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General Description

Test apparatus for pumpability testing consists of a storage tank, a test pump and a scale-mounted weigh tank. Fire retardant is transferred from the storage tank to the weigh tank using a specific pump and plumbing system. The pump and associated pump performance shall be in accordance with the following specifications:

Crane Technical Bulletin 4011, dimension page 4011-1, "Dimensions of Pumps with Type A or B Steel Base, Coupling and Motor"; and figure 13, Crane Technical Bulletin 4011, Section 14, curve page 3, "End Suction Centrifugal Pumps, Semi-Open Impeller." See figures 6.1 and 6.2.

The weight/time method is used to calculate the flow rate of the product.

Objective

The objective of the pumpability test is to ensure that the fire retardant can be recirculated and transferred at a retardant base using the techniques, pumps and plumbing systems currently being used by Forest Service airtanker bases. This test is intended to screen out those products that, due to their unique physical properties, would require bases to change or modify their equipment in order to utilize the product. A diagram of the retardant pumpability test apparatus is shown in figure 6.3.

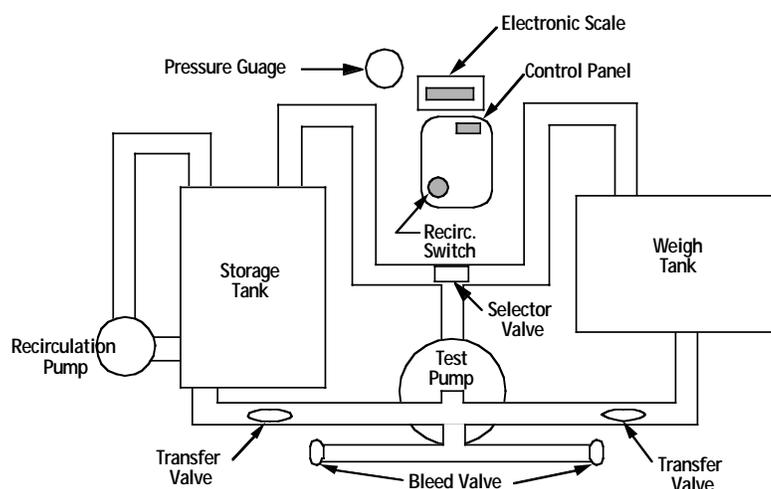


Figure 6.3—Diagram of retardant pumpability test apparatus.

Approximately 150 gallons (568 liters) of retardant is mixed in 30-gallon (114 liter) batches and pumped into the storage tank. The test pump is then started and the retardant flows from the storage tank to the weigh tank. The scale on this tank is linked to a computer that sends the weight data several times per second. The computer collects the weight data for precisely one minute and calculates the flow rate of the retardant in gallons per minute. This test is repeated five times and the average flow is compared to the minimum standard set at 18.0 gpm.

A calibration check using water is performed on the system both before and after the retardant tests to ensure that the system is functioning properly.

Pumpability Test Stand Description

A photograph of the test stand is shown in figure 6.4.



Figure 6.4—Pumpability test stand.

A storage tank is located on the left side of the test stand and is used to maintain the mixture while serving as a supply for the test. A separate recirculation pump is shown in figure 6.5 on the left side of the storage tank

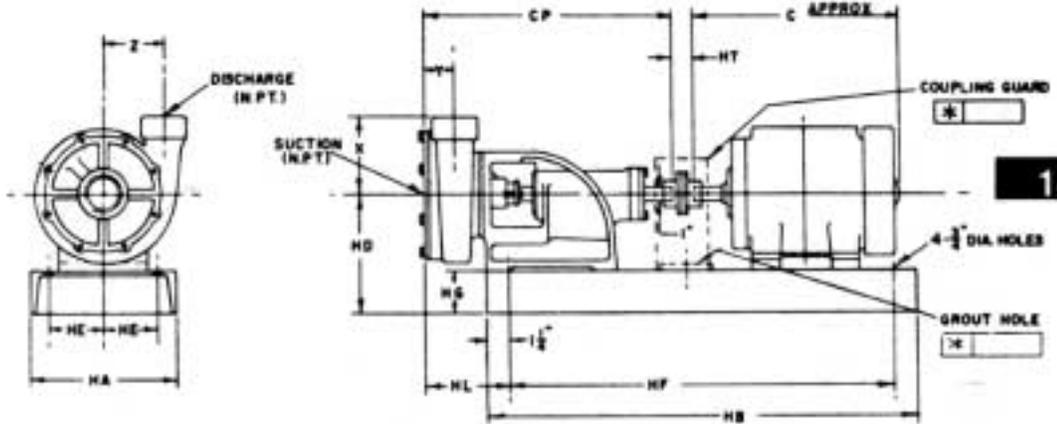
DEMING DIVISION
CRANE CO.
SALEM, OHIO, U.S.A.

SECTION 14
END SUCTION CENTRIFUGAL PUMPS
BULLETIN 4011

DIMENSION PAGE 4011-1
SUPERSEDES ALL PREVIOUS

DIMENSIONS OF PUMPS WITH TYPE A OR B STEEL BASE, COUPLING AND MOTOR

FIG. 4011 - SIZES 1½S, 1½M, 1½M, 2S AND 2M

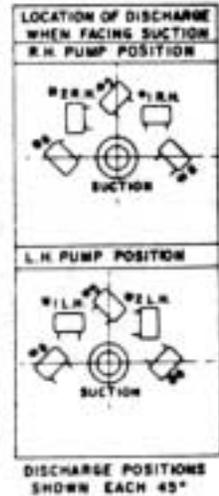


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PUMP DIMENSIONS IN INCHES							
SIZE	SUCT	DISCH.	X	Y	Z	CP	HL
1½S	1½	1½	5½	2½	4½	19½	5½
1½S	2	1½	5½	2½	4½	19½	5½
1½M	2	1½	6½	2½	5½	20	5½
2S	2½	2	6½	2½	4½	20	5½
2M	3	2	7	2½	5½	20	6

NOTE: * FURNISHED IF CHECKED

BASE DIMENSIONS IN INCHES													
FRAME NO	56	143T	145T	182T	184T	213T	215T	254T	256T	284TS	284T	286TS	286T
BASE NO	27501	27501	27501	27502	27502	27503	27503	27504	27504	27504	27504	27504	27505
HA	12	12	12	12	12	12	12	15	15	15	15	15	15
HB	28	28	28	32	32	36	36	40	40	40	40	40	43
C	13½	13½	13½	14½	15½	17½	19½	22½	24½	24½	25½	26	27½
HD	9	9	9	9	9	9	9	9	9	10	10	10	10
HE	4½	4½	4½	4½	4½	4½	4½	6	6	6	6	6	6
HF	25½	25½	25½	29½	29½	33½	33½	37½	37½	37½	37½	37½	40½
HG	3	3	3	3	3	3	3	3	3	3	3	3	3
HT	1	1	1	1	1	1	1	1	1	1	1	1	1



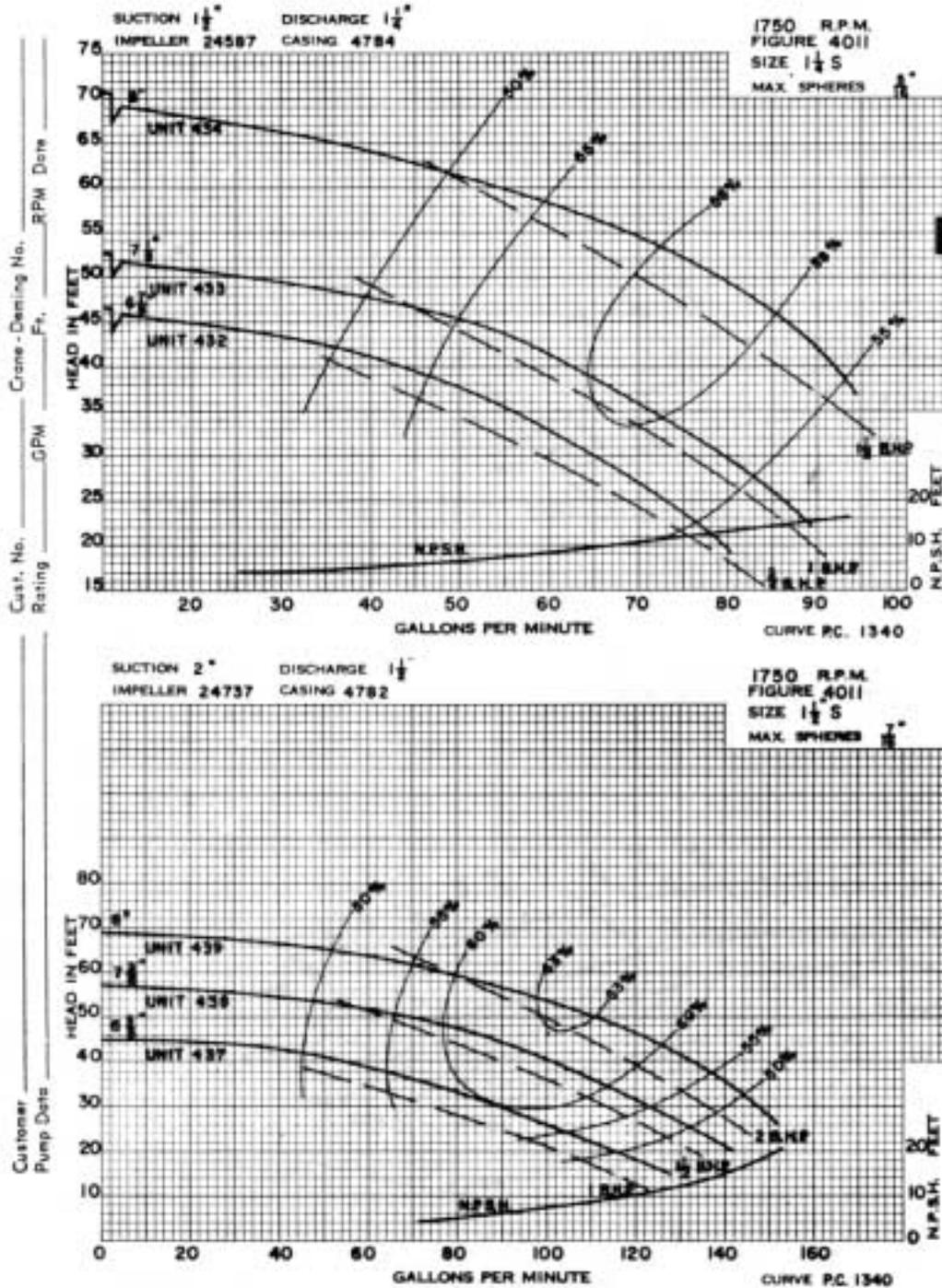
CUSTOMER										CO. NO.			
PROJECT NAME					CONTRACTOR ENGINEER								
CUSTOMER IDENT. NO.													
PUMP DATA	FIG. NO.	SIZE	CURVE NO.	GPM.	HEAD	SP. GR.	TEMP.	ROTATION	PACKING/SEAL				
MOTOR DATA	W.F.G.R.	H.P.	R.P.M.	PHASE-CYCLE-VOLTAGE		FRAME	ENCLOSURE	INSULATION FURNISHED BY/MOUNTED BY					
SHOP ORDER NO.					CERTIFIED BY					DATE			

Figure 6.1—Pump specification sheet.

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CURVE PAGE 3



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Figure 6.2—Curve.

pumps the retardant from one end of the tank to the other through a mixing nozzle. The pump is controlled by a switch labeled 'Recirc Pump' on the control panel, figure 6.6.



Figure 6.5—Recirculation pump.



Figure 6.6—Control panel.

A weigh tank is located on the right side of the test stand, and is used to measure the weight of retardant pumped during the test. The tank is mounted on an electronic scale, which sends data to a computer where the flow rate is calculated.

The test pump is located between the storage tank and the weigh tank.

Supply to the inlet of the pump is selected by opening one of two transfer valves, shown in figure 6.7, located at the base of each tank. Output from the pump is controlled by a 3-way selector valve located between the tanks.



Figure 6.7—Transfer valve.

Pumpability Test Procedures

The following are step-by-step procedures for operating the pumpability test stand. A few things should be noted before beginning the test:

For safety: **Read MSDS sheets on the product!**

Wear facemasks, gloves, and aprons when ever appropriate.

Check the calibration dates on the pressure gages. Do not conduct the tests if the gages are out of calibration.

DO NOT LEAN ON WEIGH TANK DURING ANY PART OF THE TESTING!

Water Calibration Check

Test Stand Preparation

- Turn on the power to the electronic scale and start the pumpability program on the computer.
- Close all drain valves and transfer valves.
- Fill the storage tank to about 3/4 full with water, enough to run the pump at least one minute.
- Close the transfer valve on the weigh tank and open the transfer valve on the storage tank.
- Position the output selector valve to flow to the storage tank.
- Turn on the test pump. The water will circulate back to the storage tank.

- g. Open the bleed valve for the pressure gauge momentarily while the pump is running to bleed air from the line. See figure 6.8.
- h. Press the “tare” or “zero” button on the electronic scale.

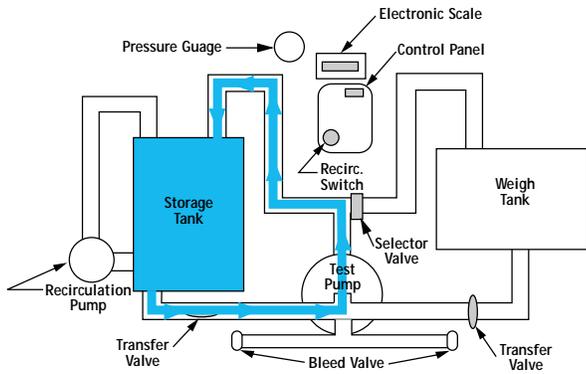


Figure 6.8—Air is bled from the system while water is pumped back into the storage tank.

- d. Position the output selector valve to the weigh tank, (the water will flow from the storage tank to the weigh tank) and start collecting scale data with the computer program.
- e. Record the pressure while the water is flowing. See figure 6.10.

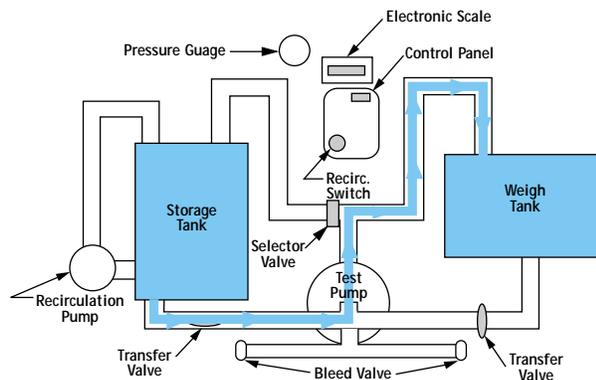


Figure 6.10—Record the pressure while the water is flowing from the storage tank to the weigh tank.

Data Collection

- a. Measure and record the temperature of the water.
- b. Position the output selector valve to the center (off) position to deadhead the test pump.
- c. Record the zero-flow-pressure. See figure 6.9.

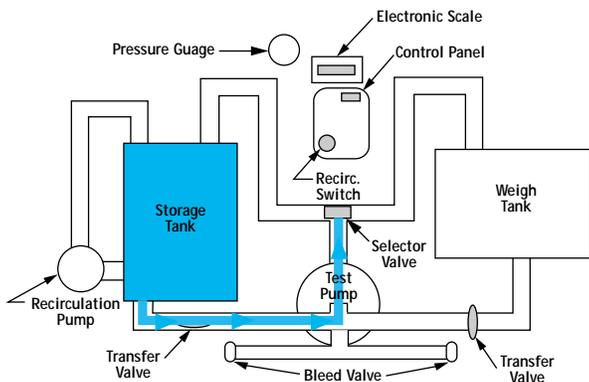


Figure 6.9—Water flow from storage tank to closed selector valve to record pressure.

- f. After the computer finishes collecting data (approximately one minute), turn off the test pump.
- g. The flow rate calculated by the computer should be 18 gpm.

If the flow varies by more than 1.0 gpm, the calibration check must be rerun.

If the flow still varies by more than 1.0 gpm after 3 runs, there is a problem with the system, and it must be solved before testing is begun.

Retardant Test

Retardant Mixing

- a. Approximately 150 gallons (568 liters) of liquid retardant is needed to run the test. Liquid Concentrates are tested as received. Follow the manufacturer’s instructions for mixing dry powder products.

- b. Measure and record the temperature, viscosity, and salt content of the mixed fire retardant.
- c. Do not conduct the qualification test if the viscosity and salt content are outside the tolerances provided by the manufacturer.

Test Stand Preparation

- a. Make sure the electronic scale is on and the pumpability test program is running on the computer.
- b. Keep the retardant mixed by running the recirculation pump on the storage tank.
- c. Record the preliminary information for the sample product by filling out the data form on the computer.

Data Collection

- a. Close the transfer valve on the weigh tank and open the transfer valve on the storage tank.
- b. Position the output selector valve to the storage tank.
- c. Turn on the test pump. The retardant will circulate back to the storage tank. See figure 6.11.

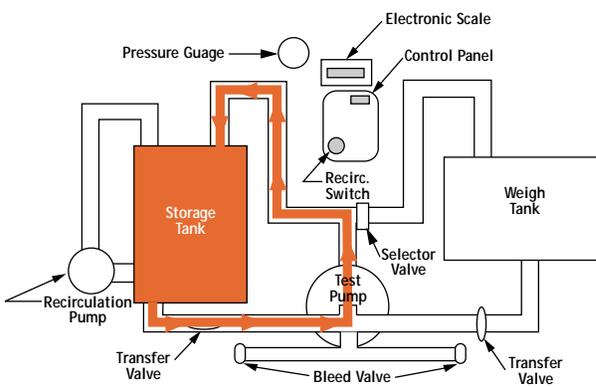


Figure 6.11—Circulate the retardant back in the storage tank through the test pump.

- d. Position the output selector valve to the center (off) position to deadhead the pump.
- e. Record the zero-flow-pressure. See figure 6.12.

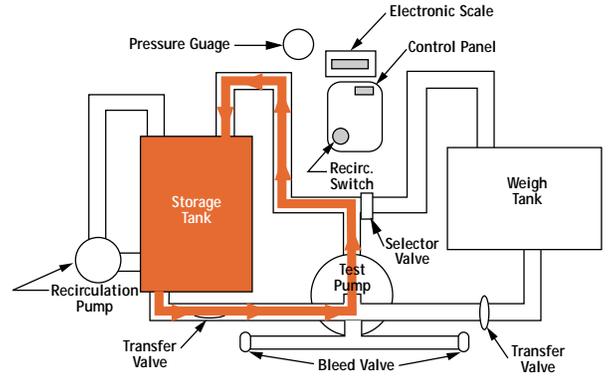


Figure 6.12—Retardant flow from the weigh tank to the closed selector valve.

- f. Position the output selector valve to the weigh tank. The retardant will flow from the storage tank to the weigh tank. Start collecting scale data with the computer program.
- g. Record the pressure while the retardant is flowing. See figure 6.13.

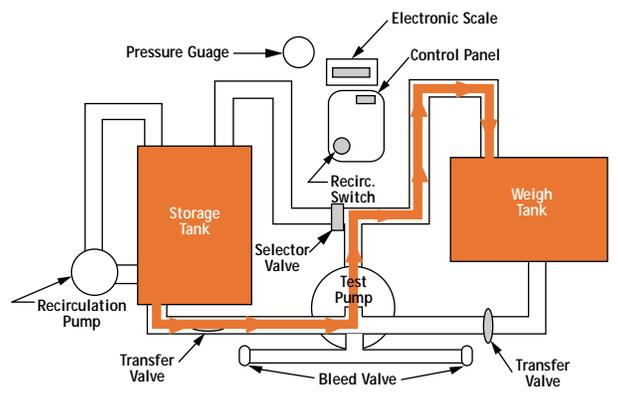


Figure 6.13—Record the pressure while the retardant is flowing from the storage tank to the weigh tank.

- h. After the computer finishes collecting data, approximately one minute, turn off the test pump.

- i. The flow rate is calculated by the computer.
- j. Repeat the test until five runs have been completed.

Repeat the water calibration check after the following clean-up procedure has been completed.

Clean-Up

- a. The test pump can be used to pump most of the material from the test stand to barrels for disposal.
- b. This can be accomplished with a hose connected to the auxiliary valve. See figure 6.14.
- c. Position the selector valve to the off (center) position, open the transfer valve on the storage tank, and open the auxiliary valve.
- d. The material will now flow through the hose when the test pump is turned on.
- e. Remove as much material as possible with the pump, then dilute the remaining material with water and allow it to empty to the lab drain.
- f. Flush all the test stand plumbing, the test pump and the recirculation pump with clean water.



Figure 6.14—Valve for hose connection.