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DETAILED ANALYSIS OF THE TESTING RESULTS

FOR

LITTLEVALVE® SPRINKLER PARTS

Conducted by the Center for Irrigation Technology

December 18, 2002

The Report Containing Supporting Data for This Analysis Provides Detailed Laboratory Results in two Memos Dated January 8, 2003 and January 27, 2003.

INTRODUCTION

The **Center for Irrigation Technology (CIT)**, conducted tests on December 18, 2002, to determine potential labor and water savings benefits of spray-type sprinkler heads containing LittleValve™ parts. The tests were conducted comparatively in that each testing procedure using LittleValve parts was matched up against heads containing only original sprinkler parts.

The water supply was a 1" valve and the pressure was set at 67 p.s.i. The tests were broken down and described as follows:

I. INSTALLATION TESTS

Test numbers **1** through **7** were devoted to determining labor and water saving benefits an installation contractor could reasonably expect by using LittleValve parts in a new installation with the goals described for each test.

The configuration of the sprinkler head layout controlled by the 1" valve was three rows of heads, each head spaced on 12 foot centers; 3 full heads (360º), 7 - ½ heads (180º), and 2 – ¼ heads (90º). All heads were equipped with 15' radius nozzles. The scope of each test involved flushing at each head location the newly-installed horizontal sprinkler lines, installing heads and nozzles and then making the final radius adjustment.

II. MAINTENANCE TESTS

Tests **8** through **12** were devoted to determining labor and water saving benefits that a company performing service work on existing sprinkler systems could reasonably expect by having sprinkler heads equipped with LittleValve parts or having those parts located under the head. *****

***Note:** Although no LittleValve under-the-head fittings were used in the tests, the same results would apply as the operating mechanism is virtually identical in all LittleValve parts.

DISCUSSION, RESULTS & ANALYSIS OF I: INSTALLATION TESTS

A. Tests **1** through **5** were conducted on Toro® Model 570 stationary shrub heads.

1. Tests **1**, **2**, and **3** are comparative to each other. Final adjustment set to full 15' throw after flushing and nozzle-up.
   a) **Operation**

   Test No. 1: <u>One person</u> – with LittleValve shrub bodies (females which accommodate Toro nozzles). 1" valve opened to full flow.

   Test No. 2: <u>Two people</u> – original Toro bodies; no LittleValve. One person turning on and off valve (or simulated controller), acting under direction of other person working at heads. 1" valve opened to full flow.

   Test No. 3: <u>One person</u> – original Toro bodies; no LittleValve. 1" valve opened to just one-third of flow during flushing, heading and nozzling-up, then 1" valve opened all the way prior to final adjustment of flow.

b) **Results – First Set**

Test No. 2 – Labor: 14 min X 2 = 28 min. / Water: 256 gallons
Test No. 1 - Labor: 19 min X 1 = 19 min. / Water: 158 gallons
LittleValve Savings: Labor - 9 minutes / Water – 98 gallons
Savings expressed as %: 32.1% less labor/ 38.3% less water

Results – Second Set

Test No. 3 – Labor: 17 min / Water: 295 gallons
Test No. 1 - Labor: 19 min / Water: 158 gallons
LittleValve Savings: Labor – 2 minutes more / Water - 137 gallons
Savings expressed as %: (11.8% more) labor / 46.4% less water

2. Tests **4** and **5** are comparative to each other. Final adjustment set with flow at 5' – 6' radius after flushing and nozzle-up.
   a) **Operation**

   Test No. 4: <u>One person</u> – original Toro bodies; no LittleValve. 1" valve opened to just one-third of flow during flushing, heading and nozzling-up, then 1" valve opened all the way prior to final adjustment of flow.
   Test No. 5: <u>One person</u> - with LittleValve shrub bodies. 1" valve opened to full flow.

   b) **Results**

   Test No. 4 – Labor: 25 min. / Water: 455 gallons
   Test No. 5 - Labor: 15 min. / Water: 52 gallons
   LittleValve Savings: Labor – 10 minutes / Water - 403 gallons
   Savings expressed as %: 40.0% less labor / 88.6% less water

B. Tests **6** and **7** were conducted on Rainbird® Model 1804 pop-up heads.
1. Tests **6** and **7** are comparative to each other. Final adjustment set with flow at 7' – 10' radius after flushing and nozzle-up.
   a) **Operation**

   Test No. 6: <u>One person</u> – original Rainbird pop-up riser; no LittleValve. 1" valve opened to just one-third of flow during flushing, heading and nozzling-up, then 1" valve opened all the way prior to final adjustment of flow.
   Test No. 7: <u>One person</u> - with LittleValve replacement Rainbird pop-up riser. 1" valve opened to full flow.

   b) **Results**

   Test No. 6 – Labor: 36 min. / Water: 389 gallons
   Test No. 7 - Labor: 14 min. / Water: 68 gallons
   LittleValve Savings: Labor – 22 minutes / Water – 321 gallons
   Savings expressed as %: 61.1% less labor / 82.5% less water

DISCUSSION, RESULTS & ANALYSIS OF II: MAINTENANCE TESTS

A. Tests **8** through **12** were conducted on Rainbird® Model 1804 pop-up heads.

B. Scope of tests was inspection, removal of non-functioning nozzle, flushing the head, replacement of new nozzle. Other heads on line assumed to be working properly. Final adjustment of all heads in every test at full flow.

1. Tests **8** and **9** are comparative to each other.

   a) **Operation**

   Test No. 8: One person - with 4" LittleValve replacement Rainbird pop-up riser. Service person employing remote-control to operate 1" valve.

   Test No. 9: One person – original Rainbird pop-up riser; no LittleValve. Service person employing remote-control to operate 1" valve.

   b) **Results**

   Test No. 9 - Labor: 3 min. / Water: 26 gallons

   Test No. 8 - Labor: 1 min. / Water: 16.5 gallons

   LittleValve Savings: Labor – 2 minutes / Water - 9.5 gallons

   Savings expressed as %: 66.6% less labor / 36.5% less water

2. Tests **10**, **11,** and **12** are comparative to each other.

   a) **Operation**

   Test No. 10: One person - with 4" LittleValve replacement Rainbird pop-up riser. Manual operation of controller to operate 1" valve. (No remote-control)

   Test No. 11: One person – original Rainbird pop-up riser; no LittleValve. Manual operation of controller to operate 1" valve. (No remote-control)

   Test No. 12: Two people - original Rainbird pop-up riser; no LittleValve. One person turning on and off controller, acting under direction of other person working at problem head.

   b) **Results – First Set**

   Test No. 11 – Labor: 5 min. / Water: 55 gallons

   Test No. 10 - Labor: 2 min. / Water: 35 gallons

   LittleValve Savings: Labor – 3 minutes / Water – 20 gallons

   Savings expressed as %: **60.0% less labor / 36.4% less water**

   Results – Second Set

   Test No. 12 – Labor: 3 min X 2 = 6 min. / Water: 55 gallons

   Test No. 10 - Labor: 2 min X 1 = 2 min. / Water: 35 gallons

   LittleValve Savings: Labor – 4 minutes / Water – 20 gallons

   Savings expressed as %: **66.7% less labor / 36.4% less water**

III. ADDITIONAL TESTS TO DETERMINE FLOW REDUCTION

Four additional tests were made to determine flow rate reduction caused by headloss due to the presence of the LittleValve.

A. Because there is a flow rate reduction due to the presence of the LittleValve®, the manufacturer requested the Center for Irrigation Technology to include the results of these tests into its final report.

1. The four tests were conducted on both Rainbird® and Toro® pop-up heads.
2. These four tests were conducted at 60 p.s.i., the heads were equipped with 15' radius nozzles.

B. The tests are numbered **13, 14, 15,** and **16.**

1. **Test No. 13** - Original Rainbird Model 1804 pop-up riser; no LittleValve.
   Flow rate: 5.4 gpm
2. **Test No. 14** - Replacement Rainbird pop-up riser with LittleValve.
   Flow rate: 4.7 gpm

CONCLUSION: Replacement Rainbird risers with **LittleValves** emit .7 gpm less water representing a reduction in flow rate of **13%** of the water normally emitted during same time period.

3. **Test No. 15** – Original Toro Model 570 pop-up riser; no LittleValve.
   Flow rate: **4.9 gpm**
4. **Test No. 16** - Replacement Toro pop-up riser with LittleValve.
   Flow rate: 4.1 gpm

CONCLUSION: Replacement Toro risers with **LittleValves** emit .8 gpm less water representing a reduction in flow rate of **16.3%** of the water normally emitted during same time period.

Therefore, the tests indicate that if the same quantity of water emitted by original Rainbird or Toro pop-ups is desired, then additional watering time will have to be programmed if LittleValve replacement risers are used.

C. If pressure regulators are not used, then the headloss introduced by the Little Valve is beneficial in reducing the operating pressure to values closer to the range of operating pressures under which spray heads were designed to operate. Further, the adjustable feature of the LittleValve allows it to introduce the additional headloss required to match the supply pressure to the design pressure.

D. The Center offered design criteria to mitigate the flow rate reduction but the manufacturer elected to leave it alone and not fix it nor change it.