

UNIFORMITY CHARTS

Accompanied with Precipitation Rates

Comparing the Water Application Uniformity of 15' Rain Bird
Nozzles Adjusted-down by LittleValve Sprinkler Parts & Fittings
Versus Standard Rain Bird Nozzles: 5' - 8' - 10' - 12' - 15'

May 14, 2004

NOTE: The information contained herein, including the charts and calculations, was taken by the manufacturer from a signed report dated April, 2004, titled "SPRINKLER PERFORMANCE COMPARISON STUDY", which was conducted and prepared by Joseph Kissinger, Certified Irrigation Auditor. Technical Advisor to the Study was Dr. Joseph Hung, Professor Emeritus, Cal-Poly, Pomona, California. Copies of the complete report are available on request.

In the Fall of 2003, independent tests commenced to establish Precipitation Rates for LittleValve sprinkler parts. All tests on the Little Valve were conducted using only a 15' Rain Bird nozzle. The common radiuses used by most in the industry – 5', 8', 10', 12' and 15', were all achieved by adjusting down the 15' nozzle with the LittleValve. At the same time, Uniformity results were also determined and were then compared to the uniformity achieved with standard Rain Bird nozzles of the several radiuses described above.

From the uniformity information obtained during the testing along with what is illustrated on the charts, it was discovered that a significant reduction in the amount of water needed to irrigate a given area to meet its Evapo-Transpiration requirements (ET Rate) is achieved with the use of LittleValve sprinkler parts.

The tests taught that compared to standard radius nozzles, substantial water savings are achieved when using only 15' nozzles and reducing the radius down to 12', 10, and 8' with LittleValve sprinkler parts. **

To reflect more realistic conditions, all tests along with their Uniformity Results and Precipitation Rates were conducted, charted and described at both 30 psi and 55 psi. Even at pressures higher than 130 psi, LittleValves substantially reduce misting and eliminate overspray. Precipitation rates are shown on the charts.

Along with savings noted in percentages, calculations showing actual inches of water saved using LittleValve-adjusted nozzles in place of standard nozzles appear on page 2. (The figures below do not include savings attributable to the elimination of overspray and misting.)

ACTUAL WATER SAVINGS

ET = Evapo-Transpiration Rate (for Southern California region)
LV = 15' nozzle adjusted down with LittleValve to corresponding radius
RB = Standard Rain Bird nozzle of corresponding radius

Reduce Water Time by:

15 foot Radius

Water applied @ **30 psi** for 0.2 in. of ET: **LV** 0.388 **RB** 0.417
Reduction in Water Use: .029 inches
Water Savings with LittleValve: 7%

Water Applied @ **55 psi** for 0.2 in. of ET: **LV** 0.367 **RB** 0.395
Reduction in Water Use: .028 inches
Water Savings with LittleValve: 7%

12 foot Radius

Water Applied @ **30 psi** for 0.2 in. of ET: **LV** 0.282 **RB** 0.335
Reduction in Water Use: .053 inches
Water Savings with LittleValve: 16%

Water Applied @ **55 psi** for 0.2 in. of ET: **LV** 0.274 **RB** 0.365
Reduction in Water Use: .091 inches
Water Savings with LittleValve: 25%

Water Applied @ **52 psi** for 0.2 in. of ET: **LV** 0.328 **RB** 0.430
Reduction in Water Use: .102 inches
(FIELD TEST) Water Savings with LittleValve: 23.7%

10 foot Radius

Water Applied @ **30 psi** for 0.2 in. of ET: **LV** 0.256 **RB** 0.416
Reduction in Water Use: .160 inches
Water Savings with LittleValve: 38%

Water Applied @ **55 psi** for 0.2 in. of ET: **LV** 0.253 **RB** 0.477
Reduction in Water Use: .224 inches
Water Savings with LittleValve: 47%

8 foot Radius

Water Applied @ **30 psi** for 0.2 in. of ET: **LV** 0.238 **RB** 0.392
Reduction in Water Use: .154 inches
Water Savings with LittleValve: 39%

Water Applied @ **55 psi** for 0.2 in. of ET: **LV** 0.230 **RB** 0.354
Reduction in Water Use: .124 inches
Water Savings with LittleValve: 35%

** 15' nozzle with LittleValve adjusted down to 5' radius uses more water than the standard 5' nozzle. The small increase in water usage is overshadowed when considering the following three important benefits of the LittleValve:

1. Because of their very small orifice, 5' nozzles consistently cause vaporization (misting). Water lost through misting is entirely eliminated when taking a LittleValve-adjusted 15' nozzle down to 5'. Larger droplets are less susceptible to wind drift than fine sprays.
2. 5' nozzles are notorious for clogging up. The larger opening of a 15' orifice is far less likely to clog and get plugged up.
3. The flat spray of a standard 5' nozzle oftentimes gets blocked by low-growing bushes and ground cover. The 30-degree trajectory of 15' nozzles lobs the water over such obstacles.

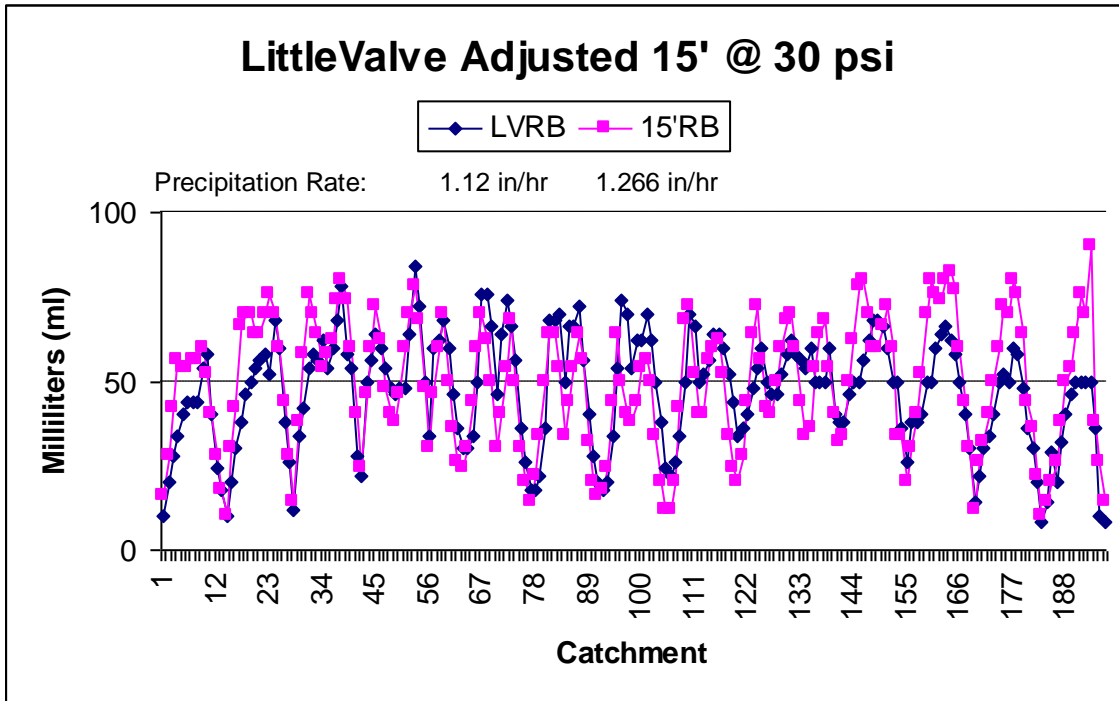
Page 4: 15' Charts

Page 5: 12' Charts

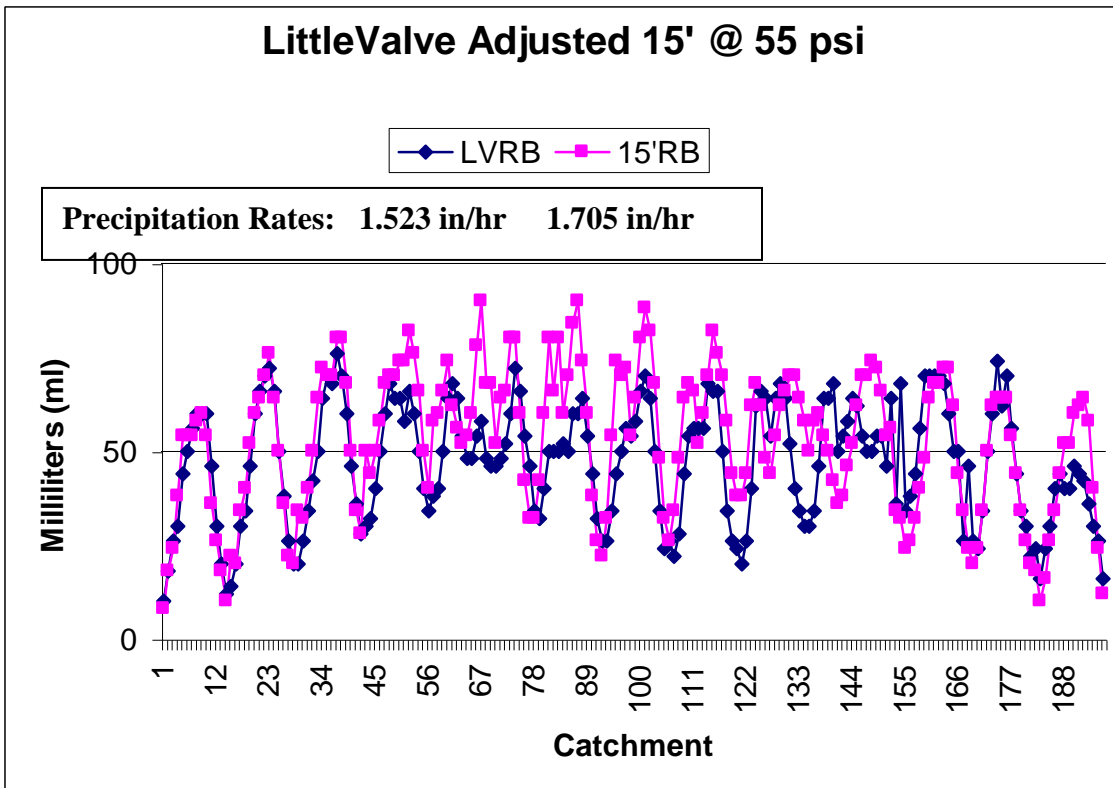
Page 6: 10' Charts

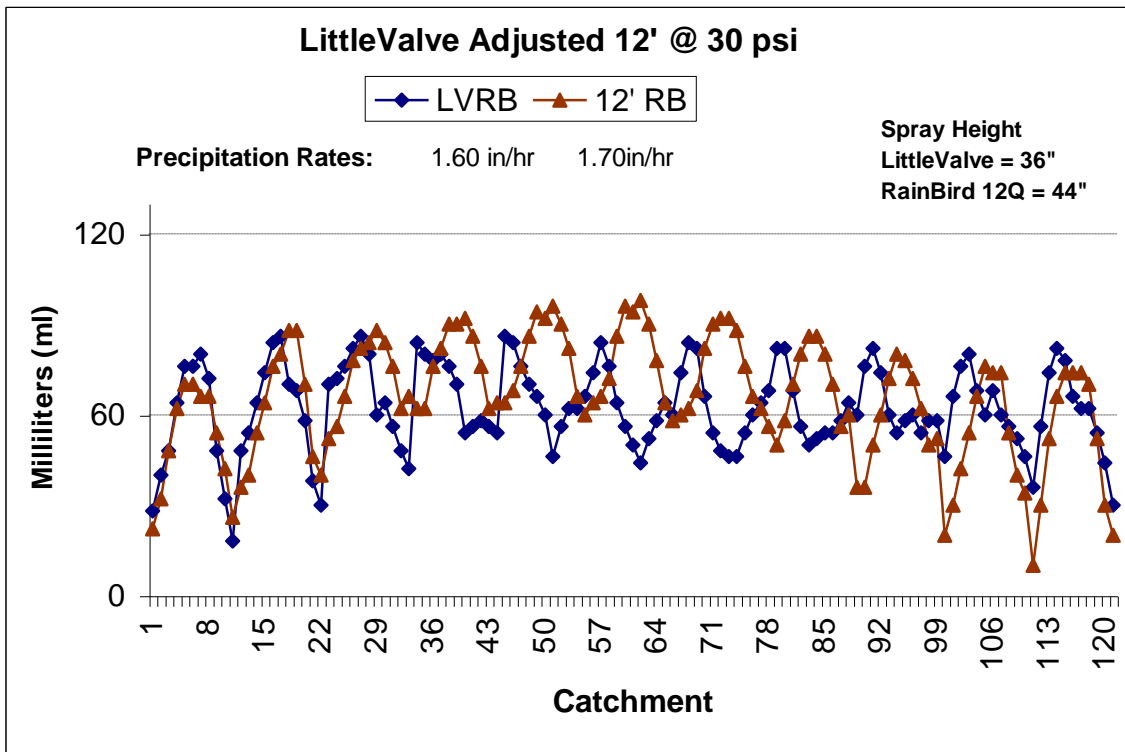
Page 7: 8' Charts

Pages 8, 9 & 10: Testing Procedures & Discussion

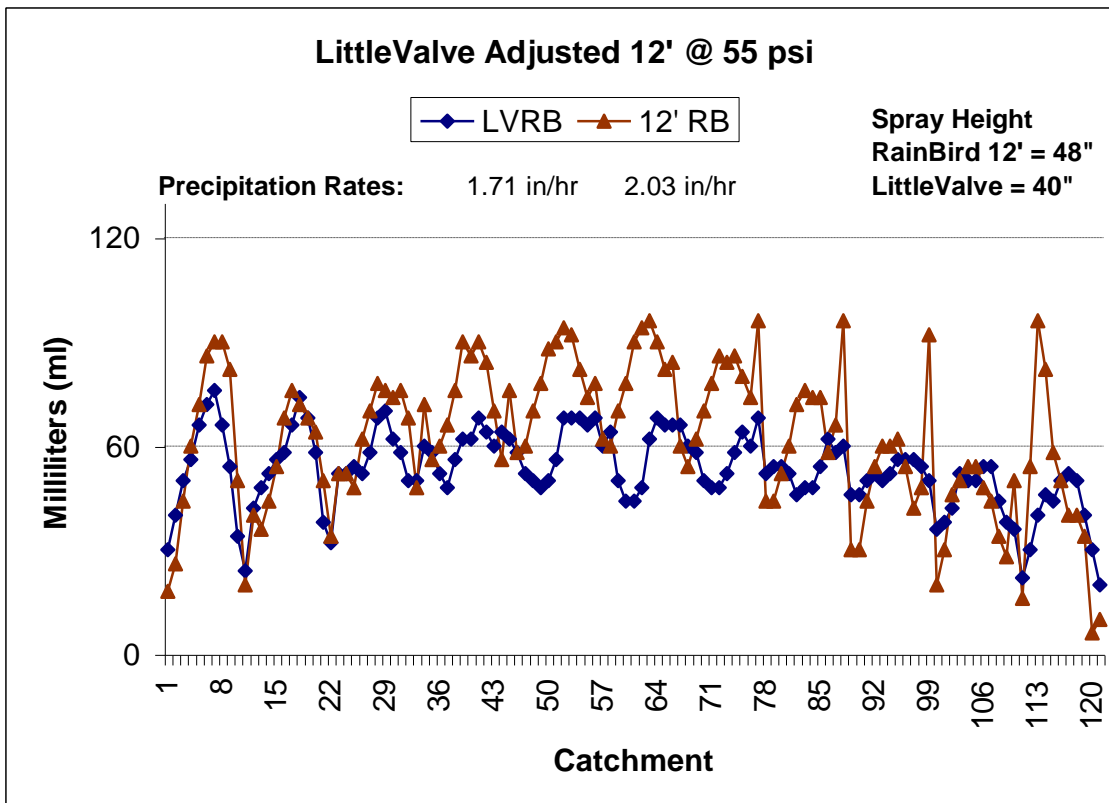


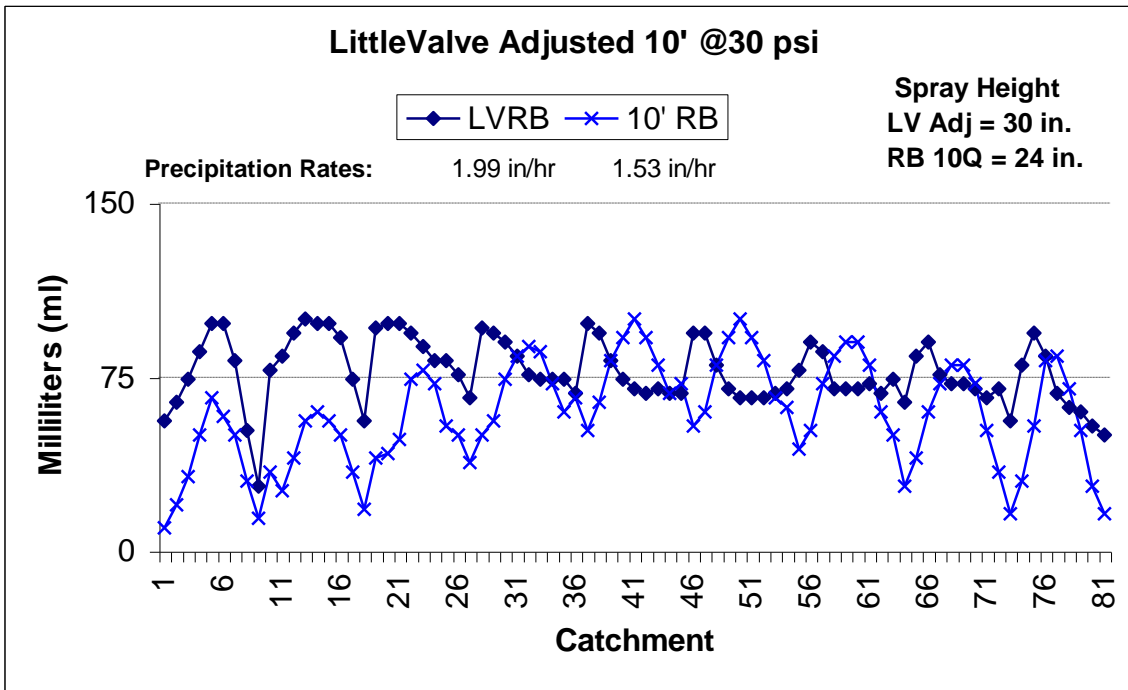
LittleValve adjusted 15' nozzles at 15' radius with 30 psi and 55 psi.



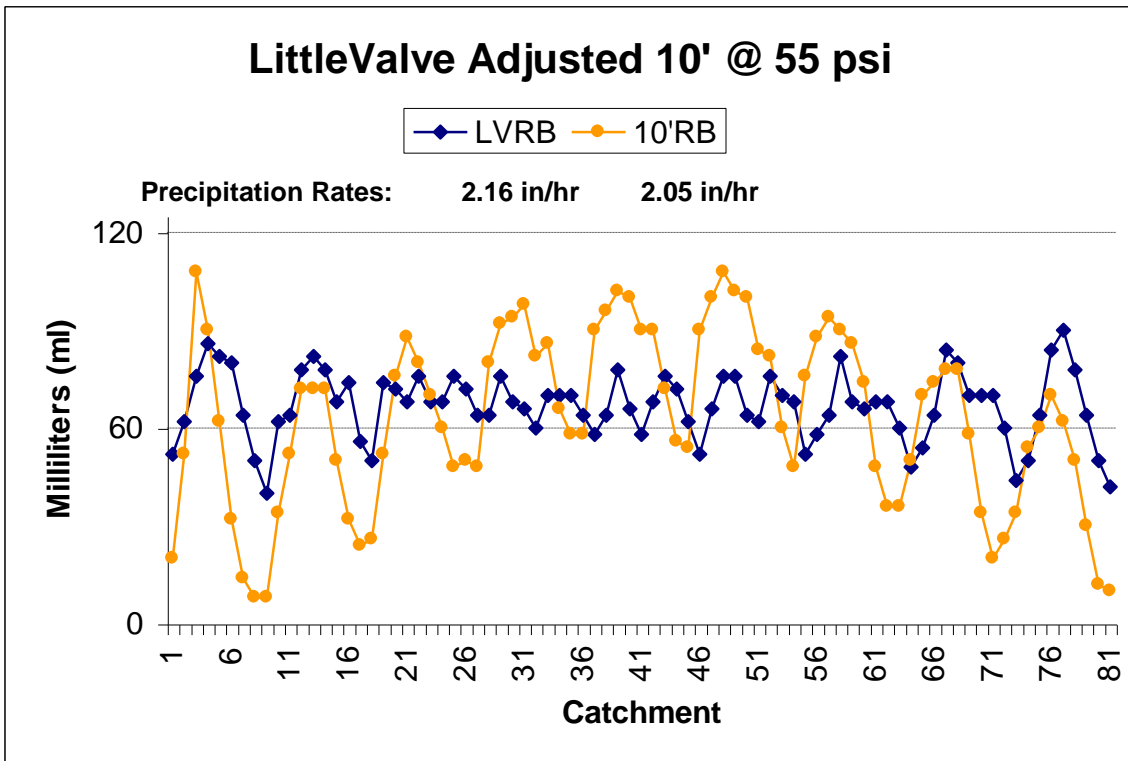


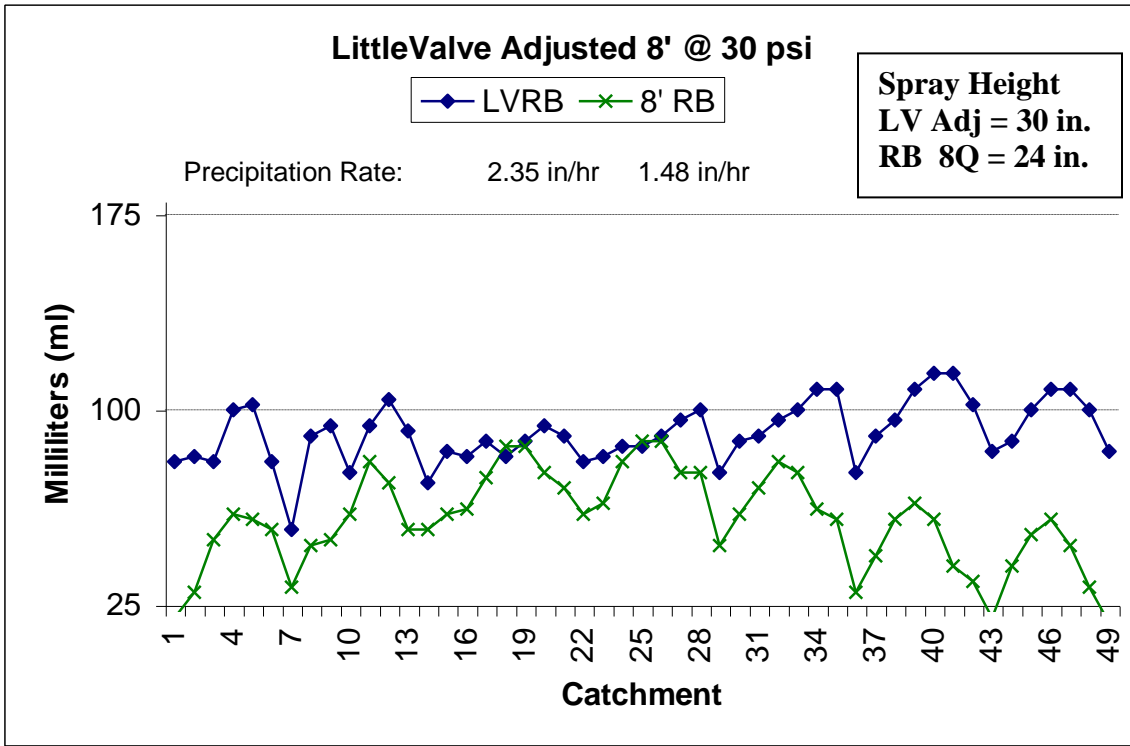
LittleValve adjusted Rain Bird 15' Nozzles adjusted down to 12' at 30 psi and 55 psi. Note the precipitation rate for the LV adjusted nozzle increased 6% as the pressure increased but the standard nozzle increased 19%.



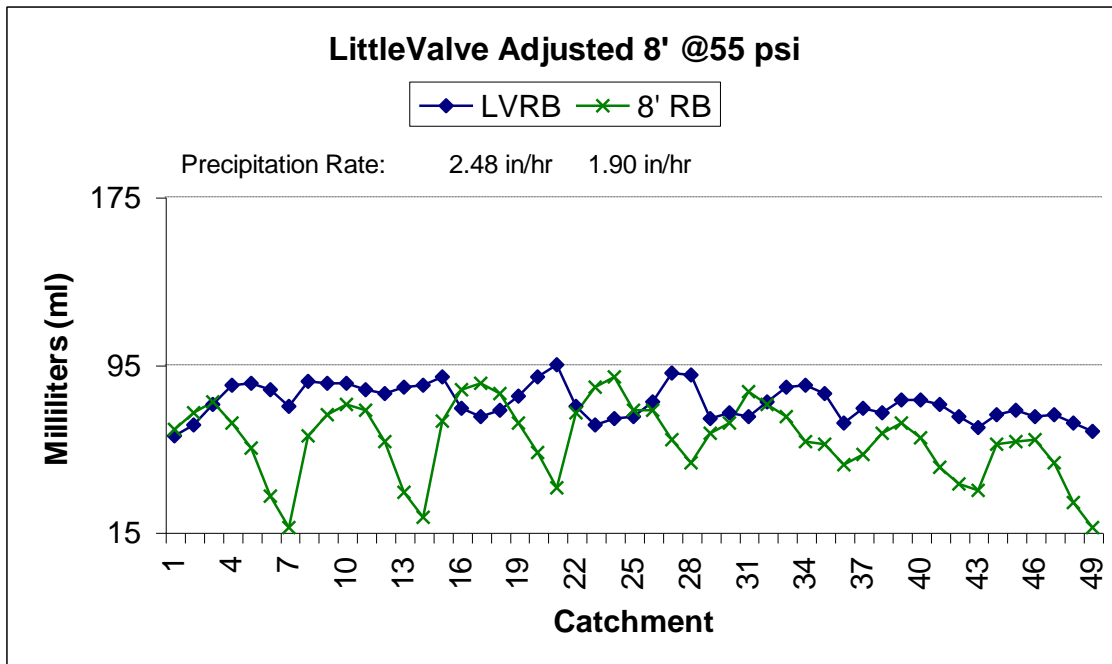


LittleValve adjusted Rain Bird 15' Nozzles adjusted down to 10' at 30 psi and 55 psi. Note the difference in precipitation rates between the LV adjusted versus the standard nozzle at 30 psi, then note the minimal precipitation rate difference between the adjusted nozzle and the standard nozzle at 55 psi. Also note that the precipitation rate for the LV adjusted nozzle increased slightly as the pressure increased but the standard nozzle increased about 35%.





LittleValve adjusted Rain Bird 15' Nozzles adjusted down to 8' at 30 psi and 55 psi. Note the minimal change in precipitation rate for the LittleValve adjusted 8' radius between 30 psi and 55 psi. But contrarily, note the 30% increase for a standard nozzle when the pressure increases from 30 psi to 55 psi.



TESTING PROCEDURES & DISCUSSION

Introduction:

LittleValve sprinkler parts and fittings contain a flow control adjustment located prior to (or below) the sprinkler nozzle. This design provides the ability to adjust a standard 15' radius spray nozzle down to a 3' radius. Observation of the product in operation shows that a 15' nozzle is indeed adjustable down to a 3' radius. Certain advantages emerge when an adjusted 15' nozzle is compared with standard nozzles of lesser radius: **1)** the adjusted LittleValve nozzle is able to eliminate the problem that ordinary 5', 8', 10' and 12' sprinklers have with wind drift (misting/fogging), which almost always occurs at operating pressures greater than 30 psi. In comparing a LittleValve adjusted nozzle throwing 15' with a standard 15' sprinkler, it was found that the LittleValve substantially reduced the misting. In many real world installations, residential and commercial irrigation systems typically have operating pressures far exceeding 30 psi. **2)** the larger orifice of a 15' nozzle is much less susceptible to clogging than the standard smaller radius nozzles of 10', 8' and 5'. **3)** there is a higher spray trajectory (generally, 30 degrees) for a 15' nozzle compared with the flat sprays of the 10', 8' and 5' radius standard nozzles.

Research work was previously done by the Center for Irrigation Technology, at California State University, Fresno. Their testing determined potential labor and water savings for spray-type sprinkler heads utilizing LittleValve products. Significant water and labor savings were documented in those tests. There has been no prior nozzle performance testing with the LittleValve product line. Performance testing provides precipitation rates, water application uniformity and sprinkler profiles, for each radius tested. Results of catchcan testing for standard 15Q, 12Q, 10Q, 8Q and 5Q nozzles were compared with a LittleValve sprinkler part using a standard 15Q nozzle, adjusted to match the stated radius of the standard nozzles.

Methodology:

A series of square test fixtures were constructed for each standard radius to be tested, 15 feet, 12 feet, 10 feet, 8 feet and 5 feet. The fixtures were made from 1/2" PVC pipe with side outlet elbows and six inch risers at each corner. A series of tests were performed on all radiuses at 30 psi and a second series of tests were run at 55 psi as requested by the manufacturer. To regulate water pressure during testing, an adjustable RainBird pressure regulator was used. The tests were conducted using standard RainBird nozzles¹. A grid was laid out for the placement of catchcans on twelve-inch centers, each catchment having an area of 14.19 inches. The 30 psi tests were run for 10 minutes, while 55 psi tests were run for 8 minutes. Testing was not performed in wind conditions greater than 2.5 mph as measured by a Kestrel 1000 pocket wind meter during each test. To measure spray height, a paper was mounted vertically on a stand that was placed in the middle of the test area. The spray height was determined from a measurement on the paper from the bottom to the point where the wet paper ended.

Three replications were conducted for each treatment. The results of the three replications were averaged to handle any anomalies that might have occurred during a single test. The standard nozzle was tested first, followed by a LittleValve with a 15' nozzle adjusted to the corresponding radius.

Test Data:

The test data shown in this Testing Report is the average of the three replications for each treatment; individual test data has been archived in a project file.

Summary:

The LittleValve with a standard 15' spray nozzle was tested at various radiuses down to five feet. No tests were made for below five feet, however the LittleValve radius was reduced to three feet before the shape of the spray fan began to deteriorate. Testing was performed outdoors so wind may have had a slight influence upon the results. Wind conditions were monitored with a Kestrel 1000 pocket wind meter to ensure tests were conducted in winds less than 2.5 mph. For most tests, the measured wind speed was below 1.5 mph.

The measured precipitation rates for the RainBird standard spray nozzles were similar to the published precipitation rates for square sprinkler head spacing in the RainBird product catalog. These measured precipitation rates provided a good reference to compare the data collected for the LittleValve. At an operating pressure of 30 psi the precipitation rate data for the standard nozzles found a somewhat comparable precipitation rate for radius from 5 to 12 feet. Whereas the adjusted LittleValve with a 15' nozzle found precipitation rates increased as radius decreased. For operating pressure at 55 psi, the precipitation rates of the standard nozzles were found to increase while the precipitation rates for the Adjusted LittleValve 15' nozzles were generally found to increase slightly or, in some cases, actually decrease from those measured at 30 psi.

The distribution of uniformity data established that the Adjusted LittleValve with a 15' nozzle provided better uniformity than the 15', 12', 10' and 8' standard nozzles. This was an unexpected benefit identified during controlled testing. Retrofit tests on existing irrigation systems found the use of the LittleValve with adjusted 15' nozzles, consistently improved the distribution of uniformity up to 50% as compared to sprinklers without the LittleValve. The higher uniformities for the adjusted LittleValve with a 15' nozzle reduces the amount of applied water required for an area compared with the uniformity level found with standard spray nozzles.

Height of Spray data showed in most cases the adjusted LittleValve, with a 15' nozzle, provides a higher spray height than the standard nozzles. The difference in heights between the LittleValve and the standard nozzles ranged from six to twelve inches. The significance of this data is that an irrigation specifier or installer has more freedom to use lower-sized pop-up heads or lower stationary shrub heads rather than higher-priced 6" & 12" pop-ups or risers, which could result in substantial cost-savings.

At operating pressures of 30 psi, no misting/fogging was observed during testing of the standard nozzles or the Adjusted LittleValve 15' nozzles. However, when the operating pressure was increased to 55 psi for testing, all the standard nozzles exhibited misting / fogging while the Adjusted LittleValve 15' nozzles did not exhibit any misting / fogging. Operating pressure was increased to 80 psi to evaluate the performance of the Adjusted LittleValve 15' nozzles and even at this pressure, no misting / fogging was observed. The LittleValve products through controlled flow at the nozzle are able to eliminate misting and wind drift resulting from high-pressure conditions. Additional testing by the manufacturer with pressures as high as 150 psi have shown that LittleValves may sometimes be only slightly affected by the higher pressures and continue to perform as intended including significant reduction of misting when opened the full 15'.

When retrofitting existing sprinkler systems utilizing LittleValve components and a 15' nozzle, landscape maintenance contractors need to take into consideration the increased flow requirements from the higher precipitation rates below a ten-foot radius. Irrigation designers need to be aware of these increased flow requirements when calculating pipe sizes and system operating pressures as well as mixing radius on the same valve. The Adjusted LittleValve 15' nozzle does not provide matched precipitation rates between different radiuses, although, it should be noted that these tests showed that the precipitation rates of standard radius nozzles vary somewhat, as well, even more so at higher pressures. Still, the manufacturer suggests careful planning should be implemented when using LittleValve Adjusted 5' nozzles on a valve system that also has 12' and 15' radius requirements.

These tests were designed and data collected to provide information about the claims made by Valvette Systems Corporation for their LittleValve sprinkler parts and fittings. In most cases the Adjusted LittleValve 15' nozzle performed as well or better than the standard radius RainBird nozzles. The use of the LittleValve to adjust a 15' radius nozzle provides an additional benefit of improved head to head coverage compared with the standard nozzles for a radius below fifteen feet. LittleValve products are a tool landscape managers can utilize in their fight to conserve water and control urban runoff through improved distribution of uniformities, the elimination of misting / wind drift, reduced installation and maintenance labor costs and reduced inventory costs.