AIR FORCE
QUALIFICATION TRAINING PACKAGE (AFQTP)

FOR

LIQUID FUEL SYSTEMS MAINTENANCE

(3E4X2)

MODULE 15

MAINTENANCE OF INSTALLED FUEL SYSTEMS

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MODULE 15

MAINTENANCE OF INSTALLED FUEL SYSTEMS

Career Field Education and Training Plan (CFETP) references from 1 Jul 02 version.

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AIR FORCE QUALIFICATION TRAINING PACKAGES
FOR
LIQUID FUEL SYSTEMS MAINTENANCE
(3E4X2)

INTRODUCTION

Before starting this AFQTP, **refer to and read the "AFQTP TRAINER/TRAINEE GUIDE."**

AFQTPs are mandatory and must be completed to fulfill task knowledge requirements on core and diamond tasks for upgrade training. ***It is important for the trainer and trainee to understand*** that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.

MANDATORY minimum upgrade requirements:

Core task:
AFQTP completion
Hands-on certification

Diamond task:
AFQTP completion
CerTest completion (80% minimum to pass)

Note: *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location*.

Put this package to use. Subject matter experts under the direction and guidance of HQ AFCESA/CEOF revised this AFQTP. If you have any recommendations for improving this document, please contact the Career Field Manager at the address below.

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Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

MAINTENANCE OF INSTALLED FUEL SYSTEMS

AUTOMATIC VALVES

MODULE 15 AFQTP UNIT 2

REPAIR (15.2.4.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

REPAIR AUTOMATIC VALVES

Task Training Guide

STS Reference Number:	15.2.4., Repair automatic valves.
Training References:	1. Air Force Manual (AFMAN) 32-1275, *Maintenance of Petroleum Systems.* 2. Manufacturer's Manual. 3. Career Development Course (CDC) 3E452, Liquid Fuel System Maintenance Volume 5, Units 1, 2, and 3: *Type I, II, and III Hydrant System*, and Unit 4: Type IV Fueling System. 4. Air Force Occupational Safety and Health Standards (AFOSHSTD) 91-25, *Confined Spaces.* 5. AFOSHSTD 91-45, *Hazardous Energy Control and Mishap Prevention Signs and Tags.*
Prerequisites:	1. **Possess as a minimum a 3E432 AFSC.** 2. **Review the following references:** 2.1. AFMAN 32-1275. 2.2. AFOSHSTD 91-25 and 91-45. 2.3. Manufacturer's Manual. 2.4. CDC 3E452, Volume 5, Units 1, 2, 3, and 4.
Equipment/Tools Required:	1. General tool kit. 2. Lock out / Tag out kit.
Learning Objective:	The trainee should learn basic steps required to safely repair an automatic valve.
Samples of Behavior:	Trainee will be able to perform a repair on an automatic valve.
Notes:	
1. To successfully complete these elements follow the steps outlined in the applicable technical manual. 2. Any safety violation is an automatic failure.	

REPAIR AUTOMATIC VALVES

1. Background: Repairs to automatic valves are made by adjusting, cleaning, repairing, and/or replacing the components. Restoring the main valve to its primary function will require troubleshooting to identify the component malfunction. Extensive and quality troubleshooting will many times reveal the true problem to be with a different part or component of the system. When troubleshooting, always think of and start with the easiest and/or most common cause. For example, if POL informed you they were unable to defuel an aircraft in your Type II Pritchard System, you should first determine if all manual valves were open and if the system was properly set up to defuel. If so, you should next check to see if the defuel pump is energizing and what automatic valves (if any) were opening. If the defuel pump was energizing but no valves were opening, you should next check to ensure that the tank they designated as the defuel tank was not high-leveled before you consider a problem with a main valve diaphragm. If you hadn't checked that, you may have opened automatic valves expecting to replace main valve diaphragms when all that was wrong was the defuel tank was full. Thus, you can see the importance of thorough troubleshooting procedures prior to initiating repairs. There are five basic steps to troubleshooting that you should follow:

1.1. Perform operational check.

1.2. Analyze malfunction.

1.3. Locate malfunction.

1.4. Perform corrective action.

1.5. Perform operational check.

2. Repair Automatic Valves. Listed in this guide are many of the components common to nearly any automatic valve found throughout the Air Force fuel systems. On the next several pages you will find a chart that list the most common valve components in the left column, a parts breakdown and possible problems with the components in the middle column, and possible actions to take in the right column. Once you determine what needs to be repaired, find that component in the left column, the part that needs to be repaired in the middle column, and the possible repairs in the right column.

Table 1. Automatic Valve Repairs Chart

Valve Component	Parts Breakdown/Possible Problems	Possible Actions
Main Valve Body	Flow Clean Strainer	Replace
	Diaphragm	Replace
	Diaphragm washers / nut	Tighten
	Disc	Flip over or replace
	Spacer washer	Replace
	Shaft	Clean or replace
	Seat	Replace
	Seat O-ring 8-16" MVB	Replace

Table 1. Automatic Valve Repairs Chart (Continued)

Valve Component	Parts Breakdown/Possible Problems	Possible Actions
CDHS-3	Diaphragm	Replace
	Tripped	Reset/Adjust
	Kinked control tubing	Replace
	O-ring	Replace
	Spring	Replace
	Gasket	Replace
	Disk assembly	Clean and Reinstall
CV Flow control	Uncontrolled Opening / Closing Rate	Adjust, disassemble and clean, or replace.
Ejector Strainer	Screens	Clean or Replace
	O-ring	Replace
	Jets	Clean
Solenoid	Retaining cap	Clean or Replace
	Coil	Replace
	Core spring	Replace
	Core assembly	Replace
	Disc holder	Replace
	Disc	Replace
	Disc spring	Replace
	Body gasket	Replace
	Wire connections	Tighten
Pressure Reducing Control	Settings	Adjust
	Diaphragm	Replace
	Disc	Flip over or Replace
	Spring	Replace
	Spring Guide	Replace
	Diaphragm Washer / Nut	Tighten or Replace
	Kinked control tubing	Replace
	Gasket	Replace
Pressure Relief Control	Settings	Adjust
	Diaphragm	Replace
	Yoke and disc Assembly	Replace
	Kinked control tubing	Replace
	Gasket	Replace
	O-ring	Replace
	Spring	Replace
	Spring Guide	Replace
	Diaphragm Washer / Nut	Tighten or Replace
	Stem	Clean / Replace
Hytrol / Hytrol Check	Diaphragm	Replace
	Disc Assembly	Replace
	Spring	Replace
	Diaphragm Washer / Nut	Tighten or Replace

Table 1. Automatic Valve Repairs Chart (Continued)

Valve Component	Parts Breakdown/Possible Problems	Possible Actions
Pressure Differential Control	Settings	Adjust
	Diaphragm	Replace
	Spring	Replace
	Stem	Clean / Replace
	O-ring	Replace
	Diaphragm Washer / Nut	Tighten or Replace
	Disc	Replace
	Yoke and disc Assembly	Replace
	Kinked control tubing	Replace
	Gasket	Replace
Powertrol	Diaphragm	Replace
	Disc	Replace
	Weep Hole	Clean Out
	Gasket	Replace
	Kinked control Tubing	Replace
Shuttle Valve	Teflon Coated Seal	Replace
CRA	Settings	Adjust
	Diaphragm	Replace
	Disc	Replace
	Spring	Replace
	Spring Guide	Replace / Install
	Body to Body Gasket	Replace
	O-Ring	Replace
	Kinked control Tubing	Replace
3 Way Hytrol w/ 1/8” orifice	Diaphragm	Replace
	Spring	Replace
	Disc	Replace
	Kinked control Tubing	Replace

3. There is a very long list of all the possible automatic valves that could possibly require repair, and the list of components on those valves is even longer. Therefore, it is impractical to explain repair procedures for each valve and every component on every valve. However, this guide explains repair procedures for a 40AF-2A found immediately downstream of a deep well turbine pump in a Type II Pritchard System pump house. Most repair procedures will be similar for other valves, but to be certain, ask your supervisor for clarification.

NOTE TO TRAINER:

The following steps **WILL NOT** supersede the T.O./manufacture’s repair instructions for your particular automatic valve(s). Insert the T.O./manufacture instructions as needed. The following steps serves only as a guide to complete the core task “repair automatic valves”.

4. ***To perform this task, follow these steps:***

Step 1: Notify Fuels Control Center (FCC) of required repairs.

1.1. Determine availability of fuel system to perform required repairs, and inform FCC of system status.

1.2. Many times you will not be able to make required repairs when you would like to because of system availability (i.e. POL may be receiving fuel or transferring to hydrant tanks with their only receipt or transfer lines). Therefore, it is imperative to communicate all fuel system repairs with POL prior to initiating repairs.

1.3. If required repairs will not interfere with POL, proceed with repairs. Otherwise, coordinate an appropriate time you can isolate the system to make the repairs.

Step 2: Identify the valve requiring repair and isolate using lock out/tag out procedures (if required).

2.1. Although lock out/tag out procedures should not vary by shop (since they're derived from AFOSHSTD 91-45), they may vary by shop or even supervisor because many times alternate methods of isolation are possible.

2.1.1. For example, if you can isolate an automatic valve by closing manual valves immediately on either side of the automatic valve, the AFOSHSTD does not require you to lock and tag. However, your supervisor or local procedures may mandate lock out/tag out procedures regardless.

2.1.2. Check with your supervisor on specific requirements.

2.2. For the purpose of this guide, to isolate the 40AF-2A, close the manual valve immediately downstream and upstream, and turn the pump switch to the deep well turbine pump off in both the pump house and control room.

2.3. If your repairs are expected to be short, you may decide not to proceed with lock out/tag out procedures. However, as explained earlier, check with your supervisor.

Step 3: Remove fuel.

3.1. Drain the system to the point required to perform the repairs.

3.2. Drain fuel from most convenient location. In some cases you may be required to drain a long section of pipeline (if the automatic valve must be removed for repair or if you must remove the main valve cover chamber.

3.3. In the case of the 40AF-2A, let's assume a diaphragm in the CDHS-2 or auxiliary hytrol requires replacement.

3.3.1. You must first drain the separator back into the underground tank because there is not an isolation valve between the separator and 40AF-2A, and if you opened the 40AF-2A without draining the separator, fuel under pressure from the height of the separator would continually leak onto the ground.

3.3.2. After the separator is drained, you can drain fuel from a plug in the main valve body or by breaking open the coupling in the control loop. At this point you should get very little fuel coming out.

Step 4: Perform repairs.

Step 5: Remove the lock out/tag out procedures put in place in Step 2. Then open the isolation valves.

Step 6: Perform operational check, pressurize, and check for leaks.

6.1. If excessive amounts of fuel were drained from the system, you may need to slowly refill the lines prior to operating the pumps with fully open valves.

6.2. In this case, you would definitely need to refill the separator prior to performing an operational check and pressurizing to check for leaks.

Step 7: Return system to original condition, and notify FCC of system status.

7.1. If the system was opened for any reason, POL's Lab section will need to perform a Quality Control (QC) sample prior to returning the system to service.

7.2. Also, they may be waiting on your repairs to use the system to meet a critical mission.

7.3. These are but some of the reasons it's important to inform the FCC your repairs are finished and of system status.

REVIEW QUESTIONS
FOR
REPAIR AUTOMATIC VALVES

QUESTION	ANSWER
1. If repairs are required to a CDHS-3 that has tripped, what should you attempt first?	a. Install a new diaphragm. b. Reset and adjust. c. Reset the actuating arm or button. d. Clean the yoke assembly.
2. What maintenance action is required for a worn disc in the main valve body?	a. Immediately replace. b. Flip over or replace. c. Clean and re-install. d. None of the above.
3. When tubing on the pressure reducing control is kinked, what action would you take?	a. Un-kink the tube by hand. b. Bypass the pressure reducer. c. Increase the pressure to un-kink the tube. d. Remove and replace.

REPAIR AUTOMATIC VALVES

PERFORMANCE CHECKLIST

INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

DID THE TRAINEE….?	YES	NO
1. Notify FCC of required repairs		
2. Identify the valve requiring repair and isolate using lock out/tag out		
3. Properly remove the required fuel from the most convenient location		
4. Properly make the appropriate repairs		
5. Remove the lock out/tag out items and the open isolation valves		
6. Perform an operational check, pressurize, and check for leaks		
7. Return the system to original condition and inform FCC of system status		
8. Comply with all safety requirements		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

MAINTENANCE OF INSTALLED FUEL SYSTEMS

PUMPS

MODULE 15 AFQTP UNIT 3

OPERATIONAL INSPECT (15.3.2.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

OPERATIONAL INSPECT PUMPS

Task Training Guide

STS Reference Number:	15.3.2., Operational Inspect (Pumps).
Training References:	1. Air Force Manual (AFMAN) 32-1275, Maintenance of Petroleum Systems. 2. Manufacturer's Manual. 3. Local Procedures. 4. Career Development Course (CDC) 3E452, Liquid Fuel System Maintenance, Volume 4, Unit 2: *Pumps*.
Prerequisites:	1. **Possess as a minimum a 3E432 AFSC.** 2. **Review the following references:** 2.1. AFMAN 32-1075. 2.2. Manufacture's Manual. 2.3. Local Procedures. 2.4. CDC 3E452, Liquid Fuel System Maintenance, Volume 4, Unit 2.
Equipment/Tools Required:	General tool kit.
Learning Objective:	The trainee should know the basic steps required to safely operationally inspect pumps.
Samples of Behavior:	Trainee will be able to operationally inspect pumps.
Notes:	
1. To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. 2. Any safety violation is an automatic failure.	

OPERATIONAL INSPECT PUMPS

1. Background: Pumps and motors are inspected under the Recurring Work Program (RWP) on a quarterly basis to identify and correct minor problems before they become major problems.

SAFETY:

WEARS HEARING PROTECTION, REMOVES ALL JEWELRY, AND DO NOT PUT HANDS ON OR NEAR MOVING PARTS.

2. ***To perform this task, follow these steps:***

2.1. Operational Inspect Procedures.

NOTE:

To operationally inspect a pump, the system may be set up to pump against a deadhead or to circulate, or the pump can be inspected while POL is operating the system.

Step 1: If pump has an oil reservoir, check fluid level and add the appropriate oil specified in the manufacturer's manual, if necessary.

Step 2: If pump or motor has grease fittings, lubricate with general purpose or lithium base grease.

2.1. If pump/motor bearings are sealed, **DO NOT** lubricate.

2.2. If pump/motor bearings are not sealed, lubricate until grease comes out around the shaft or grease fitting.

Step 3: Rotate the motor/pump shaft by hand to ensure they rotate freely and are not binding.

Step 4: Set up the fuel system both mechanically and electrically.

Step 5: Energize the motor, allow it to run for a few minutes, and then check for the following:

5.1. Leaks, and unusual noise and vibration from pump or motor.

5.2. Excessive heat (place hands on motor and pump housing).

5.3. Shaft alignment (visually ensure shaft is not wobbling).

5.4. Pressure gauge for correct discharge pressure (must know normal pressure for normal operations and pumping against a dead-head).

5.5. If pump is positive displacement, ensure pressure relief is opening and set correctly.

5.6. If pump has a bypass line, check for leaks.

Step 6: De-energize motor.

Step 7: Correct any discrepancies, or if the discrepancy cannot be corrected on the spot, annotate the AFTO Form 39 and call in a job order to CE Customer Service.

Step 8: Return system back to original condition.

8.1. Return pump switches to their original positions (some may be kept in the normally "off" position while some may be kept in the normally "on" position).

8.2. Also, restore the control room to original condition (there are differences between POL operators and even bases as to the normal position of valves and switches, so you must return the system back to its original condition specific to that base, operator, system, etc.).

REVIEW QUESTIONS
FOR
OPERATIONAL INSPECT PUMPS

QUESTION	ANSWER
1. Pumps are operationally inspected on a monthly basis.	a. True. b. False.
2. During an operational inspection, check the pump and motor for all of the following EXCEPT:	a. leaks. b. flow rate. c. unusual noise. d. unusual vibration.
3. In operationally inspecting a pump, what must be performed prior to energizing the motor?	a. Annotate the AFTO Form 39. b. Call in a job order. c. Set up the system. d. Check for leaks.
4. To operationally inspect a pump, it must be run against a deadhead.	a. True. b. False.

OPERATIONAL INSPECT PUMPS

PERFORMANCE CHECKLIST

INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

DID THE TRAINEE….?	YES	NO
1. Remove jewelry and wear hearing protection		
2. Check the oil reservoir and add fluid if necessary		
3. Lubricate the pump and motor, if applicable		
4. Rotate the motor/pump shafts by hand to ensure they rotate freely and do not bind		
5. Correctly set up the system and energize the motor		
6. Check for leaks, unusual noise and vibrations, excessive heat, shaft alignment, pressure gauge, pressure relief, and bypass line (if applicable)		
7. De-energize the motor		
8. Did trainee correct any discrepancies on the spot that could be corrected		
9. Annotate the AFTO Form 39 and call in a job order to CE Customer Service for any discrepancies that could not be corrected on the spot		
10. Return the system to original condition		
11. Comply with all safety requirements		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

PIPING SYSTEMS

PERFORM PRESSURE TEST

MODULE 15 **AFQTP UNIT 9**

ANNUAL (15.9.4.2.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PERFORM ANNUAL PRESSURE TEST

Task Training Guide

STS Reference Number/Title:	15.9.4.2., Perform pressure test – annual.
Training References:	1. Air Force Manual (AFMAN) 32-1275, *Maintenance of Petroleum Systems.* 2. Local Procedures. 3. Career Development Course (CDC) 3E452, Liquid Fuel System Maintenance, Volume 4, Unit 5-2, Section 626: *Design Features and Maintenance Requirements of Piping Systems.*
Prerequisites:	1. **Possess as a minimum a, 3E432 AFSC.** 2. **Review the following references:** 2.1. AFMAN 32-1275. 2.2. Local Procedures. 2.3. CDC 3E4X2, Volume 4, Unit 5-2, Section 626.
Equipment/Tools Required:	1. General tool kit. 2. Stethoscope or Ultrasonic probe (if available).
Learning Objective:	The trainee should know the basic steps required to safely perform an annual piping systems pressure test.
Samples of Behavior:	The trainee will be able to perform an annual piping system pressure test.
Notes:	
1. To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. 2. Any safety violation is an automatic failure.	

PERFORM ANNUAL PRESSURE TEST

1. Background: A two-hour pressure test must be performed on all on-base above and underground piping once a year by using existing installed pumps and pressurizing to normal deadhead pressure. The pressure test should be accomplished under the Recurring Work Program (RWP). Usually you cannot pressure test the entire system all at the same time due to system size and types of manual valves installed. Plug, gate, and ball valves usually will not provide positive shutoff and will allow internal leakage. For that reason, consider replacing these valves with double block and bleed valves when possible. Internal leakage can be detected by listening with a stethoscope or ultrasonic probe. Internal leakage through valves or an unexplained pressure loss will require installation of blind or skillet flanges and re-accomplishing the pressure test. When performing pressure tests, record the name and section of system tested, facility number, date of test, weather conditions and any changes, and pressure readings every 15 minutes for the first hour and every half hour for the second hour. This information will be kept on file in the Liquid Fuel Maintenance (LFM) shop for 5 years and sent to the Major Command (MAJCOM) Liquid Fuels Engineer when requested.

1.1. Inspection Requirements. The underground pipeline should be walked at least twice a year. Leaks in underground pipelines can sometimes be detected by fuel surfacing on the ground, by fuel run-off in the storm drainage system, detection of fuel in underground pits or manholes, or the continuous odor of fuel in a particular area. Above ground off-base pipelines are inspected weekly by line walkers, vehicles, and light aircraft. On-base pipelines should be visually inspected for leaks or drips at the same time that other maintenance is being performed

SAFETY:
PRIOR TO WORKING ON FUEL SYSTEM REMOVE ALL JEWELRY.

NOTE:
Notify Fuels Control Center of systems affected by the pressure test.

2. ***To perform this task, follow these steps:***

2.1. <u>Piping Systems Pressure Test (Annual) Procedures</u>.

Step 1: Determine system/section of system to be tested.

Step 2: Locate and close all manual valves required to isolate the system/section of system to be tested except the manual valve immediately downstream of the pump used to supply the pressure.

Step 3: Energize the pump for approximately 30 seconds.

Step 4: Close the manual valve on the outlet side of the pump to trap pressure in the pipeline.

Step 5: De-energize pump.

Step 6: Record the system/section of system tested:

6.1. Facility number.

6.2. Date of test.

6.3. Weather conditions (and any changes during the test).

6.4. Starting time.

6.5. Initial pressure reading and pressuring readings every 15 minutes for the first hour and every half hour for the second hour.

Step 7: If external leaks are detected during the test, take corrective actions.

Step 8: If internal leaks are detected or you experience unexplained pressure losses:

8.1. Install blind or skillet flanges.

8.2. Re-accomplish Steps 3-6.

Step 9: Open manual valves to relieve pressure from the pipeline to the tank.

Step 10: Return system to original condition and inform Fuels Control Center that you're finished.

Step 11: Record information from Step 6 on locally produced form and file in the LFM shop.

REVIEW QUESTIONS
FOR
PERFORM ANNUAL PRESSURE TEST

QUESTION	ANSWER
1. What will an unexplained pipeline pressure drop require you to do?	a. Repeat the test within 60 days. b. Monitor leak until system stabilizes and record results. c. Install blind flanges and retest. d. Call POL supervisor.
2. What is the minimum time it takes to perform an annual pipeline pressure test?	a. 1 hour. b. 2 hours. c. 3 hours. d. 4 hours.
3. Annual pipeline pressure tests require the line to be pressurized at 150% normal operating pressure.	a. True. b. False.

PERFORM ANNUAL PRESSURE TEST

PERFORMANCE CHECKLIST

INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

DID THE TRAINEE….?	YES	NO
1. Identify the system/section of system to be tested		
2. Locate and close all manual valves required to isolate the system/section of system to be tested except the valve immediately downstream of the pump		
3. Energize the pump for approximately 30 seconds		
4. Close the manual valve on the outlet side of the pump to trap the pressure		
5. De-energize pump		
6. Annotate system/section of system tested, facility number, date of test, weather conditions (and any changes), initial pressure reading and pressure readings every 15 minutes for the first hour and every 30 minutes for the second hour		
7. Correct external leaks, if applicable		
8. If internal leaks or unexplained pressure losses were detected, install blind or skillet flanges and re-accomplish Steps 3-6		
9. Open manual valves to relieve pressure		
10. Return system to original condition and inform Fuels Control Center the task was finished		
11. Record the information from step 6 above on a locally produced form and file in the LFM shop		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

PIPING SYSTEMS

PERFORM PRESSURE TEST

MODULE 15 AFQTP UNIT 9

FIVE YEAR (15.9.4.3.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PERFORM FIVE YEAR PRESSURE TEST

Task Training Guide

STS Reference Number/Title:	15.9.4.3., Perform five year (hydrostatic) pressure test.
Training References:	1. Air Force Manual (AFMAN) 32-1275, *Maintenance of Petroleum Systems, Chart 8.* 2. Local Procedures. 3. Career Development Course (CDC) 3E452, Liquid Fuel System Maintenance, Volume 4, Unit 5-2, Section 626: *Design Features and Maintenance Requirements of Piping Systems.*
Prerequisites:	1. **Possess as a minimum a 3E432 AFSC.** 2. **Review the following references:** 2.1. AFMAN 32-1275, Chart 8. 2.2. CDC 3E452, Volume 4, Unit 5-2, Section 626. 2.3. Local Procedures.
Equipment/Tools Required:	1. General tool kit. 2. Stethoscope or Ultrasonic probe. 3. Hydrostatic pump.
Learning Objective:	The trainee should know the basic steps required to safely perform a 5-year piping systems pressure test.
Samples of Behavior:	The trainee will be able to perform a 5-year piping systems pressure test.
Notes:	
1. To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. 2. Any safety violation is an automatic failure.	

PERFORM FIVE YEAR PRESSURE TEST

1. Background: A four-hour pressure test must be performed on all underground piping every five years by pressurizing the pipeline to 150% of its normal operating pressure (NOP). The pressure test should be accomplished under the Recurring Work Program (RWP). Usually you cannot pressure test the entire system all at the same time due to system size and types of manual valves installed. Plug, gate, and ball valves usually will not provide positive shutoff and will allow internal leakage. For that reason, consider replacing these valves with double block and bleed valves when possible. Internal leakage can be detected by listening with a stethoscope or ultrasonic probe. Internal leakage through valves or an unexplained pressure loss will require installation of blind or skillet flanges and re-accomplishing the pressure test. After isolating the system/section of system to be tested, energize the installed pump for approximately 30 seconds, close the manual valve immediately downstream of the pump to trap pressure in the system, then use a hydrostatic pump to pressurize the system up to 150% of NOP. When performing pressure tests, record the name and section of system tested, facility number, date of test, weather conditions and any changes, and pressure readings every 15 minutes for the first hour and every hour for the remainder of the test. Copies of these records will be sent to the MAJCOM Liquid Fuels Engineer as an attachment to the AF Form 172. If a leak or excessive pressure drop is indicated, then perform a flow test. This is done by re-pressurizing the line to 150% of NOP by first using the installed pump then the hand operated hydrostatic pump with a separate reservoir. Measure and record the amount of fluid required to maintain this pressure for a 4-hour period. Record that information and include it in the attachment to the AF Form 172.

SAFETY:

1. REMOVE ALL JEWELRY BEFORE WORKING ON FUEL SYSTEMS.

2. DO NOT USE WATER ON HYDROSTATIC PRESSURE TESTS.

NOTE:

Notify Fuels Control Center of systems affected by the hydrostatic pressure test.

2. ***To perform this task, follow these steps:***

2.1. <u>Piping Systems Pressure Test (5 Year) Procedures</u>.

Step 1: Identify section of underground pipe to be tested.

Step 2: Locate and close all manual valves required to isolate the system/section of system to be tested except the manual valve immediately downstream of the pump used to supply the pressure.

NOTE:

If double block and bleed valves will hold the pressure, blind flanging is not required. If you know your system valves will not hold the pressure, you will have to install blind or skillet flanges before beginning the test. If that's the case, skip Step 4 below.

Step 3: Install hand operated hydrostatic pump.

3.1. Review manufacturer's manual for operating instructions.

Step 4: Energize the installed pump, let it run for approximately 30 seconds, close the manual valve immediately downstream to trap pressure in the system, then de-energize the pump (if blind or skillet flanges were not installed in Step 2)**.**

Step 5: Operate hand pump to achieve 150% of normal operating pressure.

Step 6: If external leaks are detected during the test, take corrective actions.

Step 7: Record the system/section of system tested:

7.1. Facility number.

7.2. Date of test.

7.3. Weather conditions (and any changes during the test).

7.4. Starting time.

7.5. Initial pressure reading, and pressuring readings every 15 minutes for the first hour and every hour for the remainder of the test.

Step 8: If internal leaks or unexplained pressure losses are detected, install blind or skillet flanges if not previously installed per Step 2 above, then repeat pressure test from Step 5.

8.1. If the pressure holds for the entire period of the test, proceed to Step 10.

8.2. If a leak or excessive pressure drop is indicated after blind or skillet flanges have been installed, proceed to Step 9, and perform a flow test.

Step 9: Perform a flow test.

9.1. Do this by re-pressurizing the line with the hydrostatic pump. Measure and record the amount of fluid required to maintain this pressure for four hours.

9.2. If a leak is indicated, contact the Command Fuels Engineer and Environmental Flight to determine the proper repair methods and procedures.

Step 10: Open the necessary manual valves to relieve pressure from the pipeline.

10.1. This may be a large system valve or a stripper or bleeder valve.

Step 11: Return system to original condition and notify Fuels Control Center you're finished.

Step 12: Record information from Step 6 on AF Form 172 and attachment, file in the LFM shop, and forward a copy to the MAJCOM fuels engineer.

REVIEW QUESTIONS
FOR
PERFORM FIVE YEAR PRESSURE TEST

QUESTION	ANSWER
1. Where should results of the hydrostatic pressure test go?	a. Command Fuels Engineer / LFM shop files. b. Fuels Management Officer / LFM Shop Files. c. LFM shop files only. d. POL supervisor files.
2. What does a significant pressure drop require?	a. Record results and forward to Command Fuels Engineer. b. Perform flow test for four hours. c. Energize the pumps and re-pressurize the system. d. Perform a pipeline sample for contaminated fuel.
3. When performing a 5-year pressure test, how often is the pressure recorded?	a. Every 15 minutes for duration of the test. b. Every 15 minutes for the first hour, then every 30 minutes for the remainder of the test. c. Every 15 minutes for the first hour, then every hour for the remainder of the test. d. Every 15 minutes for the first two hours, then hourly for the remainder of the test.

PERFORM FIVE YEAR PRESSURE TEST

PERFORMANCE CHECKLIST

INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

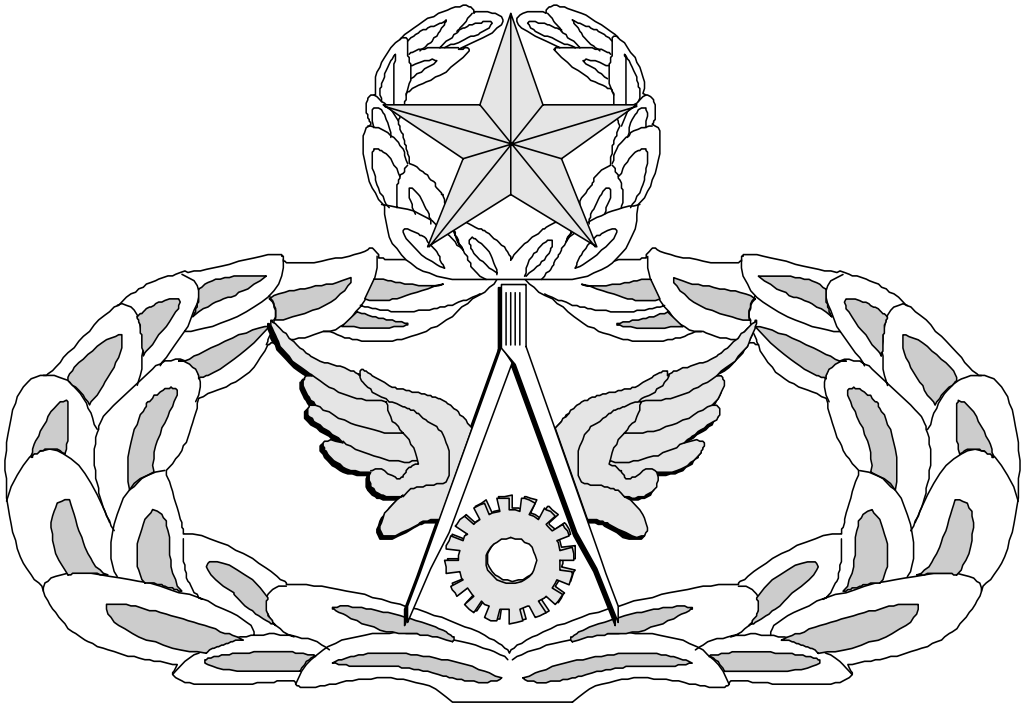
DID THE TRAINEE….?	YES	NO
1. Identify section of underground pipe to be tested		
2. Properly isolate system to be tested and include blind or skillet flanges, if needed		
3. Install hand operate hydrostatic pump correctly		
4. Energize the pump, trap pressure in the pipeline, and then de-energize the pump (if blind or skillet flanges were not installed)		
5. Operate hand pump to get 150 % above NOP		
6. Correct any external leaks		
7. Annotate system/section of system tested, facility number, date of test, weather conditions (and any changes), initial pressure reading and pressure readings every 15 minutes for the first hour and every hour for the remainder of the test		
8. If internal leaks or unexplained pressure drops were detected, install blind or skillet flanges (if not previously installed) and repeat the pressure test		
9. If required, did trainee perform a flow test		
10. Open manual valves to relieve pressure		
11. Return system to condition and notify Fuels Control Center		
12. Annotate the necessary information on AF Form 172 and attachment, file it in the LFM shop, and send copies to the Command Fuels Engineer		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Air Force Civil Engineer

QUALIFICATION TRAINING PACKAGE (QTP)

REVIEW ANSWER KEY



FOR

LIQUID FUEL SYSTEMS MAINTENANCE
(3E4X2)

MODULE 15

MAINTENANCE OF INSTALLED FUEL SYSTEMS

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

REPAIR AUTOMATIC VALVES
(3E4X2-15.2.4.)

QUESTION	ANSWER
1. If repairs are required to a CDHS-3 that has tripped, what should you attempt first?	b. Reset and adjust.
2. What maintenance action is required for a worn disc in the main valve body?	b. Flip over or replace.
3. When tubing on the pressure reducing control is kinked, what action would you take?	d. Remove and replace.

OPERATIONAL INSPECT PUMPS
(3E4X2-15.3.2.)

QUESTION	ANSWER
1. Pumps are operationally inspected on a monthly basis.	b. False.
2. During an operational inspection, check the pump and motor for all of the following EXCEPT:	b. flow rate.
3. In operationally inspecting a pump, what must be performed prior to energizing the motor?	c. Set up the system.
4. To operationally inspect a pump, it must be run against a deadhead.	b. False.

PERFORM ANNUAL PRESSURE TEST
(3E4X2-15.9.4.2.)

QUESTION	ANSWER
1. What will an unexplained pressure drop require you to do?	c. Install blind flanges and retest.
2. What is the minimum time it takes to perform an annual pipeline pressure test?	b. 2 hours.
3. Annual pipeline pressure tests require the line to be pressurized at 150% normal operating pressure.	b. False.

PERFORM FIVE YEAR PRESSURE TEST
(3E4X2-15.9.4.3.)

QUESTION	ANSWER
1. Where should results of the hydrostatic pressure test results go?	a. Command Fuels Engineer / LFM shop files.
2. What does a significant pressure drop require?	b. Perform flow test for four hours.
3. When performing a 5-year pressure test, how often is the pressure recorded?	c. Every 15 minutes for the first hour, then every hour for the remainder of the test.

MEMORANDUM FOR HQ AFCESA/CEOF
139 Barnes Drive Suite 1
Tyndall AFB, FL 32403-5319

FROM:

SUBJECT: Qualification Training Package Improvement

1. Identify module.

   Module # and title_____

2. Identify improvement/correction section(s):

   _____ STS Task Reference
   _____ Training Reference
   _____ Evaluation Instructions
   _____ Performance Resources
   _____ Steps in Task Performance
   _____ Performance Checklist
   _____ Feedback
   _____ Format
   _____ Other

3. Recommended changes--use a continuation sheet if necessary.

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

4. You may choose to call in your recommendations to DSN 523-6380 or FAX DSN/Commercial 523-6488 or (850) 283-6488 or email ceof.helpdesk@tyndall.af.mil.

5. Thank you for your time and interest.

YOUR NAME, RANK, USAF
Title/Position