LOVELAND FIRE RESCUE AUTHORITY	FIRE APPARATUS PUMP TESTING	2016 revA
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	APPROVED BY: *Mark Miller* Fire Chief Mark Miller	**REVISION DATE:** 11/19/2016

Procedure:

- Fire Apparatus Pump Testing is completed on an annual basis. The fire pump test will provide Loveland Fire Rescue Authority (LFRA) with performance data used for comparison with past pump and baseline tests to help determine repair or replacement, if necessary.
- The pump test is for all Type I engines, ladders and towers with pumps and water tenders. The pump testing will be completed annually or after work on the pump has been done.
- Before fire apparatus leaves the station for the pump test, it is imperative that all engine fluids are checked and within operational limits. The pump test will exercise the apparatus to its maximum limits for at least 60 minutes.
- Apparatus which do not meet the rated pumping capacity will be evaluated and further determinations made.
- Pump Test Gauges shall be calibrated within 60 days preceding tests.

Required Equipment:

1. 2 - 10' sections of hard suction hose
    a. 1000 GPM Pump 5" hose
    b. 1250 GPM Pump 6" hose
    c. 1500 GPM Pump 6" hose
2. Tool box
    a. Wrenches and sockets
3. Pump test gauge set
4. Nozzle and pitot tube set
5. Teflon tape
    a. For test gauge fittings
6. Clip board and writing utensil
7. Pump test data sheets
    a. Blank
8. Previous pump data sheets for that apparatus
9. Hearing protection
10. Protective clothing and shoes
11. Stop watch

Testing Procedure:

Prior to starting the pump testing:

- CHECK ALL FLUIDS LEVELS
- Drain the pump to make sure there is no foam in the pump, if there is foam, flush from hydrant until there is no foam
- Close the foam tank valve
- DURING TEST: engage the on-board generator if equipped and turn on the scene lights

TEST 1

Engine Speed Check

1. The engine will be within plus or minus 50 rpm of the governed engine speed as recorded on the pump test plate
2. The reason for any discrepancy shall be determined prior to testing and testing shall begin only if the discrepancy will not have an adverse effect on the outcome of the test
    - **Check box on pump records sheet (Pass or Fail)**

TEST 2

Pump Vacuum Test

1. Remove the vacuum plug on the apparatus and apply the vacuum side of the pitot gauge into the open port (ensure that only the vacuum port is connected and not the pressure port)
2. Drain the main pump (close tank-to-pump valve)
3. Remove all discharge and intake caps and place medical gloves on each port
4. Once the water is completely drained from the pump, close and make sure all the drains, pump/heat cooling valves, master intakes, etc. are fully closed
5. Apparatus battery should be ON (Pump PTO does not need to be engaged)
6. Engage the priming pump until maximum 22 in. Hg. is achieved on test gauge
    a. **Record time required to reach both 22 in. Hg. and Max in. Hg**
7. Disengage the priming pump; listen for air leaks
8. Observe vacuum reading for five minutes
    a. Maximum allowable drop is 10 in. Hg. in five minutes
    b. **Record test results on test sheet**
9. If a significant drop is noticed, check for any leaks. Complete a walk-around of the apparatus to check if any of the medical gloves have been sucked into the discharges or intakes.
    a. **Record any issues in the testing log**
10. After completing the vacuum test, take off all of the medical gloves and dispose
11. Remove the plug on the pressure port of the apparatus and connect the pressure pitot gauge to the open port

TEST 3

Priming Test

1. Remove the pump side external master intake
2. Place the large diameter hard suction hose on the pump side intake and place the hard suction hose into the open pump pit
3. Start the apparatus and place the pump into gear
4. Chock the apparatus rear wheels
5. Turn on all emergency and driving lights
6. Turn on A/C if equipped
7. If the pump is two-stage, place the pump into volume
8. Set the hose out appropriately for the GPM of the pump
9. Select appropriate tip size for GPM of the pump
10. Raise the RPM's of the apparatus to 1000–1200 RPM
11. Engage the primer and obtain a draft with the master intake fully open
    - **Record the time taken to obtain a draft**
        i. Example: Priming Pump Test – In volume, 10 in. Hg. obtained in 13 seconds

- The time required to prime the pump shall not exceed 30 seconds if the rated capacity is 1250 gpm or less
- The time shall not exceed 45 seconds if the rated capacity is 1500 gpm or more
- An additional 15 seconds shall be permitted to prime the pump beyond the time required or when the pump system includes an auxiliary 4-inch or larger intake pipe having a volume of 1 cubic foot or more.

TEST 4

100% Capacity @ 150 psi Test (20 Minutes)

1. Layout
    a. 1 - 50' section of 4" hose with 2" nozzle
    b. 1 – 25' section of 2 ½" hose with 1.5" nozzle
2. Place transfer valve in parallel position (volume)
3. Slowly raise pump pressure and pitot nozzle pressure to desired pressure
    a. **Record start time and all gauge readings on records sheet**
4. Continue test for 20 minutes
    a. **Record start time and all gauge readings on records sheet**
        i. **Times will be 5, 10, 15 and 20 minute intervals**
5. Monitor engine and pump pressure
6. Monitor all engine gauges
7. Be aware for fluid leaks

TEST 5

Overload Test (10 Minutes)

1. Layout
    a. 1 - 50' section of 4" hose with 2" nozzle
    b. 1 – 25' section of 2 ½" hose with 1.5" nozzle
2. Raise pump discharge pressure to 165 psi
    a. **Record start time and all gauge readings on records sheet**
        i. **Times will be 5 and 10 minutes**
3. Monitor engine and pump pressure
4. Monitor all engine gauges
5. Be aware for fluid leaks

TEST 6

70% Capacity at 200 psi Test (10 minutes)

1. Layout
    a. 1 - 50' section of 4" hose with a 2" nozzle
2. Place transfer valve in parallel position (volume)
    a. Check previous years' test sheet for transfer valve position, use same position as previous tests
3. Slowly raise pump pressure and pitot nozzle pressure to desired pressure
    a. **Record start time and all gauge readings on records sheet**
        i. **Times will be 5 and 10 minute intervals**
4. Monitor engine and pump pressure
5. Monitor all engine gauges
6. Be aware for fluid leaks

TEST 7

50% Capacity at 250 psi Test (10 minutes)

1. Layout
    a. 1 - 25' section of 2 ½" hose with a 1.75" nozzle
    b. 1 – 50' section of 2 ½" hose with a 1.75" nozzle
2. Place transfer valve in parallel position (volume)
    a. Check previous years' test sheet for transfer valve position, use same position as previous tests
3. Slowly raise pump pressure and pitot nozzle pressure to desired pressure
    a. **Record start time and all gauge readings on records sheet**
        i. **Times will be 5 and 10 minute intervals**

TEST 8

Pressure Control Test

1. The pressure control device shall be tested at rated capacity at 150 psi net pump pressure
2. The pump shall be delivering rated capacity at 150 psi
3. The pressure control device shall be set in accordance with the manufactures' instructions to maintain the desired 150 psi
4. All discharge valves shall be closed no faster than 3 seconds and no slower than 10 seconds
5. The rise in discharge pressure shall not exceed 30 psi
    a. **Check box on pump records sheet (Pass or Fail)**
6. The pressure control device shall be tested at 90 psi net pressure
7. The original conditions of the pumping rated capacity at 150 psi net pump pressure shall be reestablished
8. The discharge pressure shall be reduced to 90 psi net pressure by throttling the engine fuel supply with no change to the discharge valve setting, hose or nozzles.
9. The pressure control device shall be set in accordance with the manufactures' instructions to maintain the discharge at 90 psi net pump pressure
10. All discharge valves shall be closed no faster than 3 seconds and no slower than 10 seconds
11. The rise in discharge pressure shall not exceed 30 psi
    a. **Check box on pump records sheet (Pass or Fail)**

12. The pressure control device shall be tested at 50 percent of the rated capacity at 250 psi net pump pressure
13. The pressure control device shall be set in accordance with the manufactures instructions to maintain the discharge at 250 psi net pump pressure
14. All discharge valves shall be closed no faster than 3 seconds and no slower than 10 seconds
15. The rise in discharge pressure shall not exceed 30 psi
    a. **Check box on pump records sheet (Pass or Fail)**

TEST 9

Tank-to-Pump Flow Rate

1. The water tank shall be filled until it overflows
2. All the intakes to the pump shall be closed
3. The tank fill line and bypass cooling line shall be closed.
4. Hose lines and nozzles for discharging water at the anticipated flow rate shall be connected to one or more of the discharge outlets
5. The tank to pump valve and the discharge valves leading to the leading to the hose lines and nozzles shall be fully open
6. The engine throttle shall be adjusted until the maximum consistent pressure reading on the discharge pressure guide is obtained
7. The discharge valve(s) shall be closed and the water tank refilled, with the bypass line permitted to be opened temporarily if needed to keep the water temperature in the pump within acceptable limits
8. The discharge valve(s) shall be reopened fully and a pitot reading or other flow measurement shall be taken while the water is being discharged, with the engine throttle adjusted to maintain the discharge pressure noted
9. The flow rate shall be recorded and compared with the rate designated by the manufacturer when the apparatus was new or with the rate established in previous testing
    a. **Record maximum gpm on records sheet**

All Tests Complete:

1. Pick up hose, testing materials and place apparatus back in service
2. Complete apparatus log and note any issues and report findings to Vehicle Maintenance
3. Apparatus pump testing complete

Revision History:

References:

1. **NFPA 1911** Standard for the Inspection, Maintenance, Testing and Retirement of In-Service Automotive Fire Apparatus (2012). NFPA, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101, USA