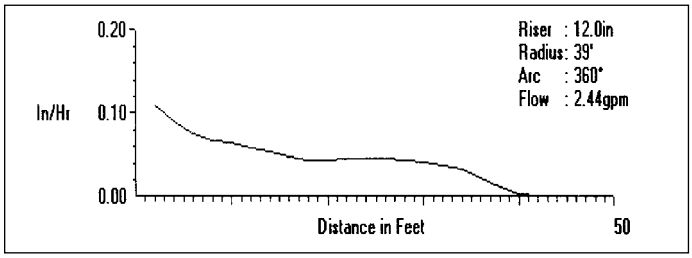
TECH SPECS

Putting Rain Bird Sprinkler Test Data To Work, Using The SPACE Program

Sprinkler irrigation system designers have always wrestled with one basic question - how to space their sprinklers to achieve a desired uniformity and precipitation rate. Before computer technology became widely available, most designers relied on “rules of thumb” or “percent of overlap” as guidelines when laying out sprinklers. And many designers drew circles to visualize the amount of sprinkler overlap. Often, the results were less than desired because there was no way to truly calculate or estimate uniformity. In recent years however, the sprinkler irrigation industry has increasingly relied and standardized on using a computer program called SPACE from the Center for Irrigation Technology (CIT) in Fresno, California.

The SPACE program (not the NASA one!) was developed to simulate sprinkler overlap uniformity based on zero wind catch-can data. SPACE stands for Sprinkler Profile And Coverage Evaluation. For rotating sprinklers, a simple catch-can test is performed in a zero wind building, and the results are entered into a database for use in the SPACE program. The graph below illustrates the results of a typical catch-can distribution test. The curve shows the precipitation rate as a function of distance from the sprinkler.

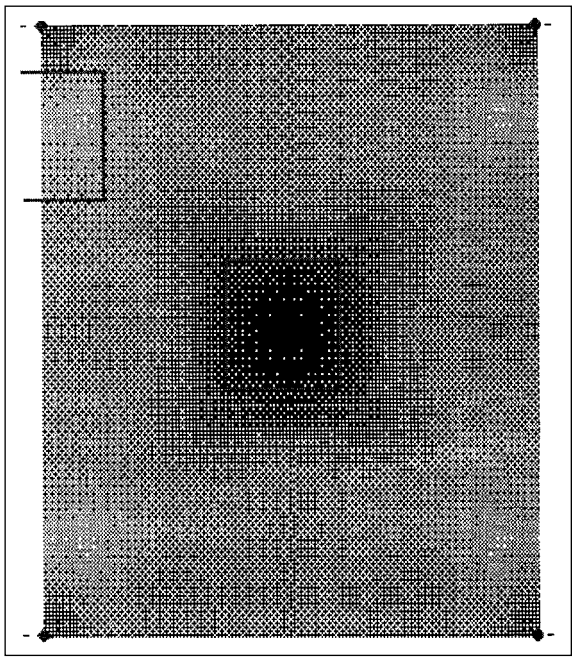


This test is conducted under zero wind conditions in a laboratory where the test pressure and riser height are fixed. Many tests have been conducted at independent facilities such as CIT in the U.S., CEMAGREF in France, and AITC in Australia. Rain Bird has conducted distribution tests at their own zero wind facility since 1980.

A designer may then evaluate the field uniformity of a sprinkler irrigation system with a specific sprinkler spaced at any desired spacing. To evaluate this data in the SPACE program, a designer enters the sprinkler spacing desired and the program then calculates CU, DU, and SC*. The results are presented graphically in a “densogram”.

For example, a 14V sprinkler with a 7/64” SB (Straight Bore) nozzle at 50 psi is to be used in a vineyard. It is to be spaced 44 feet apart on the lateral and the laterals are spaced 48 feet apart (a 44’ by 48’ spacing). Furthermore, the sprinklers are to be spaced in a rectangular although in other cases they may be spaced in a triangular or offset fashion. This information is entered as an input to the SPACE program and then, after analysis, the outputs are given for uniformity and precipitation rate.

The following figure illustrates a densogram output from the above example. It shows where relatively more water is placed in the darker shaded areas and less water in the lighter shaded areas. The title gives the sprinkler model and nozzle pressure being considered. The lines in the upper left of the densogram enclose the driest “window” where the least amount of water falls. Below the densogram are the uniformity and precipitation rate calculation results.



RAIN BIRD 14V7/64” SB @ 50 psi

CU = 90% DU = 86%
App. Rate .092 In/Hr
Sched. Coeff. (5%) = 1.2

In the design process, any or all of these results may be important. If the design is for frost protection, both uniformity and precipitation rate are important to provide adequate crop protection. If the precipitation rate is too low, then a higher flow sprinkler or closer spacing may be reviewed. This is an easy process with the SPACE program if a large database of catch-can data is available. The Agri-Products Division of Rain Bird Corporation has compiled all catch-can tests performed at various testing laboratories and made this data available to irrigation system designers who use the SPACE program. It is organized in an easy to use format where all tests for a particular sprinkler model are listed. Each sprinkler model file is organized in a way so that nozzle sizes, types, and pressures are listed in an orderly way to make it simple to locate a desired combination. For example, the file name SM20V.PRF contains all distribution tests for the SSteelhead model SM20V. The LP (Low Pressure) nozzles are listed first, from smallest to largest and from the lowest pressure to the highest. Then the SB (Straight Bore) and SM (Spacing Master) nozzles follow in order. With this system, a designer may review and compare quickly many alternative sprinklers and nozzles to optimize the design.

One word of caution should be emphasized. Since the data is based on zero wind catch-can tests, the field results will vary depending on the wind conditions. Other variables, which may affect field results, are riser straightness and height, sprinkler wear, and rotation speed changes due to aging. If there is no test data available for a desired sprinkler and nozzle, a new test may be conducted. These tests may be performed at independent testing facilities such as CIT or at Rain Bird's own zero wind test building. All tests are conducted according to ASAE standards for sprinkler distribution testing. The Rain Bird Agri-Products Division database is continually updated with the latest test data.

Designers who are interested in using this database for their designs should contact their District Manager or Rain Bird Technical Services for the latest update. The SPACE program is available separately from CIT. To purchase the SPACE program, contact CIT at (209) 278-2066. For designers who don't have the SPACE program, Rain Bird Agri-Products Division also provides a SPACE analysis free of charge. Contact Technical Services at (800) 435-5624 for specific information, which can be mailed or faxed.

*

- CU is Christiansen's Coefficient of Uniformity
- DU is Distribution Uniformity
- SC is Scheduling Coefficient

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