S.O.P. #: 400-22 (Formerly 400-44)

SUBJECT: ANNUAL PUMP TEST

DIVISION: EMERGENCY OPERATIONS

Objective: This standard shall cover the testing of Fire Pumps and Attack Pumps on Fire Department automotive apparatus. It does not apply to apparatus equipped solely with pumps rated less than 500 GPM. The standard establishes the site, environmental and equipment requirements for proper testing and the procedures to be followed in performing tests. It applies to the conduct of in-service tests of Fire Pumps on Fire Department apparatus to ensure that the pump continues to be capable of the performance for which it was designed.

Section 1: Frequency of Test

A. Pump test shall be conducted at least annually, or

B. Whenever major repairs or modification to the pump or any component of the apparatus that is used in pump operations have been made.

C. The Authority Having Jurisdiction (A.H.J.) will designate, each year, a person(s) that is responsible for conducting the annual pump tests for the department.

Section 2: Equipment and Site Requirements

A. Test Site

1. All testing will be conducted at the Baltimore County Fire Department drafting basin.

2. If Section 2, A., 1. cannot be utilized, an alternate site may be used, provided it meets the following requirements:

a. Test site shall be adjacent to a supply of clean water at least 4 feet deep.

b. The water level may not be more than 10 ft. below the center of the pump intake.

c. The water must be close enough to allow the suction strainer to be submerged at least 2 ft. below the surface of the water when connected to the pump by 20 ft. of suction hose.

d. A means by which an accurate and consistent measure of nozzle and engine pressure can be obtained shall be provided.

e. Is approved by the "authority have jurisdiction."

B. Environmental Conditions

1. Pump test shall be conducted when conditions are as follows:

a. Air Temperature 30 degrees to 100 degrees F.

b. Water Temperature 35 degrees to 90 degrees F.

c. Barometric Pressure 29 in, Hg min.

d. Test may be cancelled by A.H.J. at any time in which environmental conditions prohibit safe and accurate testing of apparatus.

C. Equipment

1. Suction Hose and Strainer

a. When testing a pump, 20 ft. of suction hose of the appropriate size for the rated capacity of the pump, as shown in Table 2.

b. A suction strainer that is rated for the proper suction hose shall be furnished.

2. Discharge Hose

a. Sufficient fire hose shall be provided to allow discharge of rated capacity to the nozzle without exceeding a flow of velocity of 35 ft. per second.

3. Flow - Measuring Equipment

a. Nozzles

1) Shall be smooth bore.

2) Size sufficient for the anticipated flows as per Table 2.

b. Pitot Tubes

1) Approved by A.H.J.

c. Test Gauges

1) Shall be calibrated annually by Fire Maintenance Division, or

2) By its manufacturer annually.

3) If not liquid filled, shall include "snubbing" means to damp out rapid gauge needle movement.

d. Speed Measuring Devices

1) Shall consist of a calibrated tachometer measuring RPM's approved by A.H.J., or

2) A revolution counter and stop watch used on a checking shaft outlet.

Section 3: Testing

A. Conditions for Test

1. Pump test shall be conducted at a site meeting conditions outlined in Section 2., A., and when the environmental conditions are as defined in Section 2., B.

2. All tests requiring the flowing water shall be conducted with the pump drafting.

3. If it is impractical to provide all specified conditions, the A.H.J. may authorize test under other conditions.

B. Procedure

1. Hydrant Check

a. Pumper being tested shall be hooked to a hydrant. The hydrant will be charged and the following will be checked.

1) Pump packing.

2) Gauges for accuracy.

3) Any unusual or abnormal leaks.

2. Pumping Test

a. The pump shall be subjected to three tests for a total time of 40 minutes duration, as follows:

1) Test One consisting of at least 20 minutes pumping the rated capacity at 150 PSI net pump pressure.

2) Test Two consisting of at least 10 minutes pumping 70 percent of rated capacity at 200 PSI net pump pressure.

3) Test Three consisting of at least 10 minutes pumping 50 percent of rated capacity at 250 PSI net pump pressure.

4) The pump shall not be stopped except when discharges are closed to permit changing hose or nozzle.

b. If the pump is a two stage parallel/series pump.

1) Test One shall be run in parallel mode.

2) Test Two shall be run in either parallel or series mode.

3) Test Three shall be run with the pump in series mode.

c. During the draft portion of the test, the following items will be checked for proper function.

1) RPM counters

2) Relief valves

3) Pressure governors

4) Tachometer
   a) Cab
   b) Pump panel
5) Oil pressure gauges
   a) Cab
   b) Pump panel
6) Water temperature gauges
   a) Cab
   b) Pump panel
7) Discharges gates
8) Discharges gauges
9) Compound gauge
10) Lights
   a) Warning
   b) Clearance
   c) Vision
   d) Spot
   e) Panel
11) Transfer valve
12) Body condition, overall
13) Fluid leaks
14) Intake screens
15) Suction sleeves
16) Discharge threads/couplings
17) Priming oil
18) Electrical generator and equipment

D. Results

1. A pump exhibiting any of the following conditions during testing will be subject to a retest. The pump and apparatus will remain in service. The repairs and retest will be done prior to the rescheduled pump test. Should the repairs not be accomplished within 90 days, the apparatus will be placed out of service until it has successfully passed its annual pump test.

    a. Failure to hold a prime during testing or between test.

    b. Failing either the 70% or 50% test.

    c. Should the RPM outlet not be operating, it will be noted and repaired within one calendar year or prior to its next annual pump test. Should repairs not be made, the unit will be placed out of service until repairs are made and it passes the annual pump test.

    d. Failure of the RPM's to be held within 10% of the underwriters plate, or the first Baltimore County test, whichever is higher on all tests, will require a proof test. If the unit can pass the proof test within the no-load governed speed of the motor, than no retest will be needed for that year.

        1) Proof test will consist of pumping 100% of the rated capacity at 165 PSI engine pressure for 10 minutes.

2. Should any pump exhibit any of the following conditions, it will be placed out of service until it is repaired and able to pass the annual pump test.

    a. Failure to obtain water from a draft in 30 seconds for a 500-1000 GPM pump and 45 seconds for a 1250-2000 GPM pump.

    b. Failure to remain in pump gear during testing.

    c. A pump failing the capacity test.

    d. Failure of a pump on two or all three tests.

    e. Failure to hold the required flow and pressure for the required time.

    f. Failure of one or more discharge gate valves, if that leaves an insufficient number of gates for the rated capacity of the pump.

    g. Failure of a proof test.

    h. Should a pump rated higher than 750 GPM experience any of the problems outlined in Items c., d., e., or f. above, than the A.H.J. will have the right to keep the unit in-service as long as the unit can pass all three tests for the next pump size smaller. Units that are already down rated will not be allowed to down rate any lower, and the minimum pump size rating will be 750 GPM. The following agencies will be notified immediately of this down rating.

        - Fire Maintenance Division
        - Fire-Rescue Academy Battalion Chief
        - Battalion Chief, Company Commander where pumper assigned
        - On Duty Station Officer

i. If the pump cannot pass all three tests of the next size smaller within 10% of the rpm's as defined by UL plate for the original capacity, it will be placed out of service until it can pass for its original capacity.

j. This temporary down-rating will remain in effect only until the next annual service test. If the pump cannot pass the next annual service test at its original capacity, the unit will be placed out of service until it can pass.

Section 4: Pump Test Record

A. The Company Commander shall cause to be maintained in the Station Journal a Pump Test Record, to include the engine number, date tested and the result of the test.

B. The Battalion Chief in charge of the Fire-Rescue Academy shall maintain a complete and continuous pump test record for every engine (first and second line) in the Baltimore County Fire Department, with copies distributed to Fire Maintenance.

DISCHARGE OF SMOOTH NOZZLES—GALLONS PER MINUTE

Pressure	Nozzle Size, Inches																								
PSI	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1	1 1/16	1 1/8	1 3/16	1 1/4	1 5/16	1 3/8	1 7/16	1 1/2	1 9/16	1 5/8	1 11/16	1 3/4	1 13/16	1 7/8	1 15/16	2
25	2.1	2.6	3.3	3.9	4.6	5.2	6.0	6.7	7.5	8.3	9.2	10.0	10.9	11.7	12.6	13.4	14.3	15.1	16.0	16.8	17.7	18.5	19.4	20.2	21.1
30	2.3	2.8	3.6	4.3	5.0	5.7	6.6	7.3	8.2	9.1	10.0	10.9	11.9	12.8	13.7	14.6	15.6	16.5	17.4	18.3	19.3	20.2	21.1	22.0	23.0
35	2.5	3.0	3.8	4.6	5.4	6.2	7.1	7.9	8.8	9.8	10.8	11.7	12.8	13.8	14.7	15.7	16.7	17.7	18.7	19.7	20.7	21.7	22.7	23.7	24.7
40	2.6	3.2	4.1	4.9	5.8	6.6	7.6	8.4	9.4	10.4	11.5	12.5	13.6	14.7	15.7	16.7	17.8	18.8	19.9	20.9	22.0	23.1	24.1	25.2	26.3
45	2.8	3.4	4.3	5.2	6.1	7.0	8.0	8.9	9.9	11.0	12.1	13.2	14.3	15.4	16.5	17.6	18.8	19.9	21.0	22.1	23.2	24.3	25.4	26.5	27.7
50	2.9	3.6	4.5	5.5	6.4	7.4	8.4	9.3	10.4	11.5	12.7	13.8	15.0	16.1	17.3	18.4	19.6	20.8	21.9	23.1	24.3	25.4	26.6	27.8	29.0
55	3.0	3.8	4.8	5.7	6.7	7.7	8.8	9.8	10.9	12.0	13.2	14.4	15.6	16.8	18.0	19.2	20.4	21.6	22.8	24.0	25.2	26.4	27.6	28.8	30.0
60	3.2	4.0	5.0	6.0	7.0	8.0	9.1	10.2	11.3	12.5	13.7	14.9	16.2	17.4	18.6	19.9	21.1	22.4	23.6	24.9	26.1	27.4	28.6	29.9	31.1
65	3.3	4.2	5.2	6.2	7.3	8.3	9.4	10.5	11.7	12.9	14.2	15.4	16.7	18.0	19.3	20.6	21.9	23.2	24.5	25.8	27.1	28.4	29.7	31.0	32.3
70	3.5	4.4	5.4	6.5	7.5	8.6	9.7	10.9	12.1	13.3	14.6	15.9	17.2	18.5	19.8	21.2	22.5	23.8	25.2	26.5	27.9	29.2	30.6	31.9	33.3
75	3.6	4.5	5.6	6.7	7.8	8.9	10.1	11.3	12.5	13.8	15.1	16.4	17.7	19.1	20.4	21.8	23.2	24.5	25.9	27.3	28.7	30.1	31.5	32.9	34.3
80	3.8	4.7	5.8	6.9	8.0	9.2	10.4	11.6	12.9	14.2	15.5	16.8	18.2	19.6	21.0	22.4	23.8	25.2	26.6	28.0	29.4	30.9	32.3	33.7	35.2
85	3.9	4.9	6.0	7.1	8.3	9.5	10.7	12.0	13.3	14.6	15.9	17.3	18.7	20.1	21.5	23.0	24.4	25.9	27.3	28.8	30.2	31.7	33.2	34.6	36.1
90	4.1	5.1	6.2	7.4	8.5	9.7	11.0	12.3	13.6	15.0	16.3	17.7	19.2	20.6	22.1	23.6	25.1	26.6	28.1	29.6	31.1	32.6	34.1	35.6	37.1
95	4.2	5.2	6.4	7.6	8.8	10.0	11.3	12.6	14.0	15.4	16.8	18.2	19.7	21.2	22.7	24.2	25.7	27.3	28.8	30.3	31.9	33.4	35.0	36.5	38.1
100	4.3	5.4	6.6	7.8	9.0	10.3	11.6	12.9	14.3	15.7	17.2	18.7	20.2	21.7	23.2	24.7	26.3	27.8	29.4	31.0	32.5	34.1	35.7	37.3	38.9
105	4.4	5.5	6.7	8.0	9.2	10.5	11.9	13.2	14.6	16.1	17.6	19.1	20.6	22.2	23.7	25.3	26.9	28.4	30.0	31.6	33.2	34.8	36.4	38.0	39.6
110	4.5	5.7	6.9	8.2	9.4	10.8	12.1	13.5	14.9	16.4	17.9	19.4	21.0	22.5	24.1	25.7	27.3	28.9	30.5	32.1	33.7	35.4	37.0	38.6	40.3
115	4.6	5.8	7.0	8.3	9.7	11.0	12.4	13.8	15.2	16.7	18.2	19.8	21.3	22.9	24.5	26.1	27.7	29.3	31.0	32.6	34.3	35.9	37.6	39.2	40.9
120	4.7	5.9	7.2	8.5	9.9	11.2	12.6	14.1	15.5	17.0	18.5	20.1	21.7	23.3	24.9	26.5	28.2	29.8	31.5	33.2	34.8	36.5	38.2	39.9	41.6
125	4.8	6.1	7.4	8.7	10.1	11.5	12.9	14.4	15.8	17.3	18.9	20.5	22.1	23.7	25.3	27.0	28.7	30.3	32.0	33.7	35.4	37.1	38.8	40.5	42.2
130	4.9	6.2	7.5	8.9	10.3	11.7	13.1	14.6	16.1	17.6	19.2	20.8	22.4	24.1	25.7	27.4	29.1	30.8	32.5	34.2	35.9	37.6	39.4	41.1	42.8
135	5.0	6.3	7.7	9.1	10.5	11.9	13.4	14.9	16.4	17.9	19.5	21.1	22.8	24.4	26.1	27.8	29.5	31.2	32.9	34.7	36.4	38.1	39.9	41.6	43.4
140	5.1	6.5	7.8	9.2	10.7	12.1	13.6	15.1	16.6	18.2	19.8	21.4	23.1	24.7	26.4	28.1	29.9	31.6	33.3	35.1	36.8	38.6	40.4	42.1	43.9
145	5.2	6.6	8.0	9.4	10.8	12.3	13.8	15.3	16.8	18.4	20.0	21.7	23.3	25.0	26.7	28.4	30.2	31.9	33.7	35.4	37.2	39.0	40.8	42.6	44.4

Rated Capacity (gpm)	Suction Hose Size (in.)	No. of Suction Lines	Maximum Lift (ft)
250 - 300	3	1	10
350 - 500	4	1	10
600 - 750	4 1/2	1	10
1000	5	1	10
1250	6	1	10
1500	6	1 or 2	10
1750	6	2	8
2000 - 2500	6	2	6