

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

ANNUAL AUTOMATIC LINE LEAK DETECTOR TESTING

- This form may be utilized to document functionality testing of automatic line leak detectors (ALLD's).
- All ALLDs (both mechanical and electronic) must be tested at installation and once every 12 months.
- All testing must follow the attached "MDEQ Procedure for Testing Automatic Line Leak Detectors"

Date Test Conducted:

UST Facility			Person Conducting Testing		
Facility Name		MDEQ Facility ID #	Tester's Name		
Physical Address			Company		
City	County	State MS	MDEQ Certification #		Expiration Date
UST Owner			Tester's Signature		Date

System Information & Testing Requirements

Test Equipment Used:	Reason for Test	<input type="checkbox"/> Annual <input type="checkbox"/> New Installation <input type="checkbox"/> Troubleshooting <input type="checkbox"/> Leak Investigation <input type="checkbox"/> Other: _____
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Description	Line # / Product				
Line Number / Product					
Type of Pipe (Steel, FRP, Thermoplastic)					
Pipe Diameter / Length of Pipe	/	/	/	/	/
Type of ALLD: Mechanical or Electronic	<input type="checkbox"/> Mech <input type="checkbox"/> Elec				
ALLD Manufacturer					
ALLD Model					
ALLD Serial Number					
ALLD is new	<input type="checkbox"/> Yes <input type="checkbox"/> NO				
STP cycles on/off properly	<input type="checkbox"/> Yes <input type="checkbox"/> NO				

Test Equipment Orifice Calibration

STP Full Operating Pressure (psi)					
Line pressure regulated to 10 psi (optional)	<input type="checkbox"/> Yes <input type="checkbox"/> NO				
Volume (mL) measured over 60 seconds					

Mechanical ALLD Test

Test Location (Ex. Dispenser 7/8)					
Check Valve Holding Pressure (psi)					
Resiliency / Bleedback (mL)					
ALLD resets ("Trips") when line pressure is zero?	<input type="checkbox"/> Yes <input type="checkbox"/> NO				
Metering Pressure (psi)					
ALLD Opening Time (seconds)					
Line remains at Metering Pressure for 60 seconds (minimum test time) with leak simulated?	<input type="checkbox"/> Yes <input type="checkbox"/> NO				
Volume (mL) measured over 60 second test period					
Leak Rate (gph) equivalent to volume measured					

Electronic ALLD Test

Set-up parameters correct	<input type="checkbox"/> Yes <input type="checkbox"/> NO				
Simulated leak causes audible or visual alarm	<input type="checkbox"/> Yes <input type="checkbox"/> NO				
Simulated leak causes STP shutdown (optional)	<input type="checkbox"/> Yes <input type="checkbox"/> NO				

Test Results

Pass / Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail				
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Comments:

MDEQ Procedure for Testing Automatic Line Leak Detectors
Mechanical Automatic Line Leak Detectors

Test Set-up

1. Visually inspect the vent tube. Verify that it is connected at both ends to the appropriate locations and that the vent tube is not broken, kinked, twisted, or leaking. If the vent tube is not properly connected or is broken, kinked, twisted or leaking, notify the appropriate person.
2. Visually inspect the piping to determine type, diameter, and approximate length of piping. Document accordingly on MDEQ form.
3. Visually inspect the line leak detector to determine type, manufacturer, model, and serial number if legible. Document accordingly on MDEQ form.
4. Remove from service all dispensers connected to the STP being tested. Verify that the STP relays are operating properly to ensure that the pump cycles on and off correctly. If the STP does not cycle OFF and the issue with the contact relay cannot be adequately addressed during testing, the LLD associated with the STP fails the LLD test. Notify the appropriate person.
5. Shut off power to the pump and perform lockout/tag out procedures on the circuit breakers.
6. Bleed line pressure to zero by activating the dispenser and opening the nozzle – allowing fuel to drain into an approved container. After all line pressure has been bled-off, hang up the nozzle and close the shear valve.
7. Connect the test apparatus to the shear valve test port at the highest dispenser. If there is no elevation change, connect the test apparatus at the furthest dispenser. Note: If the piping has master/satellite dispensers, the test apparatus must be connected to the furthest satellite dispenser. Note on the form the test location, where test was performed. (Ex. Dispenser 7/8)
8. Re-establish power to the pump. Open the shear valve and pressurize the line by activating the pump. Confirm that there are no leaks in the test apparatus or the connection to the shear valve test port.
9. Dispense product from the dispenser nozzle to remove all air from the line.

Test Equipment Orifice Calibration

10. Close the dispenser nozzle and allow the line to fully pressurize. Confirm that the line pressure observed is the full pump pressure. Record this as the full pump pressure.
11. Shut off the pump and close the shear valve.

I. Without the use of a pressure regulator

12. Referencing the full pump pressure recorded in Step 10, determine from Table 1 the volume of fluid that must be discharged in 60 seconds at full pump pressure to simulate a leak equivalent to 3 gph @ 10 psi.

13. Turn the pump on and confirm that full pump pressure is indicated. Slowly open the test apparatus leak orifice and adjust until the flow rate determined in Step 12 has been achieved. Note: To do this, direct the fluid flow into a graduated cylinder while timing for 60 seconds. Continue to adjust the size of the test apparatus leak orifice until the desired flow rate is achieved. To expedite calibration, you may find it useful to initially make coarse adjustments by measuring the volume of fluid that corresponds to the 15 second time interval indicated in Table 1. However, the final calibration of the test apparatus leak orifice must be conducted by measuring the appropriate volume of fluid over the full 60 second time frame.

14. Record the volume of fluid measured (mL) over the full 60 second calibration period.

II. With the use of a pressure regulator – (optional)

15. With pump off, install pressure regulator in line between the shear valve and test apparatus.

16. Turn the pump on and confirm that full pump pressure is indicated. Slowly open the test apparatus leak orifice and direct the fuel flow into an approved container.

17. With the pressure regulator, adjust the line pressure to 10 psi. Direct the fluid flow into a graduated cylinder and time for 60 seconds. Adjust the size of the test apparatus leak orifice until the desired leak rate of 189 ml/min is achieved while maintaining a line pressure of 10 psi. Note: It may be necessary to readjust the pressure regulator and/or the test apparatus leak orifice several times in order to correctly set the leak rate at 189 ml/minute at a line pressure of 10 psi. To expedite calibration, you may find it useful to initially make coarse adjustments by measuring the volume of fluid that corresponds to 15 seconds (47 ml). However, the final calibration of the test apparatus leak orifice must be conducted by measuring a fluid volume of 189 ml over the full 60 second time frame.

18. Record the volume of fluid measured (mL) over the full 60 second calibration period.

19. Turn the pump off and bypass or remove the pressure regulator from the line. Reconnect test apparatus to shear valve. If air is introduced into the line or pressure loss occurs during disconnecting pressure regulator it may be necessary to turn the pump on and allow the line to fully pressurize. It may also be necessary to bleed air out of the lines through the test apparatus.

Determine Operational Parameters of the Mechanical Line Leak Detector

20. Turn of the pump. Allow the line pressure to decay until it stabilizes. Record this as the holding pressure. Note: If the line pressure does not stabilize, this may indicate that the check valve/functional element are defective or the packer o-ring in the pump head is leaking and may prevent the MLLD from operating properly.

21. Bleed line pressure to zero by opening the test apparatus leak orifice and allowing fluid to drain into a graduated cylinder. The volume of fluid recovered is the resiliency or bleedback and should be recorded in milliliters (ml).

22. After waiting for 2-5 minutes, fully close the test apparatus leak orifice, turn pump back on and observe pressure gauge. Pressure should rise quickly and pause for approximately 2-5 seconds before building to full pump pressure. Note: If the line pressure goes to full pump pressure without pausing, this indicates that the leak detector did not “trip” (move to the leak search position). If the leak detector did not move to the leak search position – repeat Step 21. If the leak detector still does not move to the leak search position, the leak detector fails the test.

23. Observe the line pressure when it pauses and record this as the metering pressure.

24. Measure with a stopwatch the length of time it takes from pausing at the metering pressure until full pump pressure is achieved. Record this as the opening time. Note: If the opening time is greater than 2-5 seconds, this may indicate that there is air trapped in the line, the piping has high resiliency or a leak smaller than the leak detector is capable of detecting may exist in the piping. WARNING: You must pay very close attention to the pressure gauge while measuring the opening time as this happens rather quickly.

Mechanical ALLD Test

25. With the pump off allow the line pressure to bleed-off completely (0 psi) through the test apparatus leak orifice. This should cause the leak detector to “trip” (move into the leak sensing position). Note: Do not change the size of the test apparatus leak orifice after it has been properly calibrated in Step 13 or 17.
26. Turn the pump on and allow the simulated leak to occur through the calibrated test apparatus leak orifice. Note: If using a pressure regulator in the test apparatus, the pressure regulator must be completely bypassed or fully opened while conducting Steps 27 and 28.
27. Observe that the line pressure rises to the metering pressure (determined in step 23) and remains there indefinitely with the pump running and the simulated leak occurring through the calibrated test apparatus leak orifice. Note: The test must be conducted for a minimum of 60 seconds. If the line pressure rises to the full pump pressure at anytime during the test, this indicates that the leak detector has fully opened and fails the test.
28. Measure the volume of fluid discharged from the test apparatus leak orifice while the leak detector is being tested in Step 27 by directing the flow into the graduated cylinder while timing for 60 seconds. Record the volume of fluid measured (mL) over the full 60 second test period. Note: The volume measured in 60 seconds should be equal to the volume of fluid that corresponds to the line metering pressure in Table 1.
29. Refer to Table 2 to determine the leak rate (expressed as gallons per hour) that corresponds to the leak volume observed in Step 28. Record this as the test leak rate.

Restore the System to Operational Condition

30. Cut the pump power off, allow line pressure to bleed-off to zero and close the shear valve. Perform lockout/tag out procedure on the circuit breakers.
31. Remove the test apparatus from the shear valve body and properly reinstall the plug into the shear valve test port.
32. Re-establish power to the pump, turn the dispenser on and confirm that there are no leaks in the system.
33. Dispense product into an approved container to remove any air from the line and confirm that the leak detector is operating properly by observing that full product flow is achieved.

Pass/Fail Criteria

Pass - The line pressure does not increase above the metering pressure for the duration of the test with the simulated leak occurring.

Fail – The line pressure increases to full pump pressure while the simulated leak is occurring OR
The leak detector does not reset (trip) when the line pressure is bled off to zero.

Table 1 - Volume that must be discharged within indicated time frame to be equivalent to a leak rate of 3 gph @ 10 psi:

Line Pressure	15 seconds	60 seconds		Line Pressure	15 seconds	60 seconds
5 psi	33 ml	134 ml		30 psi	82 ml	328 ml
6 psi	37 ml	147 ml		31 psi	83 ml	333 ml
7 psi	40 ml	158 ml		32 psi	85 ml	338 ml
8 psi	42 ml	169 ml		33 psi	86 ml	344 ml
9 psi	45 ml	179 ml		34 psi	87 ml	349 ml
10 psi	47 ml	189 ml		35 psi	89 ml	354 ml
11 psi	50 ml	198 ml		36 psi	90 ml	359 ml
12 psi	52 ml	207 ml		37 psi	91 ml	364 ml
13 psi	54 ml	216 ml		38 psi	92 ml	369 ml
14 psi	56 ml	224 ml		39 psi	94 ml	374 ml
15 psi	58 ml	232 ml		40 psi	95 ml	378 ml
16 psi	60 ml	239 ml		41 psi	96 ml	383 ml
17 psi	62 ml	247 ml		42 psi	97 ml	388 ml
18 psi	64 ml	254 ml		43 psi	98 ml	392 ml
19 psi	65 ml	261 ml		44 psi	99 ml	397 ml
20 psi	67 ml	268 ml		45 psi	100 ml	401 ml
21 psi	69 ml	274 ml		46 psi	102 ml	406 ml
22 psi	70 ml	281 ml		47 psi	103 ml	410 ml
23 psi	72 ml	287 ml		48 psi	104 ml	415 ml
24 psi	73 ml	293 ml		49 psi	105 ml	419 ml
25 psi	75 ml	299 ml		50 psi	106 ml	423 ml
26 psi	76 ml	305 ml		51 psi	107 ml	427 ml
27 psi	78 ml	311 ml		52 psi	108 ml	431 ml
28 psi	79 ml	317 ml		53 psi	109 ml	436 ml
29 psi	81 ml	322 ml		54 psi	110 ml	440 ml
Adjust size of test apparatus leak orifice until the indicated flow rate is achieved						

Table 2 – Conversion of leak rate from milliliters per minute (ml/min) to gallons per hour (gph)

Leak Rate (ml/min)	Leak Rate (gph)		Leak Rate (ml/min)	Leak Rate (gph)		Leak Rate (ml/min)	Leak Rate (gph)
134	2.1		281	4.5		374	5.9
147	2.3		287	4.6		378	6.0
158	2.5		293	4.7		383	6.1
169	2.7		299	4.7		388	6.2
179	2.8		305	4.8		392	6.2
189	3.0		311	4.9		397	6.3
198	3.1		317	5.0		401	6.4
207	3.3		322	5.1		406	6.4
216	3.4		328	5.2		410	6.5
224	3.5		333	5.3		415	6.6
232	3.7		338	5.4		419	6.6
239	3.8		344	5.5		423	6.7
247	3.9		349	5.5		427	6.8
254	4.0		354	5.6		431	6.8
261	4.1		359	5.7		436	6.9
268	4.2		364	5.8		440	7.0
274	4.3		369	5.9		445	7.1
Note: 1 gallon per hour = 63.06 milliliters per minute							

Electronic Automatic Line Leak Detectors

Determine Operational Parameters of the Electronic Line Leak Detector

1. Visually inspect the piping to determine type, diameter, and approximate length of piping. Document accordingly on MDEQ form.
2. Visually inspect the line leak detector to determine type, manufacturer, model, and serial number if legible. Document accordingly on MDEQ form.
3. Remove from service all dispensers connected to the STP being tested. Verify that the STP relays are operating properly to ensure that the pump cycles on and off correctly. If the STP does not cycle OFF and the issue with the contact relay cannot be adequately addressed during testing, the LLD associated with the STP fails the LLD test. Notify the appropriate person.
4. From the control panel, verify that the system set-up parameters are correct (e.g. pipe diameter, pipe length, pipe material of construction, etc...).
5. If any of the set-up parameters are not correct, make any changes that may be necessary to bring the system settings to within specifications.

Test Set-up

6. Shut off power to pump and perform lockout/tag out procedures on the circuit breakers.
7. Bleed line pressure to zero by activating the dispenser and opening the nozzle – allowing fuel to drain into an approved container. After all line pressure has been bled-off, hang up the nozzle and close the shear valve.
8. Connect test apparatus to shear valve test port at the highest dispenser. If there is no elevation change, connect the test apparatus at the furthest dispenser. Note: If the piping has master/satellite dispensers, the test apparatus must be connected to the furthest satellite dispenser.
9. Re-establish power to the pump. Open the shear valve and pressurize the line by activating the pump. Confirm that there are no leaks in the test apparatus or the connection to the shear valve test port.
10. Dispense product from the dispenser nozzle to remove all air from the line.

Calibrate Test Apparatus Leak Orifice

11. Close the dispenser nozzle and allow the line to fully pressurize. Confirm that the line pressure observed is the full pump pressure. Record this as the full pump pressure.
12. Shut off the pump and close the shear valve.

I. Without the use of a pressure regulator

13. Referencing the full pump pressure observed in Step 11, determine from Table 1 the volume of fluid that must be discharged in 60 seconds at full pump pressure to simulate a leak equivalent to 3 gph @ 10 psi.

14. With the pump running and the line at full pump pressure, slowly open the test apparatus leak orifice and adjust until the flow rate determined in Step 13 has been achieved. Note: To do this, direct the fluid flow into a graduated cylinder while timing for 60 seconds. Continue to adjust the size of the test apparatus leak orifice until the desired volume is achieved. To expedite calibration, you may find it useful to initially make coarse adjustments by measuring the volume of fluid that corresponds to the 15second time interval indicated in Table 1. However, the final calibration of the test apparatus leak orifice must be conducted by measuring the appropriate volume of fluid over the full 60 second time frame.
15. Record the volume of fluid measured (mL) over the full 60 second calibration period.

II. With the use of a pressure regulator – (optional)

16. With pump off, install pressure regulator in line between the shear valve and test apparatus.
17. Turn the pump on and confirm that full pump pressure is indicated. Slowly open the test apparatus leak orifice and direct the fuel flow into an approved container.
18. With the pressure regulator, adjust the line pressure to 10 psi. Direct the fluid flow into a graduated cylinder and time for 60 seconds. Adjust the size of the test apparatus leak orifice until the desired leak rate of 189 ml/min is achieved while maintaining a line pressure of 10 psi. Note: It may be necessary to readjust the pressure regulator and/or the test apparatus leak orifice several times in order to correctly set the leak rate at 189 ml/minute at a line pressure of 10 psi. To expedite calibration, you may find it useful to initially make coarse adjustments by measuring the volume of fluid that corresponds to 15 seconds (47 ml). However, the final calibration of the test apparatus leak orifice must be conducted by measuring a fluid volume of 189 ml over the full 60 second time frame.
19. Record the volume of fluid measured (mL) over the full 60 second calibration period.
20. Turn the pump off and bypass or remove the pressure regulator from the line. Reconnect test apparatus to shear valve. If air is introduced into the line or pressure loss occurs during disconnecting pressure regulator it may be necessary to turn the pump on and allow the line to fully pressurize. It may also be necessary to bleed air out of the lines through the test apparatus.

Determine if leak detector sees a leak equivalent to 3 gph @ 10 psi

21. Without adjusting the test apparatus leak orifice after it has been properly calibrated in Step 14 or 18, hang-up the dispenser nozzle, allowing the pump to turn off.
22. While directing the fluid flow from the leak test apparatus into an approved container, observe that the electronic line leak detector turns the pump on and pressurizes the line.
23. Confirm that the simulated leak condition causes the electronic line leak detector to alarm and/or shut-down the pump. Note: The electronic line leak detector may cycle the pump on/off several times before alarming or shutting-down the pump.

Restore the System to Operational Condition

24. Cut the pump power off, allow line pressure to bleed-off to zero and close the shear valve. Perform lockout/tag out procedure on the circuit breakers.
25. Remove the test apparatus from the shear valve body and properly reinstall the plug into the shear valve test port.
26. Re-establish power to the pump, turn on the dispenser and confirm that there are no leaks in the system.
27. Dispense product into an approved container to remove any air from the line and confirm that full product flow is achieved.

Pass/Fail Criteria

Pass - The electronic line leak detector alarms and/or causes the pump to shut-down while the simulated leak is occurring.

Fail – The electronic line leak detector does not alarm or shut-down the pump while the simulated leak is occurring.

Note: If the leak detector initially fails the test, repeat the test procedure before declaring the test result as “fail”.