


Figure 5-8. Water Detection Kit Adapter Assembly

(2) Remove key rings (5).
(3) Remove couplings (3) and (4) from nipple assembly (6).
(4) Remove gaskets (7) from cap (2) and connector (3).

5-8. WATER DETECTION KIT ADAPTER ASSEMBLY REPAIR. - continued

b. Repair. Replace all defective parts to extent necessary for repair.

c. Assembly.

(1) Place antisieze tape on male threads of nipple assembly (6) and probe assembly (8).
(2) Install probe assembly (8) into nipple assembly (6).
(3) Install couplings (3) and (4) onto nipple assembly (6).
(4) Install gaskets (7) into coupling (3) and cap (2).
(5) Attach cap (2) and plug (1) with key rings (5).
(6) Place plug (1) and cap (2) in position and close cam arms.

APPENDIX A
REFERENCES

A-1. SCOPE.

This appendix lists all forms, field manuals, and technical manuals referenced in this manual.

A-2. PAMPHLETS.

The Army Maintenance Management System (TAMMS)	DA PAM 738-750
The Army Maintenance Management System-Aviation (TAMMS-A)	DA PAM 738-751

A-3. FORMS.

Recommended Changes to Publications and Blank Forms	DA 2028
Product Quality Deficiency Report	SF 368
Equipment Inspection and Maintenance Worksheet	DA 2404
Report of Discrepancy	SF 364

A-4. FIELD MANUALS.

NBC Contamination Avoidance	FM 3-3
NBC Protection	FM 3-4
NBC Decontamination	FM 3-5
Organizational Maintenance of Military Petroleum Pipeline, Tanks and Related Equipment	FM 10-20
Petroleum Supply Point Equipment Operation	FM 10-69
Inspecting and Testing Petroleum Products	FM 10-70
Petroleum Testing Facilities: Laboratories and Kits	FM 10-72
Petroleum Terminal and Pipeline Operations	FM 10-18
First Aid for Soldiers	FM 21-11
Aircraft Refueling (Grounded and Bonding)	FM 10-68

A-5. TECHNICAL MANUALS.

Fire Fighting in Theater of Operations	TM 5-315
Military Petroleum Pipeline Systems	TM 5-343
350 GPM Pump Unit	TM 5-4320-226-14 TM 5-4320-226-24P TM 10-4320-324-14 TM 10-4320-324-24P
600 GPM Pump Unit	TM 5-4320-305-10 TM 5-4320-305-24 TM 5-4320-305-24P
350 GPM Frame Mounted liquid Fuel Filter Separator	TM 5-4330-211-12 or TM 10-4330-235-13&P
Destruction of Army Material to Prevent Enemy Use	TM 750-244-3

A-5. TECHNICAL MANUALS. - continued

Trailer Mounted Floodlight Set	TM 9-6230-211-14 TM 9-6230-211-24P
Fire Suppression Equipment	TM 10-4210-235-13 TM 10-4210-235-23P
Type D-1 Nozzle Assembly	TM 10-4930-246-13&P
50,000 Gal and 5,000 BBL Collapsible Fabric Tanks	TM 10-5430-219-12
Petroleum Aviation Fuel Contamination Testing Kit	TM 10-6630-240-12&P or TM 10-6630-218-10
Painting Instructions for Army Material	TM 43-0139
Unit and Direct Support Maintenance Repair Parts and Special Tools List	TM 10-3835-231-23P
Military Standard Identification Methods for Bulk Petroleum Products Systems including Hydrocarbon Missile Fuels	MIL-STD-161
Expendable/Durable Items (except Medical, Class V Repair Parts, Heraldic Items)	CTA 50-970
Army Medical Dept. Expendable/Durable Items	CTA 8-100
Shelter, Tactical Nonexpandable	TM 10-5411-202-14

APPENDIX B
MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. THE ARMY MAINTENANCE SYSTEM MAC.

a. This introduction (Section I) provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the Tactical Petroleum Terminal will be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Unit - Includes two subcolumns, C (operator/crew) and O (unit) maintenance.

Direct Support - Includes an F subcolumn

General support - Includes an H subcolumn.

Depot - Includes a D subcolumn.

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.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

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, e.g., 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 position, or by setting the operating characteristics to specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

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.

B-2. MAINTENANCE FUNCTIONS. - continued

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 assigned maintenance level 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 (e.g., hours/miles) considered in classifying Army equipment/components.

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.

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

c. Column 3. Maintenance Functions. 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.)

[1]Inspect, test, service, adjust, align, calibrate, and/or replace.

[2]Fault location/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]Disassembly/assembly - The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (e.g., identified as maintenance significant).

[4]Actions - Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

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

d. Column 4. Maintenance Level. Column 4 specifies each level of maintenance authorized to perform each function listed in column 3, by indicating work time required (expressed as man-hours in whole hours or decimals) in the appropriate subcolumn. This work-time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work-time figures are to be shown for each level. The worktime 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 time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

C	Operator or Crew Maintenance
L	Specialized Repair Activity (SRA) [5]
O	Unit Maintenance
F	Direct Support Maintenance
H	General Support Maintenance
D	Depot Maintenance

e. Column 5. Tools and Equipment Reference Code. Column 5 specifies, by code, those common tool sets (not individual tools) common, TMDE, and special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to tools and test equipment in section III.

f. Column 6. Remarks. When applicable, this column contains a letter code, in alphabetical order, which is 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 Level. The lowest level 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 or type number.

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

a Column 1. Remarks 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.

[5] This maintenance level is not included in Section II, column (4) of the Maintenance Allocation Chart. Functions to this level of maintenance are identified by a work-time figure in the "H" column of Section II, column (4), and an associated reference code is used in the Remarks column (6). This code is keyed to Section IV, Remarks, and the SRA complete repair application is explained there.

Section II. MAINTENANCE ALLC)CATION CHART FOR TACTICAL PETROLEUM TERMINAL

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools & Equipment Ref Code	(6) Remarks Code
			C	O	F	H	D		
00	Tactical Petroleum Terminal								
01	Pipe Line Connection Assy								
0101	Fire Suppression Equipment								A
0102	Contaminated Fuel Module								
010201	Valve Assy, Ball, 3 in., Quick Disconnect	Inspect Replace	0.1	 1.5				 1	
010202	Hose Assy, Rubber, Synthetic, Liquid Petroleum Fuels Dispensing Collapsible, 4 in x 25 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1, 2	
010203	Pump Unit, Centrifugal Ded, 350 GPM, Type II, Style A								B
010204	Hose Assy, Liquid Fuel, Suction, 4 in x 12 ft	Inspect Replace Repair	0.2	1, 2 0.1 0.1	 2.0				
010205	Hose Assy, Liquid Fuel, Dispensing, 6 in x 50 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1, 2	
010207	Tank, Fabric, Collapsible, 50,000 Gallon								C
0103	Transfer Hoseline Assy, 6 in.								
010301	Hose, Rubber, Dispensing, 6 in. 500 ft. long	Inspect Replace	0.1	 0.5					
0104	Switching Manifold, 6 in.								
010402	Hose Assy, Liquid Fuel, Dispensing, 6 in x 50 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1	
010403	Valve Assy, Ball, 6 in.	Inspect Replace	0.1	 1.5					
010404	Fuel Sampling Assy	Inspect Replace Repair	0.1	 1.0	 1.5			 1 1	

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools & Equipment Ref Code	(6) Remarks Code
			C	O	F	H	D		
010405	Meter Skid Assy, 6 in. 800 GPM	Inspect Replace Repair	0.2	 1.0	 2.0				
010406	Valve Assy, Pressure Regulating, Skid Mounted	Inspect Replace	0.5	 2.0				1	
0105	Pipeline Connection Support Assy								
010501	Testing Kit, Petroleum Aviation Fuel, Contamination								D
010502	Suspension Kit, Hoseline 6 in.	Inspect Repair	0.1	 1.0					
010503	Displacement and Evacuation Kit 6 in.	Inspect Replace	0.1	 1.0					
02	Fuel Unit								
0201	Fire Suppression Equipment								A
0202	Tank Farm Assembly								
020201	Valve Assy, Gate, 6 in.	Inspect Replace	0.2	 1.5				1	
020202	Hose Assy, Liquid Fuel, Dispensing, 6 in x 50 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1	
020203	Tank, Fabric, Collapsible, 5,000 BBL								C
020204	Hose Assy, Liquid Fuel, Suction, 6 in x 12 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1	
020205	Pump Unit, Centrifugal Ded, Self Priming, 600 GPM at 150 PSI								E
020206	Coupling Adapter Assembly, Female	Inspect Repair	0.1	 0.1				1	
0203	Transfer Hoseline Assy, 6 in.								
020301	Hose, Rubber, Dispensing, 6 in. 500 ft. long	Inspect Replace	0.1	 0.5					
0204	Fuel Dispensing Assy								

MAINTENANCE ALLOCATIION CHART
FOR
TACTICAL PETROLEUM TERMINAL - continued

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools & Equipment Ref Code	(6) Remarks Code
			C	O	F	H	D		
020401	Nozzle Assy, Type D-1								F
020402	Valve Assy, Butterfly, 4 in.	Inspect Replace	0.2 0.1					 1	
020403	Hose Assy, Rubber, Synthetic, Liquid Petroleum Fuels Dispensing Collapsible, 4 in x 25 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1, 2, 3	
020404	Valve Assy, Gate, 4 in.	Inspect Replace	0.2	 1.5				 1	
020405	Valve Assy, Ball, 1.5 in.	Inspect Replace	0.1	 1.5				 1	
020406	Hose Assy, Rubber, Synthetic, Liquid Petroleum Fuels Dispensing Collapsible 1.5 in x 25 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1, 2	
020407	Valve Assy, Pressure Control, 1.5 in. Cam Lock	Inspect Replace	0.2	 1.5				 1	
020408	Hose Assy, Liquid Fuel, Dispensing, 6 in x 50 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1	
020409	Valve Assy, Ball, 6 in.	Inspect Replace	0.1	 1.5				 1	
020410	Valve Assy, Pressure Control, 6 in. Double Groove	Inspect Replace	0.1	 1.5					
020411	Coupling Assembly, Dry-Break	Inspect Replace	0.1	 0.1				 1	
020412	Coupling Set, NATO Tank Truck Adapter	Inspect Replace	0.1	 0.1				 1	
020413	Adapter Assy, Water Detection Kit	Inspect Replace Repair	0.1	 1.0	 2.0			 1 1	
020414	Filter/Separator, Liquid Fuel: Frame Mounted 350 GPM Capacity								G

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools & Equipment Ref Code	(6) Remarks Code
			C	O	F	H	D		
020415	Coupling, Adapter Assy, Female	Inspect Replace	0.1	 0.5				 1	
020416	Ground Rod Assy, Self Driving	Inspect Replace	0.1	 0.5				 1	
0205	Tanker-Truck Receipt Manifold								
020501	Coupling Assembly, Dry-Break	Inspect Replace	0.2	 0.5				 1	
020502	Coupling Set, NATO Tank Truck Adapter	Inspect Repair	0.1	 0.1				 1	
020503	Valve Assy, Butterfly, 4 in.	Inspect Replace	0.2	 1.5				 1	
020504	Hose Assembly, Liquid Fuel, Suction, 4 in x 12 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1, 2, 3	
020505	Valve Assy, Gate, 4 in.	Inspect Replace	0.2	 1.5				 1	
020506	Hose Assy, Liquid Fuel, Suction, 6 in x 12 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1	
020507	Valve Assy, Gate, 6 in.	Inspect Replace	0.2	 1.5				 1	
020508	Pump Unit, Centrifugal Ded, Self Priming, 600 GPM at 150 PSI								
020509	Hose Assy, Liquid Fuel, Dispensing, 6 in x 50 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1	
020510	Ground Rod Assy, Self Driving	Inspect Replace	0.1	 0.5				 1	
0206	50,000 Gallon Tank TPT Optional Configuration								
020601	Valve Assy, Butterfly, 4 in.	Inspect Replace	0.2	 0.1				 1	
020602	Hose Assy, Rubber, Synthetic, Liquid Petroleum Fuels Dispensing Collapsible, 4 in x 25 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1, 2, 3	

MAINTENANCE ALLOCATION CHART
FOR
TACTICAL PETROLEUM TERMINAL - continued

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools & Equipment Ref Code	(6) Remarks Code
			C	O	F	H	D		
020603	Valve Assy, Gate, 4 in.	Inspect Replace	0.2	 1.5				 1	
020604	Adapter Assy, Water Detection Kit	Inspect Replace Repair	0.1	 1.0	 2.0			 1 1	
020605	Filter Separator, Liquid Fuel 350 GPM, 4 in.								G
020606	Coupling, Adapter Assy, Female	Inspect Replace	0.1	 0.5				 1	
020607	Pump Unit, Centrifugal Ded, 350 GPM, Type I, Style A								B
020608	Hose Assy, Liquid Fuel, Suction, 4 in x 12 ft	Inspect Replace Repair	0.2	 0.1 0.1	 2.0			1, 2, 3	
020609	Tank, Fabric, Collapsible, 50,000 Gallon								C
020610	Y Assembly, 4 in., Cam-lock	Inspect Replace Repair	0.2	 1.0 1.5				 1 1	
020611	Ground Rod Assy, Self Driving	Inspect Replace	0.1	 0.5				 1	
0207	Fuel Unit Support Assembly								
020701	Floodlight Set, Trailer Mounted								H
020702	Pump Unit, Centrifugal Ded, Self Priming, 600 GPM at 150 PSI								E
020704	Displacement and Evacuation Kit, 6 in Hose Line	Inspect Replace	0.2	 0.5					
020705	Suspension Kit, Hoseline, 6 in.	Inspect Repair	0.1	 0.5					
020706	Coupling, Clamp, Pipe Set, Boltless, 6-inch DG	Inspect Replace	0.2	 0.5					

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR TACTICAL PETROLEUM TERMINAL

Tool or Test Equipment Ref Code	Maintenance Level	Nomenclature	National Stock Number	Tool Number
	NOTE **Standard tools and test equipment in the following kits are adequate to accomplish the maintenance functions listed in** Section II:			
1	O	Tool Kit, General Mechanics	5180-00-177-7033	SC5100-90-CL-N26
2	F	Sealer, Steel Strap	3540-00-445-3325	C001
3	F	Adapter, Banding	4920-00-007-9778	J050

Section IV. REMARKS
FOR
TACTICAL PETROLEUM T1ERMINAL

Remarks Code	Remarks	
A	See	TM 10-4210-235-13 and TM 5-4210-235-23P, Fire Suppression Equipment Set
B	See	TM 10-4320-226-14, TM 5-4320-226-24P, TM 10-4320-324-14, and TM 10-4320-324-24P, Pump, 350 GPM
C	See	TM 10-5430-219-12, 5000 BBL Tank, Collapsible
D	See	TM 10-6630-240-12&P and TM 10-6630-218-10, Aviation Petroleum Test Kit
E	See	TM 5-4320-305-14 and TM 5-4320-305-24P, Pump, 600 GPM
F	See	TM 10-4930-246-13&P, D-1 Nozzle
G	See	TM 54330-211-12 and TM 10-4330-235-13&P, Filter/Separator, 350 GPM
H	See	TM 9-6230-211-14 and TM 9-6230-211-24P, Floodlight Set, Trailer Mounted

APPENDIX C
COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS

Section I. INTRODUCTION

C-1. SCOPE.

This appendix lists components of end item and basic issue items for the Tactical Petroleum Terminal to help you inventory the items for safe and efficient operation of the equipment.

C-2. GENERAL.

The Components of End Item (COEI) and Basic Issue Items (BII) Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for information purposes only, and is not authority to requisition replacements. These items are part of the Tactical Petroleum Terminal. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to help you find and identify the items.

b. Section III. Basic Issue Items. These essential items are required to place the Tactical Petroleum Terminal in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the Fire Suppression Equipment Trailer Set during operation and when it is transferred between property accounts. This list is your authority to request/requisition them for replacement based on authorization of the end item by the TOEIMTOE. Illustrations are furnished to help you find and identify the items.

C-3. EXPLANATION OF COLUMNS.

The following provides an explanation of columns found in the tabular listings:

a. Column (1), Illus Number, gives you the number of the item illustrated.

b. Column (2), National Stock Number, identifies the stock number of the item to be used for requisitioning purposes.

c Column (3), Description and Usable On Code, identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the Commercial and Government Entity Code (CAGEC) (in parentheses) and the part number.

d. Column (4), U/I (unit of issue), indicates how the item is issued for the National Stock Number shown in column two.

e. Column (5), Qty Rqd, indicates the quantity required.

Section II. COMPONENTS OF END ITEM

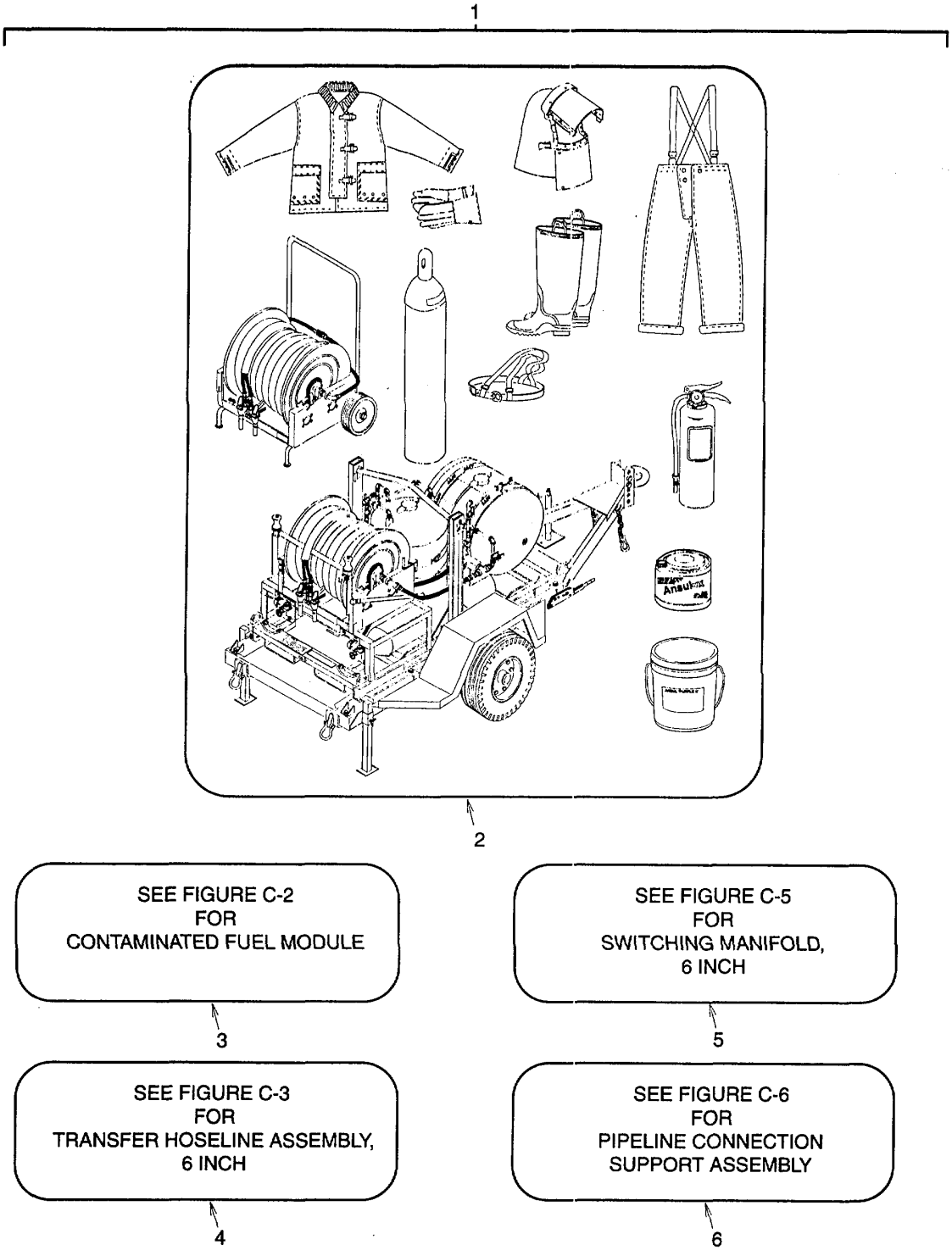


Figure C-1. Pipeline Connection Assembly

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1	3835-01-378-8445	Pipeline Connection Assembly (97403) 13228E3888 Consisting of the following:	EA	1
2	4210-01-210-8728	Fire Suppression Equipment Extinguisher (97403) 13228E3419 See TM 10-4120-235-13	EA	1
3	3835-01-288-4616	Contaminated Fuel Module (97403) 13228E3418 See fig C-2 for components	EA	1
4	3835-01-2884607	Transfer Hoseline Assembly (97403) 13228E3416 See fig C-3 for components	EA	1
5	3835-01-288-5901	Switching Manifold, 6 inch (97403) 13228E3413 See fig C-5 for components	EA	1
6		Pipeline Connection Support Assembly (97403) 13228E3889 See fig C-6 for components	EA	1

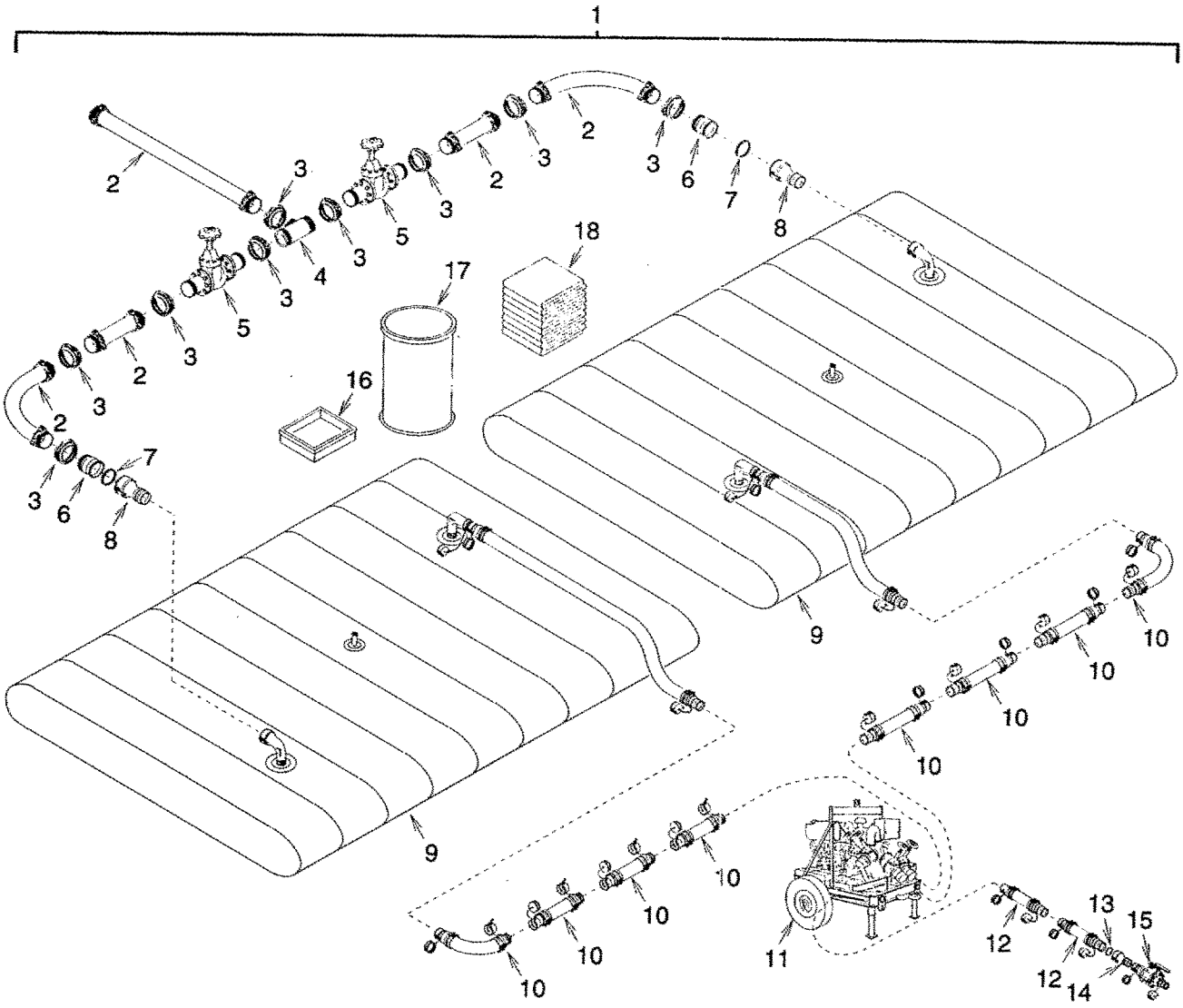


Figure C-2. Contaminated Fuel Module

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1	3835-01-288-4616	Contaminated Fuel Module (97403) 13228E3418 Consisting of the following:	EA	*
2	4720-01-288-4637	Hose Assy, Liquid, Dispensing, 6 inch x 50 ft, Double Groove (97403) 13228E3422	EA	5
3		Coupling, Clamp, Pipe, Boltless, 6 inch, Double Groove (Set of 25) (97403) PD4730-0016	EA	1
4		Tee, 6 inch, Double Groove (97403) 13228E3421	EA	I
5	4820-01-840-0070	Valve Assy, Gate, 6 inch (97403) 13228E3425	EA	2
6		ADAPTER, Cam-lock Male x Double Groove Male (97403) 13228E3423	EA	2
7	5330-00-412-9780	Gasket (96906) MS27030-10	EA	2
8		Reducer, Quick Disconnect (96906) MS49000-21-S	EA	2
9		Tank, Fabric Collapsible 50,000 Gal. (See TM 10-5430-219-12) (96906) MS2983-50 MIL-T-52983	EA	2
10	4720-00-727-1339	Hose, Nonmetallic, Liquid fuel, suction 4 in x 12 ft, Cam-lock (97403) 13228E3431	EA	8
11		Pumping Assy, DED 350 GPM (See TM 5-4320-266-24P and TM 10-4320-324-24P (81349) MIL-P-52144, Type I Style A	EA	1
12		Hose Assy, Liquid Fuel, 4 inch x 25 ft (94833) 140K0019-1	EA	2
13	5330-00-899-4509	Gasket (96906) MS27030-9	EA	1
14		Reducer, Quick Disconnect (96906) MS49000-1-S	EA	1
15	4820-01-212-9508	Valve Assy, Ball, 3 inch (97403) 13226E8273	EA	1
16		Pan Drip (97403) 13228E3909-1	EA	2
17	8110-01-343-1697	Drum Shipping and Storage with Lid, 55 Gal (OA4T6) 0-55	EA	1
18		Sorbent, Oil 36 in x 150 ft x 0.38 thick (58536) A-A-1280, Type I Class 2	EA	1
		* See figure C-1. This Assembly is part of Pipeline Connection Assembly.		

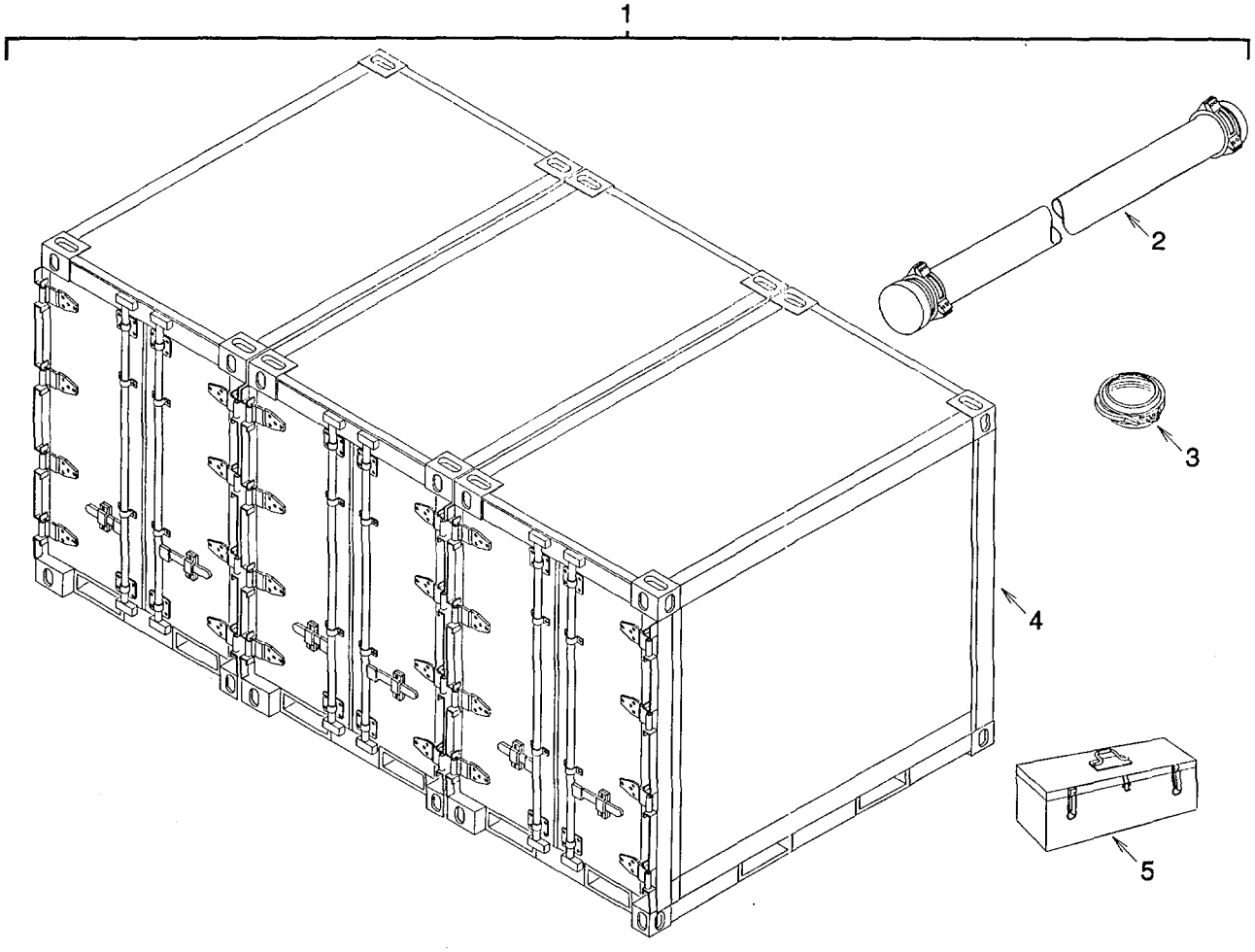


Figure C-3. Transfer Hoseline Assembly ,6 Inch

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1	3835-01-288-4607	Transfer Hoseline Assy, 6 inch (97403) 13228E3416 Consisting of the following:	*	
2		Hose Assembly, Liquid Fuel, 6 inch x 500 ft (97403) 13228E3904	EA	24
3		Coupling, Clamp, Pipe, Boltless, 6 inch, Double Groove (Sets of 25) (97403) PD4730-0016	EA	3
4		Container, Shipping and Storage, Steel Wall, Type II, Style I, Tricon (97403) PD8115-0101	EA	3
5		Hoseline Assembly Installation Tools (97403) 13228E3510 See fig C-4 for components.	EA	1
		*See figure C-1. This assembly is part of Pipeline Connection Assembly.		

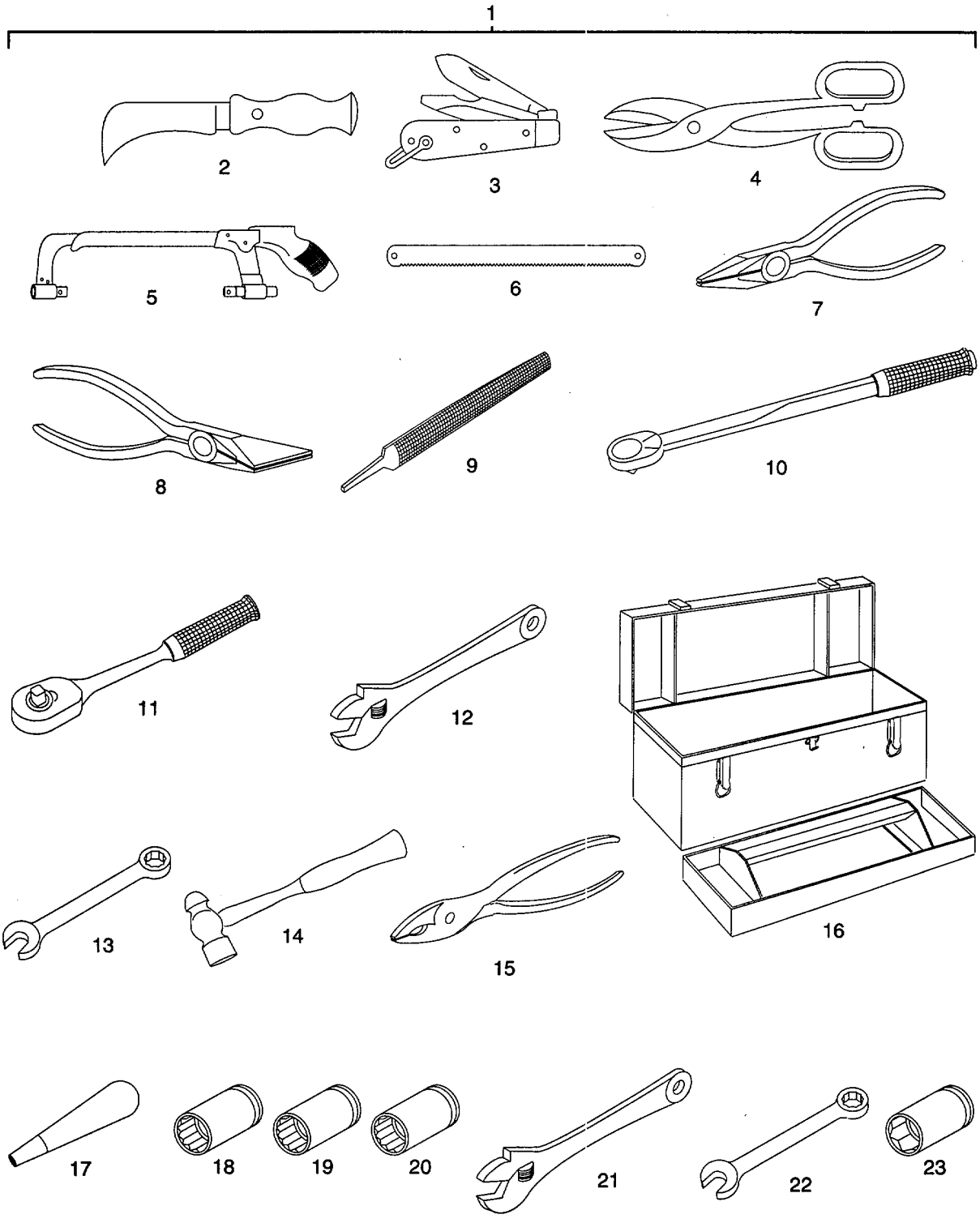


Figure C-4. Hoseline Assembly Installation Tools

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1		Hoseline Assembly Installation Tools (97403) 13228E3510 Consisting of the following:	*	
2		Knife, Craftman's Putty and Scrapping 1 1/2 in lg blade, 5 in lg handle (81348) GGG-K-481, Type I, Class 1, Style 1	EA	1
3		Knife, Pocket, Electricians, Heavy Duty, two blades (81348) GGG-K-484, Type II, Class 1, Style A, Grade B	EA	1
4		Shears, Metal cutting hand, straight cut, 12 1/2 in lg (81348) GGG-S-291, Type II, Class 1, Style B	EA	1
5		Frame, hand hacksaw, adjustable length (58536) A-A-453	EA	1
6		Blade, hand hacksaw, high speed steel 12 3/8 in lg 18 teeth per in (81348) GGG-B-451, Type, 1, Class 2, Style A	EA	10
7		Pliers, round nose (chain) with side cutter 6 in lg, 1 in min. EA (81348) GGG-P-471, Type II, Class 1, Style A	1	
8		Pliers, glass (81348) GGG-P-471, Type VII	EA	1
9		File, hand, American pattern, half round, bastard cut, 12 in lg (58536) A-A-2312	EA	1
10		Wrench, Torque, 3/8 in drive, fixed hd, 15-100 lb-ft, 17 5/8 in lg (81348) GGG-W-686	EA	1
11		Handle, Socket Wrench, reversible, 3/8 in drive, 10 1/2 in lg (58536) A-A-2165	EA	1
12		Wrench, Adjustable, Crescent, size 10, 9 1/2 - 10 1/2 in lg, 1 1/8 in max. (58536) A-A-2344	EA	1
13		Wrench, box and open end combination 9/16 in both ends (58536) A-A-1358	EA	1
14		Hammer, hand, machinist's ballpeen hickory handle, 12 oz 13 inch (81348) GGG-H-86, Type II, Class 1, Style A	EA	1
15		Pliers, slip joint, straight nose combination jaw with cutter (81348) GGG-P471, Type II, Class 2, Style A	EA	1
16		Tool Box Portable, steel, 22 in lg 8 1/2 in wide, 9 1/2 hi, removable tray (81348) GGG T-558/1, Type I, Class 2, Size 22	EA	1
17		Handle, soldering iron, large, 1 1/2 in dia, 5 1/2 in lg (81348) NN-H-106, Type II	EA	1
18		Socket, Wrench ATTAC 9/16 in nominal opening 3/8 in drive opening, long length, single hexagon 6 point (81348) GGG-W-641, Type II, Class 1, Style 8	EA	2

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
19		Socket, Wrench ATTAC 1/2 in nominal opening, 3/8 in drive opening, long length, single hexagon 6-point (81348) GGG-W-641, Type II, Class 1, Style 8	EA	1
20		Socket, Wrench ATTAC 5/8 in nominal opening, 3/8 in drive opening long length, single hexagon 6-point (81348) GGG-W-641, Type II	EA	1
21		Wrench, Adjustable, size 8, 7 1/2 - 8 1/2 in lg, 5/16 in max. jaw opening (58536) A-A-2344	EA	1
22		Wrench, box and open end combination 11/16 in both ends (58536) A-A-1358	EA	1
23		Socket, Wrench ATTAC 11/16 in nominal opening, 3/8 in drive opening, long length, single hexagon, (81348) GGG-W-641, Type II Class 1, Style 8	EA	1
		*See figure C-3, This is part of Transfer Hoseline Assembly 6 inch.		

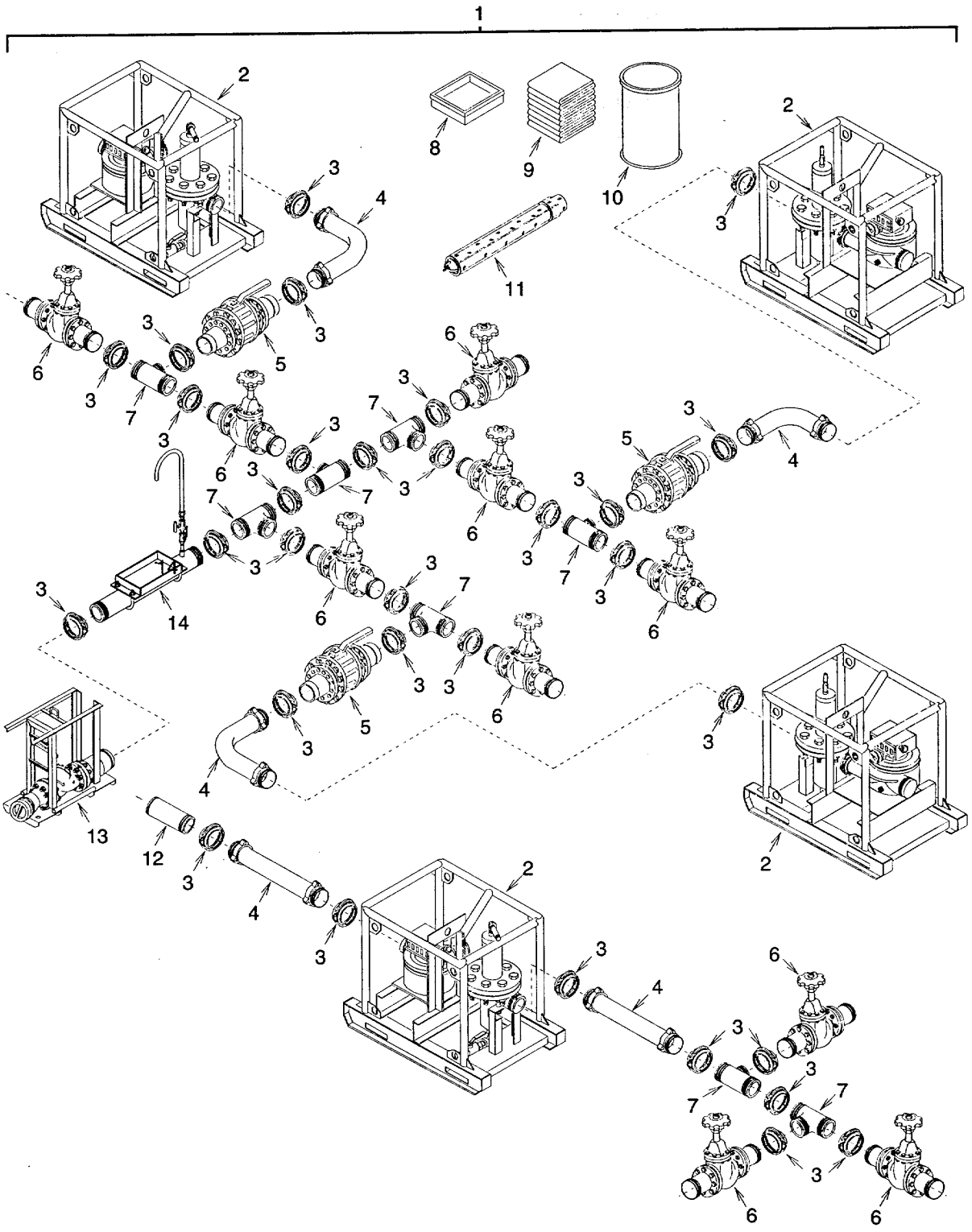


Figure C-5. Switching Manifold, 6 Inch

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1	3835-01-288-5901	Switching Manifold, 6 inch (97403) 13228E3413 Consisting of the following:	*	
2		Meter Skid Assembly, 6 inch, 800 GPM (97403) 13228E3442	EA	4
3		Coupling, Clamp, Pipe, Boltless, 6 inch, Double Groove (Sets of 25) (97403) PD4730-0016	EA	2
4	4720-01-288-4637	Hose Assy, Liquid Fuel, Dispensing, Double Groove 6 in x 50 ft (97403) 13228E3422	EA	5
5		Valve Assembly Ball, Double Groove, 6 inch (97403) 13228E3436	EA	7
6	4820-01-840-0070	Valve Assy, Gate, Double Groove, 6 inch (97403) 13228E3425	EA	12
7		Tee, Double Groove, 6 inch (97403) 13228E3421	EA	12
8		Pan, Drip (97403) 13228E3909-1	EA	4
9		Sorbent, Oil 36 in x 150 ft x 0.38 thick (58536) A-A-1280, Type I, Class 2	EA	2
10	8110-01-343-1697	Drum Shipping and Storage with Lid, 55 Gal (OA4T6) 0-55	EA	2
11		Strainer, insert, receiver, barrel (97403) 13228E3542	EA	1
12		Adapter, Double Groove to IPDS Single Groove (97403) 13228E3441	EA	6
13		Pressure Regulating Valve Assy (94833) 140K0033-1	EA	1
14	3835-01-840-0078	Fuel Sampling Assembly (97403) 13228E3536	EA	1
		* See figure C-1. This assembly is part of Pipeline Connection Assembly		

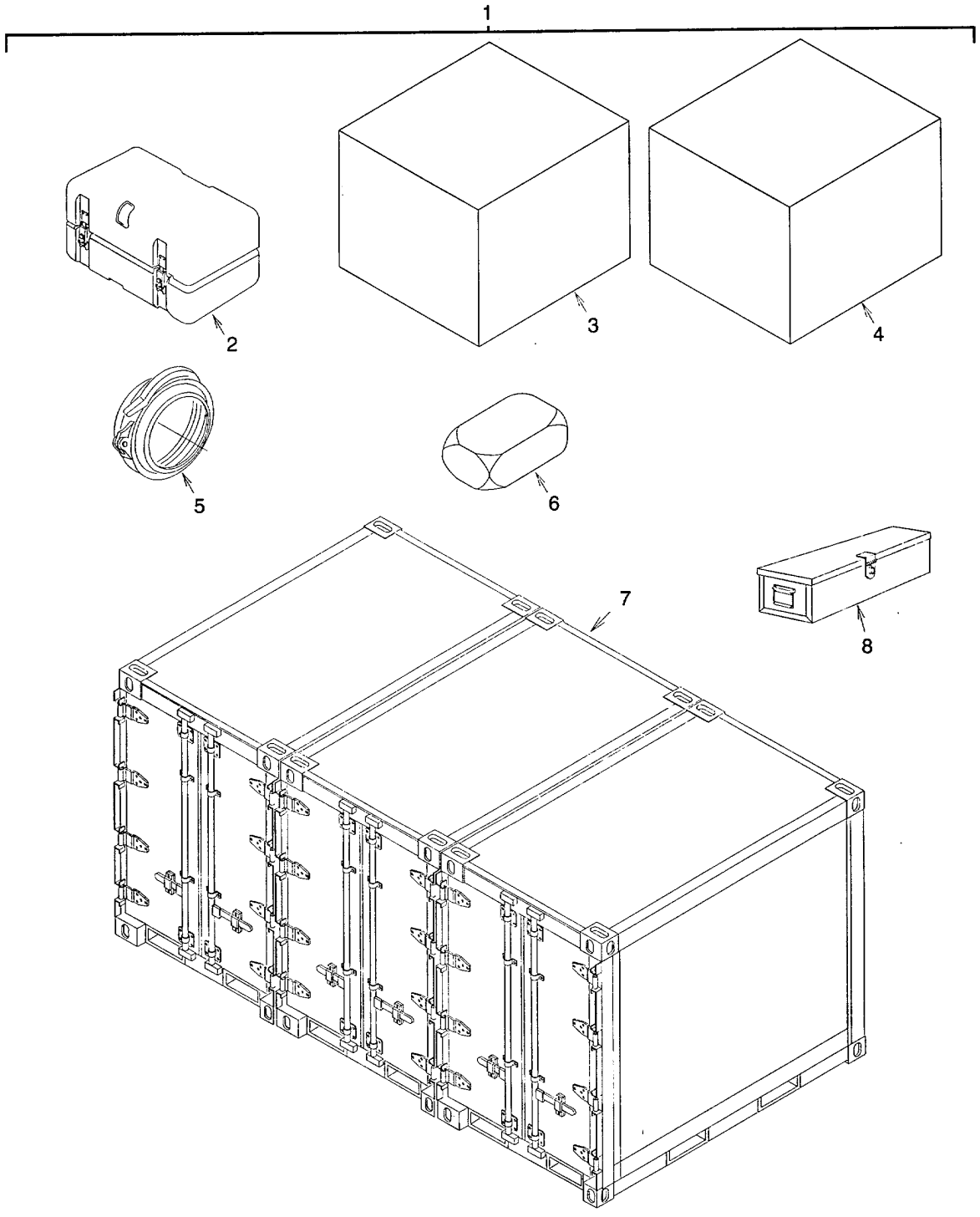


Figure C-6. Pipeline Connection Support Assembly

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1		Pipeline Connection Support Assembly (97403) 13228E3889	*	
2		Testing Kit, Petroleum Aviation Fuel, Contamination See TM 10-6630-240-12&P (81349) MIL-T-52849	EA	1
3	3835-01-195-1901	Suspension Kit, Hoseline, 6 inch (81349) MIL-S-53012	EA	1
4	3835-01-199-4014	Displacement and Evacuation Kit, 6 inch (81349) MIL-D-53015	EA	1
5		Coupling, Clamp, Pipe, Boltless, 6 inch, Double Groove (Sets of 25) (97403) PD4730-0016	EA	2
6		Bags, Sand, Polypropylene (81349) MIL-B-52472, Type II (Unit pack of 100)	PK	35
7	8115-01-363-4442	Container, Cargo Opening, 150-ICC, 2.0 ft long (58536) A-A-52032	EA	4
8		Hoseline Installation and Repair Assembly (97403) 13228E3518 See fig C-7 for components.	EA	1
		* See figure C-1. This assembly is part of Pipeline Connection Assembly.		

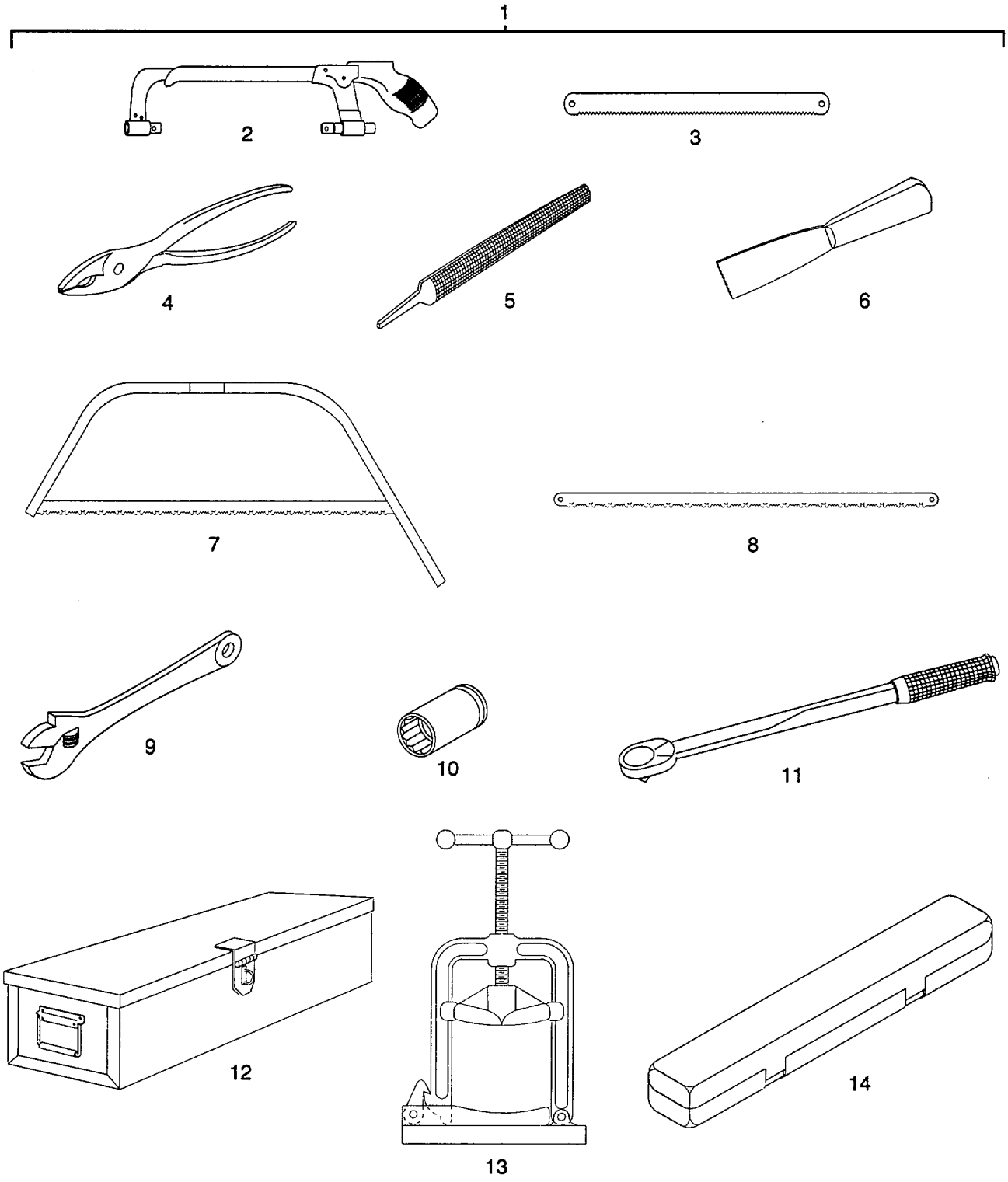


Figure C-7. Hoseline Installation and Repair Assembly

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1		Hoseline Installation and Repair Assembly (97403) 13228E3518 Consisting of the following:		
2		Frame, hand, hacksaw 10-12 inch, 3 inch throat min (58536) A-A-453	EA	1
3		Blade, hand, hacksaw, 12 inch (81348) GGG-B-451, Type I, Grade A, Class 2	EA	5
4		Pliers, side cutting (81348) GGG-P-471, Type II, Class 2, Style A	EA	1
5		File, hand, half round, 10 inch (81348) GGG-F-325, Type 9, Style A	EA	1
6		Knife, putty and shaping (81348) GGG-K-481, Type IV, Class 1	EA	1
7		Saw, Crosscut, One 36 inch (81348) GGG-S-0064, Type III	EA	1
8		Blade, Saw, bow 36 inch blade, 1 inch wide, blade only (81348) GGG-S-0064, Type III	EA	5
9		Wrench, adjustable, 10 inch (58536) A-A-2344	EA	1
10		Socket, Socket Wrench, .50 inch drive, 12 point, drive 0.5625 (81348) GGG-W-641, Type 2, Class 2, Style B	EA	4
11		Wrench, Torque 0.50 inch drive 30-150 ft-lb (81348) GGG-W-686, Type 3, Class 2	EA	2
12		Tool Box, portable (general two handled type)(42 x14 x 12) (81348) GGG-T-558/6A, Type V'II, SPL	EA	1
13		Clamp, Hose, 6 inch fig 1 (x-2410) (81349) MIL -R-53013	EA	2
14		Case, Torque Wrench case for .50 Torque Wrench (OG723) PB5	EA	2
		* See fig C-6. This assembly is part of Pipeline Connection Support Assembly.		

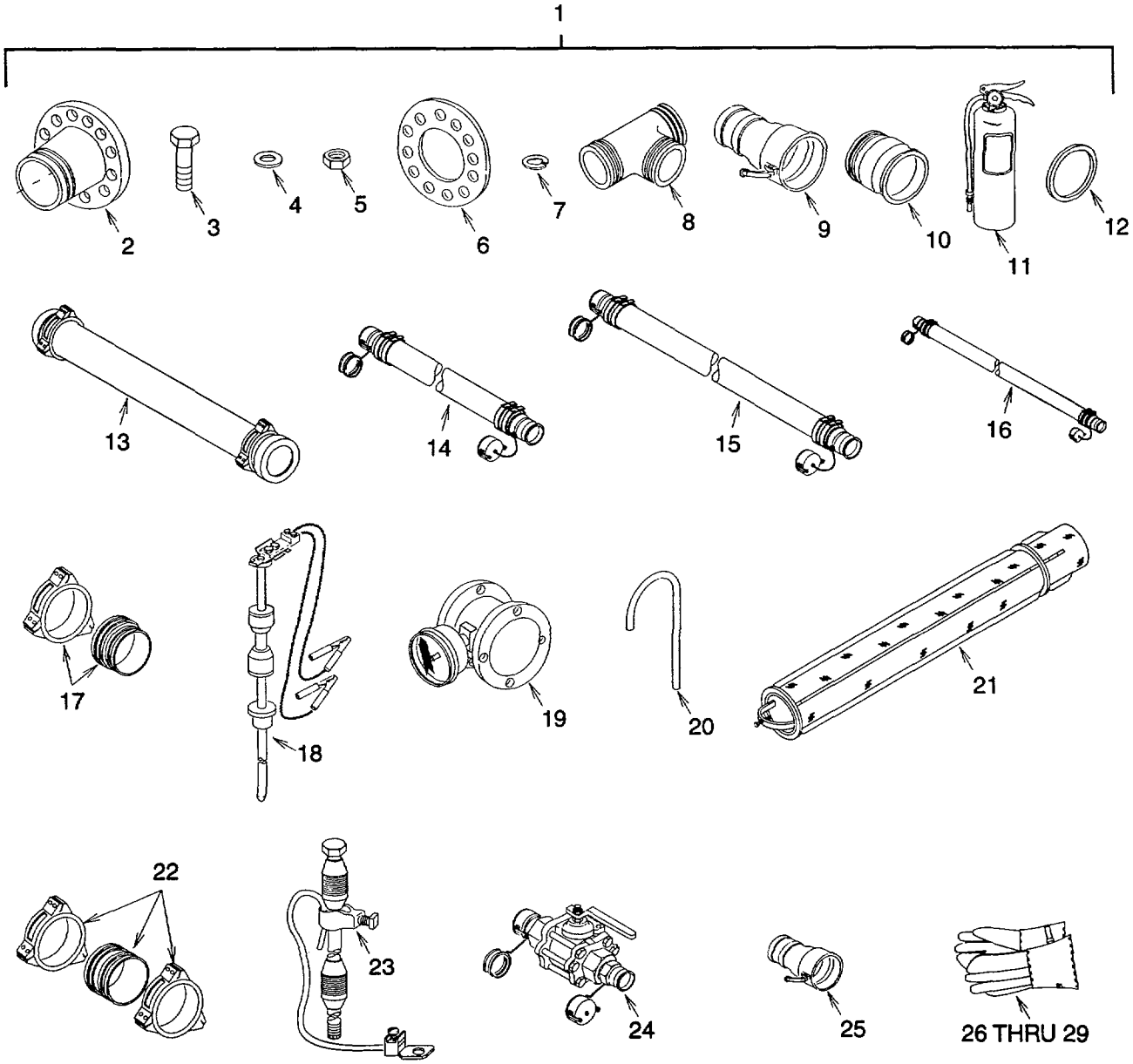
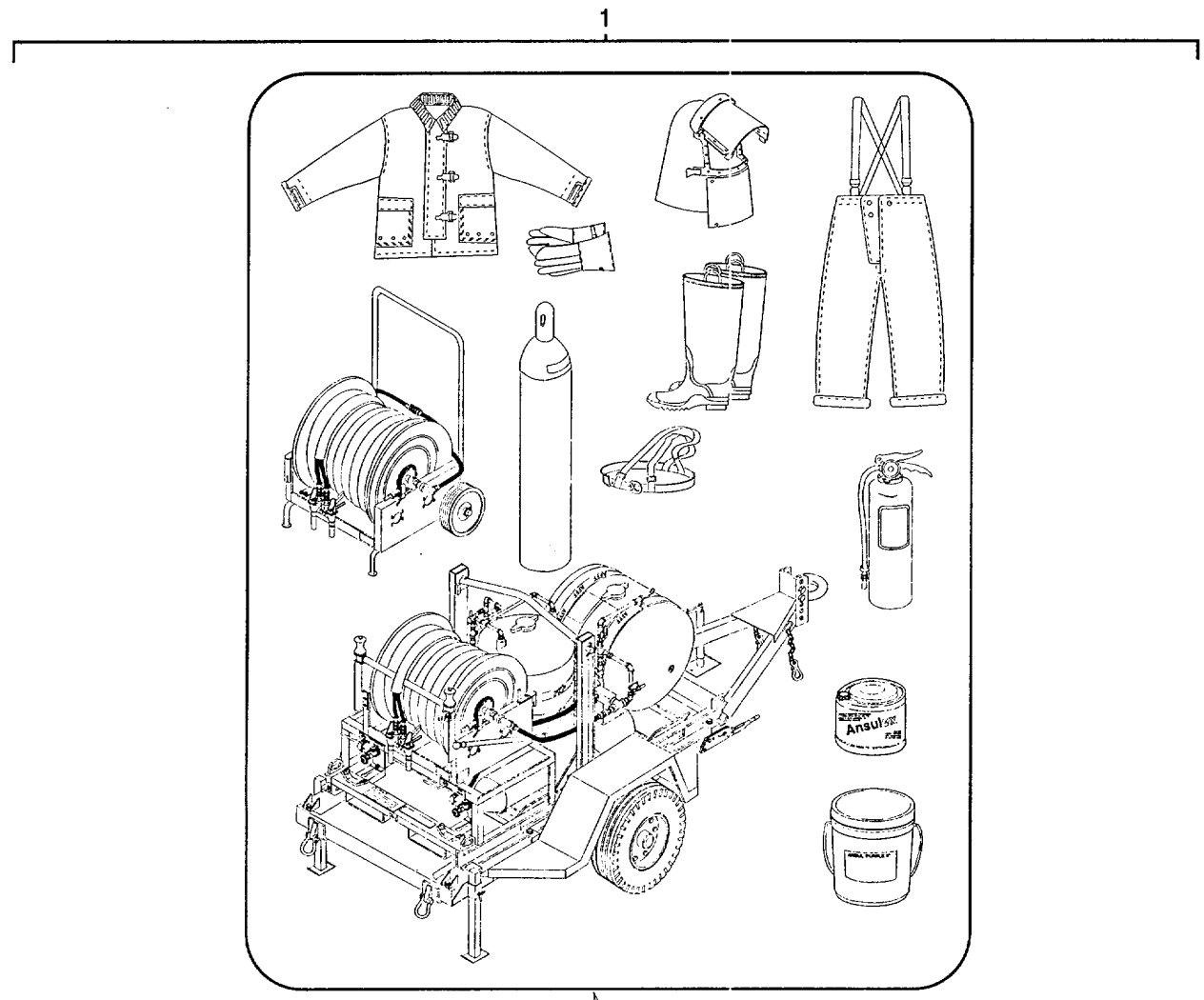


Figure C-8. Interim Support Items List (ISIL) Pipeline Connection Support Assembly (ON BOARD SPARES)

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
		ON BOARD SPARES		
1		Interim Support Items List (ISIL) Pipeline Connection Support Assembly (97403) 13228E3892	*	
2		Adapter, Flange to Double Groove, 6 inch (97403) 13228E3455	EA	2
3		Screw, Cap, hex hd (96906) MS51491-023	EA	70
4		Washer, flat (96906) MS21306-7	EA	70
5		Nut, plain, slotted, H 0.375 - 16 unc-2B, Zinc coating (81348) FF-N-836, Type II, Style 13	EA	70
6	5330-01-173-8301	Gasket (97403) 13220E1069-3	EA	14
7	5310-01-218-7137	Washer, lock (96906) MS51415-7	EA	70
8		Tee, 6 inch, Double Groove (97403) 13228E3421	EA	1
9	4730-00-951-3296	Reducer, Quick Disconnect (96906) MS49000-9	EA	1
10		Adapter, Cam-lock, Male by Double Groove Male (97403) 13228E3423	EA	1
11		Extinguisher, fire, dry chemical, 20 lb (58536) A-A-393, Type I, Class 2	EA	2
12	5330-00-088-9166	Gasket (96906) MS27030-8	EA	5
13	4720-01-288-4637	Hose Assy, Liquid Fuel, 6 in x 51 ft, Double Groove (97403) 13228E3422	EA	2
14	4720-00-727-1339	Hose, Nonmetallic, Liquid Fuel Suction, 4 in x 12 ft, Cam-lock (97403) 13228E3431	EA	2
15		Hose Assy, Liquid Fuel, 4 in x 25 ft lg (94833) 140K0019-1	EA	2
16		Hose Assy, Liquid Fuel, 1 in x 25 ft (94833) 140K0022-1	EA	3
17		Adapter, Lightweight hose to Double Groove, Bolt on type 6 inch(97403) 13228 E3813	EA	36
18	5975-01-288-4638	Ground Rod, self driving (97403) 13228E3500	EA	1
19		Flow indicator, tachometer type (97403) 13228E3492	EA	1

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
20		Tube, stainless steel (97403) 13228E3470	EA	4
21		Strainer, insert, receiver, barrel (97403) 13228E3542	EA	1
22		Mender, lightweight, hose, 6 inch bolt on type (97403) 13228E3814	EA	18
23		Ground Rod (81348) W-R-550, Type III, Class B	EA	2
24	4820-01-212-9508	Valve Assy, ball, 3 inch Quick Disconnect (97403) 13226E8273	EA	1
25	4730-00-951-3293	Reducer, Quick Disconnect (96906) MS49000-1	EA	1
26		Gloves, forest workers (81348) FSS 6170-5, small, tan	EA	3
27		Gloves, forest workers (81348) FSS 6170-5, medium, tan	EA	8
28		Gloves, forest workers (81348) FSS 6170-5, large tan	EA	10
29		Gloves, forest workers (81348) FSS 6170-5, X-large, tan	EA	5
		* See fig C-6.		
		This assembly is part of the Pipeline Connection Support Assembly.		



SEE FIGURE C-10 FOR TANK FARM ASSEMBLY

3

SEE FIGURE C-13 FOR FUEL DISPENSING ASSEMBLY

5

SEE FIGURE C-15 FOR 50,000 GALLON TANK OPTIONAL CONFIGURATION

7

SEE FIGURE C-11 & C-12 FOR TRANSFER HOSELINE ASSEMBLY, 6 INCH

4

SEE FIGURE C-14 FOR TANKER TRUCK RECEIPT MANIFOLD, 6 INCH

6

SEE FIGURE C-16 FOR FUEL UNIT SUPPORT ASSEMBLY

8

Figure C-9. Fuel Unit

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1	4930-01-377-8027	Fuel Unit (97403) 13228E3887 Consisting of the following:	EA	3
2	4210-01-210-8728	Fire Suppression Equipment (97403) 13228E3419 See TM 10-4120-235-13.	EA	6
3		Tank Farm Assembly (97403) 13228E3714 See fig C-10 for components.	EA	3
4	3835-01-288-4607	Transfer Hoseline Assembly 6 inch (97403) 13228E3416 See fig C-11 for components.	EA	1
5	3835-01-288-4626	Fuel Dispensing Assembly (97403) 13228E3415 See fig C-13 for components.	EA	1
6	3835-01-288-4617	Tanker Truck Receipt Manifold, 6 inch (97403) 13228E3414 See fig C-14 for components.	EA	1
7	3835-01-840-0072	50,000 Gallon Tank Optional Configuration (97403) 13228E3488 See fig C-15 for components.	EA	1
8		Fuel Unit Support Assy (97403) 13228E3890 See fig C-16 for components.	EA	1

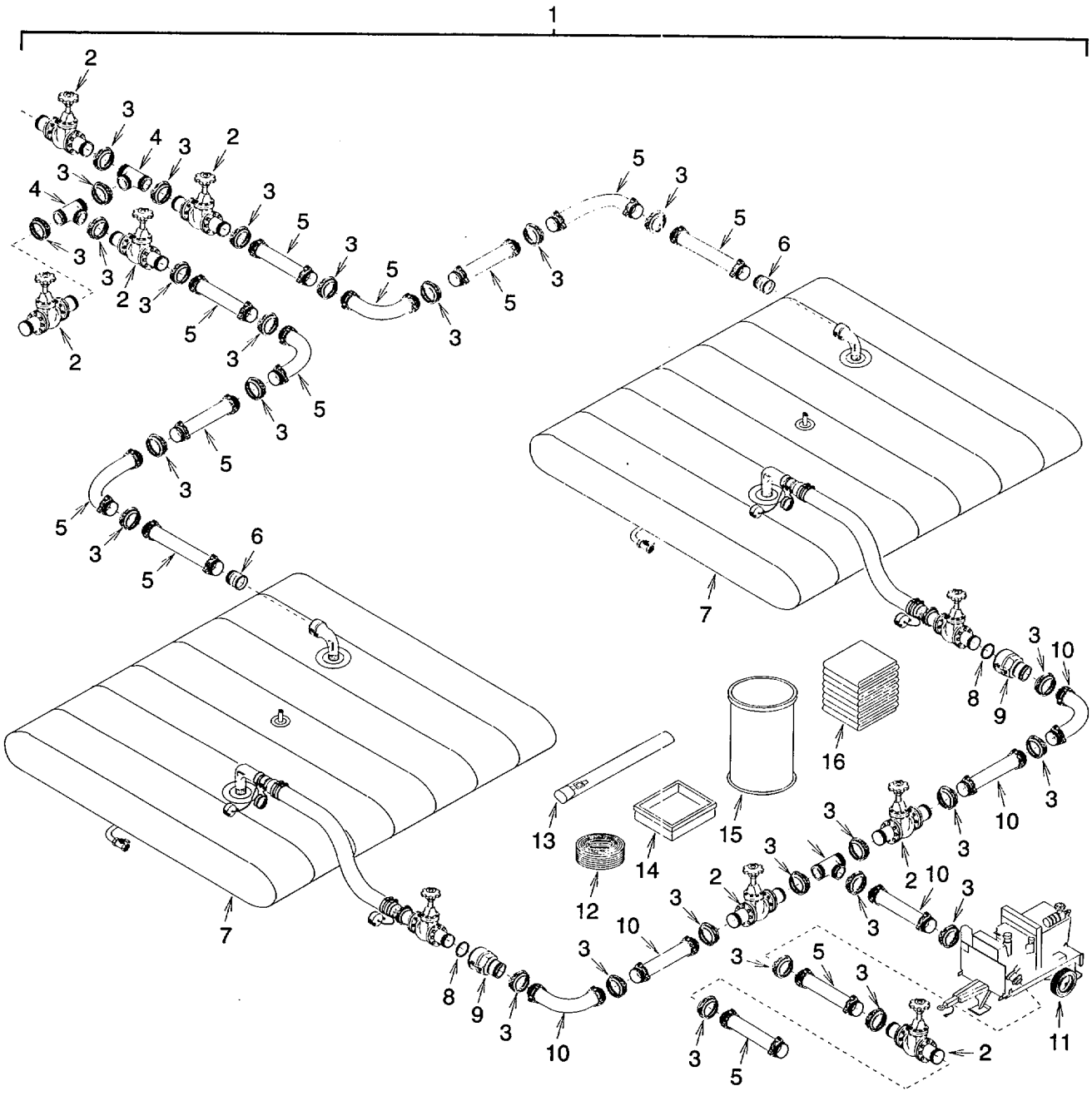


Figure C-10. Tank Farm Assembly

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1		Tank Farm Assembly (97403) 13228E3714 Consisting of the following:		*
2	4820-01-840-0070	Valve Assy, Gate, 6 inch Double Groove (97403) 13228E3425	EA	10
3		Coupling, Clamp, Pipe, Boltless, 6 inch, Double Groove (Sets of 25) (97403) PD4730-0016	EA	2
4		Tee, 6 inch Double Groove (97403) 13228E3421	EA	7
5	4720-01-288-4637	Hose Assy, Liquid Fuel Dispensing, Double Groove 6 in x 50 ft (97403) 13228E3422	EA	12
6		Adapter, Cam-lock, make by Double Groove Male (97403) 13228E3423	EA	2
7	5430-01-378-5314	Tank Assy, Fabric, Collapsible, 5,000 BBL (BFTA) See TM 10-5430-219-12 (81349) MIL-T-53066	EA	2
8	5330-00-412-9780	Gasket (96906) MS27030-10	EA	2
9	4730-01-210-4559	Coupling adapter (97403) 13226E8267-1	EA	2
10	4720-01-288-5903	Hose Assy, 6 in x 12 ft (97403) 13228E3428	EA	19
11	4320-01-181-3984	Pump Unit, Centrifugal, DED, self priming, 600 GPM 150 PSI (See TM 5-4320-305-24P) (81349) MIL-P-53051	EA	1
12		Cord, Fibrous, Nylon, make from MIL-C-5040, Type III, 2100 ft lg. (97403) 13228E3417/12	EA	1
13		Pole, Range, Metal with Case (58536) A-A-52044	EA	4
14		Pan Drip (97403) 13228E3909-2	EA	1
15	8110-01-343-1697	Drum Shipping and Storage with Lid, 55 Gal (OA4T6) 0-55	EA	1
16		Sorbent, oil 36 in x 150 ft x 0.38 thk (58536) A-A-1280, Type I, Class 2	EA	1
		See fig C-9. This assembly is part of the Fuel Unit.		

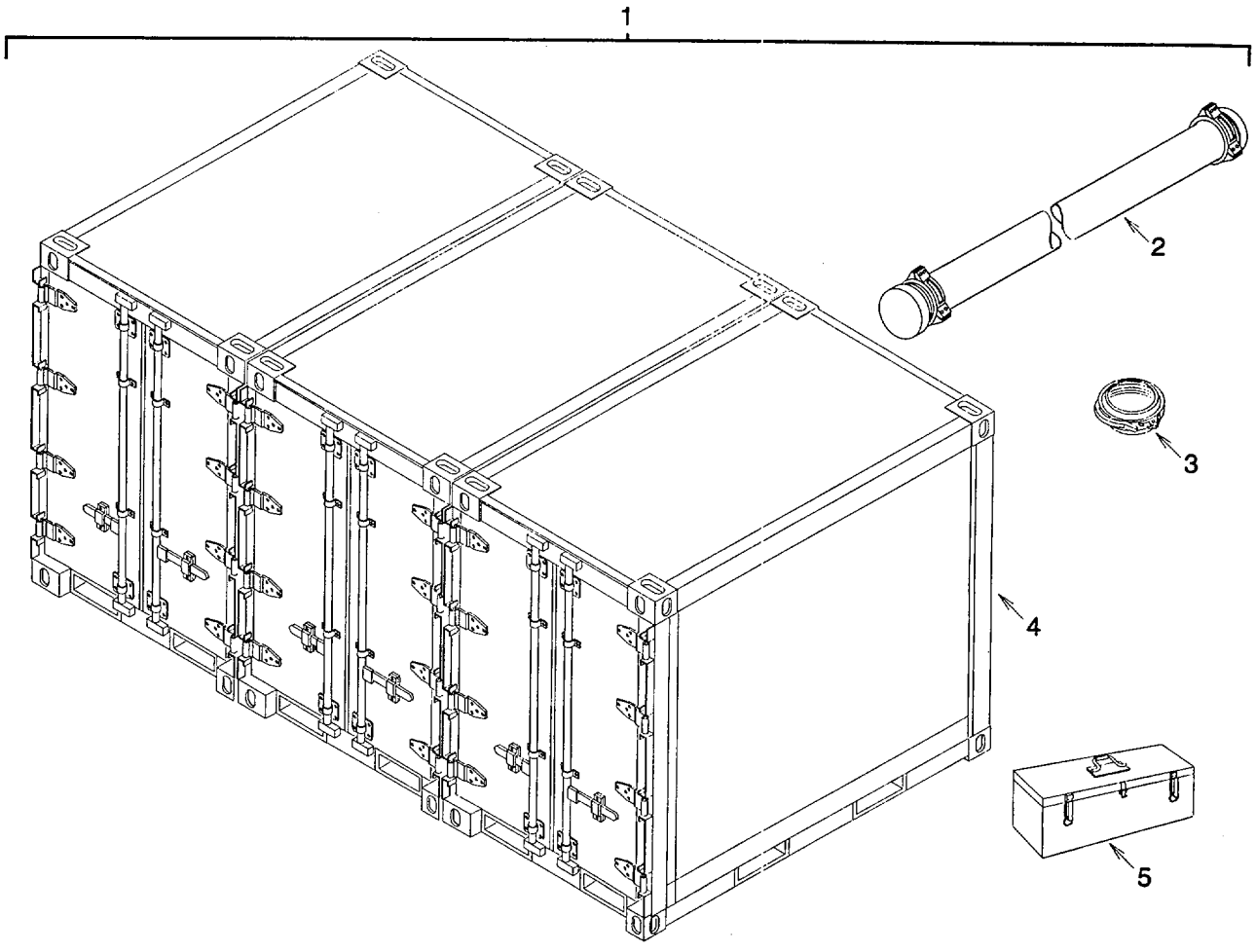


Figure C-11. Transfer Hoseline Assembly ,6 Inch

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1	3835-01-288-4607	Transfer Hoseline Assy, 6 inch (97403) 13228E3416 Consisting of the following:	*	
2		Hose Assembly, Liquid Fuel, 6 in x 500 ft (97403) 13228E3904	EA	24
3		Coupling, Clamp, Pipe, Boltless, 6 inch, Double Groove (Sets of 25) (97403) PD4730-0016	EA	3
4		Container, Shipping and Storage, Steel Wall, Type II, Style I, Tricon (97403) PD8115-0101	EA	3
5		Hoseline Assembly Installation Tools (97403) 13228E3510 See fig C-12 for components.		
		* See fig C-9. This assembly is part of the Fuel Unit.		

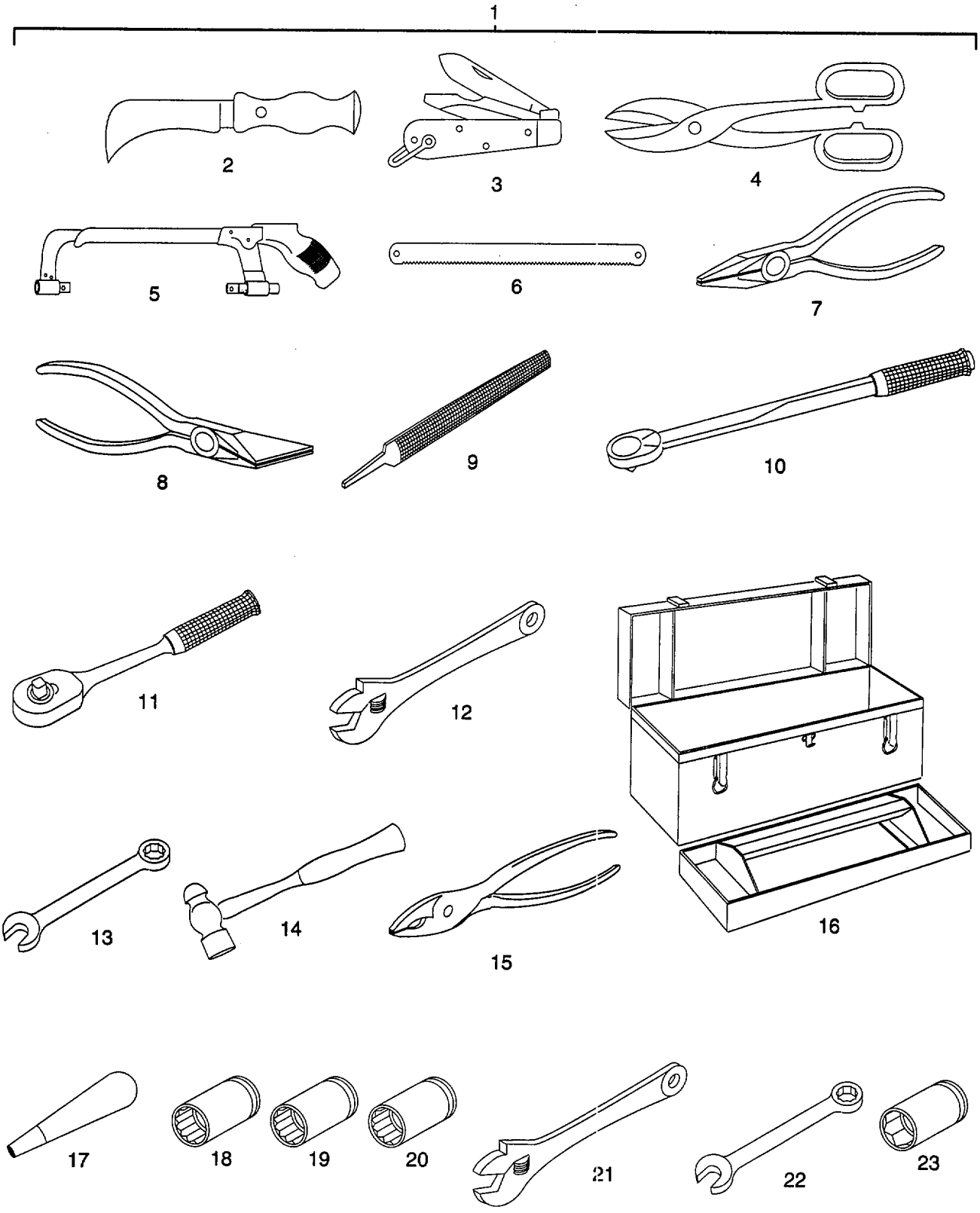


Figure C-12. Hoseline Assembly Installation Tools

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1		Hoseline Assembly Installation Tools (97403) 13228E3510 Consisting of the following:		*
2		Knife, Putty and Scrapping 1 1/2 in lg blade, 5 in. lg handle (81348) GGG-K-481, Type I, Class 1, Style 1	EA	1
3		Knife, Pocket, Electricians, Heavy Duty, Two blades (81348) GGG-K-484, Type II, Class 1, Style A, Size 3 Grade B	EA	1
4		Shears, Metal cutting hand, straight cut, 12-1/2 in lg (81348) GGG-S-291, Type II, Class 1, Style B	EA	1
5		Frame, hand hacksaw, adjustable length (58536) A-A-453	EA	1
6		Blade, hand hacksaw, high speed steel 12-3/8 in. lg 18 teeth per in. (81348) GGG-B-451, Type, I, Class 2, Style A	EA	10
7		Pliers, round nose (chain) with side cutter 6 in lg, 1 in. min jaw opening (81348) GGG-P-471, Type XI, Class 1, Style A	EA	1
8		Pliers, glass (81348) GGG-P-471, Type VII	EA	1
9		File, hand, pattern half round, bastard cut, 12 in. lg (58536) A-A-2312	EA	1
10		Wrench, Torque, 3/8 in. drive, fixed hd, 15-100 lb-ft, 17-5/8 in. lg (81348) GGG-W-686	EA	1
11		Handle, Socket Wrench, reversible, 3/8 in. drive, 10-1/2 in. lg (58536) A-A-2165	EA	1
12		Wrench Crescent, adjustable, size 10, 9-1/2 - 10-1/2 in lg, 1-1/8 in max. (58536) A-A-2344	EA	1
13		Wrench, box and open end combination 9/16 in both ends (58536) A-A-1358	EA	1
14		Hammer, Hand machinist's ballpeen hickory handle, 12 oz, 13 in. (81348) GGG-H-86, Type II, Class 1, Style A	EA	1
15		Pliers, straight nose combination jaw with cutter regular 10 in. (81348) GGG-P471, Type II, Class 2, Style A	EA	1
16		Tool Box, portable, steel, 22 in. lg 8-1/2 in. wide, 9-1/2 hi., removable (81348) GGG T-558/1, Type I, Class 2, Size 22	EA	1
17		Handle, Soldering Iron, large, 1-1/2 in. dia, 5-1/2 in. lg (81348) NN-H-106, Type II	EA	1

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
18		Socket, Wrench ATTAC 9/16 in. nominal opening 3/8 in. drive opening, long length, single hexagon 6 point (81348) GGG-W-641, Type II, Class 1, Style 8	EA	2
19		Socket, Wrench ATTAC 1/2 in. nominal opening, 3/8 in. drive opening, long length, single hexagon 6-point (81348) GGG-W-641, Type II, Class 1, Style 8	EA	1
20		Socket, Wrench ATTAC 5/8 in. nominal opening, 3/8 in. drive opening long length, single hexagon 6-point (81348) GGG-W-641, Type II	EA	1
21		Wrench, Adjustable, size 8, 7-1/2 to 8-1/2 in. lg, 5/16 in. max. jaw opening (58536) A-A-2344	EA	1
22		Wrench, box and open end combination 11/16 in. both ends (58536) A-A-1358	EA	1
23		Socket, Wrench ATTAC 11/16 in. nominal opening, 3/8 in. drive opening, long length, single hexagon, (81348) GGG-W-641, Type II Class 1, Style 8	EA	1
		* See fig C-11 This assembly is part of Transfer Hoseline Assembly, 6 inch		

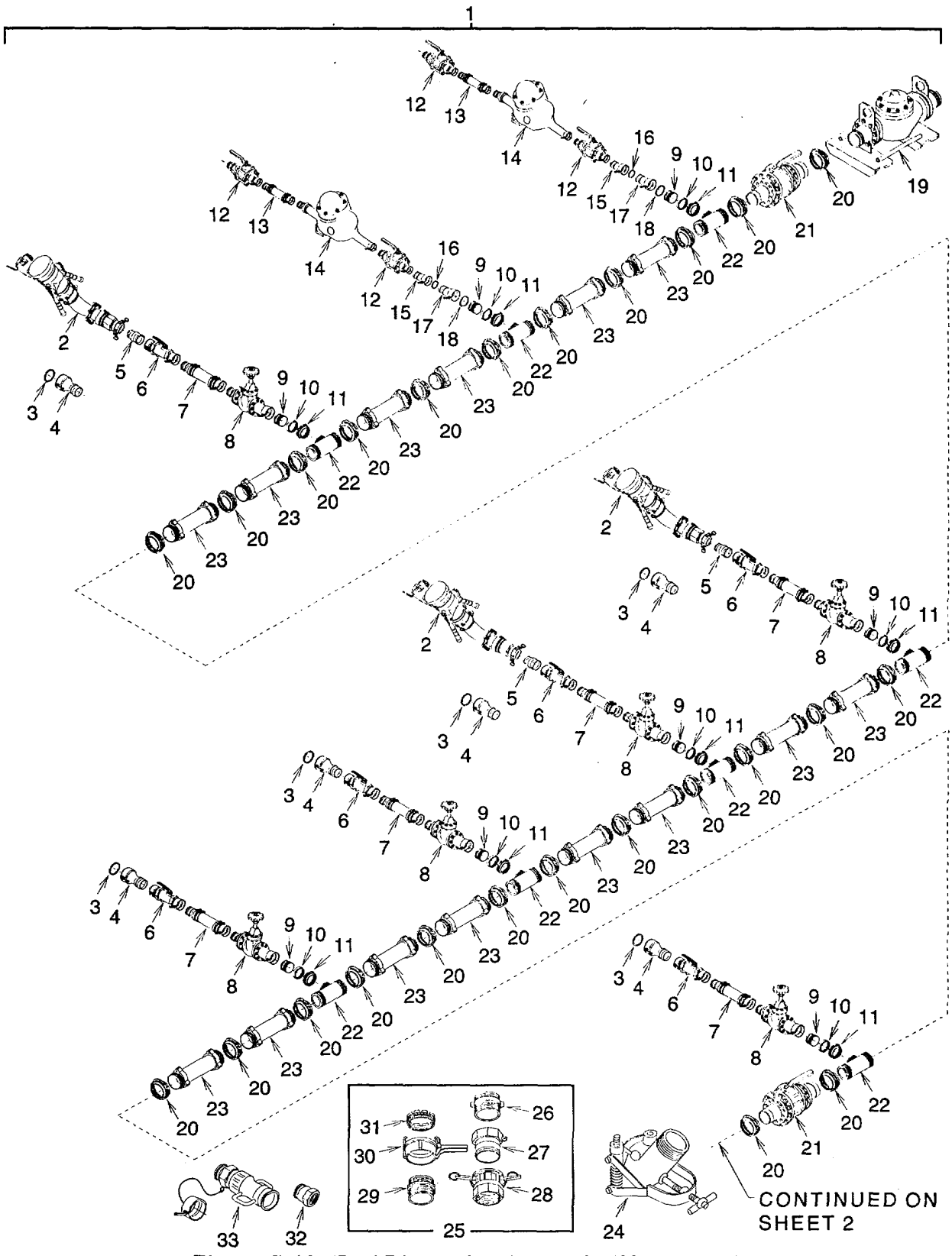


Figure C-13. Fuel Dispensing Assembly (Sheet 1 of 2)

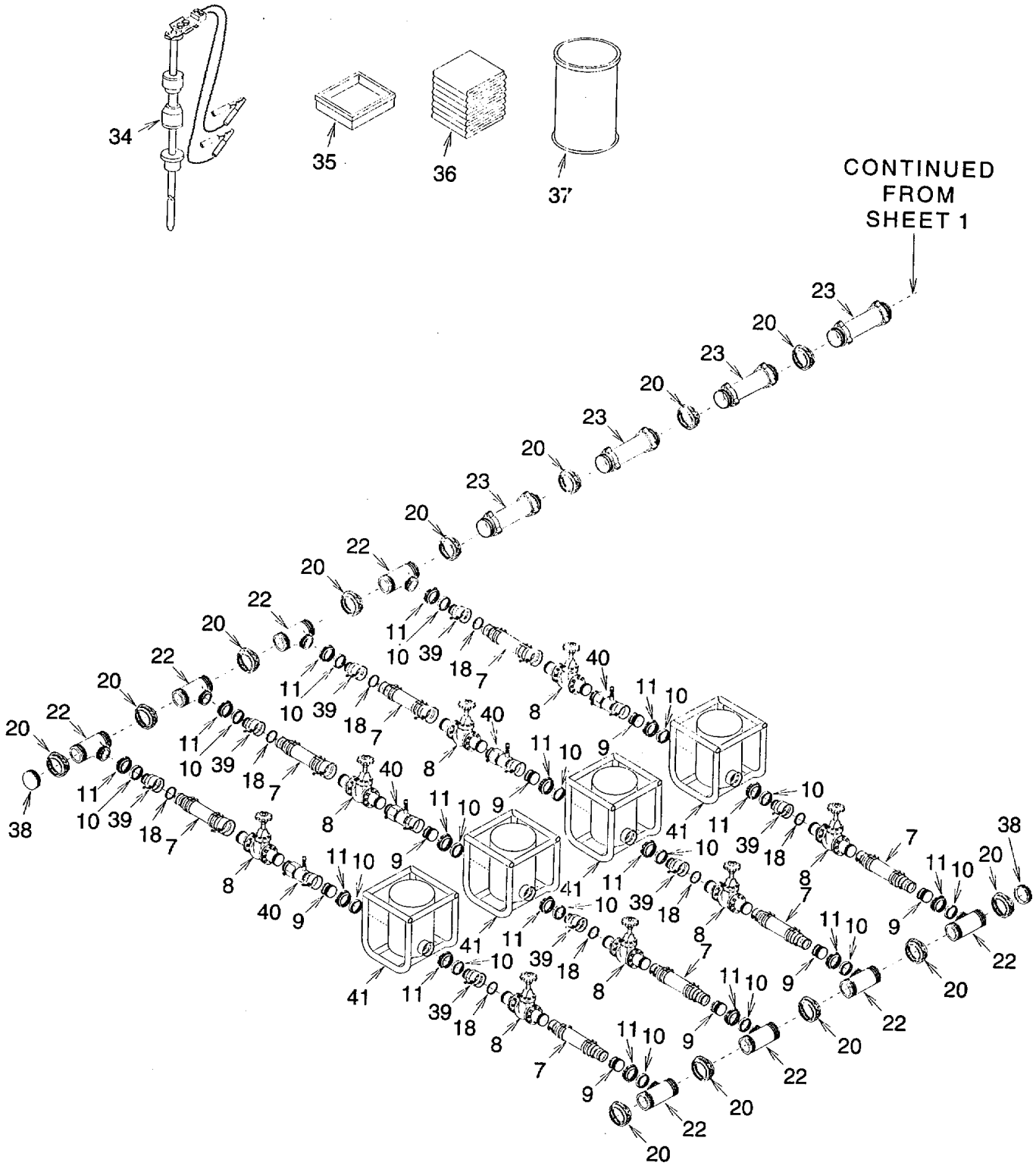


Figure C-13. Fuel Dispensing Assembly (Sheet 2 of 2)

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1	3835-01-2884626	Fuel Dispensing Assembly (97403) 13228E3415 Consisting of the following:		*
2		Nozzle Assembly (See TM 10-4930-246-13&P) (81349) MIL-N-5877, Type Dl	EA	3
3	5330-00-088-9166	Gasket (96906) MS27030-8	EA	6
4	4730-00-951-3296	Reducer (96906) MS49000-9	EA	6
5	4730-01-190-5538	Reducer, Quick Disconnect (96906) MS39352-13	EA	3
6		Valve Assembly Butterfly, 4 inch, Cam-lock, Female x Female (97403) 13228E3546	EA	6
7		Hose Assy, Liquid Fuel 4 in. x 25 ft (94833) 140K0019-1	EA	14
8	4820-01-840-0082	Valve Assembly, Gate 4 inch, Cam-lock (97403) 13228E3435	EA	14
9		Coupling half, Quick Disconnect (96906) MS70100-1-S	EA	16
10	5330-01-840-0080	Gasket, Grooved end pipe, 4 inch (97403) 13228E3432-2	EA	24
11	4730-01-840-0079	Coupling Clamp, Grooved end pipe, 4 inch (97403) 13228E3432-1	EA	24
12		Valve Assy Ball 1-1/2 inch, Cam-lock (97403) 13228E3438	EA	4
13		Hose Assy, Liquid Fuel, 1-1/2 in. x 25 ft (94833) 140K0021-1	EA	2
14		Pressure Assy Control 1-1/2 inch, Cam-lock (97403) 13228E3439	EA	2
15	4730-00-951-3295	Reducer, Quick Disconnect (96906) MS49000-5	EA	2
16	5330-00-612-2414	Gasket (96906) MS27030-6	EA	2
17	4730-01-064-0560	Reducer, Quick Disconnect (96906) MS49000-17	EA	2
18	5330-00-899-4509	Gasket (96906) MS27030-9	EA	10
19		Valve Assembly, Pressure Control, 6 inch Double Groove (97403) 13228E3437	EA	1
20		Coupling, Clamp, Pipe, Boltless, 6 inch, Double Groove (Sets of 25) (97403) PD4730-0016	EA	2
21		Valve Assembly ball, 6 inch Double Groove (97403) 13228E3436	EA	2
22	4730-01-210-5625	Coupling, Tee, Fitting Double Grooved, Aluminum (97403) 13228E3429	EA	16
23	4720-01-288-4637	Hose Assy, Liquid Fuel Dispensing 6 in. x 50 ft (97403) 13228E3422	EA	18
24	4730-01-897-6149	Coupling, rail tanker, NATO (97403) 13222E8219	EA	2

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
25	4730-01-897-6151	Coupling Set, NATO, tank truck adapter, consisting of items 26 thru 31 (97403) 13222E8212	EA	2
26		Adapter, NATO (97403) 13222E8216	EA	1
27		Coupling half (97403) 13222E8214	EA	1
28		Coupling half (97403) 13222E8213	EA	1
29		Adapter, Hose coupling, NATO (97403) 13222E3215	EA	1
30		Coupling, female tank truck (97403) 13222E8217	EA	1
31		Coupling, male tank truck (97403) 13222E8218	EA	1
32		Adapter, Drybreak, tanker truck (97403) 13228E3912	EA	3
33		Coupling Assy, Drybreak (97403) 13228E3882	EA	3
34	5975-01-288-4638	Ground Rod Assy, Self driving (97403) 13228E3500	EA	1
35		Pan Drip (97403) 13228E3909-1	EA	8
36		Sorbent, oil, 36 in. x 150 ft x 0.38 thick (58536) A-A-1280, Type I, Class 2	EA	2
37	8110-01-343-1697	Drum Shipping and Storage with Lid, 55 Gal (OA4T6) 0-55	EA	2
38	4730-01-306-6890	Cap, Pipe (97403) 13228E3434	EA	2
39	4730-01-840-0081	Coupling, Adapter Assy, Female (97403) 13226E8267-2	EA	8
40		Adapter Assy, Water Detection Kit (97403) 13228E3448	EA	4
41	4330-00-177-8485	Filter separator, liquid fuel, 350 GPM, 4 inch (See TM 10-4330-235-13&P) (97403) 13217E9320	EA	4
		* See fig C-9. This assembly is part of the Fuel Unit.		

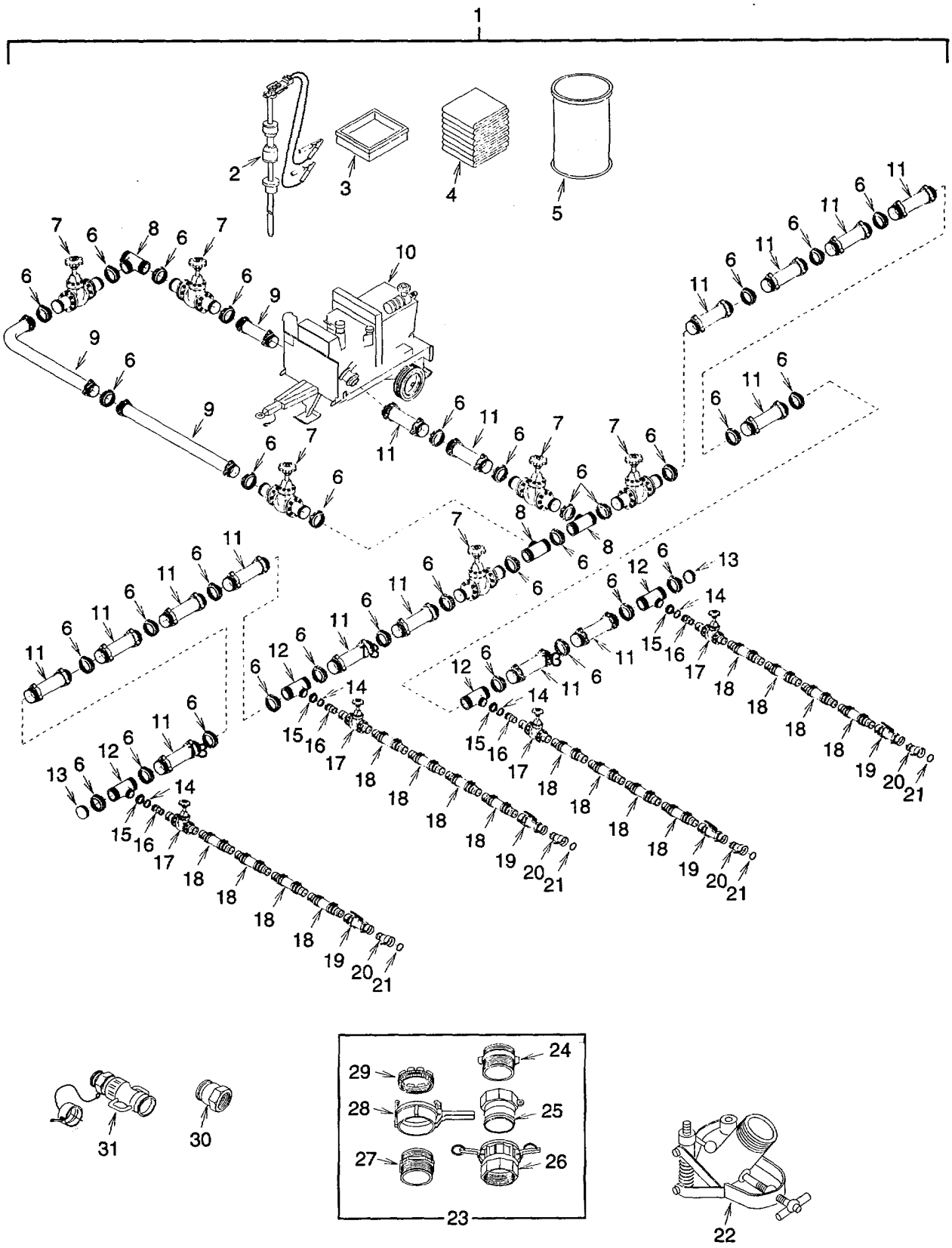


Figure C-14. Tanker-Truck Receipt Manifold

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1	3835-01-288-4617	Tanker Truck Receipt Manifold 6 inch (97403) 13228E3414 Consisting of the following:		*
2	5975-01-288-4638	Ground Rod Assy, Self Driving (97403) 13228E3500	EA	4
3		Drip pan (97403) 13228E3939-2	EA	5
4		Sorbent, oil, 36 in. x 150 ft x 0.38 thick (58536) A-A-1280, Type I, Class 2	EA	2
5	8110-01-343-1697	Drum Shipping and Storage with Lid, 55 Gal (OA4T6) 0-55	EA	2
6		Coupling, Clamp, Pipe, Boltless, 6 inch, Double Groove (Sets of 25) (97403) PD4730-0016	EA	2
7	4820-01-840-0070	Valve Assy, Gate, 6 inch Double Groove (97403) 13228E3425	EA	6
8		Tee, 6 inch Double Groove (97403) 13228E3421	EA	3
9	4720-01-288-4637	Hose Assy, Liquid Fuel Dispensing Double Groove 6 in. x 50 ft (97403) 13228E3422	EA	3
10	4320-01-181-3984	Pump Unit, Centrifugal DED Self' Priming, 600 GPM 150 PSI (See TM 5-4320-305-24P) (81349) MIL-P-53051	EA	1
11	4720-01-288-5903	Hose Assy, Liquid Fuel Dispensing Double Groove 6 in. x 12 ft (97403) 13228E3428	EA	18
12	4730-01-210-5625	Coupling, Tee fittings Double Groove, aluminum (97403) 13228E3429	EA	4
13	4730-01-306-6890	Cap, Pipe (97403) 13228E3434	EA	2
14	5330-01-840-0080	Gasket, Grooved end pipe, 4 inch (97403) 13228E3432-2	EA	4
15	4730-01-840-0079	Coupling, clamp grooved end pipe 4 inch (97403) 13228E3432-1	EA	4
16		Coupling half, Quick Disconnect (96906) MS70100-1-S	EA	4
17	4820-01-840-0082	Valve Assembly, Gate 4 inch, Cam-lock (97403) 13228E3435	EA	4
18	4720-00-727-1339	Hose Nonmetallic Liquid Fuel, suction, Cam-lock, 4 in. x 12 ft (97403) 13228E3431	EA	16
19		Valve Assembly Butterfly, 4 inch, Cam-lock, female x female (97403) 13228E3546	EA	4

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
20		Reducer, Quick Disconnect (96906) MS49000-9-S	EA	4
21	5330-00-088-9166	Gasket (96906) MS27030-8	EA	4
22	4730-01-897-6151	Coupling Set, NATO, tank truck adapter (97403) 13222E8212	EA	1
23		Adapter, hose coupling, NATO (97403) 13222E8215	EA	1
24		Adapter, NATO (97403) 13222E8216	EA	1
25		Coupling half (97403) 13222E8214	EA	1
26		Coupling half (97403) 13222E8213	EA	1
27	4730-01-897-6149	Coupling, rail tanker, NATO (97403) 13222E8219	EA	1
28		Coupling, female tank truck (97403) 13222E8217	EA	1
29		Coupling, male tank truck (97403) 13222E8218	EA	1
30		Adapter, Drybreak, tanker truck (97403) 13228E3912	EA	2
31		Coupling Assy, Drybreak (97403) 13228E3882	EA	2
		* See fig C-9. This assembly is part of the Fuel Unit.		

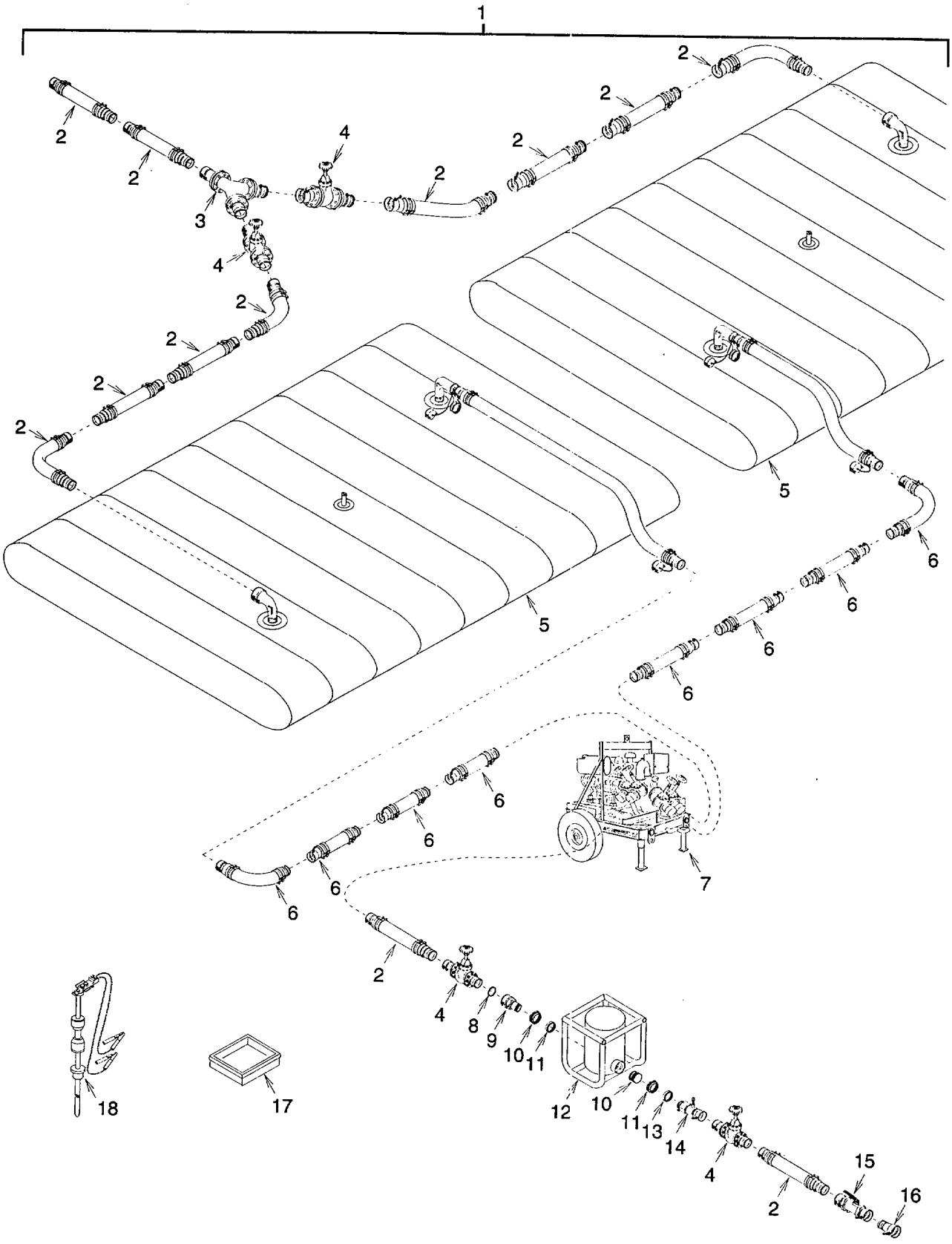


Figure C-15. 50,000 Gallon Tank TPT Optional Configuration

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1	3835-01-840-0072	50,000 Gallon Tank TPT Optional Configuration (97403) 13228E3488 Consisting of the following:		*
2		Hose Assy, Liquid Fuel, 4 in. x 25 ft (94833) 140K0019-1	EA	12
3		Y Assembly, 4 inch, Cam-lock M x M x F (97403) 13228E3450	EA	1
4	4820-01-840-0082	Valve Assembly, Gate, 4 inch Cam-lock (97403) 13228E3435	EA	4
5		Tank, Fabric, Collapsible, 50,000 Gal (See TM 10-5430-219-12) (96906) MS2983-50	EA	2
6	4720-00-727-1339	Hose Nonmetallic, Liquid Fuel, suction, 4 in. x 12 ft (97403) 13228E3431	EA	8
7		Pumping Assembly, DED, 350 GPM (See TM 5-4320-226-24P and TM 10-4320-324-24P) (81349) MIL-P-52144, Type I, Style A	EA	1
8	5330-00-899-4509	Gasket (96906) MS27030-9	EA	1
9	4730-01-840-0081	Coupling, Adapter Assy, Female (97403) 13226E8267-2	EA	1
10	4730-01-840-0079	Coupling clamp, Grooved end pipe, 4 inch (97403) 13228E3432-1	EA	2
11	5330-01-840-0080	Gasket, Grooved end pipe, 4 inch (97403) 13228E3432-2	EA	2
12	4330-00-177-8485	Filter Separator, Liquid Fuel, 350 GPM, 4 inch (See TM 10-4330-235-13&P) (97403) 13217E9320	EA	1
13	4730-01-237-0201	Coupling half, Quick Disconnect (96906) MS70100-1	EA	1
14		Adapter Assy, Water Detection Kit (97403) 13228E3448	EA	1
15		Valve Assembly Butterfly, 4 inch, Cam-lock female x female (97403) 13228E3546	EA	1
16	4730-00-951-3296	Reducer, Quick Disconnect (96906) MS49000-9	EA	1
17		Pan Drip (97403) 13228E3909-2	EA	1
18	5975-01-288-4638	Ground Rod Assy, Self Driving (97403) 13228E3500	EA	1
		* See fig C-9. This assembly is part of the Fuel Unit.		

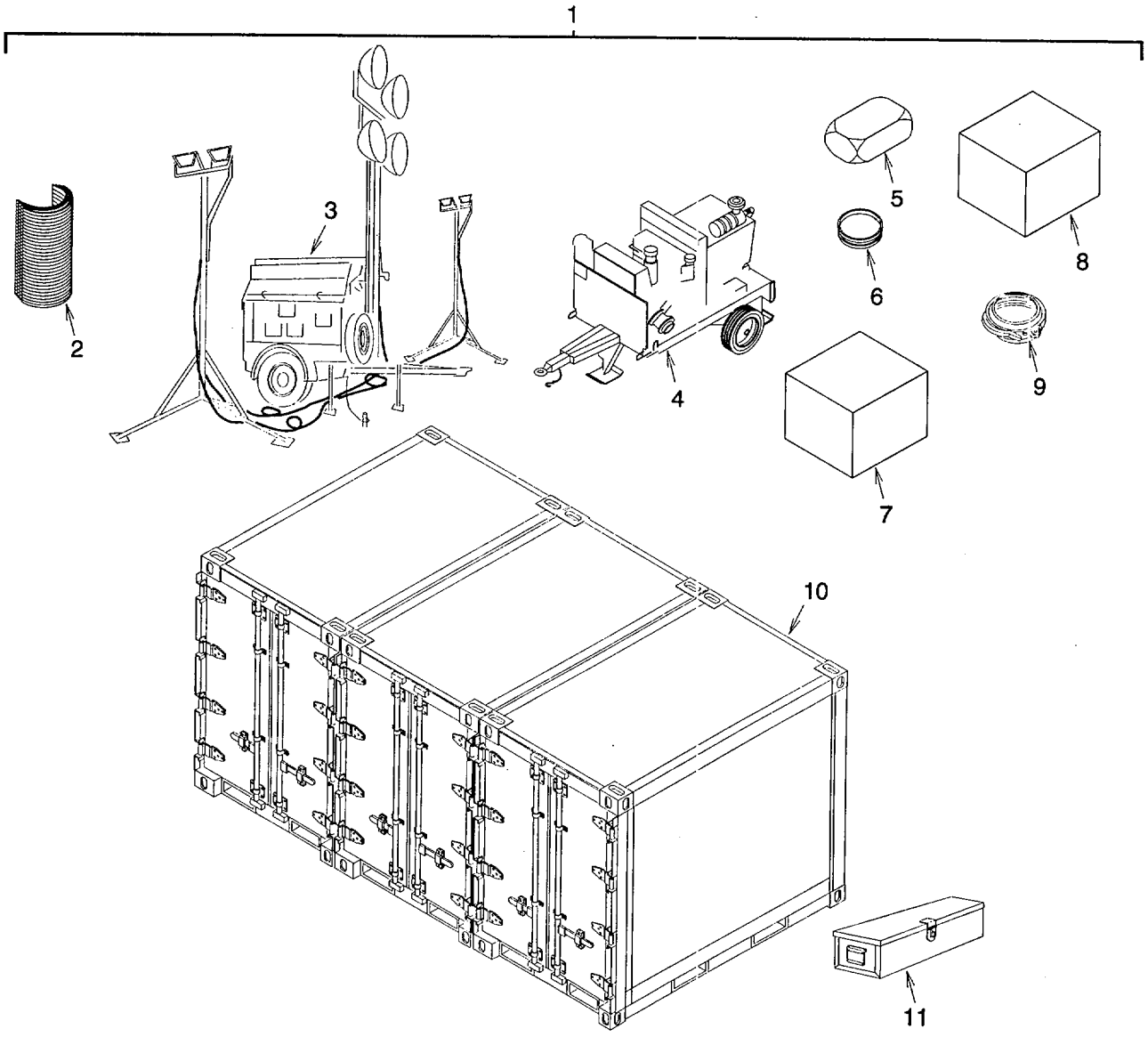


Figure C-16. Fuel Unit Support Assembly

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1		Fuel Unit Support Assy (97403) 13228E3890 Consisting of the following:		*
2		Pipe, Culvert, Nestable, 12 inch dia (97403) 13228E3440	EA	1
3		Flood Light Set, Electric, DED, Trailer Mounted Mechanical (See TM 9-6230-211-24P) (81349) MIL-F-29161	EA	2
4	4320-01-181-3984	Pump Unit, Centrifugal, DED, Self Priming 600 GPM 150 PSI (See TM 5-4320-305-24P) (81349) MIL-P-53051	EA	1
5		Bags, Sand, (Unit pack of 100) (81349) MIL-B-52472, Type II	EA	35
6	4730-01-306-6890	Cap, pipe (97403) 13228E3434	EA	2
7	3835-01-199-4014	Displacement and Evacuation Kit, 6 inch (81349) MIL-D-53015	EA	1
8	3835-01-195-1901	Suspension Kit, Hoseline, 6 inch (81349) MIL-S-53012	EA	1
9		Coupling, Clamp, Pipe, Boltless, 6 inch, Double Groove (Sets of 25) (97403) PD4730-0016	EA	2
10	8115-01-363-4442	Container, cargo end opening (58536) A-A-52032	EA	23
11		Hoseline Installation and Repair Assy (97403) 13228E3518 See fig C-17 for components	EA	1
		* See fig C-9. This assembly is part of the Fuel Unit.		

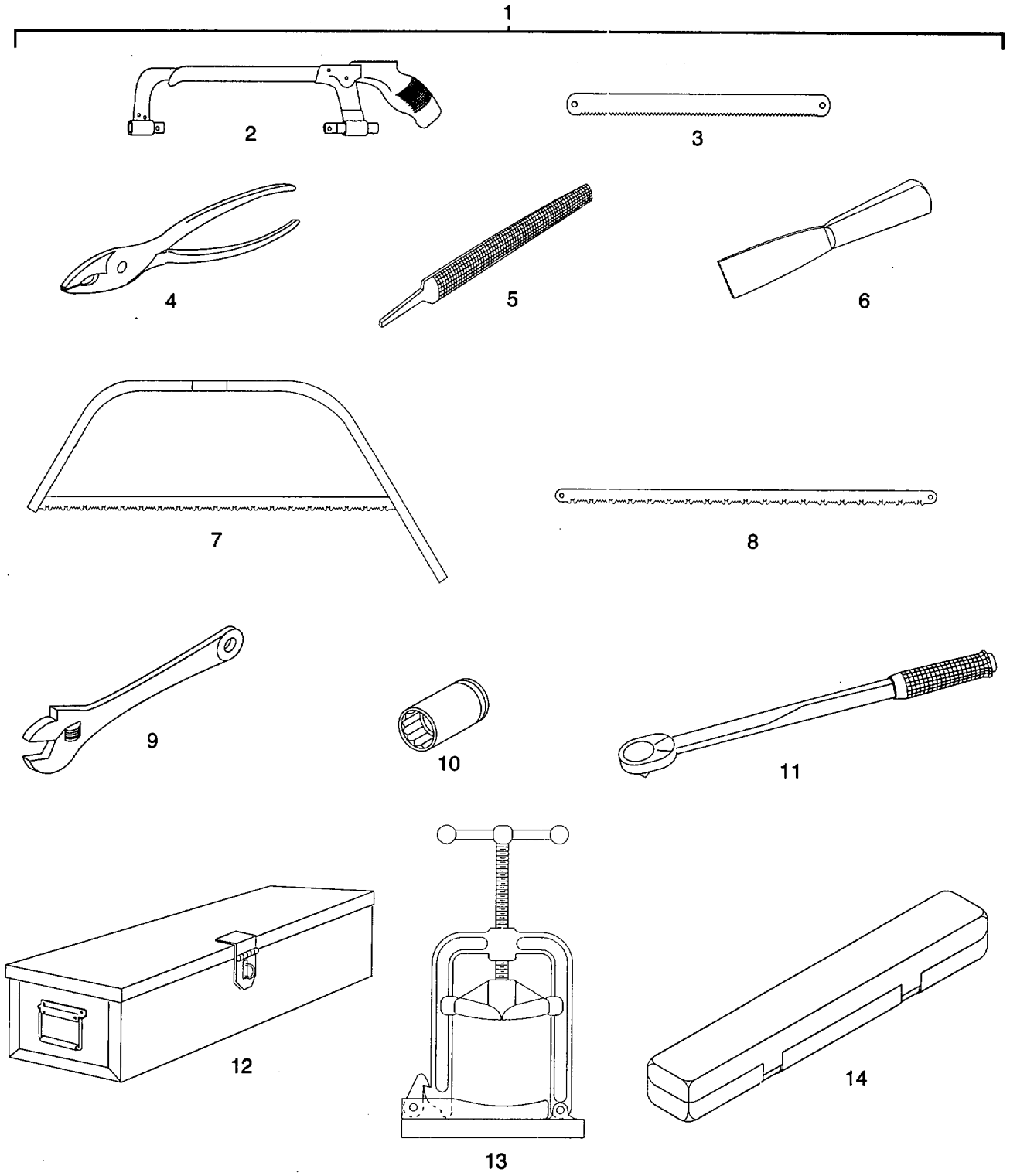


Figure C-17. Hoseline Installation and Repair Assembly

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1		Hoseline Installation and Repair Assembly (97403) 13228E3518 Consisting of the following:		*
2		Frame, hand, hacksaw, 10 - 12 in., 3 in. throat min (58536) A-A-453	EA	1
3		Blade, hand, hacksaw, 12 inch (81348) GGG-B-451, Type I, Grade A, Class 2	EA	5
4		Pliers, side cutting (81348) GGG-P-471, Type II, Class 2, Style A	EA	1
5		File, hand, half round, 10 inch (81348) GGG-F-325, Type 9, Style A, 10 inch	EA	1
6		Knife, putty and shaping (81348) GGG-K-481, Type IV, Class 1	EA	1
7		Saw, bow 36 inch (81348) GGG-S-0064, Type III, 36 inch	EA	1
8		Blade, saw, bow 36 inch blade, 1 inch wide blade only (81348) GGG-S-0064, Type III, 36 inch blade only	EA	5
9		Wrench, Adjustable, 10 inch (58536) A-A-2344,	EA	1
10		Socket, Socket Wrench 0.50 inch drive 12 point 0.5625 (81348) GGG-W-641, Type 2, Class 2, Style B	EA	4
11		Wrench Torque, 0.50 in. drive 30-150 ft/lb (81348) GGG-W-686, Type 3, Class 2	EA	2
12		Tool Box, portable, general two handle (81348) GGG-T-558/6A Type VII, SPL (42 x 14 x 12)	EA	1
13		Clamp, hose, 6 inch (x-2410) (81349) MIL-R-53013, Fig. 1	EA	2
14		Case, Torque Wrench, case for 0.50 Torque Wrench (OG723) PB5	EA	2
		* See fig C-16. This assembly is part of the Fuel Support Assembly.		

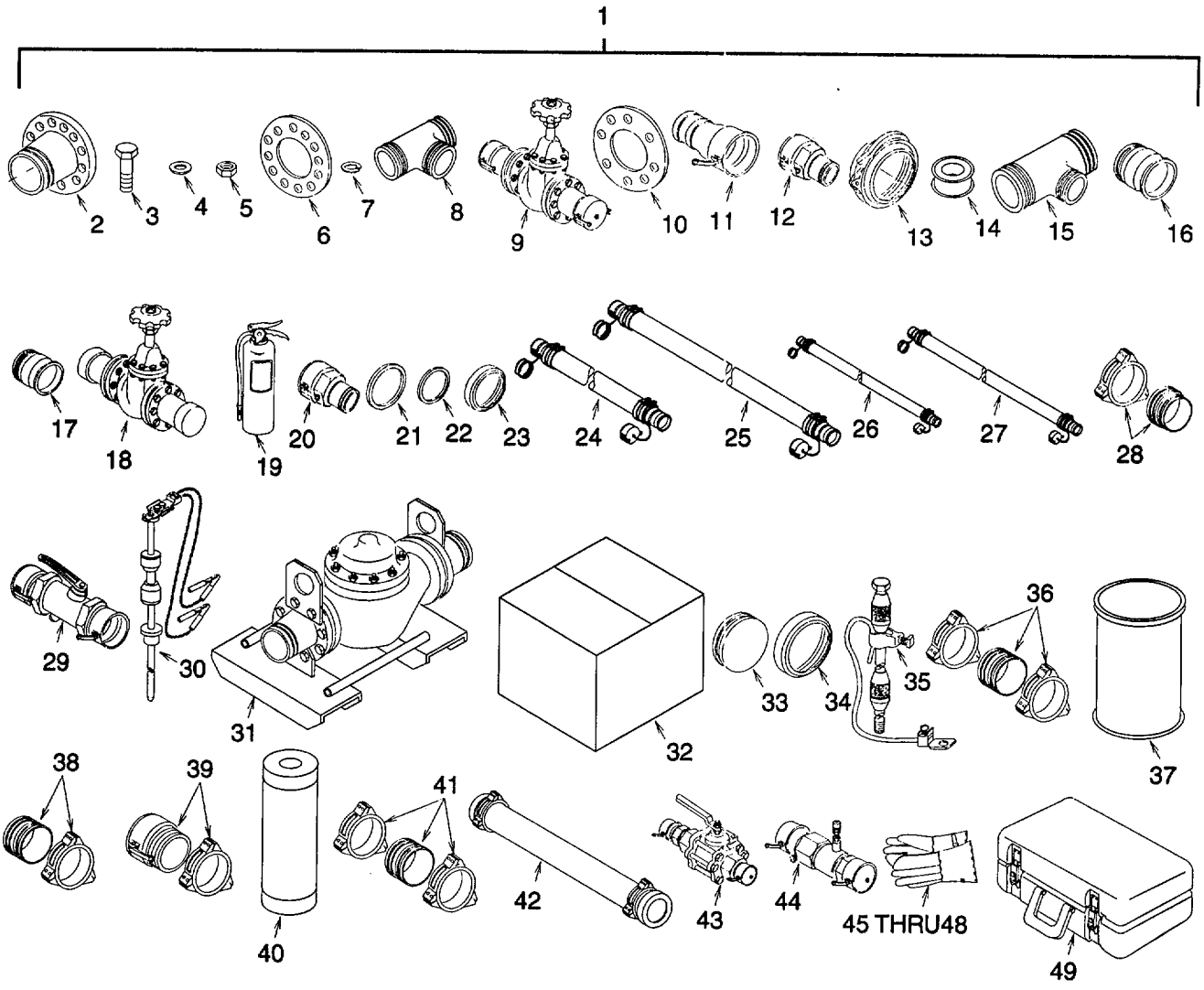


Figure C-18. Interim Support Items List (ISIL) Fuel Unit Support Assembly (ON BOARD SPARES)

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
1		ON BOARD SPARES Interim Support Items List (ISIL) Fuel Unit Support Assembly (97403) 13228E3891		*
2		Adapter, flange to Double Groove, 6 inch (97403) 13228E3455	EA	4
3		Screw, cap, hex hd (96906) MS51491-023	EA	60
4		Washer, flat (96906) MS21306-7	EA	60
5		Nut plain, slotted H unc-2B Zinc coating, 0.375-16 (81348) FF-N-836, Type II, Style 13	EA	60
6	5330-01-173-8301	Gasket (97403) 13220E1069-3	EA	12
7	5310-01-218-7137	Washer, Lock (96906) MS51415-7	EA	60
8		Tee, 6 inch, Double Groove (97403) 13228E3421	EA	2
9	4820-01-840-0082	Valve Assembly, Gate 4 inch, Cam-lock (97403) 13228E3435	EA	2
10	5330-01-141-1864	Gasket ' (97403) 13220E1069-1	EA	10
11	4730-00-951-3296	Reducer, Quick Disconnect (96906) MS49000-9	EA	1
12	4730-01-210-4559	Coupling Adapter Assembly, female (97403) 13226E8267-1	EA	1
13	4730-01-840-0079	Coupling clamp, Grooved end pipe, 4 inch (97403) 13228E3432-1	EA	3
14		Tape, antisiezing, 1/2 inch roll (81349) MIL-T-27730, 1/2 inch	EA	24
15	4730-01-210-5625	Coupling, Tee fitting, Double Groove, aluminum (97403) 13228E3429	EA	2
16		Adapter, Cam-lock, male by Double Groove male (97403) 13228E3423	EA	1
17	4730-01-237-0201	Coupling half, Quick (96906) MS70100-1	EA	2
18	4820-01-840-0070	Valve Assembly, Gate, 6 inch, Double Groove (97403) 13228E3425	EA	2
19		Extinguisher, Fire, Dry Chemical, 20 lb (58536) A-A-393, Type I, Class 2	EA	3
20	4730-01-840-0081	Coupling, adapter Assy female (97403) 13226E8267-2	EA	2

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
21	5330-00-899-4509	Gasket (96906) MS27030-9	EA	12
22	5330-00-360-0595	Gasket (96906) MS27030-5	EA	2
23	5330-01-840-0080	Gasket, Grooved end pipe, 4 inch (97403) 13228E3432-2	EA	10
24	4720-00-727-1339	Hose Nonmetallic Liquid Fuel Suction, 4 in. x 12 ft, Cam-lock (97403) 13228E3431	EA	4
25		Hose Assy, Liquid Fuel, 4 in. x 25 ft (94833) 140K0019-1	EA	1
26		Hose Assy, Liquid Fuel, 1 in. x 25 ft (94833) 140K0022-1	EA	1
27		Hose Assy, Liquid Fuel, 1-1/2 in x 25 ft (94833) 140K0021-1	EA	2
28		Adapter, light weight, hose to Double Groove 6 inch, bolt on type (97403)13228E3813	EA	36
29		Valve assembly, butterfly, 4 inch, Cam-lock, female x female (97403) 13228E3546	EA	4
30	5975-01-288-4638	Ground Rod Assy, self driving (97403) 13228E3500	EA	2
31		Valve Assembly, Pressure Control, 6 in. Double Groove (97403) 13228E3437	EA	1
32		Repair Kit Drybreak coupling (97403) 13228E3886	EA	5
33	4730-01-306-6890	Cap, pipe (97403) 13228E3434	EA	2
34		Gasket synthetic, 6 inch (81349) M10387-AA11	EA	24
35		Rod, ground (81348) W-R-550, Type III, Class B	EA	3
36		Mender, lightweight, hose, 6 in., bolt on type (97403) 13228E3814	EA	18
37		Drum, shipping and S metallic (for spill fuel) (81349) MIL-D-43703	EA	6
38	4730-01-831-0025	Adapter, hose to Cam-lock, male 4 inch, bolt on type (97403) 13228E3528	EA	6
39	4730-01-831-0026	Adapter, hose to Cam-lock female, 4 inch, bolt on type (97403) 13228E3529	EA	6
40		Filter Element, fluid pressure, coalescent (81349) MIL-F-52308	EA	450

(1) Illus Number	(2) National Stock Number	(3) Description Usable On Code CAGEC and Part Number	(4) U/I	(5) Qty Rqd
41		Adapter, hose to hose mender 4 inch, bolt on type (97403) 13228E3519		
42	4720-01-228-4637	Hose Assy, Liquid Fuel Dispensing, 6 in. x 50 ft, Double Groove (97403) 13228E3422	EA	6
43		Valve Assy Ball 1-1/2 inch, Cam-lock (97403) 13228E3438	EA	4
44	4930-01-013-7590	Adapter Assy Water Detector Kit (97403) 13220E9406-2	EA	1
45		Gloves, forest workers (81348) FSS 6170-5, small, tan	EA	3
46		Gloves, forest workers (81348) FSS 6170-5, medium, tan	EA	8
47		Gloves, forest workers (81348) FSS 6170-5, large, tan	EA	10
48		Gloves, forest workers (81348) FSS 6170-5, X large, tan	EA	5
49		Water Detector, Series III (32218) GTP 322 Series III * See fig C-16. This assembly is part of the Fuel Unit Support Assembly.	EA	48

Section III. BASIC ISSUE ITEMS

(1) Illus Number	(2) National Stock Number	(3) Description Code / Usable On	(4) U/I	(5) Qty Rqd
1		Department of the Army Technical Manual; Operator's Unit, and Direct Support, Maintenance Manual TM 10-3835-231-13	EA	1
2		Department of the Army Technical Manual; Unit and Direct Support Maintenance Repair Parts and Special Tools List (RPSTL) TM 10-3835-231-23P	EA	1

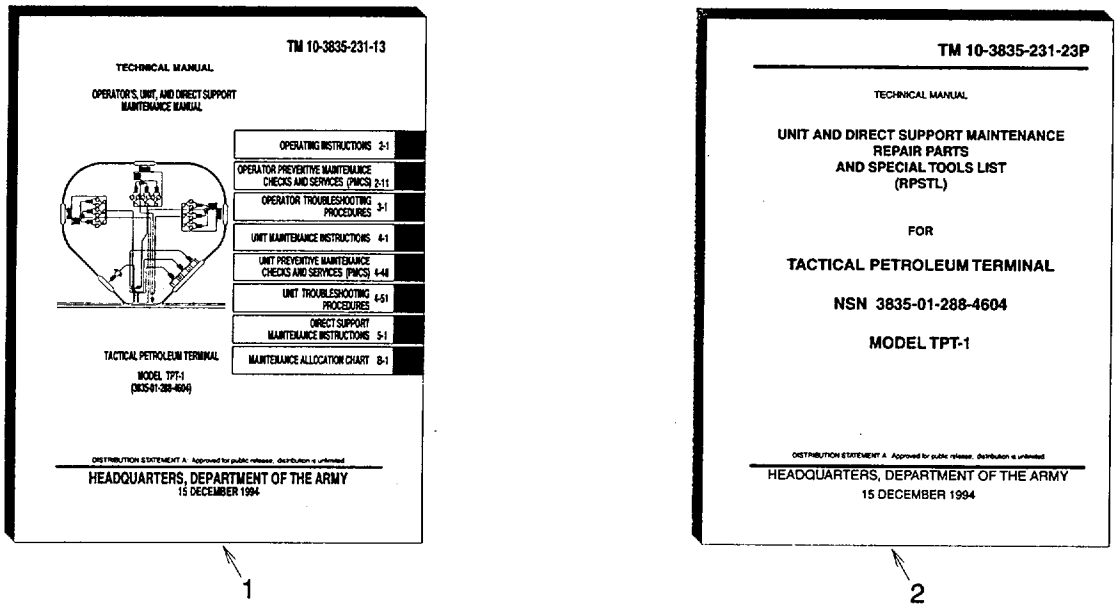


Figure C-19. Basic Issue Items

APPENDIX D
ADDITIONAL AUTHORIZATION LIST (AAL)

Section I. INTRODUCTION

D-1. SCOPE.

This appendix lists additional items you are authorized for the support of the TPT.

D-2. GENERAL.

This list identifies items that do not have to accompany the Tactical Petroleum Terminal and that do not have to be turned in with it. These items are authorized to you by CTA, MTOE, TDA, or JTA.

D-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. See the "Used on Code" column for the applicable model or models.

Section II. ADDITIONAL AUTHORIZED ITEMS LIST

(1) National Stock Number	(2) Description CAGEC & Part Number	(3) U/M	(4) Qty Recm
7520-00-559-9618	Cotton Duck Case	EA	1

APPENDIX E
EXPENDABLE AND DURABLE ITEMS LIST

Section I. INTRODUCTION

E-1. SCOPE.

This appendix lists expendable and durable items that you will need to operate and maintain the Tactical Petroleum Terminal. This listing is for information 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.

E-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 the item (e.g. "Adhesive Remover, Appendix E, item 1".)

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

c. Column 3. National Stock Number. This is the national stock number assigned to the item which you can use to requisition it.

d. Column 4. Item name, description, Commercial and Government Entity Code (CAGEC), and part number. This provides the other information you need to identify the item.

e. Column 5. Unit of measure. This code shows the physical measurement or count of an item, such as gallon, dozen, gross, ect.

Section II. EXPENDABLE AND DURABLE ITEMS LIST

(1) ITEM NUMBER	(2) LEVEL	(2) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION CAGEC, PART NUMBER	(5) U/M
1	O	7930-01-350-7034	Cleaning Compound (CITRI KLEEN)	gl
2	O	6850-01-377-1809	Dry Cleaning Solvent (81348) P-D-680, Type II	gl
3	O	7930-00-985-6911	Detergent, General Purpose (81349) MIL-D-16791	gl
4	O	7920-00-205-1711	Rag, Wiping	bl
5	O	9150-00-250-0926	Petrolatum VV-P-236	lb
6	O	8030-00889-3535	Tape antisieze (80244) MIL-T-27730, 522	rl

APPENDIX F
LUBRICATION INSTRUCTIONS

F-1. GENERAL.

See the following manuals for specific component lubrication.

Fire Suppression Equipment	TM 10-4210-235-13
350 GPM Pump Unit	TM 5-4320-226-14 or TM 10-4320-324-14
50,000 GAL AND 5,000 BBL Collapsible Fabric Tanks	TM 10-5430-219-12
Petroleum Aviation Fuel Contamination Testing Kit	TM 10-6630-240-12&P or TM 10-6630-218-10
600 GPM Pump Unit	TM 5-4320-305-10
Type D-1 Nozzle Assembly	TM 10-4930-246-13&P
350 GPM Frame Mounted Liquid Fuel Filter Separator	TM 5-4330-211-12 or TM 10-4330-235-13&P
Trailer Mounted Floodlight Set	TM 9-6230-211-14
Shelter, Tactical Nonexpandable	TM 10-5411-202-14

APPENDIX G
ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I. INTRODUCTION

G-1. SCOPE.

a. This appendix includes complete instructions for making items authorized to be manufactured or fabricated at unit or direct support.

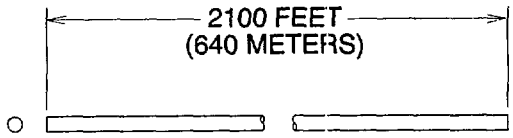
b. A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria.

c. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

d. All dimensions are given in inches with centimeters shown in parenthesis.

Manufactured Items Part Number Index

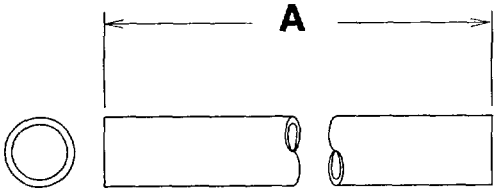
Section II. MANUFACTURED ITEMS ILLUSTRATIONS



NOTE

1. **FABRICATE FROM NYLON CORD (81349) MIL-C-5040, TYPE III (NSN 4020-00-014-6699)**

Figure G-1. Cord, Fiberous, Nylon, Part Number 13228E3417/2

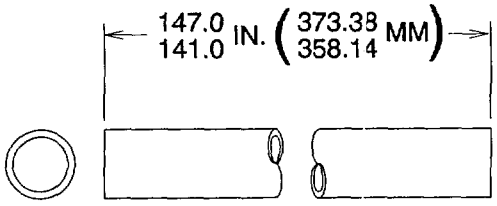


PART NUMBER	A LENGTH	
	INCHES	CENTIMETERS
13228E3422/2	612.0 588.0	1554.48 1493.52
13228E3904/2	606.0 594.0	1539.24 1508.76

NOTE

1. **FABRICATE FROM HOSE, ELASTOMERIC: FUEL DISCHARGE COLLAPSIBLE, LIGHT WEIGHT, 6 IN. (15.24 MM) (81349) M53073-6-0**

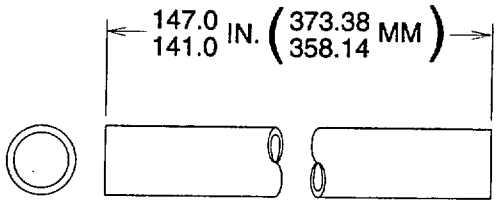
Figure G-2. Hose



NOTE

1. **FABRICATE FROM HOSE, NONMETALLIC: RUBBER, LIQUID FUEL, NONCOLLAPSIBLE, 6 IN. (15.24 MM) (81349) M370B10A1**

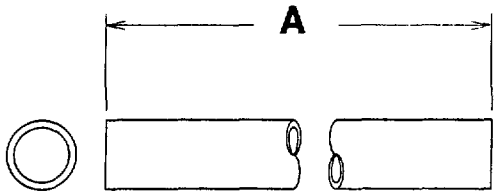
Figure G-3. Hose, Part Number 13228E3428/2



NOTE

1. **FABRICATE FROM HOSE, NONMETALLIC: RUBBER, LIQUID FUEL, NONCOLLAPSIBLE, 4 IN. (10.16 MM) (81349) M370B09A1**

Figure G-4. Hose, Part Number 13228E3431/1

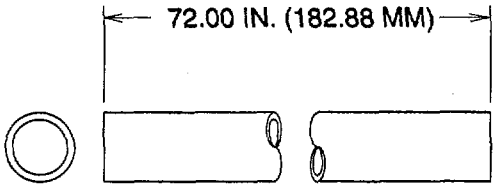


PART NUMBER	A LENGTH	
	INCHES	CENTIMETERS
13228E3422/9	72.0	182.88
140K0022-1/1	306.0 294.0	777.24 746.76

NOTE

1. **FABRICATE FROM HOSE, RUBBER, SYNTHETIC,LIQUID PETROLEUM FUELS,DESPENSING, COLLAPSIBLE, 1.00 IN. (2.54 MM) (81349) M11588-03-05-32**

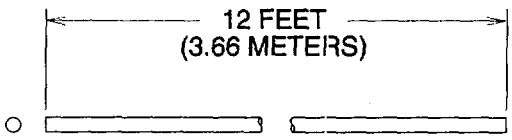
Figure G-5. Hose



NOTE

1. **FABRICATE FROM HOSE, NONMETALLIC: RUBBER, LIQUID FUEL, NONCOLLAPSIBLE, .75 IN. (1.91 MM) (81349) M370A02A1**

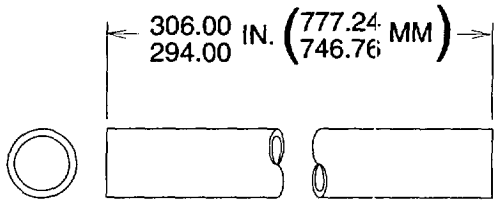
Figure G-6. Hose Part Number 13228E3442/21



NOTE

1. **FABRICATE FROM WIRE, COPPER, BARE, SOFT DRAWN 6 AWG (81346) ASTM EI-8, 6 AWG, CLASS C**

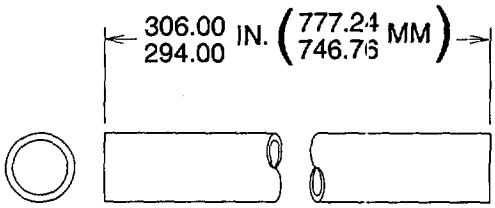
Figure G-7. Wire, Part Number 13228E3500/7



NOTE

1. **FABRICATE FROM HOSE, RUBBER, SYNTHETIC,LIQUID PETROLEUM FUELS,DESPENSING, COLLAPSIBLE, 4.00 IN. (10.16 MM) (81349) M11588-03-11-32**

Figure G-8. Hose, Part Number 140K0019-1/1



NOTE

1. **FABRICATE FROM HOSE, RUBBER, SYNTHETIC,LIQUID PETROLEUM FUELS,DESPENSING, COLLAPSIBLE, 1.50 IN. (3.81 MM) (813z.9) M11588-03-07-32 (NSN 4020-01-337-0033)**

Figure G-9. Hose, Part Number 140K0021-1/1

APPENDIX H
TORQUE LIMITS

H-1. GENERAL.

The maintenance procedures define specific torque values for the following:

Four Inch "Y" Assembly.
See paragraph 5-20.

APPENDIX I
MANDATORY REPLACEMENT PARTS LIST

ITEM NUMBER	NOMENCLATURE	CAGEC	PART NUMBER
1	Clamp, Band-it (1 Inch Hose)	70847	J236
2	Clamp, Band-it (1-1/2 Inch Hose)	70847	J208
3	Clamp, Band-it (4 Inch Hose)	70847	J215
4	Lock Washer	96906	MS35338-46
5	4 Inch Cork Flange Gasket	97403	13220E1069-1

GLOSSARY

Section I. ABBREVIATIONS

AAL ..... Additional Authorization List
AFFF ..... Aqueous Film Forming foam
API ..... American Petroleum Institute
ATTN ..... Attention
bbl ..... Barrel
BB ..... Basic Issue Items
Blvd ..... Boulevard
BOI ..... Basis Of Issue
CAGEC ..... Commercial And Government Entity Code
CPC ..... Corrosion Prevention and Control
EIR ..... Equipment Improvement Recommendation
FIG ..... Figure
gpm ..... Gallons Per Minute
Illus ..... Illustration
IPD ..... Inland Petroleum Distribution System
ISIL ..... Interim Support Item List
MAC ..... Maintenance Allocation Chart
MIL-HDBK ..... Military Standardization Handbook
MO ..... Military Standardization Handbook
MTOE ..... Modified Table of Organization and Equipment
NATO ..... North Atlantic Treaty Organization
NBC ..... Nuclear, Biological, and Chemical
NIIN ..... National Item Identification Number
NSN ..... National Stock Number
P&ID ..... Piping and Inland Distribution
PMCS ..... Preventive Maintenance Checks and Services
psig ..... Pounds per square inch gauge
QTY ..... Quantity
Ref. ..... Reference
RPSTL ..... Repair Parts and Special Tools List
SMR ..... Source Maintenance and Recoverability
St ..... Saint
TAMMS ..... The Army Maintenance Management Systems
TMDE ..... Test Measurement and Diagnostic Equipment
TPT ..... Tactical Petroleum Terminal
UOC ..... Usable On Code

Section II. DEFINITION OF UNUSUAL TERMS

Berm ..... A dirt wall barrier such as a dike surrounding the fuel tanks to contain spills.
Drybreak ..... Quick disconnect spillproof fitting.
TRICON ..... Triple storage container used....for component storage.
Wye ..... A Y-shaped part or object.
Guy-line ..... Support wire.
Off specification ..... Mixed fuel that is not to specification.

ALPHABETICAL INDEX

Subject, Paragraph

R

S

Subject, Paragraph

T

U

W

Y

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

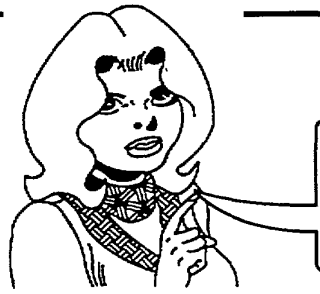
Official:

JOEL B. HUDSON
Acting Administrative Assistant to the
Secretary of the Army
00107

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25-E, block no. 6277, requirements for TM 10-3835-231-13.

☆U.S. GOVERNMENT PRINTING OFFICE: 1995-655-121/20127

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



THEN . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
PFC John DOE
CO A 3rd Engineer Bn
Ft. Leonardwood, MO 63108

DATE SENT
22 August 1992

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 1-1520-250-10	15 June 1992	Operator's manual MH60K Helicopter

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
6	2-1 a		
B1		4-3	

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

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

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

EXAMPLE

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

SIGN HERE
JOHN DOE John Doe

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

DRSTS-M verprint2, 1 Nov 80

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

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

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNITS ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

_____

_____

OFFICIAL BUSINESS

COMMANDER
U.S. ARMY AVIATION AND TROOP COMMAND
ATTN: AMSAT-I-MP
4300 GOODFELLOW BOULEVARD
ST. LOUIS, MO 63120-1798

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM,CAREFULLYTEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINTYOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 10-3835-231-13	5 APRIL 1995	TACTICAL PETROLEUM TERMINAL

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

IN THIS SPACE, TELL WHAT IS WONG 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 *verprint2, 1 Nov 80*

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

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

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNITS ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

_____

_____

OFFICIAL BUSINESS

COMMANDER
U.S. ARMY AVIATION AND TROOP COMMAND
ATTN: AMSAT-I-MP
4300 GOODFELLOW BOULEVARD
ST. LOUIS, MO 63120-1798

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

Liquid Measure

1 centiliter = 10 milliters = .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

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
acres
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

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

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	6.461	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: 073747-000