MOBILE EQUIPMENT MANAGEMENT

PUMP TEST PROCEDURES

APPARATUS PRE INSPECTION

(To be completed at the shop or station prior to pump test)

1. **ENGINE AREA** (Check fluid levels, belts, hoses, wiring, loose bolts, heat protection, and inspect for fluid leaks).

2. **PUMP DRIVES** (Check PTO driveline, main drive line, hydrostatic drive shafts, and u-joints).

3. **GEAR BOXES** (Check fluid levels, securely mounted, and operates correctly)

4. **FUEL LEVEL**

5. **EXHAUST HEAT** (Hot exhaust can cause serious injury and damage. Be aware of exhaust direction at all times)

6. **PRE DRY VACCUM TEST** (Close the tank to pump valve, drain the pump and plumbing, close all discharge and inlet valves and engage the primer to check the system's ability to hold a vacuum, (maximum vacuum loss allowable is no more than 10 IN. vacuum in 5 minutes)

7. **NO LOAD GOVERNED RPM TEST** (Ensure the listed maximum governed engine RPM can be achieved. The actual RPM should be within +/-50 RPM of listed governed speed)

Any deficiencies found with the apparatus should be corrected before the pump test begins.

NOTE: Correcting deficiencies to the Apparatus in the shop is more convenient than repairs attempted at the test pit.

Typical Hose Layout & Tip Sizes

Pump Size	Pump Press	GPM	21/2"Hose Layout	Pitot Press	Actual GPM Flow	Tip Size In	Suction Hose
500	150 200 250	500 350 250	1X 50' 1X 50' 1X 50'	58 58 88	508 350 252	11/2 11/4 1	4" 4" 4"
750	150 200 250	750 525 375	2X100' 1X100' 1X100'	68 64 68	757 532 380	13/4 11/2 11/4	41/2" 41/2" 41/2"
1000	150 200 250	1000 700 500	3X100' 2X100' 1X100'	70 58 56	1003 701 501	2 13/4 11/2	5" 5" 5"
1250	150 200 250	1250 875 625	3X100&1X50 3X100' 2X100'	70 54 46	1258 889 627	21/4 2 13/4	6" 6" 6"
1500	150 200 250	1500 1050 750	3X100&1X50 3X100 2X100	105 78 68	1519 1058 757	21/4 2 13/4	6" 6" 6"

Notes

DISCHARGE TABLE FOR SMOOTH BORE NOZZLES

GPM (U.S. Gallons Per Minute)

NOZZLE PRESSURE (PSI)	NOZZLE DIAMETER IN INCHES							
	1	1-1/8	1-1/4	1-3/8	1-1/2	1-3/4	2	2-1/4
10	94.5	120	148	179	213	289	378	479
15	116	147	181	219	260	354	463	585
20	134	169	209	253	301	409	535	676
25	149	189	234	283	336	458	598	756
30	164	207	256	309	368	501	655	828
35	177	224	277	334	398	541	708	895
40	189	239	296	357	425	578	756	957
45	200	253	313	379	451	613	810	1015
50	211	267	330	399	475	647	845	1070
55	221	280	342	418	498	678	886	1121
60	231	293	366	438	521	708	926	1172
65	241	305	376	455	542	737	964	1220
70	250	317	391	473	563	765	1001	1267
75	259	327	404	489	582	792	1037	1310
80	267	338	418	505	602	818	1070	1354
85	276	349	431	521	620	844	1103	1395
90	284	359	443	536	638	868	1136	1436
95	292	369	456	551	656	892	1168	1476
100	295	378	467	565	672	915	1196	1512
105	306	388	479	579	689	937	1226	1550
110	314	397	490	593	705	960	1255	1588
115	320	406	501	606	720	980	1282	1621
120	327	414	512	619	736	1002	1310	1659
125	334	423	522	632	751	1022	1338	1690
130	341	432	533	645	767	1043	1365	1726
135	347	439	543	656	780	1063	1390	1759
140	354	448	553	668	795	1082	1415	1790
145	360	455	562	680	809	1100	1440	1820
150	366	463	572	692	824	1120	1466	1853
175	395	500	618	747	890	1210	1582	2000
200	423	535	660	799	950	1294	1691	2140
250	473	598	739	894	1063	1447	1891	2392

END OF TEST PROCEDURES

1. CHECK ENGINE FOR ABNORMALITIES OR FLUID LEAKS (check under engine for leaks)
2. CHECK AND REFILL ALL ENGINE FLUIDS
3. CHECK AND RETURN ALL EQUIPMENT USED
4. CLEAN TEST AREA
5. NOTE ALL PROBLEMS OR OBSERVATIONS ON WORKSHEET
6. ADVISE DUTY B/C OF ANY OUT OF SERVICE EQUIPMENT OR SUSPECTED PROBLEMS
7. COMPLETE and UPDATE PUMP TEST SECTION IN 6805 ALSO REPAIRS SECTION IF ANY WERE PERFORMED
8. COMPLETE AND SIGN WORKSHEET, RETURN WORKSHEET TO UNIT FLEET MANAGER along with copies of ME-107

PUMP TEST PREPARATION

REQUIRED EQUIPMENT

- ☐ TWO 10 FOOT SECTIONS HARD SUCTION HOSE
  - 400 GPM and BELOW 3 INCH
  - 500 GPM PUMP 4 INCH
  - 750 GPM PUMP 5 INCH
  - 1000 GPM PUMP 5 INCH
  - 1250 GPM PUMP 6 INCH
  - 1500 GPM PUMP 6 INCH
- ☐ SUCTION CAP HOSE
- ☐ CAPS FOR ALL PUMP SUCTIONS AND DISCHARGES
- ☐ SUCTION HOSE STRAINER (proper GPM rating)
- ☐ 50 FOOT ROPE
- ☐ CHAFING MATERIAL (for hard suction hose)
- ☐ TOOL BOX (with wrenches and sockets)
- ☐ PUMP TEST GAUGE SET
- ☐ NOZZLE AND PITOT TEST SET
- ☐ TEFLON TAPE (for test gauge fittings)
- ☐ CLIP BOARD AND PENCIL
- ☐ PUMP TEST DATA SHEET (blank copies)
- ☐ PREVIOUS TEST DATA SHEETS
- ☐ RPM COUNTER
- ☐ PRIMING PUMP OIL (Sierra anti-freeze 50/50 mixture or vegetable oil)
- ☐ 25 FOOT TAPE MEASURE
- ☐ HEARING PROTECTION
- ☐ PROTECTIVE CLOTHING AND SHOES
- ☐ SIX 50 FOOT SECTIONS OF 3 INCH HOSE
- ☐ STOP WATCH
- ☐ WATER THERMOMETER
- ☐ BUCKET
- ☐ RUBBER BANDS
- ☐ CELLOPHANE PLASTIC WRAP

TEST #1

DRY PUMP VACUUM TEST

1. **CHOCK WHEELS OF ENGINE**
2. SET UP AND CONNECT PUMP TEST GAUGES (Teflon tape maybe necessary on fittings)
3. DRAIN THE MAIN PUMP (close tank to pump valve)
4. CONNECT 20 FT. (TWO 10 FT SECTIONS) OF HARD SUCTION HOSE TO PUMP SUCTION
5. REMOVE THE STRAINER AND CAP THE HARD SUCTION HOSE (inspect the condition of the strainer)
6. CLOSE ALL DISCHARGE VALVES, DRAINS, INTAKE VALVES AND TANK FILL VALVES
7. CAP ALL NON-VALVE OPERATED PUMP INTAKES
8. UN-CAP ALL PUMP DISCHARGES (caps may need to be reinstalled if valve leaks)
9. WRAP ALL DISCHARGES WITH PLASTIC WRAP
10. RUN PRIMING PUMP UNTIL MAXIMUM IN. Hg. IS ACHIEVED ON TEST GAUGE

(DO NOT RUN PRIMING PUMP MORE THAN ONE (1) MINUTE)

(**NOTE :** FOR CERTAIN HALE PRIMING SYSTEMS IT MAY BE) NECESSARY TO START ENGINE (engage main pump only if required to engage priming pump) RAISE ENGINE RPM'S TO 1000 AND START PRIMING PUMP)

12. RECORD TIME TO ATTAIN 22 in. Hg. and Max in Hg.) (Time to reach 22 in. Hg. should be within 30 seconds)
13. TURN OFF PRIMING PUMP (and engine if running), LISTEN FOR LEAKS
14. OBSERVE VACUUM READING FOR 5 MINUTES (maximum allowable drop is 10 inches Hg. in 5 minutes)
15. RECORD TEST RESULTS ON TEST SHEET

NOTE: THE PRIMING DEVICE SHALL NOT BE OPERATED ONCE THE 5 MINUTE TEST HAS BEGUN.

TEST #10

INTAKE RELIEF VALVE TEST

1. PILOT OPERATED (adjustable) INTAKE RELIEF VALVES
   - A - Close all drain, discharge, and suction valves
   - B – Secure a water source capable of supplying a continuous flow at 50 – 100 PSI.
   - C – Set the pilot valve slightly above source pressure introduce source pressure to intake. Relief valve should remain **closed**.
   - D – Reduce pilot valve setting to slightly below source pressure. Relief valve should **open "dumping"** a large volume of water.
   - E – Reset pilot to slightly above source pressure, relief valve should **close**

2. FIXED PRESSURE INTAKE RELIEF VALVES
   - A – Close all drain, discharge, and suction valves
   - B – Secure a water source capable of supplying a continuous flow at a pressure greater than intake valve preset (80-100-125 whatever it may be)
   - C – Introduce source pressure, monitor when intake pressure rises slightly higher than preset. Relief valve should **open "dumping"** excess pressure.
   - D – Decrease source water pressure, relief valve should close

TEST #9

PRESSURE CONTROL DEVICE TEST @ 250 PSI

1. OBTAIN 250 PSI PUMP PRESSURE BY ADJUSTING ENGINE THROTTLE ONLY (do not change discharge valve settings from those used in test #8 for capacity flow)
2. SET PRESSURE CONTROL DEVICE AT 250 PSI
3. SLOWLY CLOSE ALL DISCHARGE VALVES **ONE AT A TIME** (no faster than 3 seconds, or slower than 10 seconds)
4. OBSERVE AND RECORD PUMP DISCHARGE PRESSURE RISE ON WORKSHEET (pressure rise with all discharges closed should not exceed 30 psi)
5. OPEN DISCHARGE VALVE TO ALLOW WATER FLOW
6. REFILL WATER TANK
7. SLOWLY REDUCE ENGINE SPEED, AND SHUT OFF WATER FLOW
8. DISENGAGE MAIN PUMP
9. IDLE ENGINE FOR 10 MINUTES BEFORE SHUTTING DOWN (to cool engine)

TEST #2

PRIMING TEST

CHECK TACHOMETER IN CAB AND PUMP PANEL FOR ACCURACY

1. SET UP PITOT WITH PROPER NOZZLE FOR CAPACITY TEST
2. REMOVE SUCTION HOSE CAP AND REPLACE WITH STRAINER
3. ATTACH ROPE TO STRAINER AND SUCTION HOSE
4. PLACE HARD SUCTION HOSE INTO PIT
5. SUBMERGE STRAINER AT LEAST 24 INCHES BELOW WATER SURFACE
6. TIE OFF HOSE WITH ROPE (rope to relieve strain on hose)
7. USE CHAFING PAD ON HARD SUCTION HOSE AS NEEDED
8. MEASURE WATER LEVEL IN DRAFTING PIT, 10 FOOT MAXIMUM LIFT (measure top of water surface to eye of pump) (calculate friction loss, approx. ½ of vacuum reading at suction side)
9. SET UP DISCHARGE HOSES TO PITOT MANIFOLD
10. START ENGINE AND ENGAGE MAIN PUMP (turn on all lights and a/c, heater if equipped)
11. PLACE TRANSFER VALVE IN PARALLEL POSITION (volume)
12. RAISE ENGINE RPM'S TO 1000 – 1200
13. START PRIMING PUMP AND STOP WATCH, TIME PRIMING TEST (time test ends when water discharges at nozzle and out of priming pump) (can fill discharge lines before test)
    UP TO 1250 GPM pumps 30 seconds
    1500 GPM and above pumps 45 seconds
14. MAINTAIN MINIMUM OF 50 PSI PUMP PRESSURE (any lower will loose primer)
15. MAINTAIN WATER FLOW (to maintain prime and cool pump)
16. RECORD RESULTS ON WORKSHEET AND PROCEED TO TEST #3

TEST #3

100% CAPACITY @ 150 PSI NPP (20 MINUTES)

1. SELECT AND SET UP PROPER PITOT NOZZLE SIZE FOR GPM (Use pitot nozzle size to attain pressure 50 – 80 psi if possible. If possible use same pitot size as previous year's test)
2. PLACE TRANSFER VALVE IN **PARALLEL** POSITION (volume)
3. SLOWLY RAISE PUMP PRESSURE AND PITOT NOZZLE PRESSURE TO DESIRED READINGS (pressure control devise set above desired pump pressure)
4. START TIME TEST AND RECORD ALL GAUGE READINGS ON WORKSHEET
5. OBTAIN AND RECORD MANUAL PUMP COUNTER READING (one minute minimum)
6. CONTINUE TEST FOR 20 MINUTES (make sure suction hose is still 2 ft below water level)
7. RECORD ALL GAUGE READINGS ON WORKSHEET (at start of test and at, 5, 10, 15, 20 minute intervals)
8. MONITOR ENGINE AND PUMP PERFORMANCE (fluid levels, gauge readings, fluid leaks, hose fittings, etc.)
9. PROCEED TO TEST #4

TEST #8

50% CAPACITY @ 250 PSI NPP (I0 MINUTES)

1. SELECT AND SET UP PROPER PITOT NOZZLE SIZE FOR REQUIRED GPM FLOW (pitot nozzle pressure 50 - 80 psi if possible) (same as previous year test if possible)
2. PLACE TRANSFER VALVE IN **SERIES** POSITION (pressure) (check previous year test sheet for transfer valve position, use same position as previous year test)
3. SLOWLY RAISE PUMP PRESSURE AND PITOT NOZZLE PRESSURE TO DESIRED READINGS (pressure control device set above desired pump pressure)
4. START TIME TEST AND RECORD ALL GAUGE READINGS ON WORKSHEET
5. OBTAIN AND RECORD MANUAL PUMP COUNTER READING (one minute minimum)
6. CONTINUE TEST FOR 10 MINUTES
7. RECORD ALL READINGS ON WORKSHEET (start, 5 minutes, and 10 minutes)
8. MONITOR ENGINE AND PUMP PERFORMANCE (fluid levels, gauge readings, fluid leaks, hose fittings, etc.)
9. PROCEED TO TEST #9

TEST #7

70% CAPACITY @ 200 PSI NPP (I0 MINUTES)

1. SELECT AND SET UP PROPER PITOT NOZZLE SIZE FOR REQUIRED GPM FLOW (pitot nozzle pressure 50 - 80 psi if possible) (same as previous year test if possible)
2. PLACE TRANSFER VALVE IN **PARALLEL** POSITON (volume) (check previous year test sheet for transfer valve position, use same position as previous year test)
3. SLOWLY RAISE PUMP PRESSURE AND PITOT NOZZLE PRESSURE TO DESIRED READINGS (pressure control device set above desired pump pressure)
4. START TIME TEST AND RECORD ALL GAUGE READINGS ON WORKSHEET
5. OBTAIN AND RECORD MANUAL PUMP COUNTER READING (one minute minimum)
6. CONTINUE TEST FOR 10 MINUTES
7. RECORD ALL READINGS ON WORKSHEET (start, 5 minutes, and 10 minutes)
8. MONITOR ENGINE AND PUMP PERFORMANCE (fluid levels, gauge readings, fluid leaks, hose fittings, etc.)
9. PROCEED TO TEST #8

TEST #4

OVERLOAD (SPURT) TEST

(Only required on 750 GPM pumps and greater)

1. RAISE PUMP DISCHARGE PRESSURE TO 165 PSI (maintain same pitot pressure as test #3)
2. CONFIRM AND RECORD RESULTS ON PUMP TEST WORKSHEET
3. GENERALLY 5 MINUTES, MAINTAIN FOR 5 MINUTES THEN PROCEED TO TEST #5

TEST #5

PRESSURE CONTROL DEVICE TEST @ 150 PSI

1. MAINTAIN 150 PSI PUMP PRESSURE AND PITOT FLOW PRESSURE AS IN TEST #3
2. SET PRESSURE CONTROL DEVICE AT 150 PSI
3. SLOWLY CLOSE ALL DISCHARGE VALVES **ONE AT A TIME**. (no faster than 3 seconds, no slower than 10 seconds)
4. OBSERVE AND RECORD PUMP DISCHARGE PRESSURE RISE ON WORKSHEET (pressure rise with all discharges closed should not exceed 30 psi)
5. OPEN DISCHARGE VALVES TO ORIGINAL FLOW PRESSURE AND PROCEED TO TEST #6

TEST #6

PRESSURE CONTROL DEVICE TEST @ 90 PSI

1. OBTAIN 90 PSI PUMP PRESSURE BY ADJUSTING ENGINE THROTTLE ONLY (do not change discharge valve settings from those used in test #5 for capacity flow)
2. SET PRESSURE CONTROL DEVICE AT 90 PSI
3. SLOWLY CLOSE ALL DISCHARGE VALVES **ONE AT A TIME** (no faster than 3 seconds, or slower than 10 seconds)
4. OBSERVE AND RECORD PUMP DISCHARGE PRESSURE RISE ON WORKSHEET (pressure rise with all discharges closed should not exceed 30 psi)
5. OPEN DISCHARGE VALVE TO ALLOW WATER FLOW
6. PROCEED TO TEST #7