THE EFFECT OF REDUCED PRESSURE ON THE PERFORMANCE OF CENTER-PIVOT SPRINKLER IRRIGATION SYSTEMS

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CHAPTER I

INTRODUCTION

Relevance of the Research

Irrigation surveys conducted by Schwab (21) in Oklahoma stated that in 1971, 229,335 acres (92,811 hectares) of land were irrigated by sprinklers out of a total of 656,418 acres (265,649 hectares) and 292 center-pivot self propelled sprinkler systems were in operation out of a total of 3,095 sprinkler systems. His 1973 report indicated that out of a total of 758,036 acres (306,773 hectares) of irrigated land, 312,614 acres (126,513 hectares) were irrigated by sprinkler systems and 645 center-pivot self propelled sprinkler systems were in operation out of a total of 3,230 sprinkler systems. The 1975 Irrigation Survey also indicated an increased tendency of farmers to use center-pivot sprinklers.

This information indicates that the number of center-pivot sprinkler systems is rapidly increasing in Oklahoma. The reasons for the increasing popularity are their labor saving advantages and their tremendous versatility. The system's ability to irrigate rolling terrain with a wide range of application rates account for its versatility. Center-pivot sprinkler systems have proven to be very useful in applying light applications very quickly which is beneficial in promoting the seed germination. Greater depths can also be applied when desired to meet the water requirements of different types of crops at different growth stages.

Evaporation loss as high as 45 percent of the total applied water has been reported by Christiansen (8). This high loss of irrigation water is critical in areas with a limited water supply. Ground water reservoirs are being depleted by the present high rate of use of irrigation water without being replenished. It is therefore necessary to find ways and means to reduce evaporation loss during irrigation.

While studying any irrigation system, it is of primary importance that the system be able to apply water uniformly to the field with a comparatively lower cost of operation. Center-pivot sprinkler systems may offer a good promise to this aspect.

At present, a large percent of fuel or energy is used to operate a self propelled center-pivot sprinkler system to maintain a high operating pressure which usually ranges between 414 to 552 kilopascals. One reported reason for this high operating pressure is to provide better distribution of water to the field. If this high operating pressure can be reduced without materially affecting the system's ability to distribute water uniformly, energy could be saved and the system's operating cost could be lowered. The present energy crisis is a major factor in the increased farm production costs and the crisis is expected to continue in the future. If a good percentage of energy could be saved from each center-pivot sprinkler system, Oklahoma and the nation as a whole would save a large amount of energy. Because of these factors, extensive research is needed to explore the possibility of operating center-pivot sprinklers at reduced pressures with different nozzle types, sizes, and trajectory angles.

Scope of Investigation

The study described in this thesis was designed to evaluate the effect of reduced operating pressure on uniformity of application of water, sprinkler spacing, and evaporation loss of a center-pivot self propelled sprinkler system using data obtained from a single stationary sprinkler or spray nozzle.

A spray nozzle and full circle sprinkler with 26° and 6° trajectories were operated between average pressures of 134 and 556 kilopascals. The stationary distribution pattern obtained from each test was used to simulate a continuously moving system. The application rate, uniformity of application, and the sprinkler spacing were calculated from the continuously moving sprinkler system. The evaporation loss was also determined for each test. Attempts were made to determine the factors that affect evaporation loss.

Every test was repeated three times with measurements taken in the field to determine the following variables for each repetition:

1. Flow rate
2. Operating pressure
3. Relative humidity
4. Wind speed and direction
5. Air temperature
6. Volume of sprayed water collected in catch-cans

While measuring the flow rate, operating pressure, and wind speed, alternate provisions were utilized to evaluate the correctness of the data.

Objectives

1. To determine evaporation loss from different types of sprinklers at different operating pressures, and to study the factors that affect evaporation loss.
2. To study the effect of wind on distribution patterns at different pressures, nozzle types and sizes, relative humidity, and temperatures.
3. To evaluate the effect of reduced operating pressure on uniformity of application.
4. To determine the best sprinkler spacing for an acceptable uniformity coefficient and the corresponding application rate for different sprinkler types at different operating pressures.
5. To study the effect of pressures and sprinkler types on application rates.
6. To evaluate the effect of angle of trajectory on uniformity of application, evaporation loss and wetted diameter.

CHAPTER II

REVIEW OF LITERATURE

The center-pivot sprinkler irrigation system was first patented in 1952. Since that time, considerable research has been conducted and a good number of technical papers have been written on many aspects of it. However, the literature reviewed for this study covered the following aspects of center-pivot sprinkler irrigation systems:

1. Application losses due to evaporation and drift
2. Uniformity of application and application depth
3. Application rate
4. Pressure and uniformity of application

Application Losses Due to Evaporation and Drift

In an extensive study on sprinkler irrigation, Christiansen (8) investigated the spray evaporation from the system. He utilized the widely accepted catch-can method to evaluate the system and reported a loss range of 10 to 45 percent of the total inflow to the system. He also observed that there was no correlation of losses with climatic variables. This conclusion was partly supported by Seginer and Kostrinsky (22).

Seginer and Kostrinsky (22), on the basis of their study on data obtained from tests with two single nozzles of 0.40 and 0.50 cm in

3/16" 1/4"

diameter, were of the opinion that there exists a very high correlation between the loss and the solar radiation while the correlation between the loss and the wind speed is practically nonexisistent. They reported that wind was totally unconfounded with the other meteorological parameters. They observed very low correlation between wind and solar radiation and stated that the drift loss, which almost by definition is a result of the wind alone, need not be well correlated with the evaporation loss, which is only partially affected by the wind and the separation of these two loss components may not be essential for sprinkler evaluation purposes.

Frost and Schwalen (12) investigated combined spray evaporation loss by use of the catch-can method. No corrections were made for evaporation loss from the water collected in the cans during the test period since in their previous work the correction had appeared to be negligible. From results of their 700 tests run under a wide range of climatic conditions, they observed that losses increased with temperature, wind movement, and operating pressure and decreased with increase in the relative humidity and nozzle sizes. Frost and Schwalen found good correlation between losses and vapor pressure deficit. Their previous work indicated very low application efficiency at high temperature and at low relative humidity.

In an attempt to determine the water losses from sprinklers, Clark and Finley (10) conducted tests with a system of 15 sprinklers over an area of 1673 square meters (0.167 hectares). Their study revealed that wind velocity and vapor pressure deficit had the most influence on evaporation, while operating pressure had a minor influence. They stated that at high wind speeds, the wind was the dominant factor causing the water losses.

Seginer (23) studied the effect of application rate on the total water loss during sprinkling. He considered the total loss to be the summation of spray evaporation, surface evaporation, and drift loss. Using an electrical resistance model of evaporation during sprinkling, he indicated that the evaporation loss might be negligible in comparison with the drift loss.

In research conducted by Kraus (18) it was found that the total application loss from the sprinkler system ranged from 3.4 to 17.0 percent. A direct relationship between loss and relative humidity was established. No accurate correlation could be made with the wind speed because of its difficulty to measure. Thirty-six percent of the total loss was reported due to drift.

Petersen (20) studied the pressure, spacing, and uniformity of application of a center-pivot sprinkler irrigation system and reported the evaporation loss to range from 2.26 percent for spray nozzle to 25.4 percent for full circle sprinkler.

Uniformity of Application and Application Depth

Evaluation of the uniformity of application of water from the sprinkler irrigation systems has been discussed by Beale and Howell (2). Heermann and Hein (14) compared various coefficients to measure uniformities and relationships among the various coefficients. They stated that the coefficient of uniformity as proposed by Christiansen (8) was a satisfactory measure of uniformity of application. The well known Christiansen's uniformity coefficient which was used to determine the uniformity of application of water in this study, is given by,

$$Cu = \left[1 - \frac{\Sigma |d - davg|}{n.davg} \right] 100 \qquad [1]$$

where

Cu = Uniformity coefficient in percent
d = Depth of water on any grid point in units of length
davg = Average value of d in units of length
n = Total number of grid points

Chu (9) commented on Christiansen's coefficient of uniformity as follows:

> Although laborious, the above expression can be used to calculate the uniformity of a system if (a) the spacing of the grid system is small in comparison with the spacing of the sprinklers, and (b) if the region of the the grid system is clearly specified. (p. 540)

Heermann and Hein (14) compared the theoretical distribution of application depths with actual field measurements. Uniformities from field data were reported by them to be 90.5 and 87.3 for flow rates of 3596 and 2271 liters per minute, respectively, while those from theoretical distributions were 89.0 and 89.3 for the triangular pattern, and 89.5 and 89.3 for the elliptical pattern, respectively, for the same flow rates. They stated that the two systems used for comparison demonstrated uniformity in application depths.

Pair (19) tested sprinkler nozzles, 1/8 to 1/2 inch (0.32 to 1.27 cm) in diameter, on a center-pivot sprinkler system under southern Idaho conditions. He reported uniformity coefficients of 81 and 86 for wind speeds of 7.1 and 5.0 miles per hour (11.43 and 8.05 kilometers per hour).

Bilanski and Kidder (3) investigated the effect of operating pressure, nozzle diameter, and angle of inclination of the sprinkler nozzle with the horizontal on the distribution of water. They reported that as the angle of inclination was increased, the maximum trajectory distance increased and the amount of water deposited at the point of maximum accumulation of water decreased; as the angle of inclination increased, the rate of decrease was diminished.

Jones (15) studied the effect of wind speed on the uniformity of water application from tests on a 10-tower center-pivot system with an overall lateral length of 1299 feet (396 meters). He reported an average uniformity coefficient of 85.2 with a standard deviation of 2.48. Jones also observed that the uniformity of water application decreased linearly with the wind speed.

Petersen (20), from his study on pressure, spacing, and uniformity of center-pivot sprinkler system, recommended spacings for a fixed diameter part circle, full circle, and spray nozzle to attain acceptable uniformity of application. He recommended spacings such that within the range of spacings, the uniformity coefficient remained above 80 for pressures between 200 and 550 kilopascals.

Branscheid and Hart (6) conducted tests to determine correct methods for utilizing single sprinkler patterns in the prediction of field distribution. By comparing distribution patterns from a single sprinkler and from a lateral line of 13 equally spaced sprinklers, they concluded that predicting field distribution by use of the single sprinkler data is accurate.

Davis (11) used catch-cans to collect spray samples from operating sprinkler systems. He evaluated patterns of distribution for sampling-station densities in which a station represented two, five, six and 10-foot (0.61, 1.52, 1.83, and 3.05 meters) grid spacings. He stated that low sampling density may result in deceivingly higher values of distribution parameters. Davis observed that six foot (1.83 meters) grid spacing gave similar results as those from two foot (0.61 meters) grid spacing while the 10-foot (3.05 meters) grid spacing gave inaccurate result. He concluded that for purposes of identifying the uniformity of water distribution, each sampling station should represent from 2.0 to 2.5 percent of the pattern area or from five to six percent of the wetted diameter of the pattern.

Bittinger and Longenbaugh (4) studied the theoretical distribution of water from a moving sprinkler. They investigated the distribution pattern resulting from a continuously moving sprinkler, the course of movement being both in a straight line and in a circular path. They concluded that sprinklers which move in a circular path have a skewed pattern when located close to the pivot point. For sprinklers located at a distance of at least five sprinkler radii from the pivot point, the distortion of the pattern is small and a straight line travel path may be assumed.

Application Rate

The effectiveness of the center-pivot sprinkler system is evaluated by using established guidelines such as the ASAE recommendations (1) covering minimum requirements for the design, installation and performance of sprinkler irrigation equipment. One of these recommendations specify that water should be applied at a rate which does not cause runoff during the normal operating period, nor cause water to stand on the surface of the ground after the sprinkler line has been shut off.

Heermann and Hein (14), while comparing theoretical distribution of application rates with actual field measurements, observed non-uniformity in application rates. They stated that the application rates may be too high for many conditions and suggested to limit the length of the line or to utilize sprinkler heads with a longer pattern radius to get rid of this problem.

Pair (19) from his tests under southern Idaho conditions observed that the application rates varied from 0.21 in/hr (0.53 cm/hr) at the first tower from the pivot point to 1.01 in/hr (2.57 cm/hr) at the last tower on the outer end of the lateral. He found that the application rate from the larger nozzles for much of the lateral exceeded the soil infiltration rate of 0.89 in/hr (2.26 cm/hr) resulting in runoff. Many soils under irrigation today have infiltration rates of less than 0.35 in/hr (0.89 cm/hr).

Field observations of the effect of water application rates in California was reported by Gray (13). He studied actual field installations and observed that while using sprinkler irrigation, water application rates as low as 0.011 in/hr (0.10 cm/hr) resulted in an improvement in the soil structure. He also noted that the soils became more friable following the low application rates of sprinkling.

Bityukov (5) investigated the effect of sprinkler irrigation drop size and application rate on the stability of the surface inch of a well-structured, heavy, black loam soil on field plots in the Ukraine. He stated that the degree of disruption of the crumb structure of soil depends as much on the rate of application as on the drop size. An increase in the application rate which caused surface puddling resulted in considerable disruption of the surface soil aggregate.

Keller (16) investigated the effect of sprinkler intensity on soil tilth and concluded that soil tilth can be destroyed by high application rate.

Busch, Rochester, and Jernigan (7) studied the effect of sprinkler intensity on soil crusting and reported that lower application rate produces weaker crust.

Petersen (20) reported that the application rate for the full circle sprinkler was 0.6 cm/hr and those for the part circle sprinkler and the spray nozzle were 1.7 and 5.5 times greater, respectively, than that of the full circle sprinkler.

Pressure and Uniformity of Application

One of the recommendations of the American Society of Agricultural Engineers (1) states that a uniform distribution of application depth be achieved in a center-pivot sprinkler system. For practical purposes this is done by limiting the pressure drop on a lateral to 20 percent of the higher pressure. An excessive pressure difference would cause considerable non-uniformity in water application with a conventional system. This is not true for center-pivots.

Wiersma (24) tested the effects of pressure on the uniformity of application from a handmove irrigation system. He observed that there was little or no difference in uniformity of application of water between pressures of 56 and 48 psi (386 and 331 kilopascals) and only a slight difference between pressure of 30 and 40 psi (207 and

276 kilopascals). Wiersma concluded that the use of pressures above 56 psi (386 kilopascals) was of little value in obtaining a better distribution of water. This was supported by Petersen (20). Petersen indicated that high uniformities can be obtained at much lower than 55 Newtons per square centimeter (550 kilopascals) of pressure.

Bilanski and Kidder (3), from their study on effect of pressure on the distribution of water, stated that the trajectory distance was increased only five feet (1.52 meters) by raising the pressure from 30 to 60 psi (207 to 414 kilopascals). They also noted that larger diameter nozzles gave better distribution at any given operating pressures.

Kincaid and Heermann (17) investigated the pressure distribution on a center-pivot sprinkler system and developed curves which can be used to determine the pivot pressure required to maintain a specified minimum pressure at the outer gun of the lateral. Their analyses indicated that an increase in the pipe size results in a decrease of pressure loss along the lateral which in turn reduces pumping cost and provides more uniform pressure distribution along the lateral.

CHAPTER III

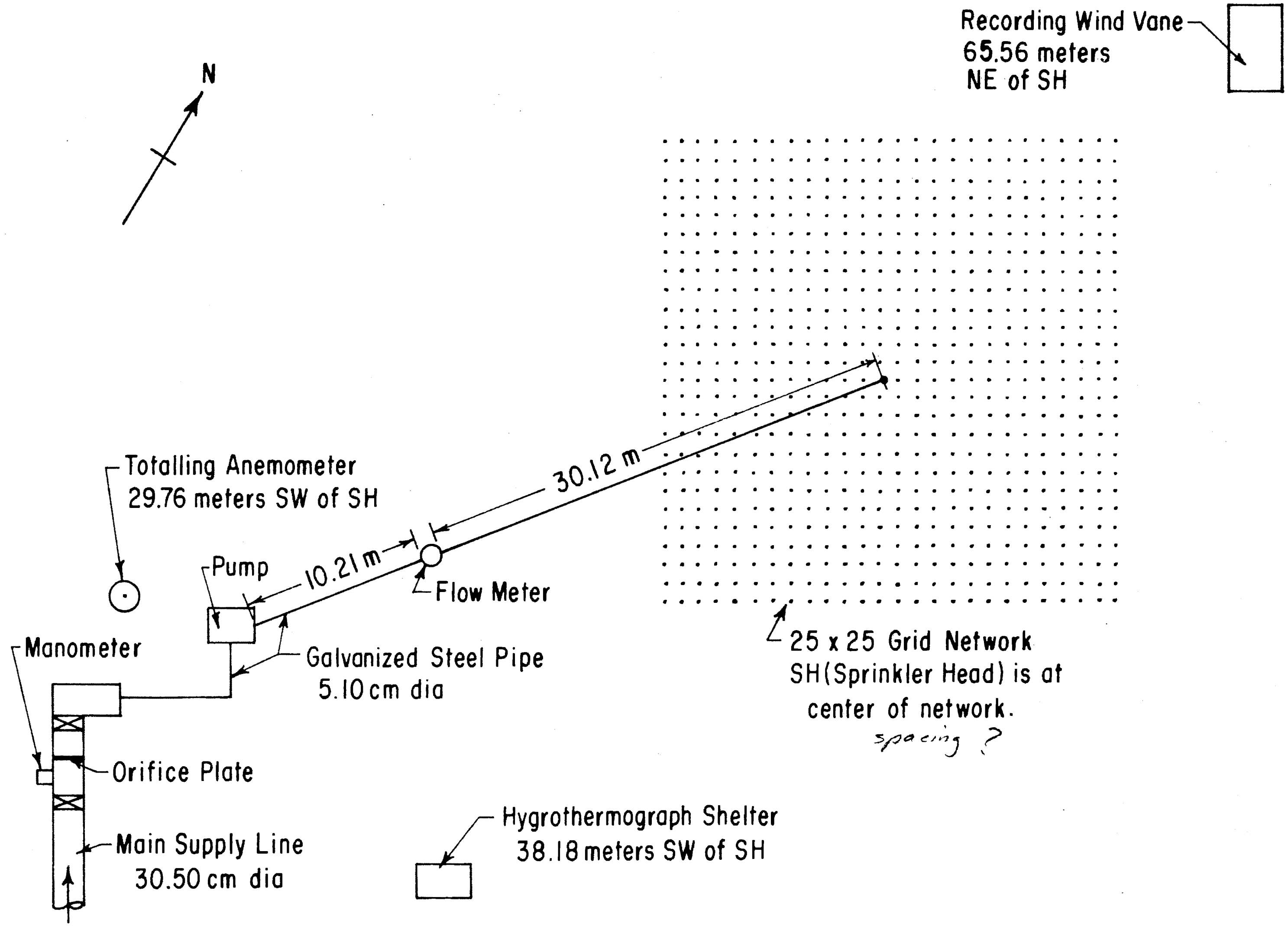
EXPERIMENTAL EQUIPMENT AND SETUP

The System

Data for this research project were collected from a single stationary sprinkler system. The system consisted of the sprinklers and spray nozzle, pump, pipelines, orifice plate and U-tube manometer, flowmeter, and pressure gauges. To obtain data for climatic variables, a recording wind vane, anemometer, hygrothermograph, and sling psychrometer were used. Graduated transparent cylinders and several catch-cans were used to collect and measure the distribution of water sprayed by the sprinkler. The layout of the system is shown in Figure 1, and a view of the system after making it ready for the test is shown in Figure 2. A brief description as well as the purpose of the location of the system, equipment, and instruments is presented below.

Location of the System

The system under study needed an adequate supply of water and sufficient area for placing catch-cans to collect all the sprinkler spray. Such a location was available at the Water Conservation Structures Laboratory of the Agricultural Research Service near Stillwater, Oklahoma. In addition to providing a large area, this



spacing ?

Figure 1. Layout of the System

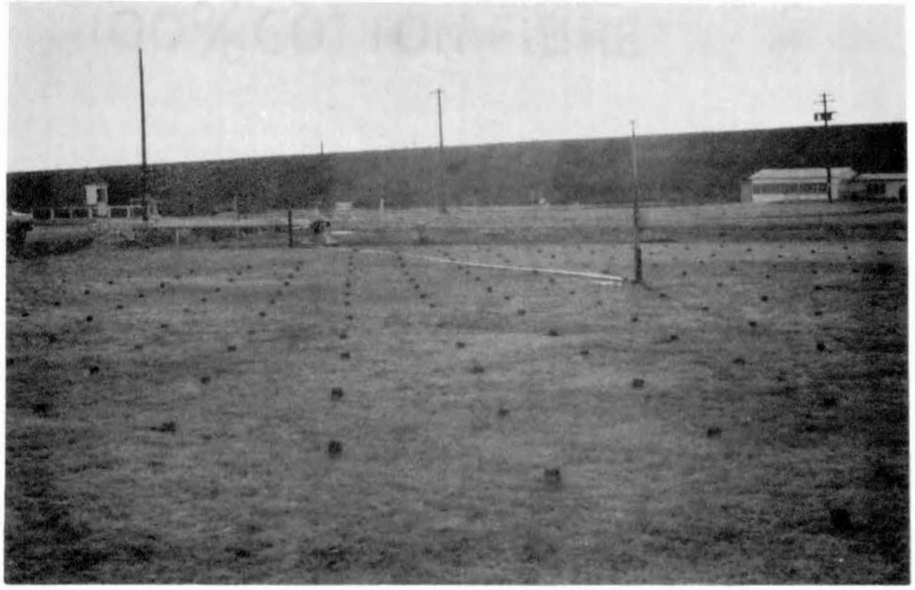


Figure 2. A View of the System

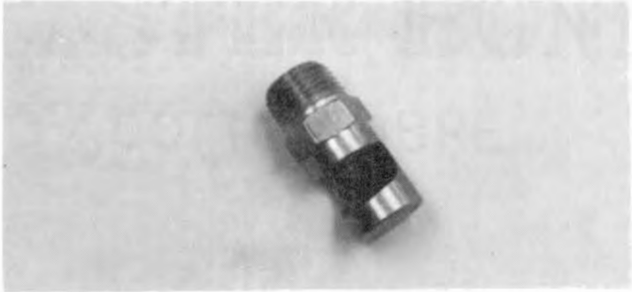
laboratory had the facility to supply water to the sprinkler system by gravity from the nearby Lake Carl Blackwell through a 30.50 cm diameter main pipeline as needed.

Sprinklers and Spray Nozzle

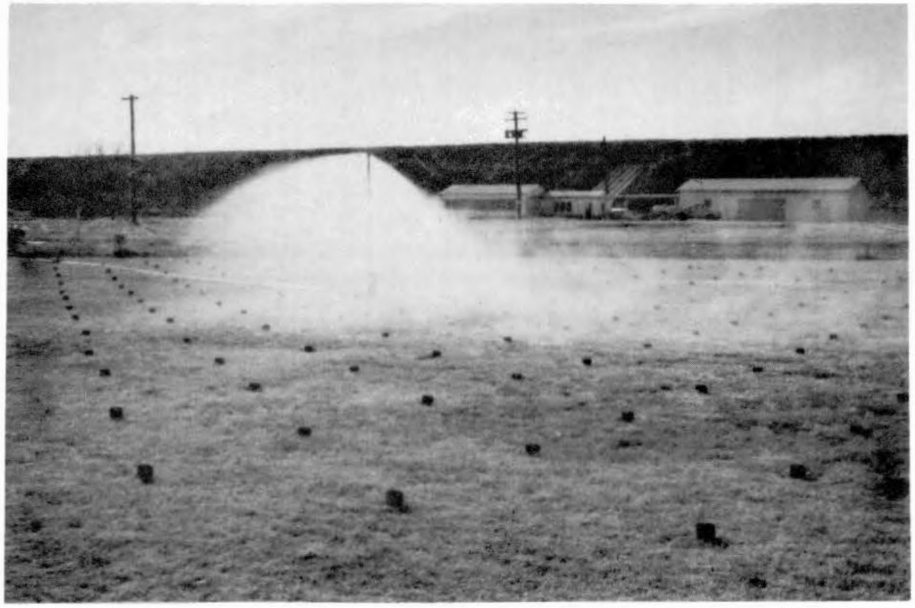
Sprinklers and spray nozzle that are currently being used with center-pivot sprinkler systems were tested in this work. One Flood Jet Spray Nozzle, Model 1/2k-80, manufactured by the Spraying Systems Company, one Full Circle Sprinkler, Model 70 EW, manufactured by the Rain Bird Sprinkler Manufacturing Corporation, and one low trajectory Full Circle Sprinkler, Model 4006, manufactured by the Senninger Irrigation, Inc., were selected for testing. All future references to the Spray Nozzle, Full Circle Sprinkler by Rain Bird Sprinkler Manufacturing Corporation, and the Full Circle Sprinkler by Senninger Irrigation, Inc., will be designated as FJSN, 26° FCS, and 6° FCS, respectively. The FJSN was tested with a nozzle diameter of 0.726 cm. The 26° FCS had a 26° angle of inclination of the sprinkler barrel with the horizontal and was tested with a nozzle diameter of 0.632 cm. The 6° FCS had a 6° angle of inclination with the horizontal and was tested with nozzle diameters of 0.483, 0.559 and 0.635 cm. The sprinklers and the spray nozzle are shown in Figures 3, 4, and 5 both at idle and operating conditions.

Pump

The usual operating pressure of a center-pivot sprinkler system is between 414 and 552 kilopascals. The 26° FCS had the maximum flow rate and pressure requirement among the sprinklers and spray

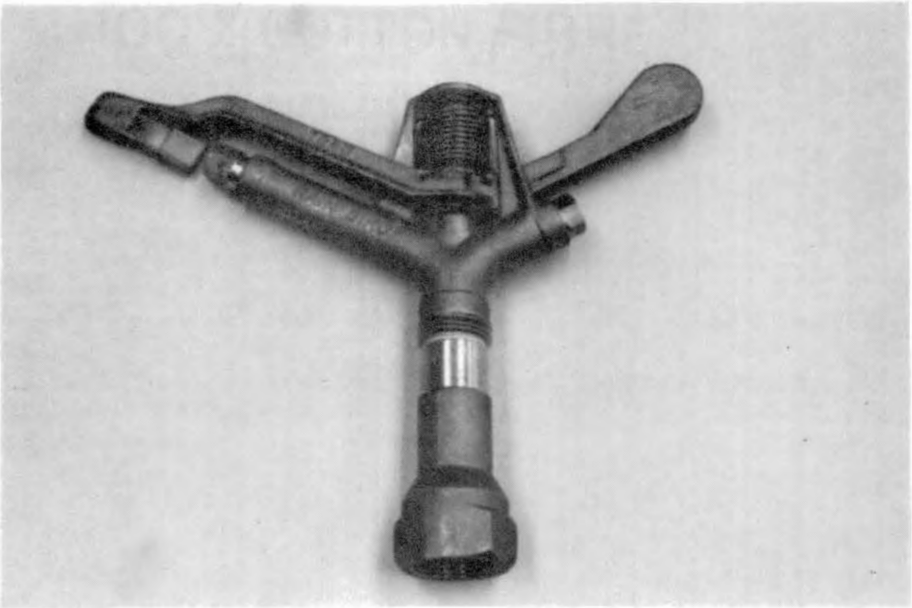


(a) Idle Condition



(b) Operating Condition

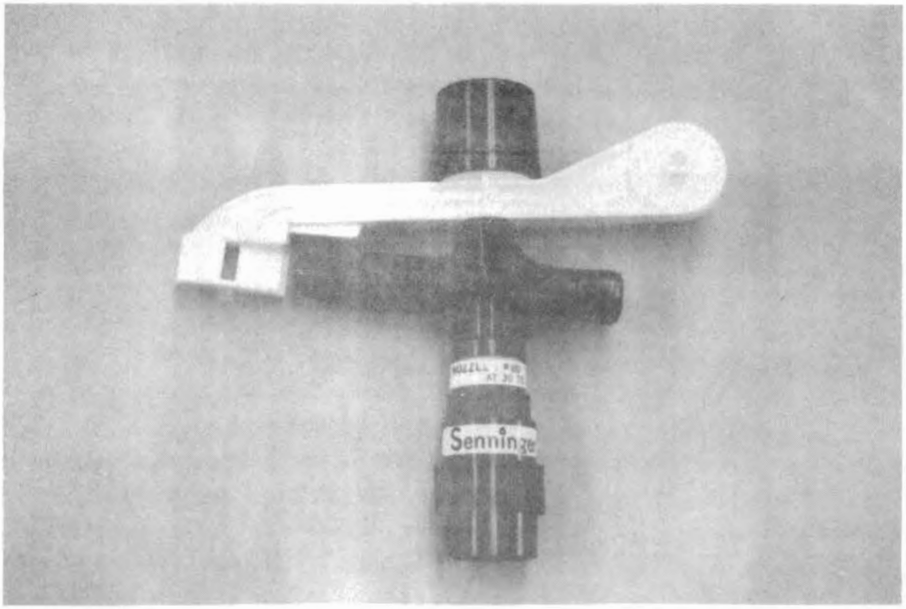
Figure 3. Flood Jet Spray Nozzle



(a) Idle Condition

(b) Operating Condition

Figure 4. 26° Full Circle Sprinkler



(a) Idle Condition

(b) Operating Condition

Figure 5. 6° Full Circle Sprinkler

nozzle tested. It needed about 80 liters of water per minute at 550 kilopascals of pressure. Therefore, a pump had to be selected such that it could provide the above flow rate and pressure. The pump selected was a single stage centrifugal Marlow Pump, Model 2-1/2 C15S. It was a high head-low flow pump; it had a pumping capacity of 136 liters per minute at a maximum pressure of 759 kilopascals. The pump is shown in Figure 6 after installation.

Pipelines

The sprinkler system was supplied with water by gravity through a 30.5 cm diameter main pipeline. Galvanized steel pipe, 5.04 cm nominal diameter, was used to connect the main supply line to the pump, and the pump to the sprinkler riser. The same diameter pipe was used as a sprinkler riser, 2.74 meters tall, and was secured at the end of the pipe line to the ground. Sprinkler heads were attached to the top of the sprinkler riser.

Orifice Plate and U-Tube Manometer

To determine the application loss due to evaporation and drift, it was necessary to measure accurately the inflow of water to the system. Accurate measurement of flow was accomplished by measuring the head loss across a gated orifice with a U-tube differential manometer, connected upstream and downstream of the orifice plate. A King Manometer, with a graduated scale on it to read accurately to 0.04 cm was used. It could measure a maximum head loss of 1.52 meters of water. An orifice diameter of 2.15 cm was constructed which could fulfill the maximum flow rate of 80 liters per minute with a head loss

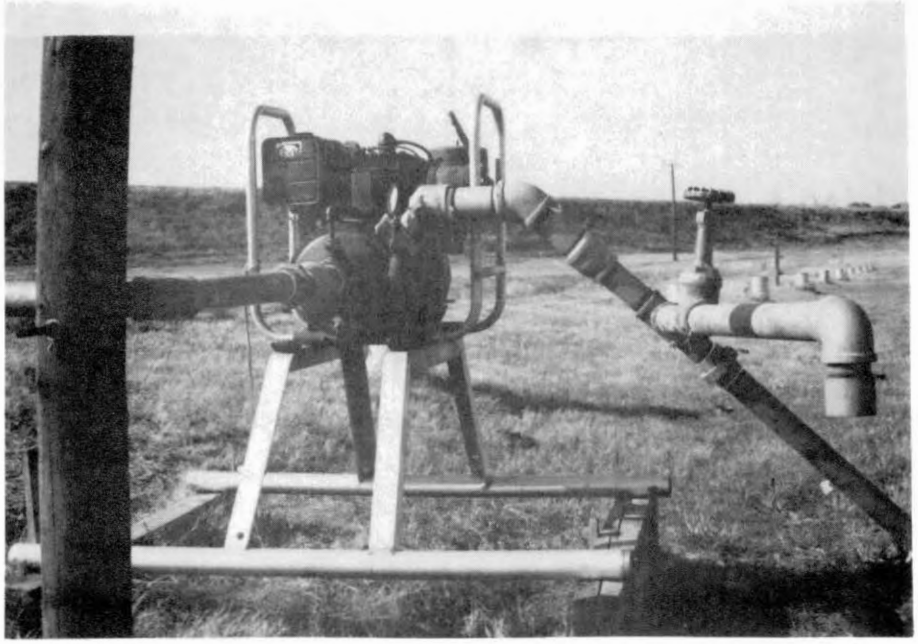


Figure 6. Single Stage Centrifugal Pump

of 1.52 meters or less. The orifice plate was constructed of 0.40 cm thick aluminum plate and installed into the 30.5 cm main supply line.

Flow Meter

To check the flow rates to the system obtained by the orifice plate and manometer, a 5.04 cm nominal diameter flow meter was installed in the pipeline between the pump and the sprinklers. The flowmeter used was a Trident Model 3. It could be read to the nearest one-tenth of a gallon by recording the total flow in gallons over a specified period of time.

Pressure Gauges

Standard pressure gauges, which indicated pressures in psi were used to measure pressures during the test. One pressure gauge was installed 45.72 cm below the sprinklers and the static pressures at this pressure gauge were assumed to be the operating pressures of the sprinklers. A second pressure gauge was installed on the pump as a check of the pressure gauge at the sprinkler.

Recording Wind Vane

To determine the speed as well as the direction of wind, a recording wind vane was installed by the Agricultural Research Service. It was a Belford Observatory 8 Direction Recorder and was located 65.56 meters northeast of the sprinkler head. The wind directions that the wind vane could record were north, south, east, west, northeast, southeast, northwest, and southwest.

Anemometer

A cup-type totalling anemometer was used to determine wind speeds. The anemometer was installed 29.76 meters southwest of the sprinkler head and used as a check of the wind speed obtained by the recording wind vane. The recording wind vane and the anemometer are shown in Figures 7 and 8.

Hygrothermograph

A Brown Recorder Hygrothermograph, shown in Figure 9, was used to record the temperatures during the test periods. The hygrothermograph was installed in a weather shelter located 38.18 meters southeast of the sprinkler head.

Sling Psychrometer

To determine the relative humidity during the test period, a sling psychrometer was used to record the dry bulb and wet bulb temperatures. The mercury thermometer that recorded the dry bulb temperature was graduated from -20° to 120 °F while the one that recorded the wet bulb temperature was graduated from 0° to 120° F. Both the thermometers were accurate to 1 °F.

Catch-Cans

Since the catch-can method of sampling the distribution of sprayed water was employed, several catch-cans were required. Number 3 squat cans obtained from a food canning plant were available for use. These cans were 10.9 cm in inside diameter, and 8.7 cm in height with

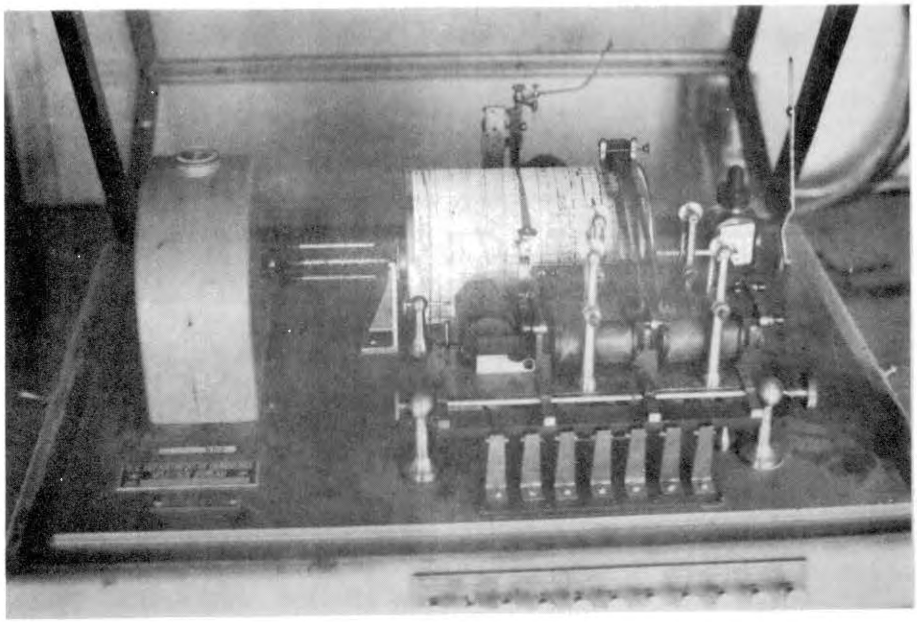


Figure 7. Closeup of the Recording Wind Vane

Figure 8. Totalling Anemometer

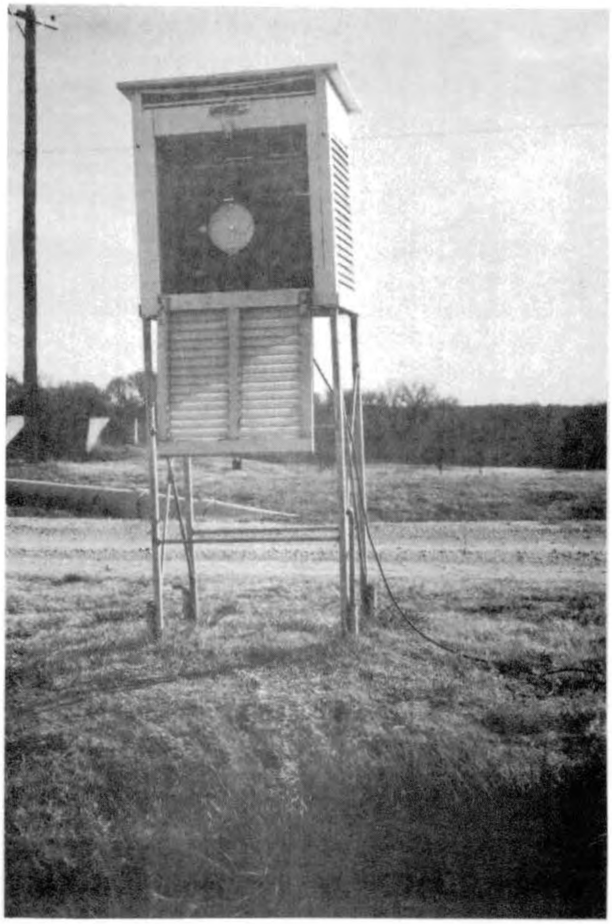


Figure 9. Hygrothermograph in Shelter

sharp edges and no lids. They were placed in a grid network before every test.

Graduated Cylinders

To measure the volume of water caught by each can in the grid network, two graduated cylinders were used. The smaller one was graduated from 0 to 100 ml (milliliters) and was accurate to one ml, while the larger one was graduated from 0 to 500 ml and was accurate to 10 ml. Positions of the pump, pipeline, orifice plate, U-tube manometer, flowmeter, anemometer, recording wind vane, hygrothermograph and the catch-cans are shown on the system layout diagram in Figure 1.

CHAPTER IV

PROCEDURE

The sprinkler system consisted of the sprinklers and spray nozzle, pump, pipelines, orifice plate and manometer, flowmeter, pressure gauges, anemometer, recording wind vane, and the hygrothermograph. Before installing this equipment it was necessary to calibrate some of it.

The orifice plate was calibrated by the time-volume method. The calibration was done such that the calibration curve could be used to determine the flow of water to the system in liters per minute by using the head loss, in cm of water, across the orifice plate. The flowmeter was calibrated by the time-volume method in the field, the hygrothermograph and the pressure gauges by comparing them with accurate thermometer and pressure gauge, respectively, in the laboratory.

An experimental schedule was prepared and followed.

Each test was run at four pressure levels, namely 134, 278, 415 , and 556 kilopascals and each test was repeated three times. For each repetition, records of the test duration, flow of water to the sprinklers, pressures at the sprinkler and at the pump, temperature, relative humidity, direction and speed of wind, and the volume of water caught by each can were kept. The procedure of recording the data for the above listed parameters are described below.

Test Duration

Preliminary tests were conducted with each type of sprinkler to select a suitable test duration. Durations were selected such that a sufficient amount of water was caught by the cans. A duration of only 24 minutes was selected for the FJSN since it had a high application rate. For both the 26° FCS and 6° FCS, the duration was selected as 150 minutes because of their light application rates.

Determination of Flow of Water

Flow of water to the sprinklers was determined using both the orifice and the flowmeter. Head loss across the orifice was recorded from the manometer. Manometer readings at three, ten, and ten minute intervals were taken for the FJSN, 26° FCS, and 6° FCS, respectively. Since the test duration for the FJSN was less, a shorter interval between readings was selected. These readings were averaged at the end of each repetition to obtain an average head loss across the orifice which was used to determine the flow in liters per minute using the orifice calibration curve.

The flow meter recorded the total flow of water in gallons to the sprinklers during the test period. To determine the flow rate, readings of the flowmeter were taken before and after each test. The difference of these two readings when divided by the test duration gave the flow rate in gallons per minute, which was converted to liters per minute and compared with those obtained from the orifice readings. The two flow rates usually agreed within four percent and the flow rates obtained by the orifice were used in the analyses of the data.

Measurement of Pressures

Before opening the flow to the sprinkler, the pressure at the pump, indicated by the pressure gauge set on it, was raised to the desired operating pressure by adjusting the pump-engine rpm (revolution per minute). Flow was then opened to the sprinkler and the desired static pressure, indicated by the pressure gauge below the sprinkler, was then set again by changing the pump-engine rpm.

Reading of pressures were taken at three, ten, and ten minute intervals for the FJSN, 26° FCS, and 6° FCS, respectively. Pressures obtained from the static pressure gauge were averaged at the end of each repetition to obtain an average operating pressure which was used during analyses of the data.

Measurement of Temperatures

Intermittent recording of the temperatures during the test period was not necessary as the hygrothermograph recorded the temperature continuously.

Determination of Relative Humidity

A sling psychrometer was used to determine the relative humidity during the test period. Dry bulb and wet bulb temperatures were recorded at the beginning and end of each test. These temperatures were used with a psychrometric chart, printed by General Electric, to determine the relative humidity both at the beginning and end of the test. The two relative humidity values were averaged and the average values were used in the analyses.

Determination of Wind Speed and Direction

The recording wind vane was used to determine both the wind speed and direction. The cup-type totalling anemometer, used to determine wind speed, was employed to make a check of the wind speeds obtained from the recording wind vane. Results obtained from the wind vane usually agreed within four percent of those obtained from the anemometer and were used in the analyses.

The recording wind vane recorded eight wind directions, namely north, south, east, west, northeast, southeast, northwest, and southwest. The prevailing wind direction during each test period was considered to be the wind direction during the test.

Measurement of Spray Distribution

To get a good representation of the distribution of water, the 25 by 25 grid network shown in Figure 1 was chosen for every test, the position of the sprinkler head being at the center (13 by 13 position). This grid network size was selected to make sure that all the sprinkler spray from the 26° FCS, which had the largest wetted diameter, remained within the network. Spacing between two grid points was chosen depending on the wetted diameter. Davis (11) stated that in order to get a good representation of water distribution, each sampling station (grid point) should represent from 2.0 to 2.5 percent of the pattern area, or from five to six percent of the wetted diameter. Therefore, grid spacings of one, two, and two meters were chosen for FJSN, 26° FCS, and 6° FCS, respectively, which ensured each sampling station to represent less than 2.5 percent of the pattern area.

Before every test, the inner surfaces of the catch-cans were wetted to compensate for the water that would stick to the cans while pouring it into the graduated cylinders for measurement. Cans were placed over the sampling stations before every test, and immediately after the test, the volume in ml caught by each can was measured using two graduated transparent cylinders. For volumes less than 100 ml, the smaller cylinder was used while volumes greater than 100 ml were measured by the larger cylinder. Evaporation from the cans was considered negligible since Frost and Schwalen (12) found it so and therefore no suppressant was used in the cans to prevent surface evaporation.

CHAPTER V

ANALYSIS OF DATA AND DISCUSSION OF RESULTS

Application Losses Due to Evaporation and Drift

Seginer (23) defined various loss components of sprinkler systems as spray evaporation, surface evaporation, and drift. Frost and Schwalen (12) observed that surface evaporation from catch-cans were negligible. Seginer and Kostrinsky (22) felt that separation of the two loss components, spray evaporation and drift, may not be essential for purposes of sprinkler evaluation. Therefore, in this study, the application losses were considered as the sum of evaporation and drift losses, which occurred between the sprinkler nozzles and the ground surface, and will be designated as evaporation loss.

Evaporation loss for a test repetition was found by determining the difference between the volume of water leaving the nozzle and the volume reaching the ground surface. The volume of water leaving the nozzle is, by continuity, equal to the volume entering the system. Volume entering the system is the volume passing through the orifice. Therefore, the flow rate obtained from the manometer readings and the orifice calibration curve, when multiplied by the test duration would give the volume leaving the nozzle. The following relationship was used for this:

$$VE = (QO)\ (TM) \qquad [2]$$

where

VE = Volume of water entering the system in liters

QO = Flow rate at the orifice in liters per minute

TM = Test duration in minutes

To determine the volume of water that reached the ground, it was necessary to calculate the volume of water that would be caught by the area represented by each sampling station. This was done by finding the depth caught by each can placed over every sampling station of the 25 by 25 grid network and then multiplying this depth by the area represented by each sampling station. The volume of water caught by the area represented by each sampling station when summed over the entire area gave the volume of water reaching the ground surface.

The depth caught by each can was determined by using the relationship:

$$DC\ (I,\ J) = \frac{VC\ (I,\ J)}{CA} \qquad [3]$$

where

DC (I, J) = Depth caught by each can in cm

VC (I, J) = Volume caught by each can in ml

CA = Internal cross-sectional area of catch-cans in sq cm

I = Number of rows in the grid network varying from one to 25

J = Number of columns in the grid network varying from one to 25

Volume that would be caught by the area represented by each sampling station would then be given by the equation below:

$$V\ (I,\ J) = \frac{DC\ (I,\ J)\ (G\ A)}{1000} \qquad [4]$$

where

V (I, J) = Volume of water that would be caught by area represented by each can in liters

GA = Area represented by each sampling station in sq cm

Total volume reaching the ground was then determined by:

$$VR = \sum_{I=1}^{25} \sum_{J=1}^{25} V(I, J) \qquad [5]$$

where

VR = Total volume of water reaching the ground surface in liters.

The percentage of evaporation was determined by using the following relationship:

$$EVAP = \left(\frac{VE - VR}{VE} \right) 100 \qquad [6]$$

These calculations were done with an IBM 370 computer for each test repetition. The results for evaporation loss is given in Table I.

The average evaporation loss by each nozzle and the sprinklers was found to range from 15 to 35 percent for FJSN, from 40 to 52 percent for 26° FCS, and from 8 to 41 percent for 6° FCS for pressures between 134 and 556 kilopascals.

Factors Affecting Evaporation Loss

Factors that affect evaporation loss were considered to be the nozzle type and size, operating pressure, relative humidity and wind speed. Statistical analyses were performed on these variables to determine their relative effects on evaporation.

The table of means, presented in Table II, showed that average

TABLE I

EVAPORATION LOSS

Type	Nozzle Diameter (cm)	Test No.	Repetition	Operating Pressure (Kilopascals)	Evaporation (%)
FJSN	0.726	1	1	127	19
			2	124	15
			3	123	15
		2	1	266	19
			2	283	19
			3	282	35
		3	1	426	21
			2	430	23
			3	430	21
		4	1	563	25
			2	551	30
			3	569	27
26° FCS	0.632	5	1	155	50
			2	121	41
			3	146	48
		6	1	278	44
			2	273	43
			3	279	46
		7	1	407	40
			2	415	45
			3	408	51
		8	1	551	45
			2	556	44
			3	554	52
6° FCS	0.635	9	1	133	34
			2	123	29
			3	129	31
		10	1	280	34
			2	281	31
			3	280	33
		11	1	408	32
			2	415	33
			3	415	40
		12	1	556	34
			2	553	39
			3	549	41
6° FCS	0.483	13	1	136	35
			2	139	27
			3	140	26
		14	1	279	29
			2	281	34
			3	281	24

TABLE I (Continued)

Type	Nozzle Diameter (cm)	Test No.	Repetition	Operating Pressure (Kilopascals)	Evaporation (%)
6° FCS	0.559	15	1	408	24
			2	418	36
			3	415	28
		16	1	549	34
			2	560	38
			3	557	30
		17	1	136	32
			2	136	28
			3	139	8
		18	1	278	9
			2	274	10
			3	280	31
		19	1	415	14
			2	412	26
			3	411	31
		20	1	553	23
			2	557	34
			3	558	24

TABLE II

TABLE OF MEANS

Pressure (Kilo-pascals)	Type	Nozzle Diameter (cm)	Number of Tests	Evapo-ration (%)	Humidity (%)	Wind Speed (km/hr)
134	FJSN	0.726	3	16	49	14.88
134	26° FCS	0.632	3	46	51	12.82
134	6° FCS	0.635	3	32	38	9.84
134	6° FCS	0.559	3	23	60	10.30
134	6° FCS	0.483	3	29	51	8.11
278	FJSN	0.726	3	24	42	14.04
278	26° FCS	0.632	3	44	46	12.24
278	6° FCS	0.635	3	33	38	7.07
278	6° FCS	0.559	3	17	72	10.87
278	6° FCS	0.483	3	29	57	6.08
415	FJSN	0.726	3	21	57	13.15
415	26° FCS	0.632	3	45	44	11.70
415	6° FCS	0.635	3	35	39	12.45
415	6° FCS	0.559	3	24	41	9.39
415	6° FCS	0.483	3	29	49	9.39
556	FJSN	0.726	3	28	52	16.37
556	26° FCS	0.632	3	47	36	10.02
556	6° FCS	0.635	3	38	31	13.48
556	6° FCS	0.559	3	27	39	13.87
556	6° FCS	0.483	3	34	52	20.05
	FJSN	0.726	12	22	50	14.61
	26° FCS	0.632	12	46	44	11.69
	6° FCS	0.635	12	34	36	10.71
	6° FCS	0.559	12	23	53	11.11
	6° FCS	0.483	12	30	52	10.91
134			15	29	50	11.19
278			15	29	51	10.06
415			15	31	46	11.22
556			15	35	42	14.76
Overall Means			60	31	47	11.81

evaporation loss ranged from 22 to 46 percent for different sprinklers and spray nozzle and from 29 to 35 percent for different pressure levels. It also indicated that at pressures between 134 and 278 kilopascals, the evaporation loss was the same, but at pressures higher than 278 kilopascals, it increased slowly. It means that evaporation loss due to an increase in pressure can be kept to a minimum if the maximum operating pressure is limited to 278 kilopascals.

Attempts were also made to determine the relative influence of the factors considered on evaporation loss. An analysis of variance of the data ignoring relative humidity and wind speed showed that the nozzle type and size had a significant effect on evaporation while pressure had comparatively little and there was no interaction between pressures and nozzle sizes. This result is shown in Table III.

It was hypothesized that data on evaporation and relative humidity, as well as evaporation and wind speed, for different pressure levels would fit straight lines. This hypothesis was made since three data points were available for each pressure level as a consequence of taking only three repetitions. Based on this hypothesis, a test of parallelism was done on these lines taking relative humidity as covariable on evaporation. The test indicated an insignificant F value of 1.74 on the null hypothesis that the lines were parallel and therefore the null hypothesis could not be rejected. Since the lines were parallel and indicated a non-zero slope, the use of covariance could be made.

The analysis of covariance showed that the effect due to relative humidity had an F value of 56.25 while the nozzle type and size value was 32.8 indicating that relative humidity had a larger effect on

TABLE III

ANALYSIS OF VARIANCE

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                                     CENTER PIVOT SPRINKLER SYSTEMS, 1977

                ANALYSIS OF VARIANCE FOR VARIABLE EVAP           MEAN     31.1175000
                SOURCE                                    DF  SUM OF SQUARES  MEAN SQUARE
                PRESS                                      3       292.64839     97.54963
                SPRAY                                      4      4473.64755   1118.41189
                PRESS*SPRAY                               12       216.67889     18.05657
                REP(PRESS SPRAY)                          40      1512.48420     37.81210
                CORRECTED TOTAL                           59      6495.45953    110.09253


TESTS           SOURCE                                    DF  SUM OF SQUARES  MEAN SQUARE      F VALUE      PROB > F
NUMERATOR:      PRESS                                      3       292.64839     97.54963      2.57985        0.0659
DENOMINATOR:    REP(PRESS SPRAY)                          40      1512.48420     37.81210

NUMERATOR:      SPRAY                                      4      4473.64755   1118.41189     29.57814        0.0001
DENOMINATOR:    REP(PRESS SPRAY)                          40      1512.48420     37.81210

NUMERATOR:      PRESS*SPRAY                               12       216.67889     18.05657      0.47753        0.9161
DENOMINATOR:    REP(PRESS SPRAY)                          40      1512.48420     37.81210
```

evaporation loss than nozzle type and size. This suggests that running the sprinkler system at high humid conditions, preferably at night, will result in lower evaporation losses.

Test of parallelism was also performed on the lines taking wind speed as covariable on evaporation. It indicated a significant F value of 2.4 to the null hypothesis that the lines were parallel and therefore the null hypothesis had to be rejected. Since the lines were not parallel, a common slope could not be found and consequently analysis of covariance could not be performed. Results of parallelism test with relative humidity (RH) as covariable, analysis of covariance with relative humidity as covariable, and parallelism test with wind speed (WS) as covariable are shown in Tables IV, V, and VI. In these tables, 'Press' stands for operating pressure in kilopascals and 'Spray' stands for type and size of different nozzles.

Uniformity of Application

Christiansen's uniformity coefficient, given by Equation 1, is a good measure of the uniformity of application. A uniformity coefficient of 100 would mean perfect uniform distribution of water.

Branscheid and Hart (6) stated that predicting field distribution by use of single sprinkler data is accurate. Therefore, this study evaluated the uniformity of application by determining Christiansen's uniformity coefficient from patterns simulated from a single stationary sprinkler data. The procedure of analysis is given below.

For every pattern, a 25 by 25 array which corresponds to the grid network, was used. The sprinkler riser as well as the sprinkler head

TABLE IV

PARALLELISM TEST, RELATIVE HUMIDITY AS COVARIABLE ON EVAPORATION

	DF	SS	MS	F	PR > F
Corrected Total	59	6495.46			
Press	3	292.65	97.55	4.85	0.0107
Spray	4	4473.65	1118.41	55.62	0.0001
Press * Spray	12	216.68	18.06	0.90	0.5638
RH (slope)	1	447.00	447.00	22.23	0.0001
RH (Press * Spray) (parallelism)	19	663.34	34.91	1.74	0.1148
Error	20	402.15	20.11		

TABLE V

ANALYSIS OF COVARIANCE, RELATIVE HUMIDITY AS COVARIABLE ON EVAPORATION

	DF	SS	MS	F	PR > F
Corrected Total	59	6495.46			
Press (adjusted)	3	68.39	22.80	0.83	0.4831
Spray (adjusted)	4	3584.16	896.04	32.80	0.0001
Press * Spray	12	240.54	20.04	0.73	0.7104
RH (covariable)	1	1536.89	1536.89	56.25	0.0001
Error	39	1065.49	27.32		

TABLE VI

PARALLELISM TEST, WIND SPEED AS COVARIABLE ON EVAPORATION

	DF	SS	MS	F	PR > F
Corrected Total	59	6495.46			
Press	3	292.65	97.55	4.24	0.0179
Spray	4	4473.65	1118.41	48.61	0.0001
Press * Spray	12	216.68	18.06	0.78	0.6603
WS (Slope)	1	2.00	2.00	0.09	0.7711
WS (Press * Spray) (parallelism)	19	1050.31	55.28	2.40	0.0293
Error	20	460.17	23.01		

was assigned a position at the center of the array (13, 13). The can volumes as measured from each stationary test were placed at the appropriate positions within the array using the location of the sprinkler head as reference. These 25 by 25 arrays for each test repetition are given in the Appendix A. Depths, DC (I, J), in each can in the grid were determined by using Equation 3 and the application rate at each can was found by using the following relationship:

$$AR\ (I,\ J) = \left(\frac{D\ (I,\ J)}{TM} \right) 60 \qquad [7]$$

where

AR (I, J) = Application rate in can (I, J) in the grid in cm/hr.

This two-dimensional array of application rates, AR (I, J), was then simulated to a moving one and a one-dimensional array of accumulated depths, AD (J), J varying from one to 25, was generated from it in the following way.

An imaginary row of 25 cans was placed ahead of the continuously moving array AR (I, J) which was assigned a velocity of movement of 18.29 meters per hour. A straight line travel path of AR (I, J) was assumed as described by Bittinger and Longenbaugh (4). Figure 10 represents this simulation of pattern movement.

The depths that would be caught and accumulated in the imaginary row of cans when the pattern AR (I, J) completely passed over it would be given by the relationship:

$$AD\ (J) = \frac{CS}{PV} \sum_{I=1}^{25} AR\ (I,\ J) \qquad [8]$$

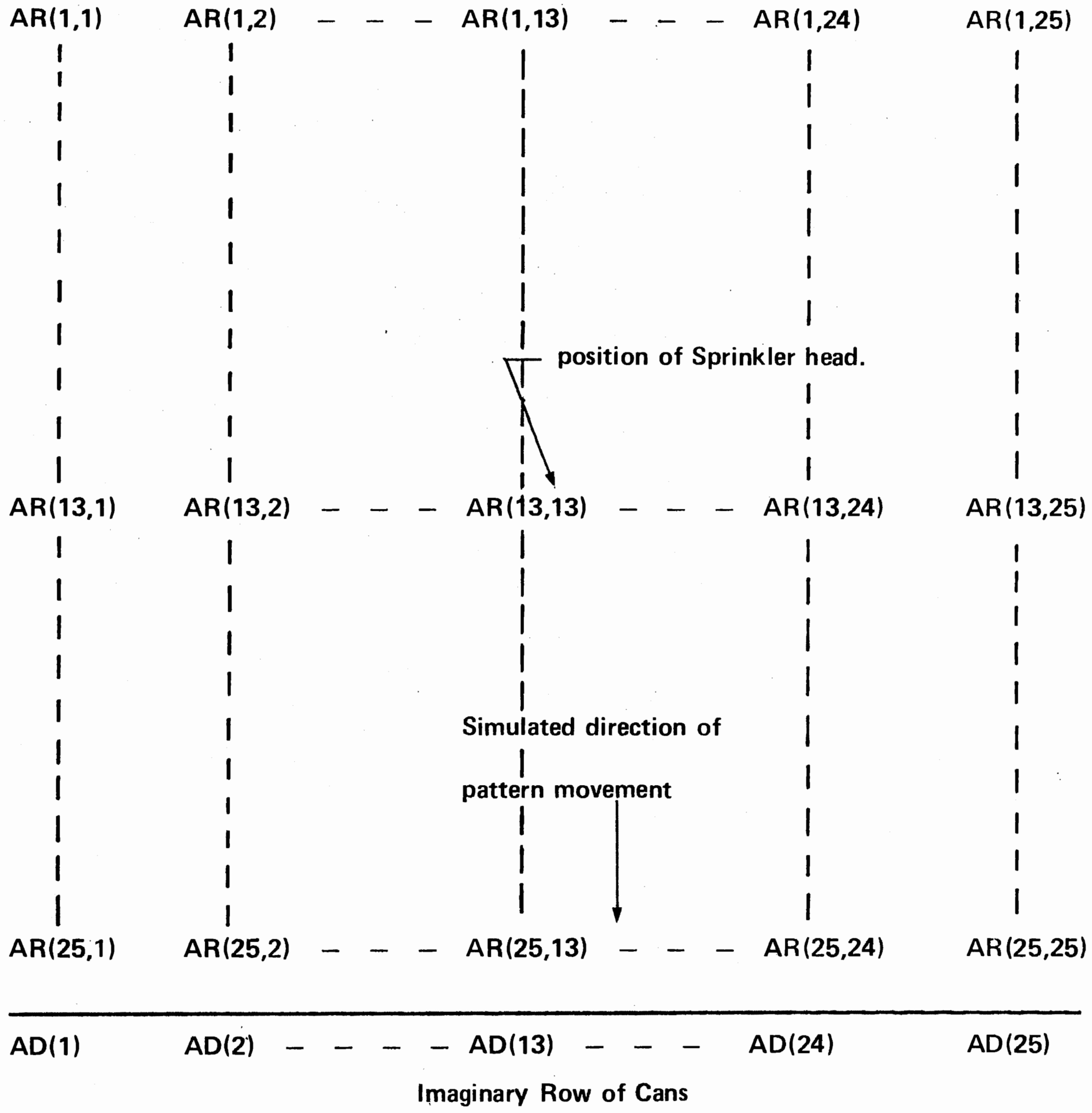


Figure 10. Simulation of Pattern Movement

where

AD(J) = Accumulated depth in can (J) in cm
CS = Distance between cans in meters
PV = Assigned pattern velocity in meters per hour

Seven of this array of accumulated depths, AD(J), J varying from one to 25, were placed side by side and were meshed toward the center array from both left and right side by unit increment to obtain a new array of simulated depths, SD(J), that would be applied if seven identical distribution patterns were overlapped. The meshing continued for all 25 increments. Each increment would represent a spacing between sprinklers, depending on the can spacing. For example, the spacing between sprinklers would be 24, 48, and 48 meters for the first increment, 23, 46, and 46 meters for the second increment, and so on, for FJSN, 26° FCS, and 6° FCS, respectively.

Simulated depths, SD(J), which would represent the accumulated depths obtained from a complete passage of at most seven overlapped patterns, were generated for each increment of meshing by summing the depths in column J,J varying from one to 25, in the center array.

Christiansen's uniformity of application, given by Equation 1, was then applied on SD(J) to determine the uniformity coefficient when the spacing between sprinklers became equal to or less than the wetted diameter of the pattern in concern, during the process of meshing.

This analysis was done with an IBM 370 computer on every test repetition. The uniformity coefficient versus spacing between sprinklers, spacing being equal to or less than the pattern wetted diameter, were plotted for each test repetition. Three typical plots at four different pressures for FJSN, 26° FCS, and 6° FCS are given in Figures 11, 12, and 13. The other plots are given in the Appendix B.

Effect of Pressure on Uniformity, Spacing, and Pattern Wetted Diameter

A study on the plots shown in Figures 11, 12, and 13 and appended in Appendix B would indicate that acceptable uniformity coefficients can be achieved from a large variation of operating pressures.

Jones (15) measured the uniformity of application from a center-pivot sprinkler irrigation system and reported an average uniformity of 85.2. Heermann and Hein (14) reported uniformities between 87.3 and 90.5. Pair (19) observed uniformity coefficients of 81 and 86. Petersen (20) used a uniformity of 80 as a suitable lower limit for a center-pivot system. It appears that a uniformity coefficient value of 80 or above may be considered as acceptable. Using this criterion, a recommendation for spacing between sprinklers is made and presented in Table VII. The table also shows the values of the uniformities within the range of the recommended spacings for different types of sprinklers and the spray nozzle operating at pressures between 134 and 556 kilopascals. The uniformities varied from 83 to 90, from 90 to 91, and from 85 to 91 for the FJSN, 26° FCS, and 6° FCS, respectively.

Figure 14 shows the effect of pressure on the pattern wetted diameter. It was observed that the wetted diameter increased as the operating pressure increased from 134 to 278 kilopascals. The increase was small at pressures beyond 278 kilopascals. These data agreed with the report of Bilanski and Kidder (3) who stated that raising the

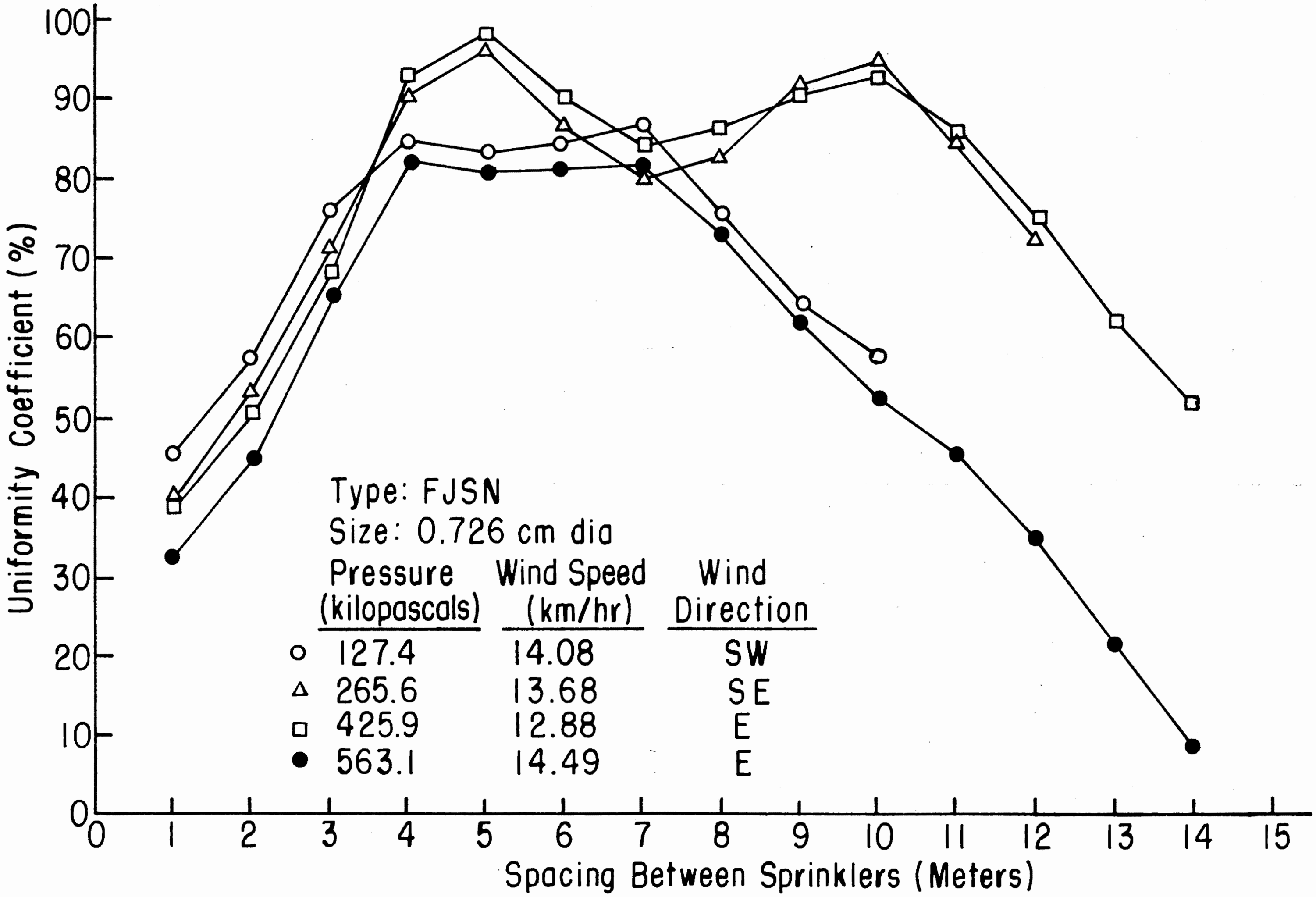


Figure 11. Uniformity Coefficient Versus Spacing Between Sprinklers for the Flood Jet Spray Nozzle, Repetition 1

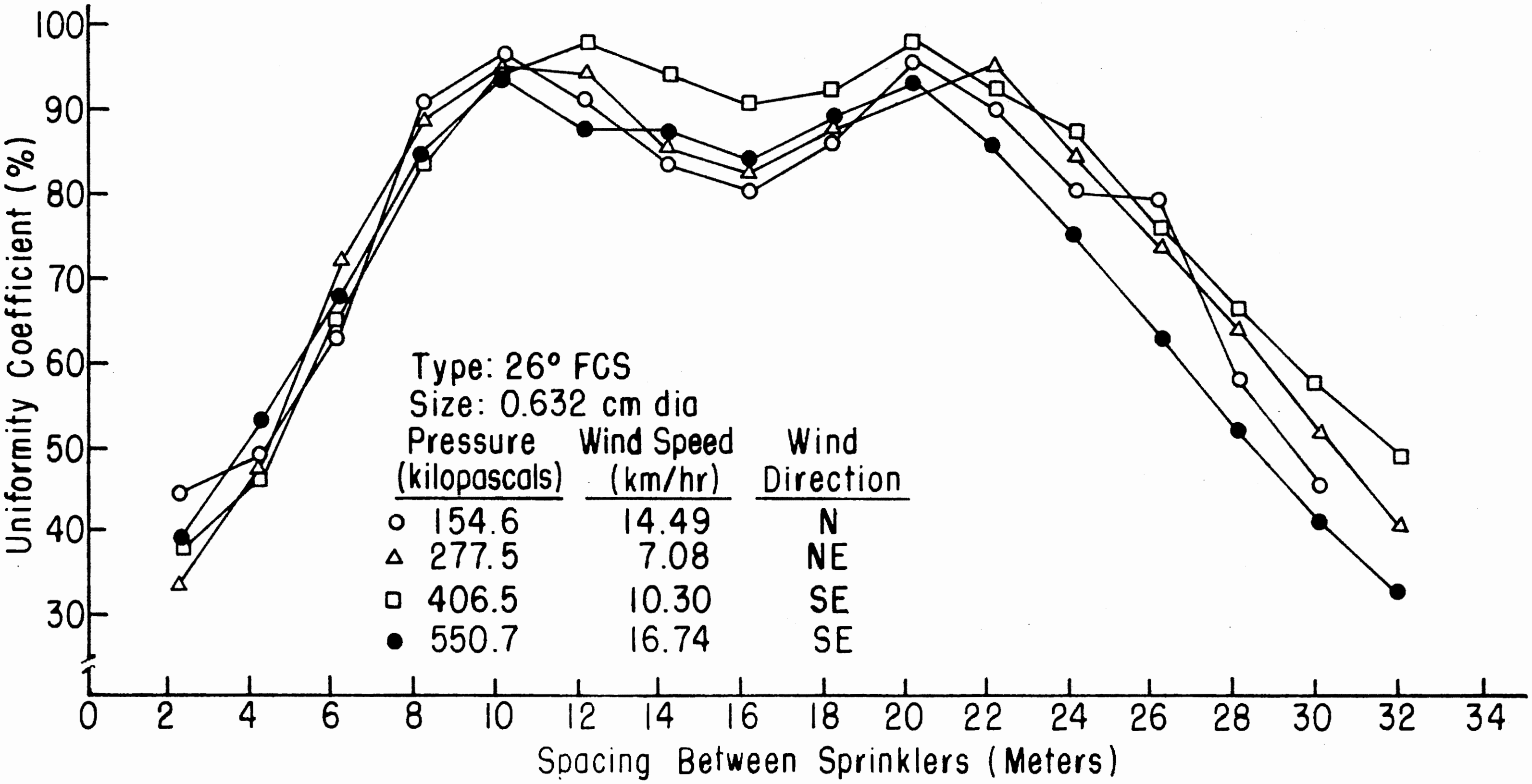


Figure 12. Uniformity Coefficient Versus Spacing Between Sprinklers for the 26° Full Circle Sprinkler, Repetition 1

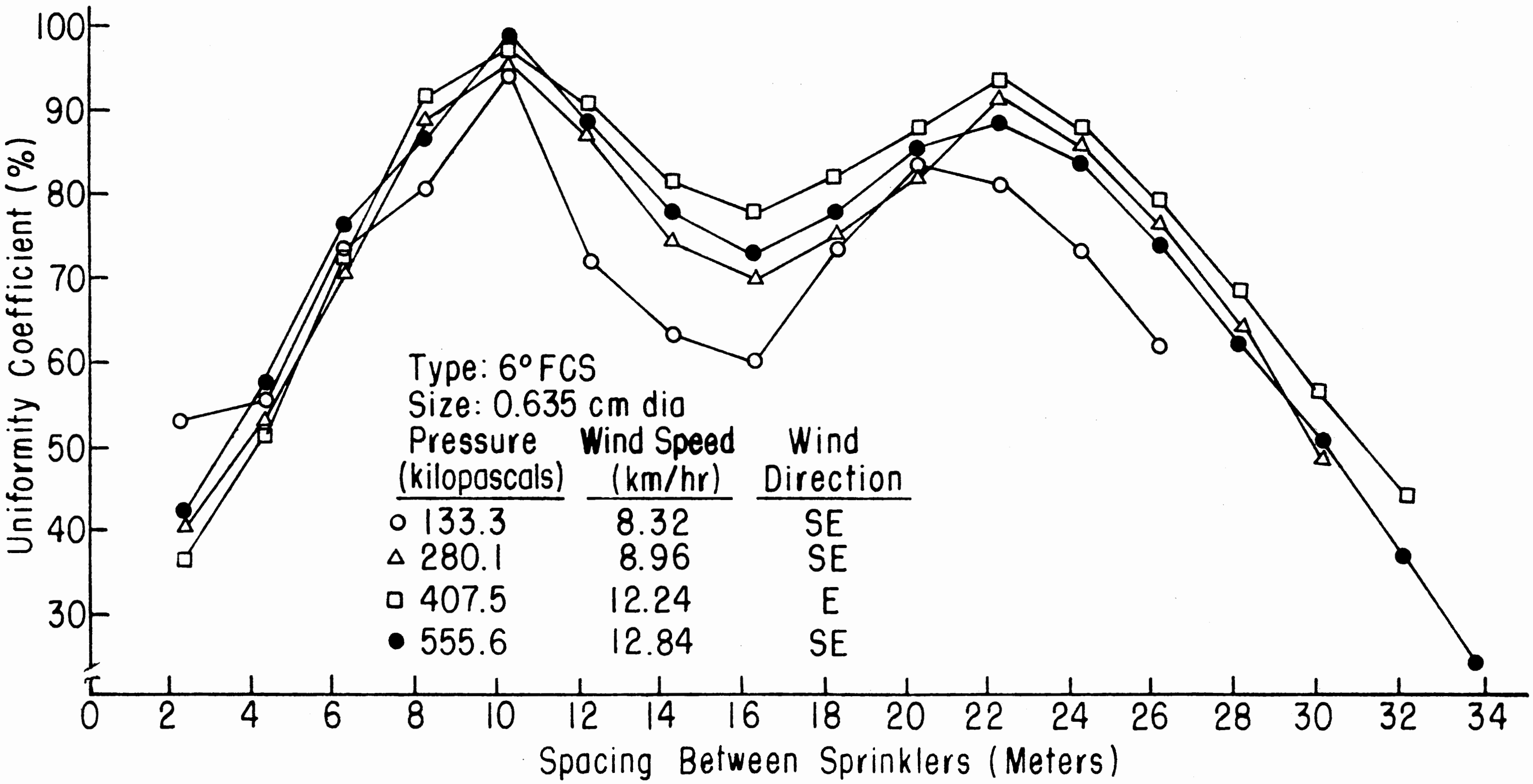


Figure 13. Uniformity Coefficient Versus Spacing Between Sprinklers for the 6° Full Circle Sprinkler, Repetition 1

TABLE VII

RECOMMENDED SPACINGS FOR THE SPRINKLERS AND THE SPRAY NOZZLE

Type	Nozzle Diameter (cm)	Pressure (Kilopascals)	Recommended Spacings, S (Meters)	Average Uniformity (%)	Average Application Rate (cm/hr)
FJSN	0.726	134	$4 < s < 7$	85	4.31
		278	$4 < s < 11$	88	3.49
		415	$4 < s < 11$	90	4.17
		556	$4 < s < 7$	83	5.14
26° FCS	0.632	134	$7 < s < 12$, $19 < s < 23$	91	0.30
		278	$7 < s < 12$, $17 < s < 23$	91	0.45
		415	$8 < s < 14$, $17 < s < 24$	90	0.48
		556	$8 < s < 22$	90	0.50
6° FCS	0.635	134	$8 < s < 10$	85	0.66
		278	$7 < s < 13$, $23 < s < 25$	90	0.60

TABLE VII (Continued

Type	Nozzle Diameter (cm)	Pressure (Kilopascals)	Recommended Spacings, S (Meters)	Average Uniformity (%)	Average Application Rate (cm/hr)
		415	$8 < s < 12$, $18 < s < 22$	88	0.61
		556	$8 < s < 13$, $19 < s < 22$	88	0.69
6° FCS	0.559	134	$8 < s < 10$, $18 < s < 21$	85	0.22
		278	$8 < s < 10$	88	0.68
		415	$7 < s < 11$	91	0.68
		556	$7 < s < 12$, $19 < s < 22$	89	0.55
6° FCS	0.483	134	$8 < s < 10$, $18 < s < 22$	88	0.20
		278	$8 < s < 12$, $21 < s < 24$	89	0.31
		415	$7 < s < 11$	89	0.53
		556	$7 < s < 9$	93	0.63

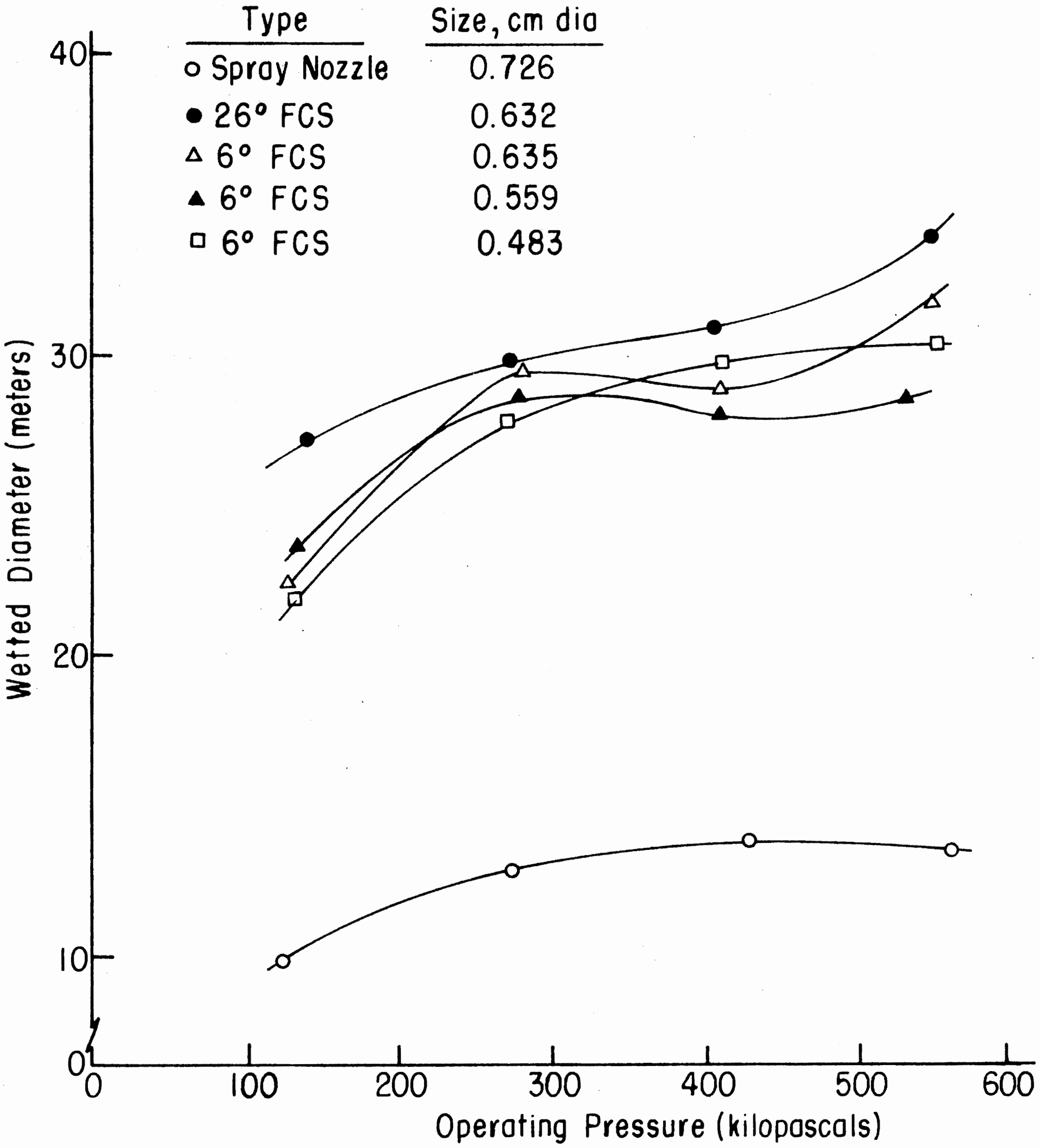


Figure 14. Wetted Diameter Versus Operating Pressure for the Sprinklers and the Spray Nozzle

pressure from 30 to 60 psi (207 to 415 kilopascals) resulted in an increase of only five feet (1.52 meters) in the trajectory distance. It also indicated that increasing pressures beyond 278 kilopascals is not very effective in obtaining a greater wetted diameter. Table VII and Figure 14 indicate that an operating pressure of 278 kilopascals is almost as good as pressures between 278 and 415 kilopascals, from the viewpoint of uniformity of application and pattern wetted diameter, provided that the recommended spacing between sprinklers is followed.

Effect of Wind on Distribution Patterns

Extensive study by Wiersma (24) on effect of wind on water distribution revealed that the distribution is affected very little, or not at all, by wind, at pressures between 48 and 56 psi (331 and 386 kilopascals) and that the angle of wind direction with respect to lateral lines has little or no effect on the distribution pattern. Seginer and Kostrinsky (22) stated that the only effect of wind was that of distorting the distribution pattern.

This study viewed the effect of wind only on the stationary single sprinkler pattern. The distribution patterns for some selected tests are shown in Figures 15, 16, 17, 18, 19, and 20, which seem to agree with the above researchers. These contours were drawn on the average depths of water obtained from all three repetitions within a test.

It was also observed that the distribution pattern was distorted little in case of a FJSN for which the application rate was quite high.

Type - Spray Nozzle
Size - 0.726 cm dia
Pressure - 428 kilopascals
Wind Speed - 8.17 km/hr
Contour Interval - 0.6 cm

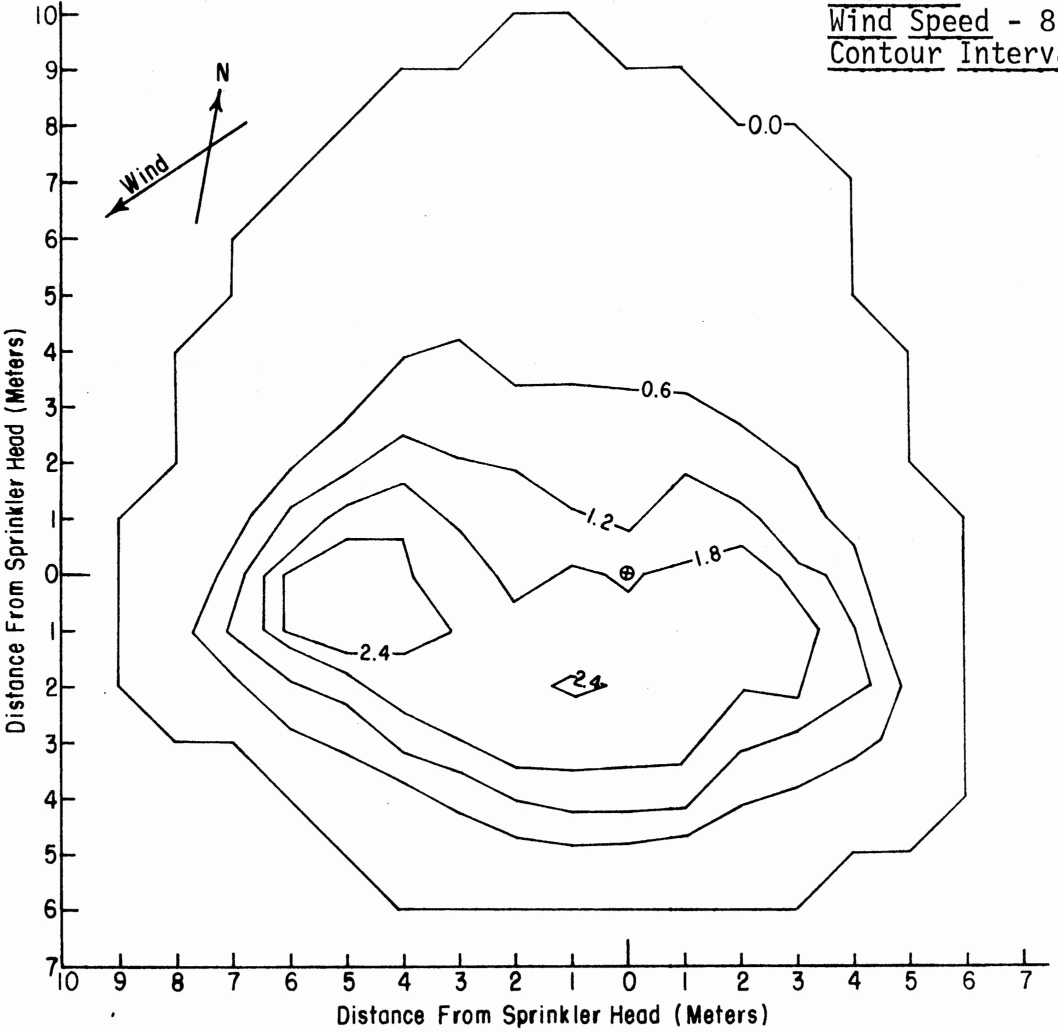
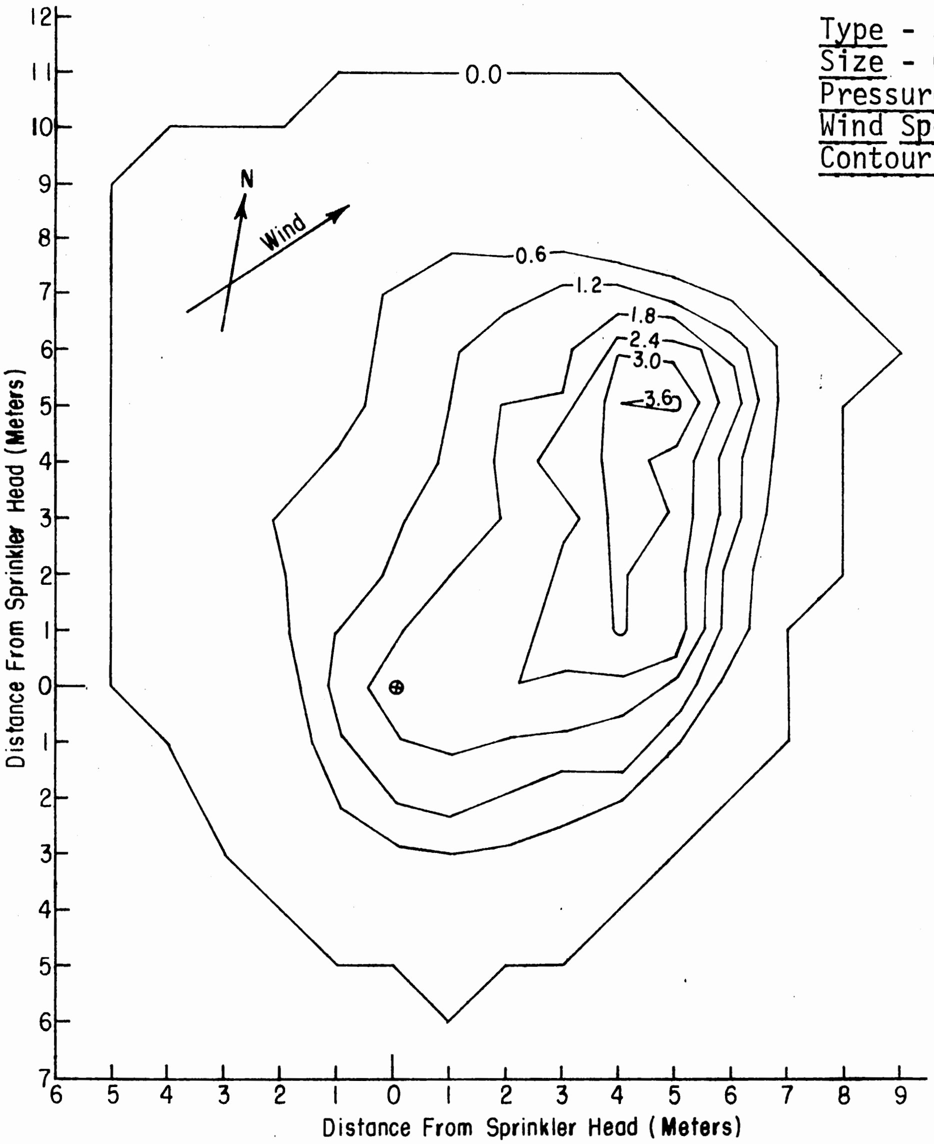


Figure 15. Contours of the Spray Distribution Depths from the Flood Jet Spray Nozzle at Low Wind Speed



Type - Spray Nozzle
Size - 0.726 cm dia
Pressure - 561 kilopascals
Wind Speed - 10.17 km/hr
Contour Interval - 0.6 cm

Figure 16. Contours of the Spray Distribution Depths from the Flood Jet Spray Nozzle at High Wind Speed

Type - 26° FCS
Size - 0.632 cm dia
Pressure - 410 kilopascals
Wind Speed - 7.27 km/hr
Contour Interval - 0.2 cm

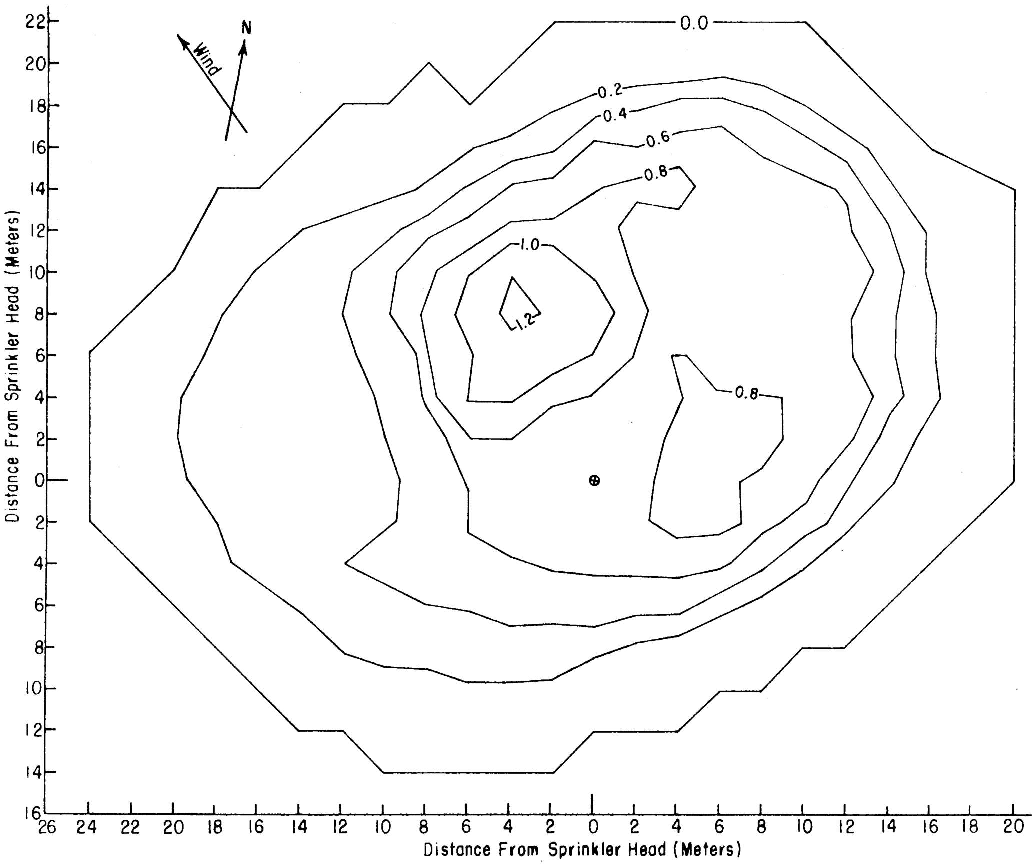


Figure 17. Contours of the Spray Distribution Depths from the 26° Full Circle Sprinkler at Low Wind Speed

<u>Type</u> - 26° FCS
<u>Size</u> - 0.632 cm dia
<u>Pressure</u> - 554 kilopascals
<u>Wind Speed</u> - 7.47 km/hr
<u>Contour Interval</u> - 0.2 cm

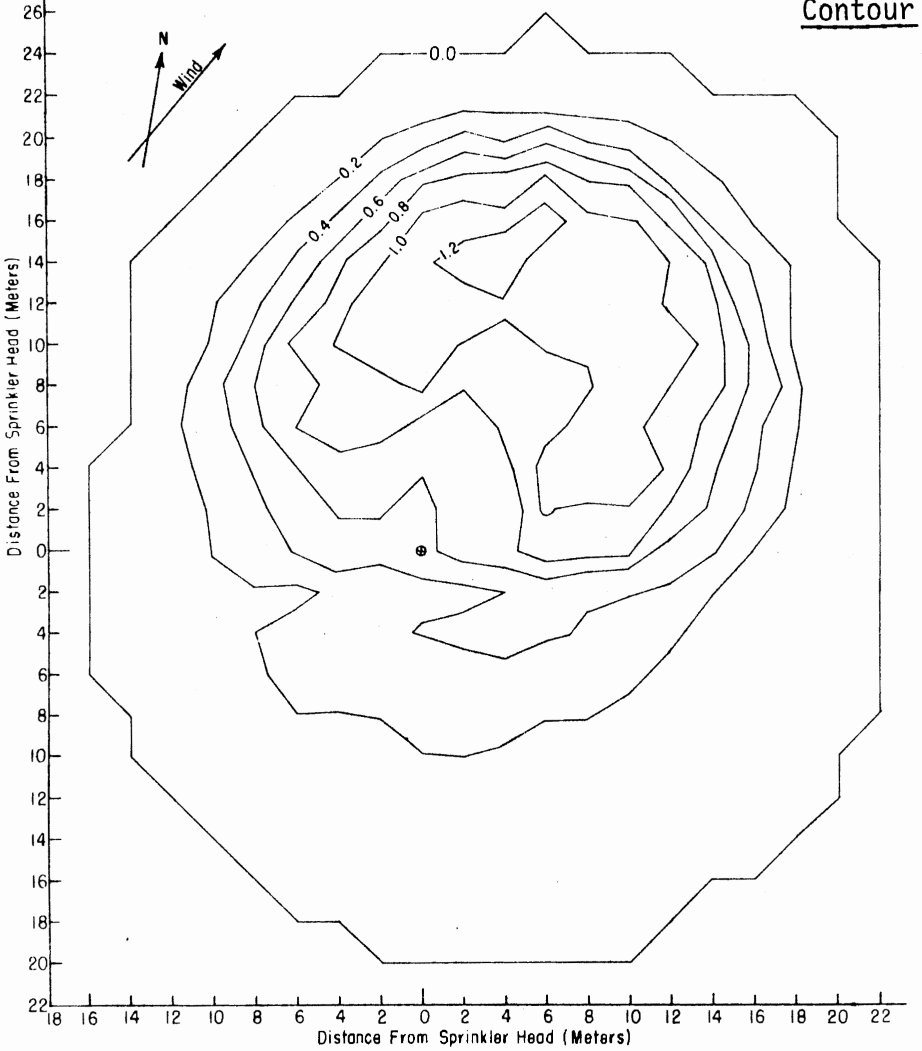


Figure 18. Contours of the Spray Distribution Depths from the 26° Full Circle Sprinkler at High Wind Speed

Type - 6° FCS
Size - 0.483 cm dia
Pressure - 280 kilopascals
Wind Speed - 3.80 km/hr
Contour Interval - 0.2 cm

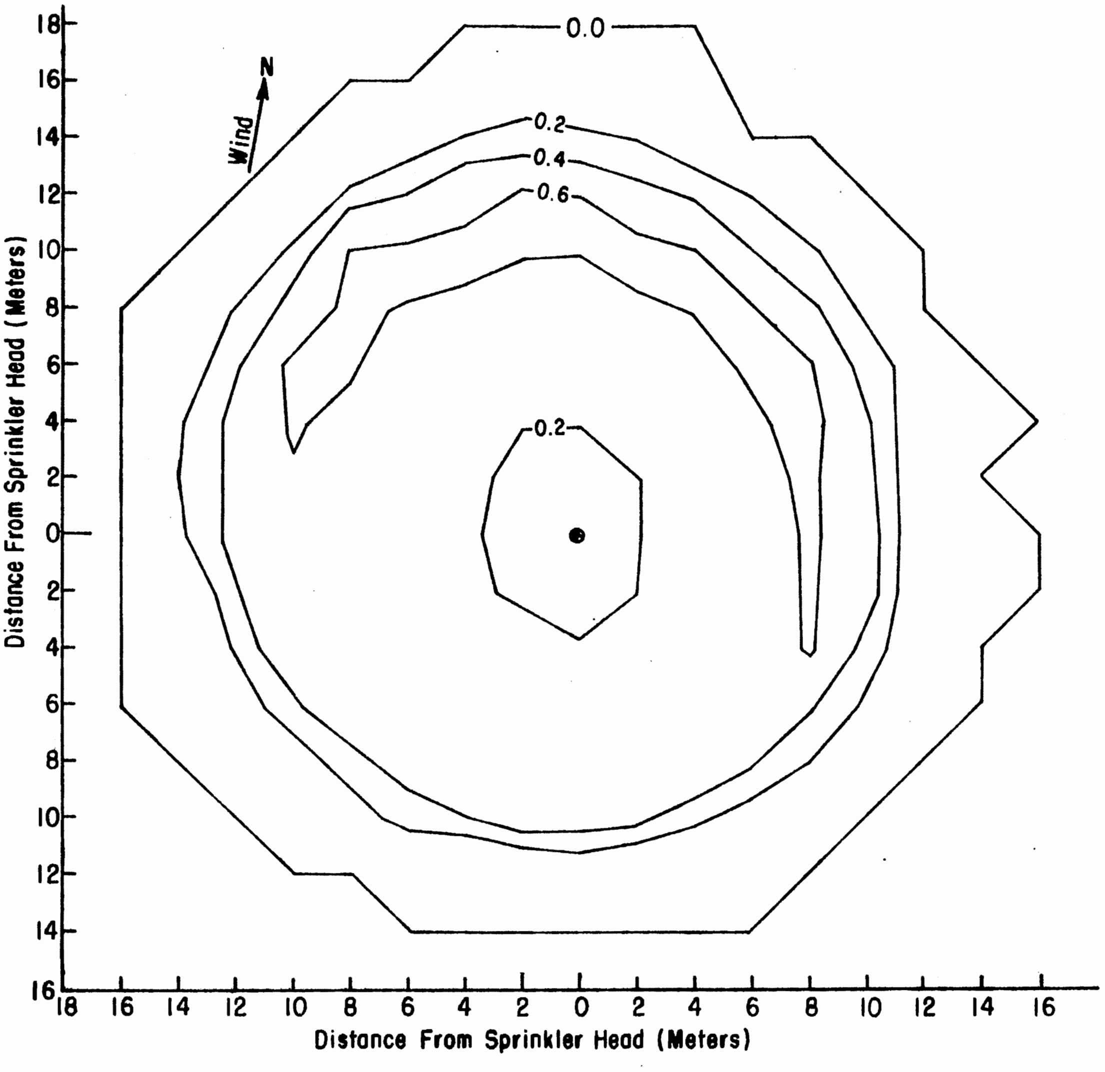
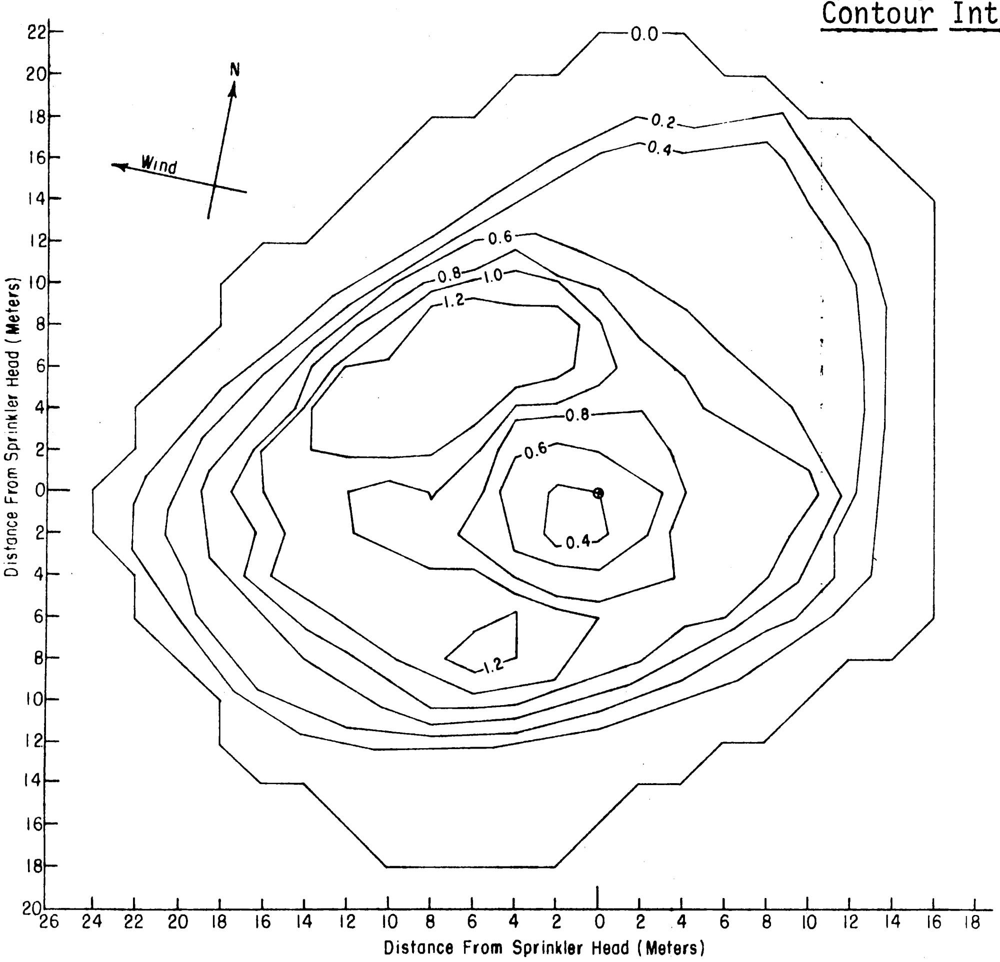


Figure 19. Contours of the Spray Distribution Depths from the 6° Full Circle Sprinkler at Low Wind Speed



<u>Type</u> - 6° FCS
<u>Size</u> - 0.635 cm dia
<u>Pressure</u> - 553 kilopascals
<u>Wind Speed</u> - 8.40 km/hr
<u>Contour Interval</u> - 0.2 cm

Figure 20. Contours of the Spray Distribution Depths from the 6° Full Circle Sprinkler at High Wind Speed

Average Application Rate

Application rates for spacings which would give uniformities of 80 or above for seven overlapped patterns were determined by meshing seven identical one-dimensional arrays of simulated application rates, SA(J), in a manner similar to that of meshing of the arrays of accumulated depths, AD(J), as described before. SA(J) represents an array of application rates which would be obtained from a continuously moving pattern and was generated in the following way.

Accumulated depths at column J of the array AD(J), which was already generated, were caught by the time the pattern AR (I, J) took to pass completely over the imaginary row of cans placed ahead of it. This time would be given by the following relationship:

$$T\ (J) = \frac{L}{PV} \qquad [9]$$

where

T(J) = Time taken by the moving pattern AR(I, J) for a complete passage over the imaginary row of cans in hours

L = Distance between two extreme points in column J which was wet in meters

PV = Velocity of pattern movement in meters per hour

SA(J) was then determined by using the equation given below:

$$SA(J) = \frac{AD(J)}{T(J)} \qquad [10]$$

where

SA(J) = Simulated application rates in column J in cm/hr

Mean application rate for the seven combined patterns corresponding to each sprinkler spacing which yielded uniformities of 80 or above was computed by taking the mean of the application rates from the center array after the patterns were meshed together. An average application rate for all the above spacings were computed by averaging the above means from the three test repetitions. Average application rates for all the sprinklers and the spray nozzle tested were determined for each of the four pressures and are presented in Table VII.

Effect of Pressure on Average Application Rate

A plot of the average application rate versus operating pressure for each of the sprinklers and the spray nozzle is shown in Figure 21. Within the range of the recommended spacing, the average application rates were found to range from 3.49 to 5.14 cm/hr, from 0.30 to 0.50 cm/hr, and from 0.20 to 0.69 cm/hr for the FJSN, 26° FCS, and 6° FCS, respectively, for the four pressures.

Effect of Reduced Pressure on Energy Savings

This study established that a center-pivot sprinkler irrigation system could be operated at low pressures without materially affecting its uniformity and pattern area and with less evaporation loss. Operating a system at reduced pressure would mean great savings in energy consumption as well as operating cost, provided that the recommended sprinkler spacing is maintained.

For example, if a system is operated at the reduced pressure of 207 kilopascals instead of 552 kilopascals, the irrigation pump would need a reduced pressure head. The reduction in pressure head would

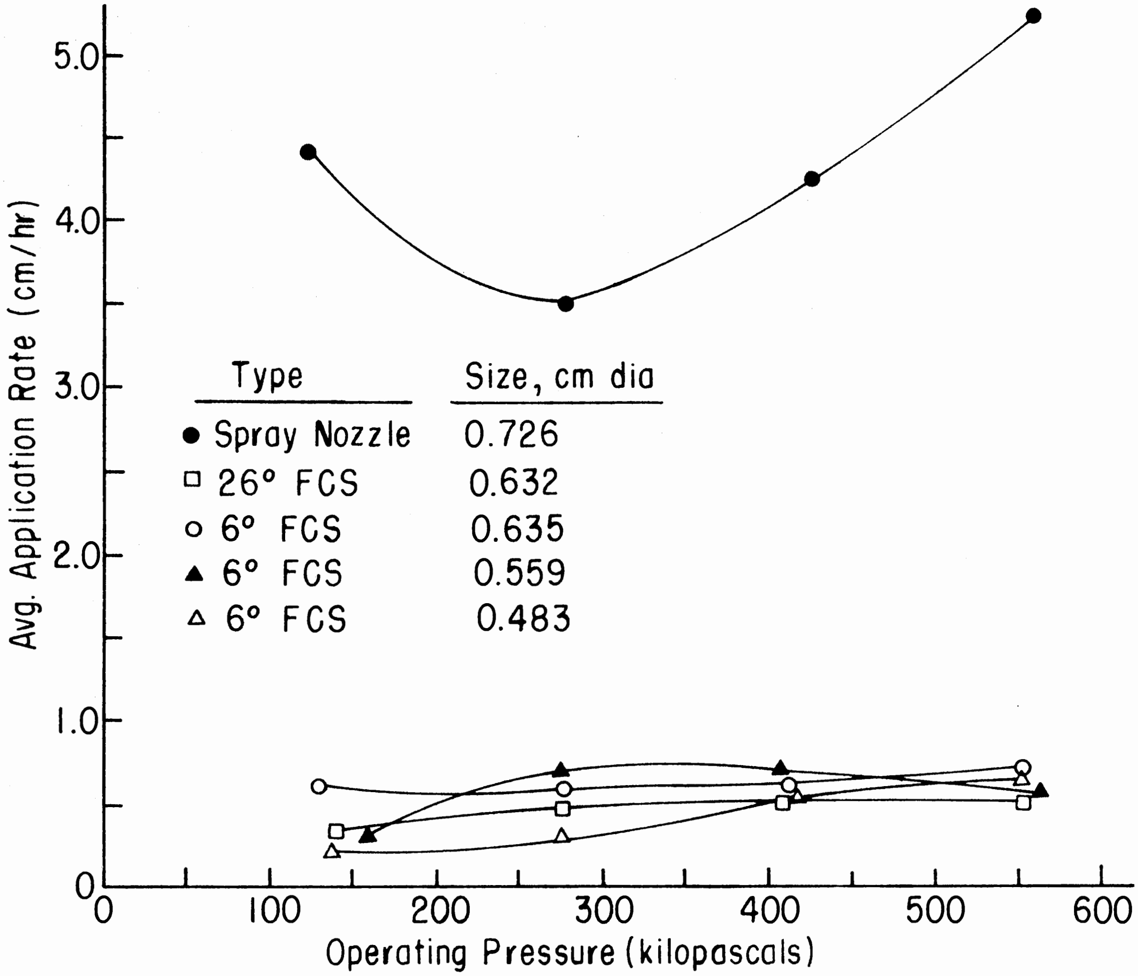


Figure 21. Average Application Rate Versus Operating Pressure for the Sprinklers and the Spray Nozzle

be 345 kilopascals or 35 meters of water. Assuming a 70 percent efficient pump and using nomographs presented by Petersen (20), energy savings per unit volume of water applied would be 1335 kilowatt-hours per hectare-meter. And money saved per unit volume of water applied would be $40.00 per hectare-meter assuming a total power cost per unit of energy of three cents per kilowatt-hour.

Thus operating the sprinkler system at a reduced pressure of 207 kilopascals following the recommended sprinkler spacing would mean satisfactory sprinkler performance with much lower operating cost, energy consumption, and evaporation loss.

Effect of Trajectory Angle on Pattern Wetted Diameter, Uniformity, and Evaporation Loss

Two types of full circle sprinklers, one having a 26° trajectory angle, and the other 6°, were tested in this study. Based on three repetitions and stationary distribution patterns, results obtained from analyses are summarized in Table VIII which indicate that the low trajectory sprinkler had uniformities comparable to those of the high trajectory sprinkler but it had about 24 percent less evaporation loss and about seven percent less wetted diameter on the average for the four pressures.

TABLE VIII

COMPARISON OF WETTED DIAMETER, UNIFORMITY, AND EVAPORATION LOSS OF 6° FCS AND 26° FCS

Type	Nozzle Diameter (cm)	Pressure (Kilopascals)	Relative Humidity (%)	Wind Speed (km/hr)	Wetted Diameter (Meters)	Uniformity (%)	Evaporation (%)
6° FCS	0.635	128	38	9.84	24.42	69	32
		280	38	7.07	31.29	63	33
		412	39	12.45	30.82	53	35
		552	31	13.48	33.57	48	38
26° FCS	0.632	140	51	12.82	29.01	69	46
		276	46	12.24	31.76	55	44
		410	44	11.70	32.83	52	45
		554	36	10.02	35.82	49	47

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

Tests were conducted on a single stationary sprinkler head with two different types of full circle sprinklers and a spray nozzle to evaluate the performances of a center-pivot sprinkler system at reduced operating pressure. The 6° trajectory full circle sprinkler was tested with three different nozzle sizes while the 26° trajectory full circle sprinkler and the spray nozzle were tested each with only one size. Every size of the sprinklers and the spray nozzle was tested at four pressure levels, each level being repeated three times.

From the stationary distribution tests, evaporation loss for the sprinklers and the spray nozzle was determined for every test repetition. Evaporation loss was considered to be the combined loss of spray evaporation and drift. It was defined as the loss that occurred between the nozzle and the ground surface. Loss from catch-cans was considered negligible as reported by Frost and Schwalen (12) and no correction was made for it.

Average evaporation loss was found to be 22 percent for the spray nozzle, 46 percent for the 26° trajectory full circle sprinkler, and 29 percent for the 6° trajectory full circle sprinklers. It was also observed that pressures of 134, 278, 415 and 556 kilopascals resulted in evaporation losses of 29, 29, 31, and 35 percent, respectively. These results indicated that at pressures between 134 and 278 kilopascals, evaporation loss was the same but at pressures higher than 278 kilopascals it increased slowly.

Attempts were made to determine the relative influence of nozzle type and size, operating pressure, relative humidity, and wind speed on evaporation. It was found that relative humidity probably had the greatest effect on evaporation. The nozzle type and size also had a significant effect while pressure had comparatively little. Effects of wind on evaporation could not be determined due to the lack of data at wide variations of wind speeds.

Effect of wind on the distribution pattern was observed. Contours of depths of applications were used to demonstrate this phenomenon. It was observed that at higher application rates, the distortion was less.

The distribution from the stationary test was used to determine the uniformity of application of a center-pivot sprinkler system. The stationary pattern was simulated to a continuously moving one and depths collected by an imaginary row of cans placed ahead of the continuously moving pattern were determined for a complete passage of the pattern. These depths were meshed together with the depths obtained from six other identical patterns. Meshing was done by unit increment, each increment representing a spacing between sprinklers. Christiansen's uniformity of application equation was used to determine the uniformity coefficient for the combined depths after every increment of meshing, when the spacing between sprinklers became equal to or less than the pattern wetted diameter.

From the results of the meshed patterns, plots of the uniformity coefficient versus sprinkler spacing indicated that high uniformities can be achieved from any of the four pressures. After reviewing the reports of Jones (15), Heermann and Hein (14), Pair (19), and Petersen (20), an acceptable uniformity was selected at 80 or above. Using this criterion, a recommendation was made for sprinkler spacings for different sprinklers and the spray nozzle at different pressures as shown in Table VII. Average application rates and uniformities corresponding to the recommended spacings were also determined and are shown in Table VII. It was found that within the range of the recommended spacings and for pressures between 134 and 556 kilopascals, the uniformities ranged from 83 to 93, while average application rate varied from 0.20 to 5.14 cm/hr, among the different sprinklers and the spray nozzle tested.

From the point of view of uniformity (Table VII), wetted diameter (Figure 14), and evaporation loss (Table I), this study established that center-pivot sprinkler systems can be operated at reduced pressures below 278 kilopascals without materially affecting its performance. A reduced operating pressure would save energy and pumping cost which was demonstrated by an example.

A comparison was made between the 6° trajectory full circle sprinkler and the 26° trajectory full circle sprinkler and it was observed that the 6° trajectory full circle sprinkler had uniformities comparable to the 26° trajectory full circle sprinkler. However, the 6° trajectory full circle sprinkler indicated about 24 percent less evaporation loss and about seven percent less wetted diameter on the average of the four pressures.

Conclusions

1. Average evaporation losses for each nozzle and sprinkler ranged from 15 to 35 percent for FJSN, from 40 to 52 percent for 26° FCS, and from eight to 41 percent for 6° FCS, for pressures between 134 and 556 kilopascals.
2. Overall evaporation loss was 22 percent for the spray nozzle, 46 percent for the 26° trajectory full circle sprinkler, and 29 percent for the 6° trajectory full circle sprinklers.
3. For pressures between 134 and 278 kilopascals, evaporation loss remained the same but at pressures above 278 kilopascals, evaporation loss increased slowly.
4. Relative humidity and nozzle type and size had the greatest effect on evaporation loss while operating pressure had comparatively little effect.
5. Effect of wind speed on evaporation loss could not be determined due to the lack of variation in wind speeds.
6. The only effect of wind on distribution patterns was observed in distorting the pattern. The higher the application rate, the less was the degree of distortion.
7. Within the range of the recommended sprinkler spacing, uniformities and application rates for the seven combined patterns ranged from 83 to 93 and from 0.20 to 5.14 cm/hr, respectively, for pressure between 134 and 556 kilopascals.
8. A center-pivot sprinkler irrigation system can be operated at reduced pressures, between 134 and 278 kilopascals, resulting in satisfactory uniformity and less evaporation loss, provided the recommended sprinkler spacing is followed.

9. Comparison between the 6° trajectory full circle sprinkler and the 26° trajectory full circle sprinkler showed that the 6° trajectory full circle sprinkler had uniformities comparable to the 26° trajectory full circle sprinkler. However, it had about 24 percent less evaporation loss and about seven percent less wetted diameter.

Suggestions for Future Research

1. Perform extensive tests at shorter pressure intervals between pressures of 134 and 278 kilopascals to decide reduced operating pressure more precisely using a single sprinkler head.
2. Determine effect of relative humidity, wind speed and direction, temperature, operating pressure and nozzle size on evaporation loss by taking enough replications with different size spray nozzles and full circle sprinklers.
3. Determine effect of wind speed, wind direction, nozzle size, trajectory angle, and height of the sprinkler nozzles on sprinkler spacing.
4. Determine uniformity and evaporation loss at reduced pressure on a commercial center-pivot sprinkler system following the recommended spacings.
5. Test different size spray nozzles and full circle sprinklers with a single sprinkler head at a wide range of relative humidity, wind speed, and temperature, preferably at controlled levels.
6. Perform extensive test with different sizes of 6° trajectory full circle sprinklers to evaluate its evaporation loss, uniformity, and application rate.

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APPENDIXES

APPENDIX A

DISTRIBUTION OF SPRINKLER SPRAY

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                                  VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  SPRAY NOZZLE                         NOZZLE SIZE (CM OF DIA) : 0.726                      TEST SERIAL NO:    1
TEST NO:    1     REPLICATION NO:    1     TEST DATE:JUNE    9     OPERATING PRESSURE (KPASCALS):127.40 TEST DURATION(MINT):  24.

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                                   VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  SPRAY NOZZLE                          NOZZLE SIZE (CM OF DIA) : 0.726                 TEST SERIAL NO:   3
TEST NO:   1     REPLICATION NO:   3     TEST DATE:JUNE   9     OPERATING PRESSURE (KPASCALS):122.80 TEST DURATION(MINT):  24.

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    0    0    0    0    0   41  330  405  190  100   61   31   19   15    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0   23  155  210  195  120   62   41   28   13    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   77  175  180  120   95   75   41   22    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   45  190  235  200  110   80   85   47    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   10  115  195  265  195  185  130   79    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0  130  220  250  210  195  100    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   38   80  220  160  180  160   14    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   33   48   59   80   10    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  SPRAY NOZZLE                          NOZZLE SIZE (CM OF DIA) : 0.726                 TEST SERIAL NO:   4
TEST NO:   2     REPLICATION NO:   1     TEST DATE:JUNE  16     OPERATING PRESSURE (KPASCALS):265.60 TEST DURATION(MINT):  24.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    1    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    4    7   10    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    2   10   19   13   15   11    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   10   23   34   21   21   13   18    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    8   30   52   58   40   27   36   27   17    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   24   95  100   85   60   60   55   53   39   13    0    0    0    0    0    0    0    0    0
    0    0    0    0    0   17  105  175  150  105   80   79   75   83   85   32    0    0    0    0    0    0    0    0    0
    0    0    0    0    0  135  260  260  285  145  110  120  175  145  155  100   21    0    0    0    0    0    0    0    0
    0    0    0    0    8  140  190  210  205  190  165  165  180  195  220  205   95    0    0    0    0    0    0    0    0
    0    0    0    0    0   15   80  165  185  210  215  200  220  205  190  190  115    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   27  110  160  190  210  215  180  105   65   50    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    5   35   70   83   80   86   25    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

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                         VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  SPRAY NOZZLE                         NOZZLE SIZE (CM OF DIA) : 0.726                  TEST SERIAL NO:   5
TEST NO:   2     REPLICATION NO:   2     TEST DATE:JUNE  16     OPERATING PRESSURE (KPASCALS):283.10 TEST DURATION(MINT):  24.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    7   12    6    7    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    6   16   18   17   15   15    8    2    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   12   25   26   25   26   17   17    8    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    5   26   32   46   39   38   38   23   14    4    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   21   52   75   77   61   55   61   45   21    7    0    0    0    0    0    0    0    0    0
    0    0    0    0    0   15   55  100  120  110   85   75   80   80   75   27    2    0    0    0    0    0    0    0    0
    0    0    0    0    4   42  165  210  170  130  125  110  105  125  105   56   10    0    0    0    0    0    0    0    0
    0    0    0    0   10  130  225  260  205  175  130  130  160  165  170  140   48    2    0    0    0    0    0    0    0
    0    0    0    0   15  100  125  205  195  195  170  180  208  192  195  190  110    9    0    0    0    0    0    0    0
    0    0    0    0    2   21   60   77  120  175  210  210  215  195  160  135   95   20    0    0    0    0    0    0    0
    0    0    0    0    0    0    5   24   70  100  140  155  155  140   85   52   30   15    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    1   10   30   45   55   58   50   18    5    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    1    5    2    3    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  SPRAY NOZZLE                         NOZZLE SIZE (CM OF DIA) : 0.726                  TEST SERIAL NO:   6
TEST NO:   2     REPLICATION NO:   3     TEST DATE:JUNE  22     OPERATING PRESSURE (KPASCALS):282.10 TEST DURATION(MINT):  24.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    1    1    0    2    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    1    3    0    2    1    1    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    2    4   10    8    5    8    1    2    1    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    3    4    8   10   10    8   10    7    5    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    3   11   14   20   17   17   14   11    5    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    4    7   17   20   22   17   25   18   12    4    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    1   10   20   38   40   38   39   34   30   19   10    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    1   17   31   53   52   45   50   38   30   35   18    4    0    0    0    0    0    0    0    0    0
    0    0    0    0    1   31   75   68   94   44   70   38   73   50   35   10    0    0    0    0    0    0    0    0    0
    0    0    0    0    9   37  135  140  115   80   99   79   93   93   56   22    0    0    0    0    0    0    0    0    0
    0    0    0    0   26  125  175  180  150  100  115  130  130  115   90   40    6    0    0    0    0    0    0    0    0
    0    0    0    0   35  180  200  160  165  150  120  145  155  140  125   70   18    0    0    0    0    0    0    0    0
    0    0    0    0   16   95  125  130  145  155  140  150  145  135  120   70   20    0    0    0    0    0    0    0    0
    0    0    0    0    0   17   50   76  100  115  130  125  125   90   60   45   10    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   14   45   66   80   78   77   32   16    5    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   20   18   23   13    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
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                              VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  SPRAY NOZZLE                            NOZZLE SIZE (CM OF DIA) : 0.726                      TEST SERIAL NO:   7
TEST NO:   3     REPLICATION NO:   1     TEST DATE:JUNE  26     OPERATING PRESSURE (KPASCALS):425.90 TEST DURATION(MINT):  24.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    4    7    8    8    5    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    9   15   18   15   11    5    3    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    5   12   17   15   25   28   15   10    7    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    8   19   27   30   40   42   36   21   13    4    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    8   25   51   55   37   44   40   40   24   13    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    1   20   41   71   73   74   60   68   65   33   19    4    0    0    0    0    0    0    0    0
    0    0    0    0    0   12   55  100  140   95  105   90   95  115   90   48    7    0    0    0    0    0    0    0    0
    0    0    0    0    0   32  130  190  205  175  150  150  105  140  145   91   32    0    0    0    0    0    0    0    0
    0    0    0    0    0   71  195  265  250  215  150  180   90  185  205  150   80    5    0    0    0    0    0    0    0
    0    0    0    0    0   69  195  290  285  235  200  190  185  180  210  190  125   24    0    0    0    0    0    0    0
    0    0    0    0    0   20   89  150  200  215  200  240  225  205  175  200  165   55    0    0    0    0    0    0    0
    0    0    0    0    0    0   13   50  125  160  230  210  210  200  135  130  145   70    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   33   72  125  145  150  140   90   71   41   18    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   11   32   65   56   66   21    8    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  SPRAY NOZZLE                            NOZZLE SIZE (CM OF DIA) : 0.726                      TEST SERIAL NO:   8
TEST NO:   3     REPLICATION NO:   2     TEST DATE:JUNE  26     OPERATING PRESSURE (KPASCALS):429.60 TEST DURATION(MINT):  24.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    1    3    3    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    3    4   10   10    8    9    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   10   19   24   20   17   13   10    3    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    2    3   14   22   28   30   15   28   13    8    1    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    4   13   30   35   47   47   33   29   21    9    1    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    8   18   64   75   47   55   57   45   40   23    3    0    0    0    0    0    0    0    0
    0    0    0    0    0    1   15   48  115  110   75   75   80   80   68   32   10    0    0    0    0    0    0    0    0
    0    0    0    0    0    7   45  103  160  125  120   70  105  120   90   61   18    0    0    0    0    0    0    0    0
    0    0    0    0    0   31  145  205  230  150  130   90  100  150  140  110   41    0    0    0    0    0    0    0    0
    0    0    0    0    3   74  255  275  225  200  155  180  195  205  245  165   75   10    0    0    0    0    0    0    0
    0    0    0    0   12  100  215  255  230  210  200  210  200  235  235  215  115   17    0    0    0    0    0    0    0
    0    0    0    0    0   25   65  125  180  205  225  230  210  210  170  185  120   24    0    0    0    0    0    0    0
    0    0    0    0    0    0   10   43  110  150  195  205  200  185  115   80   58   15    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   14   45   90  106  100  110   34   15    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    3    6   14   11   13    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
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                         VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  SPRAY NOZZLE                     NOZZLE SIZE (CM OF DIA) : 0.726                 TEST SERIAL NO:   9
TEST NO:   3     REPLICATION NO:   3     TEST DATE:JUNE  26     OPERATING PRESSURE (KPASCALS):429.60 TEST DURATION(MINT):  24.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    1    3    1    1    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    5    8    8    8    8    5    4    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    5    6    8   11   16   11    7    8    5    2    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    6   12   18   21   30   30   12   16   12    4    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    7   10   18   43   65   31   37   26   27   21   12    2    0    0    0    0    0    0    0    0
    0    0    0    0    0   11   21   35   65   78   52   60   60   45   36   16    8    0    0    0    0    0    0    0    0
    0    0    0    0    0   15   48   75  135  125  105   80   75   78   60   41   13    0    0    0    0    0    0    0    0
    0    0    0    0   28   62  130  210  210  155  130  115  115  130  110   65   31    3    0    0    0    0    0    0    0
    0    0    0    0   28  105  235  280  240  195  155  185  195  185  185  130   60   11    0    0    0    0    0    0    0
    0    0    0    0   32  170  270  280  240  205  205  210  215  236  209  195  105   22    0    0    0    0    0    0    0
    0    0    0    0    9   83  125  170  225  230  230  240  215  225  180  165  115   40    0    0    0    0    0    0    0
    0    0    0    0    0    0   60   90  150  190  215  225  215  190  136   95   68   35    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   20   40  100  125  150  140  125   66   25    7    8    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   26   30   35   28   23    5    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  SPRAY NOZZLE                     NOZZLE SIZE (CM OF DIA) : 0.726                 TEST SERIAL NO:  10
TEST NO:   4     REPLICATION NO:   1     TEST DATE:JULY   2     OPERATING PRESSURE (KPASCALS):563.10 TEST DURATION(MINT):  24.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2    9    7   10   19   25   21   17   10    2    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    8   16   15   29   42   34   35   20   20    8    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   10   17   25   38   53   64   90   90   71   47    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   15   15   31   45   81  125  140  245  250  165    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    1   15   22   28   64   92  150  155  345  425  265    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   15   22   60   71  105  170  235  300  310  185    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   15   53   62   94  125  125  205  330  325  180    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    7   49   82  140  160  205  250  310  320  135    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    4   45  115  165  225  250  265  335  335  135    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   24  150  215  235  265  265  290  230   55    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   10  110  190  220  215  205  185  100   14    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0   61  150  170  145  135   95   35    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0   22   75   84   66   50   21    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0   23   30   22    6    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    2    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

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                                   VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  SPRAY NOZZLE                        NOZZLE SIZE (CM OF DIA) : 0.726                   TEST SERIAL NO:  11
TEST NO:   4     REPLICATION NO:   2     TEST DATE:JULY   2     OPERATING PRESSURE (KPASCALS):551.20 TEST DURATION(MIN):  24.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0   10   15   11    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    5   11    7   10   25   18   30   40   30   20    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    5    8   12   18   30   51   55   61   51   65   38    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    4   11   18   29   51   70   94  113  130  145  105   54    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   10   17   38   60   96  140  130  260  290  195  100    2    0    0    0    0
    0    0    0    0    0    0    0    0    2   12   23   28   65   98  150  160  285  340  255   95    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   12   18   53   73  105  175  220  285  270  190   40    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   18   42   50   98  155  155  135  295  290  180   40    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   11   38   68   25  155  180  225  265  285  135   11    0    0    0    0    0
    0    0    0    0    0    0    0    0    1   11   40   78  125  185  170  225  265  270  110    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    5   22   92  155  175  205  195  205  175   45    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    1   11   64  130  175  155  140  130   80    8    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    5   38   90  115  100   85   62   24    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0   11   41   51   39   30   13    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    2    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  SPRAY NOZZLE                        NOZZLE SIZE (CM OF DIA) : 0.726                   TEST SERIAL NO:  12
TEST NO:   4     REPLICATION NO:   3     TEST DATE:JULY   2     OPERATING PRESSURE (KPASCALS):568.70 TEST DURATION(MIN):  24.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0   16   22   12   15   25   12    1    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   10    7   18   18   40   20   33   25   14    6    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    9   18   28   26   48   60   45   54   32   24   10    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   10   27   35   53   85   88  125  150  130    8    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   10   35   43   64   90  130  175  195  310  225   90   15    0    0    0    0    0
    0    0    0    0    0    0    0    0   11   40   48   48  103  145  235  215  370  270  125   12    0    0    0    0    0
    0    0    0    0    0    0    0    0    8   28   38   80  110  150  255  275  310  190   72    6    0    0    0    0    0
    0    0    0    0    0    0    0    0    5   36   94   95  140  185  235  295  320  205   60    5    0    0    0    0    0
    0    0    0    0    0    0    0    0    8   25   85  125  190  190  225  265  280  200   33    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    3   23   90  160  210  225  230  260  250  160   20    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   13   58  190  220  200  210  190  170   72    4    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    7   26  140  175  170  130  115   75   20    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    1   14   73  115   95   66   53   20    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    2   28   47   33   20   13    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    6   11   15   10    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
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                         VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK.(ML)

SPRINKLER TYPE:  26 DEGREE FULL CIRCLE SPRINKLER       NOZZLE SIZE (CM OF DIA) : 0.634                TEST SERIAL NO:  13
TEST NO:   5      REPLICATION NO:   1      TEST DATE:JULY   9      OPERATING PRESSURE (KPASCALS):154.60 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    8   24   27   20   23   23    7    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    9   28   46   55   60   72   69   40   38   23    1    0    0    0    0    0    0    0
    0    0    0    0    0    0    2   20   22   56   42   50   46   49   48   46   42   18    7    0    0    0    0    0    0
    0    0    0    0    0    0    7   32   34   42   31   37   31   31   44   55   36   31   15    0    0    0    0    0    0
    0    0    0    0    0    0   13   40   52   44   39   31   21   26   25   37   35   47   14    0    0    0    0    0    0
    0    0    0    0    0    0   16   55   50   44   40   52   48   50   32   50   50   44   27    0    0    0    0    0    0
    0    0    0    0    0    0   25   40   45   58   64   55   40   53   56   53   61   44   34    0    0    0    0    0    0
    0    0    0    0    0    0   21   41   56   76   59   55   44   53   51   78   58   58   28    0    0    0    0    0    0
    0    0    0    0    0    0   25   35   53   70   63   58   51   59   55   81   58   45   22    0    0    0    0    0    0
    0    0    0    0    0    0    0   28   45   63   73   47   50   78   70   79   45   32   16    0    0    0    0    0    0
    0    0    0    0    0    0    0   13   32   53   50   49   52   60   55   60   30   16    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    3   10   20   30   32   37   34   25   21    8    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    4   13   12   15   15    8    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    4    1    0    1    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  26 DEGREE FULL CIRCLE SPRINKLER       NOZZLE SIZE (CM OF DIA) : 0.634                TEST SERIAL NO:  14
TEST NO:   5      REPLICATION NO:   2      TEST DATE:JULY  15      OPERATING PRESSURE (KPASCALS):120.50 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    5   18   28   43   37   18    8    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   16   48   78   76   82   88   81   40    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   17   60   75   53   43   38   40   52   75   45    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   10   60   75   55   35   22   11   10   20   58   68   22    0    0    0    0    0
    0    0    0    0    0    0    0    0   31   58   58   45   43   38   21   16   18   32   55   39    0    0    0    0    0
    0    0    0    0    0    0    0    0   40   65   68   64   55   38   68   21   22   41   57   32    0    0    0    0    0
    0    0    0    0    0    0    0    0   30   66   90   58   46   39   48   62   38   55   67   40    0    0    0    0    0
    0    0    0    0    0    0    0    0   21   54   80   74   48   45   42   65   51   58   68   25    0    0    0    0    0
    0    0    0    0    0    0    0    0    9   44   75   56   60   60   72   85   75   76   50   14    0    0    0    0    0
    0    0    0    0    0    0    0    0    5   23   43   53   58   76   84   80   79   54    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    8   21   36   43   68   75   72   48   25    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   10   10   29   29   38   32    8    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
                         VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  26 DEGREE FULL CIRCLE SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.634               TEST SERIAL NO:  15
TEST NO:   5     REPLICATION NO:   3     TEST DATE:JULY  23     OPERATING PRESSURE (KPASCALS):146.30 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    1    3    6    3    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   23   48   48   52   70   42   37    2    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   16   45   44   52   53   57   59   55   38   12    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   15   50   45   40   33   20   25   36   59   55   45    6    0    0    0    0    0    0
    0    0    0    0    0    0    0   40   45   50   35   20   12   15   15   31   46   58    5    0    0    0    0    0    0
    0    0    0    0    0    0   15   55   55   45   30   28   28   26   18   28   43   68   31    1    0    0    0    0    0
    0    0    0    0    0    0   15   56   65   50   50   40   30   36   44   30   51   45   41    0    0    0    0    0    0
    0    0    0    0    0    0   24   65   50   49   44   28   30   37   36   58   53   65   40   12    0    0    0    0    0
    0    0    0    0    0    0   15   45   58   59   50   32   32   41   41   60   50   53   48    1    0    0    0    0    0
    0    0    0    0    0    0   13   35   65   60   47   35   39   52   57   71   58   60   29    0    0    0    0    0    0
    0    0    0    0    0    0    3   25   39   46   60   40   38   59   59   63   50   29    4    0    0    0    0    0    0
    0    0    0    0    0    0    0    8   24   29   41   40   40   47   59   51   40   15    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   11   18   20   24   25   34   37   27   10    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   11   12   15   18   18   12    1    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    3    6    4    4    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  26 DEGREE FULL CIRCLE SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.634               TEST SERIAL NO:  16
TEST NO:   6     REPLICATION NO:   1     TEST DATE: AUG   3     OPERATING PRESSURE (KPASCALS):277.50 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    5    8   14    0    1    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   16   31   48   46   45   35   18    6    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   40   40   48   65   65   58   61   38   31    9    3    0    0    0    0    0    0    0    0
    0    0    0    0    0   24   40   58   69   62   58   70   66   65   48   22   10    0    0    0    0    0    0    0    0
    0    0    0    0    3   35   47   71   59   55   51   69   70   66   67   36   24    6    0    0    0    0    0    0    0
    0    0    0    2   24   53   58   70   63   49   42   59   70   70   61   60   37   12    0    0    0    0    0    0    0
    0    0    0    3   31   56   64   65   52   52   56   60   68   71   81   63   53   21    0    0    0    0    0    0    0
    0    0    0    2   22   53   72   71   55   66   60   50   60   64   78   70   58   20    0    0    0    0    0    0    0
    0    0    0    2   22   44   63   58   64   66   40   37   50   56   73   61   58   25    2    0    0    0    0    0    0
    0    0    0    2   23   50   61   68   72   70   49   40   54   54   70   55   46   23    5    0    0    0    0    0    0
    0    0    0    1   18   38   61   85   85   81   60   50   49   56   60   53   42   20    0    0    0    0    0    0    0
    0    0    0    1   12   25   51   85   87   78   74   79   71   58   51   40   36    3    0    0    0    0    0    0    0
    0    0    0    0    6    8   29   57   72   70   76   62   66   52   36   36   13    0    0    0    0    0    0    0    0
    0    0    0    0    3    4    7   23   42   48   53   55   45   35   23   10    1    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    1    7   11   21   24   20   19   14    8    1    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    1    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
                          VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  26 DEGREE FULL CIRCLE SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.634          ,     TEST SERIAL NO:  17
TEST NO:   6      REPLICATION NO:   2      TEST DATE: AUG   5      OPERATING PRESSURE (KPASCALS):273.40 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    8   15   30   21    7    1    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    5   36   40   68   65   67   40   22    1    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   10   35   61   63   78   72   82   70   53   18    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    1   37   50   92   60   65   58   71   65   71   46   20    0    0    0    0    0    0
    0    0    0    0    0    0    0   23   53   79   87   61   43   41   50   55   70   55   38    1    0    0    0    0    0
    0    0    0    0    0    0    1   27   78   83   79   55   41   33   32   46   71   61   49   10    0    0    0    0    0
    0    0    0    0    0    0   13   52   91   84   89   58   63   45   58   61   73   73   53   21    0    0    0    0    0
    0    0    0    0    0    0   15   51   97  111   78   58   62   42   87   74   81   80   56   16    0    0    0    0    0
    0    0    0    0    0    0    6   50   95  130   95   48   49   52   84   99   94   75   41    6    0    0    0    0    0
    0    0    0    0    0    0    1   37   81   96   86   71   43   57   79   86   98   60   36    2    0    0    0    0    0
    0    0    0    0    0    0    0   14   64   85   87   66   63   77   92   91   89   64   24    0    0    0    0    0    0
    0    0    0    0    0    0    0    3   31   51   60   61   65   79   80   76   50   30    8    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    1   25   40   50   50   58   62   48   28    7    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    2   20   17   24   29   30   16   10    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    1    0    7    8    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  26 DEGREE FULL CIRCLE SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.634                 TEST SERIAL NO:  18
TEST NO:   6      REPLICATION NO:   3      TEST DATE: AUG   5      OPERATING PRESSURE (KPASCALS):278.50 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    2    6    5    5    1    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   12   22   37   46   25   40   13   15    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    1    6   38   53   66   75   68   75   46   35   10    1    0    0    0    0    0
    0    0    0    0    0    0    0    0   11   31   59   71   68   55   69   72   65   58   28    4    0    0    0    0    0
    0    0    0    0    0    0    0    1   32   60   80   69   80   61   71   54   67   62   55   14    0    0    0    0    0
    0    0    0    0    0    0    0   16   41   72   78   68   60   46   42   45   55   53   50   20    5    0    0    0    0
    0    0    0    0    0    0    0   11   55   71  100   85   59   45   36   40   73   63   55   34   11    0    0    0    0
    0    0    0    0    0    0    0   20   70   88   97   95   85   61   72   90   83   78   51   31    2    0    0    0    0
    0    0    0    0    0    0    0   19   62   86  108   92   84   45   85   83  124   90   68   32    1    0    0    0    0
    0    0    C    0    0    0    0   12   45   86   88   69   50   55   56  123  114   86   60   18    0    0    0    0    0
    0    0    0    0    0    0    0    1   29   66   74   73   52   69   81  112  107   64   36    8    0    0    0    0    0
    0    0    0    0    0    0    0    0   15   35   53   56   63   71   70   83   83   39   18    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2    9   26   31   40   58   55   48   30   17    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    2    8   18   19   20   15    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    1    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
                                   VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  26 DEGREE FULL CIRCLE SPRINKLER        NOZZLE SIZE (CM OF DIA) : 0.634                     TEST SERIAL NO:  19
TEST NO:   7     REPLICATION NO:   1     TEST DATE: AUG   7     OPERATING PRESSURE (KPASCALS):406.50 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    3    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    3   11   23   27   23    5    1    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    9   31   40   42   54   46   26   19    1    0    0    0    0    0    0    0    0    0    0    0
    0    0    0   10   20   55   69   77   83   78   87   59   42   30   11    0    0    0    0    0    0    0    0    0    0
    0    0    0   37   58   94  103  105  101  100  110   85   89   52   33   10    0    0    0    0    0    0    0    0    0
    0    0   26   50   69  116  113  120  107  119  125  118  100  100   55   26    1    0    0    0    0    0    0    0    0
    0    4   27   69   86   96  101  101   97  104  105  110  110   90   62   33    7    0    0    0    0    0    0    0    0
    0   15   41   78   81   94   89   85   75  101   95   95   92   75   65   45   20    0    0    0    0    0    0    0    0
    0   15   46   76   92   90   83   76   75   71   58   67   78   73   63   39   17    2    0    0    0    0    0    0    0
    0    9   40   76   85  109   94   80   84   93   69   47   60   68   59   43   18    2    0    0    0    0    0    0    0
    0    5   25   55   79  110   98   92  103  104   87   78   72   66   52   42   20    0    0    0    0    0    0    0    0
    0    0   12   48   70   90  106  130  103  102  105   99   80   62   50   31   13    0    0    0    0    0    0    0    0
    0    0    0   15   40   63   98  109  110  103  107   95   78   52   44   23    3    0    0    0    0    0    0    0    0
    0    0    0    0   10   36   58   77   78   93   80   75   55   30   17    5    0    0    0    0    0    0    0    0    0
    0    0    0    0    0   12   24   36   40   61   42   38   22   15    5    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    7   12   12   11   13    1    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  26 DEGREE FULL CIRCLE SPRINKLER        NOZZLE SIZE (CM OF DIA) : 0.634                     TEST SERIAL NO:  20
TEST NO:   7     REPLICATION NO:   2     TEST DATE: AUG   9     OPERATING PRESSURE (KPASCALS):415.30 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    3    9   15   13   10    1    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   14   26   43   62   67   61   47   20    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   22   45   64  101   93  118  110   82   60   32    4    0    0    0    0    0
    0    0    0    0    0    0    0    0   12   48   79   86  103  105  135   76  105   87   67   20    0    0    0    0    0
    0    0    0    0    0    0    0    1   46   68   93   91   98   82   86   66  110   95   83   47    5    0    0    0    0
    0    0    0    0    0    0    0   23   68  102  127  110   87   60   55   57   94   90   99   54    3    0    0    0    0
    0    0    0    0    0    0    0   31   87  124  129  110  111   61   66   60   87   85   82   48   16    0    0    0    0
    0    0    0    0    0    0    0   36   77  105  118  100   80   51   65   64   93   87   80   49   18    0    0    0    0
    0    0    0    0    0    0    0   29   74  118  105   58   58   48   73   87  121   94   93   54   23    0    0    0    0
    0    0    0    0    0    0    0   23   66   94   91   58   58   50   84   82  120   96   83   36    9    0    0    0    0
    0    0    0    0    0    0    0    9   44   71   63   50   66   73  102   92  100   98   62   29    2    0    0    0    0
    0    0    0    0    0    0    0    1   29   50   55   57   71   78   92   97   86   71   32   12    0    0    0    0    0
    0    0    0    0    0    0    0    0   15   34   41   51   65   65   79   70   55   32   10    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   16   25   36   40   42   47   36   18    5    1    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    2    3   15   18   16   15    4    1    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

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                                   VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  26 DEGREE FULL CIRCLE SPRINKLER        NOZZLE SIZE (CM OF DIA) : 0.634                  TEST SERIAL NO:  21
TEST NO:   7      REPLICATION NO:   3      TEST DATE: AUG   9      OPERATING PRESSURE (KPASCALS):407.90 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    2    7   12   12   23   12    2    1    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    2   16   32   42   56   63   60   37   16    1    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    2   24   40   80   74   82  100   71   79   55   21    0    0    0    0    0
    0    0    0    0    0    0    0    1    8   28   51   60  100  125  115   77   98   99   93   50   12    8    0    0    0
    0    0    0    0    0    0    0    5   22   44   74  101  100   96  105   86  120   98   99   77   48   17    0    0    0
    0    0    0    0    0    0    0   10   36   73   96  123   95  108   62   62  106   85  112   87   50   16    1    0    0
    0    0    0    0    0    0    0    7   37   62   95   98  120   75   71   72   87   86   85   80   48   21    1    0    0
    0    0    0    0    0    0    0   10   40   68   93  120   84   72   79   75   94   95   92   77   41   16    1    0    0
    0    0    0    0    0    0    0    9   40   72   92   80   71   58   83  104  105  106  110   83   55   14    0    0    0
    0    0    0    0    0    0    0   13   35   54   75   62   61   57   95   89  108   91   97   51   32    6    0    0    0
    0    0    0    0    0    0    0    3   17   37   48   60   65   65   88  100   92   99   67   34   18    4    0    0    0
    0    0    0    0    0    0    0    0   12   22   33   51   56   71   95  110   87   75   44   22    6    0    0    0    0
    0    0    0    0    0    0    0    0    3    6   19   28   40   56   72   71   51   33   15    2    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    6    8   15   29   34   26   19   10    7    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    2    4    7    8    2    1    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  26 DEGREE FULL CIRCLE SPRINKLER        NOZZLE SIZE (CM OF DIA) : 0.634                  TEST SERIAL NO:  22
TEST NO:   8      REPLICATION NO:   1      TEST DATE: AUG  11      OPERATING PRESSURE (KPASCALS):550.70 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    2    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    7    9   27   10    8   12    1    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    1   18   44   39   80   70   60   33   29    4    3    0    0    0
    0    0    0    0    0    0    0    0    0    0    4   27   66   94   96  142  100  150   80   63   20    9    0    0    0
    0    0    0    0    0    0    0    0    0    2   32   55  112  140  140  192  122  162  125   80   46   15    0    0    0
    0    0    0    0    0    0    0    0    0   18   58   95  125  165  188  115  130  140  157  146   80   33   18    0    0
    0    0    0    0    0    0    0    0    6   38   95  115  130  135  125  119   70  165  117  150   90   42   18    0    0
    0    0    0    0    0    0    0    0   12   40   90  109  126  121   82  115   93  142  168  135   83   30    8    0    0
    0    0    0    0    0    0    0    0   13   31   82  100  140  100   76  101   98  145  130  140   93   50   10    0    0
    0    0    0    0    0    0    0    0    6   45   89  103   90   67   95  100  130  127  100  105   58   32    0    0    0
    0    0    0    0    0    0    0    0    1   31   65   78   75   70   57  135  135  155  120   97   54   15    0    0    0
    0    0    0    0    0    0    0    0    0   18   50   74   43   60   52  120  110  125   95   71   29    1    0    0    0
    0    0    0    0    0    0    0    0    0   11   35   40   51   61   65  110   82   92   64   31    2    0    0    0    0
    0    0    0    0    0    0    0    0    0    2   20   26   34   33   54   65   43   36   15    1    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    8   10   16   15   31   19    4    1    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    2    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

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                                   VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK.(ML)

SPRINKLER TYPE:  26 DEGREE FULL CIRCLE SPRINKLER       NOZZLE SIZE (CM OF DIA) : 0.634                    TEST SERIAL NO:  23
TEST NO:   8     REPLICATION NO:   2     TEST DATE: AUG  11     OPERATING PRESSURE (KPASCALS):555.80 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    1    1    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    1    6   16   20   21   18   21   11    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    1   10   25   55   63   78   64   68   36   27   10    1    0    0    0    0    0
    0    0    0    0    0    0    0    1    9   24   52   98  130  147  135  135  107   58   35    9    0    0    0    0    0
    0    0    0    0    0    0    0   11   29   54   90  116  156  134  130  160  126  102   55   18    4    0    0    0    0
    0    0    0    0    0    0    1   17   52   87  118  125  145  132  145  100  125  115   87   42   12    0    0    0    0
    0    0    0    0    0    0    8   33   71   97  105  125  115  100  115  101  118  130   98   49   18    0    0    0    0
    0    0    0    0    0    0   13   38   86  125  130  107   86   85   70  110  122  115   87   63   28    1    0    0    0
    0    0    0    0    0    0   17   56   98  107  115  103   91   77   76   94  104  117   86   57   18    1    0    0    0
    0    0    0    0    0    0   14   51   83  110  110   80   79   62   98  102  125  115   79   43   17    0    0    0    0
    0    0    0    0    0    0   13   34   66   88   92   73   67   80   96  121  125  107   80   14    9    0    0    0    0
    0    0    0    0    0    0    6   23   53   79   84   70   51   75   80  104  100   87   60   26    2    0    0    0    0
    0    0    0    0    0    0    5   19   40   67   80   54   61   87   90   89   90   72   46   12    0    0    0    0    0
    0    0    0    0    0    0    3    8   22   48   49   51   51   69   61   69   53   45   15    1    0    0    0    0    0
    0    0    0    0    0    0    0    6   10   25   30   32   44   50   47   37   27   14    1    0    0    0    0    0    0
    0    0    0    0    0    0    0    2    5   14   14   12   25   21   24   16    4    1    1    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2    8    6    6   10    6    3    2    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  26 DEGREE FULL CIRCLE SPRINKLER       NOZZLE SIZE (CM OF DIA) : 0.634                    TEST SERIAL NO:  24
TEST NO:   8     REPLICATION NO:   3     TEST DATE: AUG  13     OPERATING PRESSURE (KPASCALS):554.40 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    2    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    3   10    8    9   10   14   15   12    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   17   12   29   26   37   33   34   38   30   23   10    0    0    0    0    0
    0    0    0    0    0    0    0    0   12   28   40   48   53   65   65   60   52   52   37   21   10    0    0    0    0
    0    0    0    0    0    0    0   10   28   45   56   74   68   72   78   78   72   68   55   41   22   10    0    0    0
    0    0    0    0    0    0    7   22   46   65   70   76   75   71   61   64   75   71   65   51   37   12    0    0    0
    0    0    0    0    0    1   15   40   57   66   62   66   59   51   50   58   68   71   68   61   50   30    3    0    0
    0    0    0    0    0    1   23   40   55   68   58   54   50   56   46   50   56   60   69   58   49   28    6    0    0
    0    0    0    0    0   10   26   38   55   49   51   54   42   50   45   51   56   62   65   65   52   38   14    0    0
    0    0    0    0    0   10   23   41   46   47   41   41   38   47   43   58   58   64   67   64   59   42   16    0    0
    0    0    0    0    0   14   30   42   45   46   38   43   42   53   52   67   63   75   79   71   54   33   16    0    0
    0    0    0    0    3   10   25   39   48   45   47   51   54   57   59   71   76   79   79   58   46   28   14    0    0
    0    0    0    0    0    7   22   42   45   46   54   53   60   68   61   66   72   85   65   47   35   19    8    0    0
    0    0    0    0    0    5   16   32   46   53   55   52   56   63   63   62   73   70   45   34   26   15    2    0    0
    0    0    0    0    0    0    9   20   40   49   48   54   58   63   63   57   62   45   34   24   19   12    2    0    0
    0    0    0    0    0    0    2   12   25   39   41   46   53   50   53   46   42   33   27   21   13    7    0    0    0
    0    0    0    0    0    0    0    3   10   22   25   29   32   37   39   28   21   19   17   12    7    3    0    0    0
    0    0    0    0    0    0    0    0    6   12   14   16   17   18   19   17   15   14   10    8    3    0    0    0    0
    0    0    0    0    0    0    0    0    0    2    3   10   10   12   11   11   12    9    3    1    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    3    3    4    4    3    3    2    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
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                                   VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.635                      TEST SERIAL NO:  25
TEST NO:   9     REPLICATION NO:   1     TEST DATE: AUG  20     OPERATING PRESSURE (KPASCALS):133.30 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   10   66   69   50    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    9   96  157  107  103  140   81   54    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    2  136  104   68   39   40   47   74  139   19    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   75  130   59   23   16   20   31   50  115   85    4    0    0    0    0    0    0    0
    0    0    0    0    0    0   16  101   90   36   16   12   19   21   30   82  103   45    0    0    0    0    0    0    0
    0    0    0    0    0    0   23   78   80   25   15   11   19   13   27   58  113   58    0    0    0    0    0    0    0
    0    0    0    0    0    0   18   90   88   30   13    8   16   15   30   63  118   62    0    0    0    0    0    0    0
    0    0    0    0    0    0    4   71  113   46   22    8    8   14   33   78  103   34    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   67  101   80   41   20   18   30   54  110   83    9    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    2   77  113   85   53   51   67   94   81   25    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    1   67   90  110  110   90   75   27    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    4   30   31   26    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.635                      TEST SERIAL NO:  26
TEST NO:   9     REPLICATION NO:   2     TEST DATE: AUG  20     OPERATING PRESSURE (KPASCALS):122.70 TEST DURATICN(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0   43   62   37    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   67  190  147  125  132  120   23    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0  112  142   66   40   38   57   90  151   29    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   32  134   86   23   21   20   28   51  112  110    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   67  123   65   23   16   17   19   33   95  146    3    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   65  113   48   25   14   16   18   32   81  161    4    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   47  116   66   32   10   13   21   42  100  144    3    0    0    0    0    0    0    0
    0    0    0    0    0    0    0  122  121   89   45   16   15   27   64  140   95    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   69  120   69   38   36   55   95  120   19    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    4   85  112   79   80   97   94   40    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   35   82   73   54   15    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

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                                   VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.635                   TEST SERIAL NO:  27
TEST NO:   9      REPLICATION NO:   3     TEST DATE: AUG  22     OPERATING PRESSURE (KPASCALS):244.90 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    4   92  130   95   14    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   45  154  130   94  103  154  145    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   56  141   95   31   18   15   41  176  157    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    4  144  117   38   22   14   14   15   62  114   35    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   29  150   92   29   12   13   15   16   44  136   50    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   35  143   69   24    8   11    9   20   45  132   74    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   26  138   71   22    6   11   15   28   61  161   49    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    5  123   89   30   12   13   22   49  102  160    7    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   63  110   56   30   32   50   94  144   54    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   11   76  107   80   85  115  130   58    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    5   43   94   78   64   20    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.635                   TEST SERIAL NO:  28
TEST NO:  10      REPLICATION NO:   1     TEST DATE: AUG  24     OPERATING PRESSURE (KPASCALS):280.10 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   19   36   50   31   17    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   19   58   81   97  110   72   88   41   13    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   18   92  135  102   86   91  105   96   93   70    4    0    0    0    0    0    0    0    0
    0    0    0    0    0    1   68  125  115   87   90   73   87  105  103  101   54    0    0    0    0    0    0    0    0
    0    0    0    0    0   28   95  124   94   65   58   47   63   72   99  110   75   20    0    0    0    0    0    0    0
    0    0    0    0    0   50  107  112   82   51   37   31   42   59   85  104  100   40    0    0    0    0    0    0    0
    0    0    0    0    2   50   87  102   73   45   23   18   31   41   69   99   95   83    1    0    0    0    0    0    0
    0    0    0    0    9   42   86   93   80   48   20   14   20   38   62   89   99   52    2    0    0    0    0    0    0
    0    0    0    0    1   32   74   95   93   83   32   18   18   32   58   87   91   36    2    0    0    0    0    0    0
    0    0    0    0    0   19   61   74   90   76   50   33   32   38   62   82   76   21    1    0    0    0    0    0    0
    0    0    0    0    0    4   29   82  100   93   81   64   58   64   75   80   61    2    0    0    0    0    0    0    0
    0    0    0    0    0    0    3   23   65  102  102   91   90   80   78   50   15    2    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    2   15   42   67   83   66   58   35   12    2    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    1    4   11   13   12    2    2    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
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                                  VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.635                     TEST SERIAL NO:  29
TEST NO:  10     REPLICATION NO:   2     TEST DATE: AUG  24     OPERATING PRESSURE (KPASCALS):280.60 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   13   17   19    8    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    1   20   39   58   59   51   40   24   10    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   39   74   85   90   95   96   90   61   35    5    0    0    0    0    0    0    0    0
    0    0    0    0    0    1   36   91  110   94  102   95   98  104  102   79   39    3    0    0    0    0    0    0    0
    0    0    0    0    0   12   80   95  103   92   81   77   72   81   92  101   79   28    0    0    0    0    0    0    0
    0    0    0    0    0   40  102  110   94   65   50   46   49   54   71   92  101   67    0    0    0    0    0    0    0
    0    0    0    0    2   55  112  101   74   50   36   24   31   35   53   75   97   79   12    0    0    0    0    0    0
    0    0    0    0    1   54  120   68   63   41   25   23   22   27   42   67   91   85   22    0    0    0    0    0    0
    0    0    0    0    3   50  102   91   69   45   29   19   20   25   43   68   93   77   17    0    0    0    0    0    0
    0    0    0    0    2   45  120  100   69   52   38   29   29   36   55   75   92   64    5    0    0    0    0    0    0
    0    0    0    0    0   22  102   92   90   71   64   52   54   61   71   88   87   38    0    0    0    0    0    0    0
    0    0    0    0    0    2   36   75   86   91   89   87   82   85   93   85   50    8    0    0    0    0    0    0    0
    0    0    0    0    0    0    7   37   62   92   92   93   91   90   75   40   12    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    1    5   24   39   58   52   58   41   20    5    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    5   12   17   12    2    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.635                     TEST SERIAL NO:  30
TEST NO:  10     REPLICATION NO:   3     TEST DATE: AUG  25     OPERATING PRESSURE (KPASCALS):280.10 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    2    6   14   16   20    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    8   22   81  115  118  130  110   64    1    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   10   49  101  107   91   76   87   90  103   84   15    0    0    0    0    0    0    0
    0    0    0    0    0    0    1   37  108   92   65   45   40   42   60   75  100  123    6    0    0    0    0    0    0
    0    0    0    0    0    0   13   92  105   64   35   25   18   21   35   49   67  113   82    0    0    0    0    0    0
    0    0    0    0    0    2   30  115   90   45   26   15   11   16   18   34   50  106  115    8    0    0    0    0    0
    0    0    0    0    0    3   52  110   73   40   21   11    7   12   18   24   43   81  105   35    0    0    0    0    0
    0    0    0    0    0    2   62  107   72   43   25   15   15   22   28   27   43   75  114   55    0    0    0    0    0
    0    0    0    0    0    2   51  104   84   56   36   23   18   20   28   31   50   85  115   51    0    0    0    0    0
    0    0    0    0    0    0   20  110   93   71   46   31   23   26   31   44   63   94   99   16    0    0    0    0    0
    0    0    0    0    0    0    3   86  113   90   71   53   46   44   51   66   84  104   70    0    0    0    0    0    0
    0    0    0    0    0    0    0    7   83  121   97   87   78   73   84   92   98   80    9    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    8   74  118  102  105  111  115   95   66   23    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    2   22   51   79   80   71   39    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
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                         VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK.(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.635                  TEST SERIAL NO:  31
TEST NO:  11      REPLICATION NO:   1      TEST DATE: AUG  25      OPERATING PRESSURE (KPASCALS):407.50 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    1    3    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    7   26   33   46   33   39   25   15    4    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   12   36   68   72   80  112   99   92   75   59   26    2    0    0    0    0    0    0    0
    0    0    0    0    0    8   24   48   96  101  113  142  127  137  136   90   48   26    0    0    0    0    0    0    0
    0    0    0    0    0   18   37   96  113   98  117  122  137  143  131  124   66   51   20    1    0    0    0    0    0
    0    0    0    0    0   24   62  107  111   96   99   96  115  130  135   99   75   62   41    6    0    0    0    0    0
    0    0    0    0    2   19   78   94  114  105   72   64   67   92  122  117   87   78   51   11    0    0    0    0    0
    0    0    0    0    1   26   85  130  141   97   55   39   51   75  105  125  100   87   58   19    0    0    0    0    0
    0    0    0    0    0   20   84  140  121   83   46   26   41   61   86  110  115   93   54   17    0    0    0    0    0
    0    0    0    0    0   11   69   91  112   88   39   26   41   61   87  110  110   85   58   13    0    0    0    0    0
    0    0    0    0    0    0   43  101  132   99   68   45   54   71  100  112  110   75   40    4    0    0    0    0    0
    0    0    0    0    0    0   14   65  103   97   80   73   70   83  100  105   89   55   16    0    0    0    0    0    0
    0    0    0    0    0    0    0   27   67   88   95   89   94  102  105   89   60   26    4    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   26   60   77   90   93   89   77   50   21    3    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   17   38   54   51   46   28    9    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    1    2    6    3    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.635                  TEST SERIAL NO:  32
TEST NO:  11      REPLICATION NO:   2      TEST DATE: AUG  27      OPERATING PRESSURE (KPASCALS):415.00 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    3   14   38   60   59   48   12    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    5   25   61  100  126  130   91   97   22    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   28   94  157  130  143  125  137  132   88   21    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   23   85  142  162  141   95   91   85  146  128   58    0    0    0    0    0    0
    0    0    0    0    0    0    0    8   60  132  183  147  131   88   78   77  135  152  104   15    0    0    0    0    0
    0    0    0    0    0    0    0    9   83  175  177  106   74   51   50   85  122  163  126   18    0    0    0    0    0
    0    0    0    0    0    0    1   34  125  165  130   78   35   37   48   71  142  177  140   25    0    0    0    0    0
    0    0    0    0    0    0    1   42  128   95   67   30   66   36   52  123  168  167  108   15    0    0    0    0    0
    0    0    0    0    0    0    4   53   86   79   40   24   41   64   87  134  185  170   94    8    0    0    0    0    0
    0    0    0    0    0    0   11   47   83   77   53   41   59   91  134  165  185  115   43    0    0    0    0    0    0
    0    0    0    0    0    0    0   39   78   92   86   84   95  122  141  142  129   67    3    0    0    0    0    0    0
    0    0    0    0    0    0    0   15   58   87  103  106  110  117  122   99   55    9    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   10   35   61   67   76   69   54   21    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    2    8   14    8    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
                         VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK.(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.635                 TEST SERIAL NO:  33
TEST NO:  11      REPLICATION NO:   3      TEST DATE: AUG  27     OPERATING PRESSURE (KPASCALS):414.50 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    1    4    5    3    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    9   18   49   67   56   55   20    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    3   28   73  125  137  136   94  103   37    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   34   96   60  130  157  135  135  120   95   30    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   32   83   54   73  150  135  105   80  135  116   70    7    0    0    0    0    0
    0    0    0    0    0    0    0    8   53  130  191  168  125   80   70   75  124  151   96   23    0    0    0    0    0
    0    0    0    0    0    0    0    8   74  151  165  123   72   52   48   80  115  170   19   18    0    0    0    0    0
    0    0    0    0    0    0    0   22   95  140  132   79   40   24   53   94  130  173   99   15    0    0    0    0    0
    0    0    0    0    0    0    0   21   76  115   70   39   23   36   50  107  160  174   91   15    0    0    0    0    0
    0    0    0    0    0    0    0   19   63   84   47   22   37   67   83  145  167  156   81    3    0    0    0    0    0
    0    0    0    0    0    0    2   22   63   70   52   47   58   93  131  160  161  100   27    0    0    0    0    0    0
    0    0    0    0    0    0    0   15   45   71   82   77   78  108  121  125   90   39    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    8   26   58   75   81   82   85   85   71   35    2    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   20   28   44   44   40   27   12    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    5    5    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.635                 TEST SERIAL NO:  34
TEST NO:  12      REPLICATION NO:   1      TEST DATE: AUG  27     OPERATING PRESSURE (KPASCALS):555.60 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    3    2    2    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   17   35   57   70   67   52   28    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   22   58   78  125  135  115  125   78   33    3    0    0    0    0    0    0
    0    0    0    0    0    0    0    4   12   50  116  135  178  163  155  155  140   78   41    4    0    0    0    0    0
    0    0    0    0    0    0    0   12   48  100  163   67  130  121  130  148  150  110   61   12    0    0    0    0    0
    0    0    0    0    0    0    1   32   89  130  165  152  111  105  185  100  140  141   93   31    0    0    0    0    0
    0    0    0    0    0    0   10   50  120  145  155  120  101   72   83   95  146  173  125   46    0    0    0    0    0
    0    0    0    0    0    1   50   69  120  160  140   76   56   53   79  103  134  176  131   40    0    0    0    0    0
    0    0    0    0    0    3   30   69  125  135   98   52   34   35   73   89  125  174  127   43    0    0    0    0    0
    0    0    0    0    0    7   32   68  105  102   52   28   31   50   66  120  136  181  123   32    0    0    0    0    0
    0    0    0    0    0    0    9   27  101   86   34   22   38   64   90  143  165  162  105   19    0    0    0    0    0
    0    0    0    0    0    0    9   26   61   68   44   37   51   81  137  150  165  125   59   15    0    0    0    0    0
    0    0    0    0    0    0    2   25   59   78   72   67   63   72  102  125  130  125   77   19    0    0    0    0    0
    0    0    0    0    0    0    0   12   48   66   78   85   97   83  102  125  105   70   28    2    0    0    0    0    0
    0    0    0    0    0    0    0   30   44   73   72   78   87   76   71   52   18    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    5   13   35   34   38   43   33   24   10    2    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2    8   10    6    2    2    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
                         VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.635                        TEST SERIAL NO:  35
TEST NO:  12        REPLICATION NO:   2       TEST DATE: AUG  29       OPERATING PRESSURE (KPASCALS):1552.50 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    3    1    6    4    2    1    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    1    6   26   55   80   65   70   50   31    6    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0   14   55   93  118  151  142  126  131   84   48   14    0    0    0    0    0    0    0    0    0    0
    0    0    0   21   56  113  150  163  172  162  147  156  115   83   55   13    0    0    0    0    0    0    0    0    0
    0    0    5   55  105  167  176  201  171  140  100  115  107   88   75   45    6    0    0    0    0    0    0    0    0
    0    0   33   85  173  150  160  150  135  110   92   80   75   75   90   72   40    0    0    0    0    0    0    0    0
    0    4   34  140  161  163  141   92   91   70   43   40   43   60   76   78   58   12    0    0    0    0    0    0    0
    0    2   24  111  142  146  144  102   89   56   41   28   32   37   64   71   51   16    0    0    0    0    0    0    0
    0    1   14   62  170  181  145  150  111  117   86   69   77   65   74   68   42    6    0    0    0    0    0    0    0
    0    0    2   53  110  137  155  165  152  130  137  127   96   90   76   47   23    0    0    0    0    0    0    0    0
    0    0    1   15   58   90  112  135  154  180  140  149   97   73   43   12    1    0    0    0    0    0    0    0    0
    0    0    0    0   12   46   54   98   97  125  105   78   55   23    7    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    2   10   15   42   35   36   29   14    2    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.635                        TEST SERIAL NO:  36
TEST NO:  12        REPLICATION NO:   3       TEST DATE: AUG  29       OPERATING PRESSURE (KPASCALS):1548.50 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    2    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   11   39   38   40   48   35   15    2    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    5   26   50   85  105   95   88   84   69   46   90    0    0    0    0    0    0    0    0    0    0
    0    0    0    0   30   62   98  120  126  127  122  137  112   92   55   16    0    0    0    0    0    0    0    0    0
    0    0    0   15   50  100  141  122  137  120  126  136  135  114   83   46   12    0    0    0    0    0    0    0    0
    0    0    0   38   82  124  146  141  115  101   78   92  100   98   95   68   33    3    1    0    0    0    0    0    0
    0    0    9   50  130  135  141  125  105   80   55   48   61   63   83   76   58   14    1    0    0    0    0    0    0
    0    0   10   55  120  132  130  130   90   98   55   40   30   34   55   63   75   70   27    4    0    0    0    0    0
    0    0    3   57  100  122  142  122  110   64   48   29   20   30   57   65   66   30    4    0    0    0    0    0    0
    0    0    3   24   93  131  136  147  115   95   70   55   45   45   59   64   55   21    1    0    0    0    0    0    0
    0    0    2   23   62  105  151  137  130  110  125   92   86   74   62   53   43   10    0    0    0    0    0    0    0
    0    0    0    0   22   61   95  113  118  125  124  110   91   79   58   40   20    3    0    0    0    0    0    0    0
    0    0    0    0   10   34   44   82  184  102   95   84   65   48   31   14    6    0    0    0    0    0    0    0    0
    0    0    0    0    3    9   15   50   44   42   43   37   17   16    5    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    1    3   14   21   10   12   10    4    1    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    2    4    3    2    2    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

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                              VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK.(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.483                    TEST SERIAL NO:  37
TEST NO:  13      REPLICATION NO:    1      TEST DATE: AUG  29      OPERATING PRESSURE (KPASCALS):135.50 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    5    6    6    4    3    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   49   62   60   48   26    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   12  119   55   50   59   71   61   35    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   13   72   56   19   19   28   42   60   54   30    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   44   58   36   17    9   13   24   36   60   60    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   64   46   32   16   12    8   14   26   42   59   11    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   51   31   35   18   10    8   10   17   33   63   16    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   34   58   44   26   23   17   13   18   40   43    7    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    2   55   60   48   34   30   32   38   50   31    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   15   40   60   74   71   64   41   26    1    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   13   25   33   22   10    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.483                    TEST SERIAL NO:  38
TEST NO:  13      REPLICATION NO:    2      TEST DATE:SEPT   1      OPERATING PRESSURE (KPASCALS):139.10 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    3    9   11    5    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   23   64   83   74   65   42   10    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   44   77   65   41   40   42   58   66   14    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   26   80   50   25   19   17   19   29   61   48    3    0    0    0    0    0    0    0
    0    0    0    0    0    0    5   59   64   31   15   11   11    9   14   44   66   20    0    0    0    0    0    0    0
    0    0    0    0    0    0   16   70   48   26   14   11   18   10   16   36   57   31    2    0    0    0    0    0    0
    0    0    0    0    0    0   18   60   44   26   16   14   12   13   18   38   60   28    1    0    0    0    0    0    0
    0    0    0    0    0    0   14   66   41   33   21   16   13   14   21   47   50   22    0    0    0    0    0    0    0
    0    0    0    0    0    0    1   41   65   38   26   17   17   21   36   63   42   14    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    6   52   61   55   36   32   48   67   44   20    1    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    4   58   63   76   80   68   52   24    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    3    6   17   15    6    4    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
                                    VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.483                       TEST SERIAL NO:  39
TEST NO:  13     REPLICATION NO:   3      TEST DATE:SEPT   1      OPERATING PRESSURE (KPASCALS):140.00 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0   12   15   14    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    1   26   63   72   82   70   35    8    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    2   45   80   61   47   41   46   58   63    9    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   27   93   46   25   19   17   17   29   57   43    1    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   76   63   26   14   12   11    9   16   42   59    8    0    0    0    0    0    0    0
    0    0    0    0    0    0   11   73   42   16   13   12   16    8   17   38   61   23    0    0    0    0    0    0    0
    0    0    0    0    0    0    8   78   34   18   15   14   12    9   18   40   73   15    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   98   36   16   16   14   11   12   21   56   55    7    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   58   66   22   16   15   14   20   44   76   29    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   92   68   34   38   34   55   88   39    7    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   64   80   79   87   76   36    7    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    5   12    9    3    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.483                       TEST SERIAL NO:  40
TEST NO:  14     REPLICATION NO:   1      TEST DATE:SEPT   2      OPERATING PRESSURE (KPASCALS):279.20 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    6   18   21   20   10    4    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   28   38   55   61   53   45   33   11    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   31   64   61   62   55   59   65   59   44   10    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   21   58   63   46   38   37   38   46   56   61   55    8    0    0    0    0    0    0    0
    0    0    0    0    0    1   44   65   48   34   24   21   24   28   42   60   60   31    0    0    0    0    0    0    0
    0    0    0    0    0   19   58   60   42   25   19   19   18   21   32   50   63   48    3    0    0    0    0    0    0
    0    0    0    0    0   17   54   59   42   23   17   15   13   17   26   40   60   56   13    0    0    0    0    0    0
    0    0    0    0    0   16   60   61   41   36   17   12   14   15   22   38   57   58   17    0    0    0    0    0    0
    0    0    0    0    0    6   45   67   52   30   18   11    8   14   24   37   56   59   14    0    0    0    0    0    0
    0    0    0    0    0    0   37   70   57   41   23   15   12   16   26   43   57   45    0    0    0    0    0    0    0
    0    0    0    0    0    0   17   49   55   52   35   23   21   26   36   35   53   24    0    0    0    0    0    0    0
    0    0    0    0    0    0    1   28   42   58   52   41   40   46   52   51   33    5    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    2   22   41   56   62   59   58   47   26    1    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   11   20   27   28   27   10    3    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
                                     VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.483                      TEST SERIAL NO:  41
TEST NO:  14     REPLICATION NO:    2     TEST DATE:SEPT    2     OPERATING PRESSURE (KPASCALS):281.00 TEST DURATION(MINT): 150.

     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    3    4   12   12    9    4    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    9   21   35   43   41   33   30   13    2    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0   15   46   58   57   64   57   56   45   35   24    5    0    0    0    0    0    0    0
     0    0    0    0    0    0   10   41   57   63   65   58   53   58   48   46   39   18    1    0    0    0    0    0    0
     0    0    0    0    0    2   32   54   58   51   39   38   38   42   46   51   50   25    5    0    0    0    0    0    0
     0    0    0    0    0   21   42   54   50   36   28   22   21   26   38   48   53   33   12    2    0    0    0    0    0
     0    0    0    0    0   26   35   42   43   30   20   13   11   16   27   41   52   38   15    1    0    0    0    0    0
     0    0    0    0    0   26   35   36   39   27   17   11   15   15   22   36   51   43   21    3    0    0    0    0    0
     0    0    0    0    0   18   37   41   45   31   23   14   10   18   28   43   52   43   15    3    0    0    0    0    0
     0    0    0    0    0    7   30   48   44   44   33   28   24   31   39   47   52   30    5    0    0    0    0    0    0
     0    0    0    0    0    2   25   42   50   53   50   43   39   48   51   52   38   16    1    0    0    0    0    0    0
     0    0    0    0    0    0    3   18   34   47   57   60   57   52   46   35   18    4    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0   10   25   34   41   40   28   19   16    3    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    4    4    7    4    3    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.483                      TEST SERIAL NO:  42
TEST NO:  14     REPLICATION NO:    3     TEST DATE:SEPT    2     OPERATING PRESSURE (KPASCALS):281.00 TEST DURATION(MINT): 150.

     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    2    4    4    2    3    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    5   22   39   47   38   36   18    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0   15   39   54   66   80   74   62   50   31   10    0    0    0    0    0    0    0    0
     0    0    0    0    0    0   11   42   61   67   63   54   55   70   68   50   30    4    0    0    0    0    0    0    0
     0    0    0    0    0    2   29   47   60   54   47   39   40   47   67   68   46   17    0    0    0    0    0    0    0
     0    0    0    0    0   14   32   57   67   51   37   27   29   36   51   69   68   28    0    0    0    0    0    0    0
     0    0    0    0    0   11   34   57   64   48   30   21   19   28   50   53   81   43    1    0    0    0    0    0    0
     0    0    0    0    0   12   41   63   62   46   31   16   16   21   39   62   77   44    5    0    0    0    0    0    0
     0    0    0    0    0    9   32   51   75   52   31   12   15   24   37   58   71   42    6    0    0    0    0    0    0
     0    0    0    0    0    3   17   55   75   55   40   19   15   23   45   64   69   35    1    0    0    0    0    0    0
     0    0    0    0    0    0    8   42   61   63   48   29   26   32   47   67   65   16    0    0    0    0    0    0    0
     0    0    0    0    0    0    0   13   45   65   61   45   40   45   56   59   32    1    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0   15   40   54   55   54   58   52   32    9    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0   10   20   31   39   31   19    3    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    1    2    9    6    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
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                        VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.483                  TEST SERIAL NO:  43
TEST NO:  15     REPLICATION NO:   1     TEST DATE:SEPT    3     OPERATING PRESSURE (KPASCALS):408.30 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    8    4    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    4   31   51   51   48   27   22    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    2   32  115  117  126   93   46   26   10    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   62  145  214  181  138   85   33   48   18   15    3    0    0    0    0    0
    0    0    0    0    0    0    0    0   19  103  194  245  180   88   62   33   18   28   42    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   20   97  134   91   75   40   38   42   61   26    2    0    0    0    0    0    0
    0    0    0    0    0    0    0    1   56   90   82   50   23   10   23   49   68   83   62    3    0    0    0    0    0
    0    0    0    0    0    0    0    0   27   50   43   21   11   10   45  100  104  103   64    4    0    0    0    0    0
    0    0    0    0    0    0    0    0   21   33   26   14   14   29   49  150  200  120   53    0    0    0    0    0    0
    0    0    0    0    0    0    0    2   18   40   35   22   30   47   86  177  188  125   40    0    0    0    0    0    0
    0    0    0    0    0    0    0   11   17   45   36   40   45   67   95  151  130   41    5    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    1   49   52   60   80   86   84   79   37    3    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    8   50   36   91   44   38    2    1    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    2   13    0   19    6    1    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    4    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.483                  TEST SERIAL NO:  44
TEST NO:  15     REPLICATION NO:   2     TEST DATE:SEPT    3     OPERATING PRESSURE (KPASCALS):418.10 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    2    3    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   15   11   36   32    9    2   11    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   14    8    5   37   50   54   51   50   21   18    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    8   11   29   20   37   65   47   63   48   48   39   11    1    0    0    0    0    0    0
    0    0    0    0    0    0    1   27   47   71   89   80   51   71   49   46   50   16   18    0    0    0    0    0    0
    0    0    0    0    0    0    7   27   81   63  111   85   55   56   48   50   39   32   19   10    0    0    0    0    0
    0    0    0    0    0    0    7   33  115  161  115   68   45   39   25   36   41   49   31    4    0    0    0    0    0
    0    0    0    0    0    0    8   43   88  130  109   62   31   29   30   45   51   41   21    3    0    0    0    0    0
    0    0    0    0    0    0   16   72  120  140   63   27   13   21   37   50   48   37    6    0    0    0    0    0    0
    0    0    0    0    0    2   19   42  115   67   20   10    5   47   67   53   52   37   12    0    0    0    0    0    0
    0    0    0    0    0    0    3   35   49   33   20    9   21   92  110   70   48   29   12    0    0    0    0    0    0
    0    0    0    0    0    0    0   11   25   30   36   23   75  126  110   65   33   11    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   10   21   43   37   60  115  105  115   58   18    2    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    8   31   37   44   61   68   61   76   19    1    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    6   16   31   16   14   24    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

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                                   VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK.(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.483                    TEST SERIAL NO:  45
TEST NO:  15      REPLICATION NO:   3      TEST DATE:SEPT   3      OPERATING PRESSURE (KPASCALS):415.00 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    1    5   21    3    0    0    0    0    0    0    0    9    0    0    0    0    0    0
    0    0    0    0    0    0    0    4   51   57   68   44   34   23    3    1    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    8   17   58   81  110   90   90   52   16   23   11    0    0    0    0    0    0    0    0
    0    0    0    0    0    5   12   59   60  127  146  104  103  100   79   52   33    1    0    0    0    0    0    0    0
    0    0    0    0    0    0   40   68  125  151  179   98   90   77   66   42   22    1    0    0    0    0    0    0    0
    0    0    0    0    0    4   26   95  199  200  165  125   77   67   63   63   29    8    0    0    0    0    0    0    0
    0    0    0    0    0    8   27   76  168  205  175   83   43   38   40   57   40   17   12    0    0    0    0    0    0
    0    0    0    0    0    1   25  127  175  135   64   26   10   15   31   46   49   30    7    0    0    0    0    0    0
    0    0    0    0    0    0   61  120  130   77   40   12    9   15   27   44   47   30    4    0    0    0    0    0    0
    0    0    0    0    0    2   45   63   90   61   22   11    7   28   39   57   45   31    3    0    0    0    0    0    0
    0    0    0    0    0    0    7   47   48   47   36   14    4   20   60   65   68   19    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   10   28   28   44   17   11   37   54   60   41   11    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    7   28   28   23   24   46   50   38   25    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   10   12   27   21   25   38   24   14    1    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    4   10   13   14   14   23    3    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    2    2    2    3    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.483                    TEST SERIAL NO:  46
TEST NO:  16      REPLICATION NO:   1      TEST DATE:SEPT  12      OPERATING PRESSURE (KPASCALS):549.00 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    5    7   12    7    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    2    6   25   33   29   42   13    1    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    4   30   60   63   71   52   44   23   13    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   12   58  101   82   80   80   68   59   29    1    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    1   32   50  115   89   90   83   83   86   57   19    1    0    0    0    0    0    0    0    0
    0    0    0    0    0   11   40   92  154  103   78   55  105  102   98   50    6    0    0    0    0    0    0    0    0
    0    0    0    0    0   23   90  122  158   81   67   72  110  151  170   63   15    1    0    0    0    0    0    0    0
    0    0    0    0    0   15   62   92  167   88   56   36   66  146  206  127   35    0    0    0    0    0    0    0    0
    0    0    0    0    0    1   46  103  125   78   41   24   52  121  204  115   51    1    0    0    0    0    0    0    0
    0    0    0    0    0    0   29   61   08   78   61   26   42   78  175  130   37    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   32   63   77   50   31   36   75  110   96   34    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    8   27   57   64   31   38   48   85   73    3    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   14   31   34   42   47   40   27    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    3    8   25   36   26    5    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    5   10    6    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    2    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

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                                        VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.483                        TEST SERIAL NO:  47
TEST NO:  16     REPLICATION NO:   2      TEST DATE:SEPT  12      OPERATING PRESSURE (KPASCALS):560.40 TEST DURATICN(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    1    1    8    9    5   10   12    8    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    3   15   26   25   30   36   38   35   12   10    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    6   36   72   71   68   47   57   67   25   20    0    0    0    0    0    0    0    0    0
    0    0    0    0    3   11   28   52   99   70   57  100  120  112   78   14    0    0    0    0    0    0    0    0    0
    0    0    0    0    4   17   25   85   85   45   76  109  120  124   85   54    4    0    0    0    0    0    0    0    0
    0    0    0    0    0   19   37   68  105   85   62   65  116  180  100   64   22    0    0    0    0    0    0    0    0
    0    0    0    0    0   15   62   80  100   65   50   43   99  153  146   64   31    0    0    0    0    0    0    0    0
    0    0    0    0    0   13   44   66  102  103   52   62   57  126  157  100   37    6    0    0    0    0    0    0    0
    0    0    0    0    0    1   24   48  102   90   33   25   54  132  165  118   44    2    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   30   56   58   38   43   38  105  136  105   43    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    9   24   37   32   39   38   72  115   55   18    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    9   17   40   48   31   40   65   41    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    3    6   28   24   30   20   14    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    1    3   10    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    2    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.483                        TEST SERIAL NO:  48
TEST NO:  16     REPLICATION NO:   3      TEST DATE:SEPT  12      OPERATING PRESSURE (KPASCALS):556.50 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    1    1    1    1    2    1    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    7   13    6   10    9    3    3    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    8   18   40   33   39   34   34   20   13    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    1    7   21   76   75  103   44   61   42   18    8    0    0    0    0    0    0    0    0    0
    0    0    0    0    1   10   22   40   40   75   82   73   91  101   68   26    1    0    0    0    0    0    0    0    0
    0    0    0    0    2   10   34   46   62   51   70   83   96  130   69   50    8    0    0    0    0    0    0    0    0
    0    0    0    0    1   20   43   98  120   80   79   64  113  160  118   97   22    1    0    0    0    0    0    0    0
    0    0    0    0    0   16   67   92  115   70   59   92  123  160  140   70   27    2    0    0    0    0    0    0    0
    0    0    0    0    1   10   40   64   97   87   76   51   97  175  181  135   52    4    0    0    0    0    0    0    0
    0    0    0    0    0    7   31   72  119  105   50   35   83  165  205  141   58    2    0    0    0    0    0    0    0
    0    0    0    0    0    2   18   60   92   91   78   58   54  101  156  145   59    1    0    0    0    0    0    0    0
    0    0    0    0    0    1    9   35   65   77   61   53   67   90   98   87   24    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    1   18   44   55   67   45   60   47   55   64   10    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    4    5   22   32   45   42   42   30   11    1    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    8   19   23   36   17    5    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    8   11   11    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
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                    VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK.(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.559              TEST SERIAL NO:  49
TEST NO:  17      REPLICATION NO:   1      TEST DATE:SEPT  23      OPERATING PRESSURE (KPASCALS):136.40 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    2   15   15   15    3    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   38   75   87   90  101   74   24    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   42  106   75   71   63   64   75   80   51    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   99   95   38   24   23   26   36   58   79   26    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   30  130   44   17   13   10   13   14   30   65   55    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   50   74   25   13   12   12    9    5   18   63   65    0    0    0    0    0    0    0    0
    0    0    0    0    0    0   14  133   29   15   12    8   10   10   24   65   61    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0  142   46   17   14   13   15   19   45   80   37    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   69  106   50   28   26   33   60   85   68    9    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   71   97   85   79   87   97   67   10    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   35   57   64   53   28    4    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.559              TEST SERIAL NO:  50
TEST NO:  17      REPLICATION NO:   2      TEST DATE:SEPT  23      OPERATING PRESSURE (KPASCALS):136.40 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    7   36   60   63    4    2    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   49   69  115  115   98  100   96   28    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   26  130   99   56   46   39   39   63  102   12    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0  122  102   42   28   21   19   16   30   82   48    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    7  100   46   20   17   12   14   12   32   91   53    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    2  145   36   18   13   10   10   14   39  105   53    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    2   30   18   22   13   16   24   61  125   13    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0  115   75   20   18   16   23   46  115   93    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0  130   50   50   63   73  115  123    8    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0  130  130  125  123   82    6    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    2    2    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

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                              VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.559                TEST SERIAL NO:  51
TEST NO:  17      REPLICATION NO:   3      TEST DATE:SEPT  26      OPERATING PRESSURE (KPASCALS):139.10 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    2   19   42   20    2    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    8   64  100  100   87   56    3    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   73  119   92   57   78  119   63    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   46  130  110   58   30   47   95  130   55    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    4  102  120   88   44   25   32   68  120  125   10    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    7  125  113   52   38   31   30   45   85  148   21    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   10  125  121   58   36   25   30   38   78  130   29    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    2  110  115   51   35   32   32   37   75  131   20    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   46  164   61   39   33   31   50  113  100    1    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   50  161   79   49   56  122  125   17    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    1   32  112  142  154  103   21    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    7    8    2    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.559                TEST SERIAL NO:  52
TEST NO:  18      REPLICATION NO:   1      TEST DATE:SEPT  26      OPERATING PRESSURE (KPASCALS):278.40 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    6   10   30   32   12    1    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    8   43   63   70   72   54   22    4    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    7   41   77   48   72   73   78   45   12    3    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    4   43   95   96   80   57   57   86   94   32    2    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   19   91  130   98   64   42   43   87  125   90   14    0    0    0    0    0    0    0
    0    0    0    0    0    0    2   35  137  122   97   62   22   33   92  145  132   45    0    0    0    0    0    0    0
    0    0    0    0    0    0    2   58  152  125   85   50   33   37   73  124  145   78    4    0    0    0    0    0    0
    0    0    0    0    0    0    4   80  141  130   80   51   32   33   77  115  150   90   10    0    0    0    0    0    0
    0    0    0    0    0    0    2   57  142  127   77   56   37   42   78  106  145   90    9    0    0    0    0    0    0
    0    0    0    0    0    0    0   37  133  130   78   62   40   51   85  115  135   70    3    0    0    0    0    0    0
    0    0    0    0    0    0    0   11   75  140  100   68   50   60   86  114  100   32    1    0    0    0    0    0    0
    0    0    0    0    0    0    0    2   23  100  140   89   76   83   98  110   49   16    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    2   32   97   93  118  126  100   84   26    2    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    1   25   75   90   90   57   18    2    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    3    4    2    2    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

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                         VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.559                        TEST SERIAL NO:  53
TEST NO:  18     REPLICATION NO:   2      TEST DATE:SEPT '26      OPERATING PRESSURE (KPASCALS):273.50 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0   13   23   25    9    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    8   30   51   60   61   38   14    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    5   30   59  152   73   71   58   30    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   27   70   82   81   62   60   86   73   22    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   11   61  115   98   61   43   45  102  110   68   13    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   22  114  136  112   60   24   40  103  140  125   37    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   40  143  120   92   55   38   40   78  122  150   81    2    0    0    0    0    0    0
    0    0    0    0    0    0    0   53  135  135  102   52   35   37   79  140  148   94   11    0    0    0    0    0    0
    0    0    0    0    0    0    0   48  145  147  105   48   42   71  110  165   97    8    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   32  115  137   94   68   45   47   86  107  155   84    5    0    0    0    0    0    0
    0    0    0    0    0    0    0    6   83  140  115   73   52   62   83  123  120   42    3    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   23   89  125   89   90   94   93  125   68   25    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    1   40   95  102  115  120  105   93   36   11    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    6   33   65  100  103   59   35    8    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    5   13    5    9    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.559                        TEST SERIAL NO:  54
TEST NO:  18     REPLICATION NO:   3      TEST DATE:SEPT  30      OPERATING PRESSURE (KPASCALS):280.10 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    2   18   27   30   23    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   25   66   73   61   71   63   54   21    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   54   75   80   70   70   72   69   75   73   46    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   43   78   68   53   42   38   41   46   60   72   85   35    0    0    0    0    0    0
    0    0    0    0    0    0   14   63   71   46   28   21   20   23   28   33   51   83   72   10    0    0    0    0    0
    0    0    0    0    0    0   34   69   56   33   19   14   10   13   16   22   36   64   83   48    0    0    0    0    0
    0    0    0    0    0    0   50   70   50   27   10    8    9   12   15   15   27   50   78   74    0    0    0    0    0
    0    0    0    0    0    0   53   70   50   28   17    9   13   17   20   19   27   50   83   63    0    0    0    0    0
    0    0    0    0    0    0   39   70   56   35   23   16   15   17   20   24   35   57   89   58    0    0    0    0    0
    0    0    0    0    0    0   17   70   65   53   35   27   24   21   27   37   51   73   81   40    0    0    0    0    0
    0    0    0    0    0    0    0   46   73   68   58   44   43   39   46   53   74   83   54   11    0    0    0    0    0
    0    0    0    0    0    0    0    8   52   77   76   72   68   63   72   80   84   67   15    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    3   43   79   81   86   86   88   69   51   21    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0   12   29   41   53   36   25    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
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                                   VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.559                      TEST SERIAL NO:  55
TEST NO:  19      REPLICATION NO:   1      TEST DATE:SEPT  30      OPERATING PRESSURE (KPASCALS):415.00 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    2    3    2    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   11   23   35   39   35   29   17    3    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    2   22   44   56   76   74   71   70   50   41   15    0    0    0    0    0    0    0
    0    0    0    0    0    0    4   33   62   69   81   80   78   75   75   61   44   18    0    0    0    0    0    0    0
    0    0    0    0    0    2   31   44   83   87   80   71   68   68   72   76   86   73   35   10    0    0    0    0    0
    0    0    0    0    0   14   55   76   85   74   68   60   55   55   60   70   77   90   63   32    0    0    0    0    0
    0    0    0    0    0   35   72   80   74   65   51   46   41   42   49   59   75   85   83   44    0    0    0    0    0
    0    0    0    0    4   52   71   76   68   50   36   35   33   37   42   50   67   87   92   59   14    0    0    0    0
    0    0    0    0   13   59   75   75   62   41   30   37   30   33   38   44   66   90   92   63   25    0    0    0    0
    0    0    0    0   13   55   77   71   58   39   31   36   40   34   37   49   69   91   96   65   19    0    0    0    0
    0    0    0    0    8   48   76   74   61   43   36   38   43   35   40   56   80   96   95   60   11    0    0    0    0
    0    0    0    0    0   41   75   80   67   58   48   40   43   44   55   69   91   94   83   46    3    0    0    0    0
    0    0    0    0    0   20   60   78   71   67   62   54   55   61   70   82   97   90   60   24    0    0    0    0    0
    0    0    0    0    0    0   31   63   72   73   72   71   71   74   83   90   90   74   38    5    0    0    0    0    0
    0    0    0    0    0    0   13   35   59   72   73   76   76   81   81   79   66   43   18    0    0    0    0    0    0
    0    0    0    0    0    0    2   14   35   37   63   64   65   68   69   55   34   16    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   11   19   24   35   33   36   26   21   11    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    2    6   11   15   14    5    2    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER     NOZZLE SIZE (CM OF DIA) : 0.559                      TEST SERIAL NO:  56
TEST NO:  19      REPLICATION NO:   2      TEST DATE: OCT  10      OPERATING PRESSURE (KPASCALS):412.20 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    2    3    4    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    2   23   35   62   72   46   43    5    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   22   51   90  120  114  110   82   63   10    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   15   54  104  112   76   89   92  110   86   35   10    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   60   95  130  112   66   73   69   90   90   66   19    0    0    0    0    0    0
    0    0    0    0    0    0    0   14   96  137  137   95   64   45   56   95  107  115   30    0    0    0    0    0    0
    0    0    0    0    0    0    0   25   99  130  115   65   31   30   48   99  112  135   36    0    0    0    0    0    0
    0    0    0    0    0    0    0   28  110  136   90   42   20   24   49   82  121  131   40    0    0    0    0    0    0
    0    0    0    0    0    0    0   40   88  110   75   32   20   36   58  110  123  115   55    0    0    0    0    0    0
    0    0    0    0    0    0    0   24   70  100   52   21   36   55   68  113  120  100   15    0    0    0    0    0    0
    0    0    0    0    0    0    0   14   62   77   46   30   47   55  100  127  124   45    2    0    0    0    0    0    0
    0    0    0    0    0    0    0   10   42   61   52   46   52   73   87  102   67    8    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   30   49   53   55   63   70   68   54   10    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    7   27   38   46   48   42   28    2    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    1   10   16   12    4    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

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                         VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK,(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.559                  TEST SERIAL NO:  57
TEST NO:  19      REPLICATION NO:   3      TEST DATE: OCT  10      OPERATING PRESSURE (KPASCALS):410.90 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    2    4    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    2    8   24   45   59   46   48   12    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    8   32   71  117  117  104   79   81   31    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   10   34   94  120   92   98   84   85   83   58   20    0    0    0    0    0    0
    0    0    0    0    0    0    0    2   30   87  135  120   75   81   62   70   75   85   42    2    0    0    0    0    0
    0    0    0    0    0    0    0    7   67  121  125   89   69   44   44   66   86  102   50    4    0    0    0    0    0
    0    0    0    0    0    0    0   10   87  115  125   74   30   26   37   73   90  120   66    3    0    0    0    0    0
    0    0    0    0    0    0    0    8   86  130  100   40   23   18   40   72  102  117   61    2    0    0    0    0    0
    0    0    0    0    0    0    0   20   70  110   77   33   16   23   47   96  114  107   45    0    0    0    0    0    0
    0    0    0    0    0    0    0    7   60   83   43   13   24   45   65  102  115   85   33    0    0    0    0    0    0
    0    0    0    0    0    0    0    7   50   66   44   25   32   52   90  115  105   48    4    0    0    0    0    0    0
    0    0    0    0    0    0    0    2   32   58   43   44   47   73   88   91   58   11    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   18   42   44   50   58   63   73   41   12    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   15   27   37   39   32   22    2    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    1    9    8    2    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.559                  TEST SERIAL NO:  58
TEST NO:  20      REPLICATION NO:   1      TEST DATE: OCT  10      OPERATING PRESSURE (KPASCALS):552.70 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   11   18   19   27   30   24   16    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   27   43   48   73   75   64   41   11    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   19   28   40   60   93  110  106  105   99   82   43   12    0    0    0    0    0    0
    0    0    0    0    0    0   12   27   40   61  115  115  105   97   83   96   83   66   30    0    0    0    0    0    0
    0    0    0    0    0    0   16   32   63  102  120  112   82   84   50   79   91   97   52   11    0    0    0    0    0
    0    0    0    0    0   14   36   41   93  115  115   99   71   39   51   73  103  122   67   15    0    0    0    0    0
    0    0    0    0    0   16   30   49   99  105  110   75   46   40   42   77  102  135   92   15    0    0    0    0    0
    0    0    0    0    9   20   31   36   97  106   82   46   35   31   47   74  105  141   95   19    0    0    0    0    0
    0    0    0    0   11   20   32   57   90   80   54   31   30   35   49   98  130  130   91   13    0    0    0    0    0
    0    0    0    0    0   21   34   50   68   59   34   25   41   52   66  102  120  120   76    0    0    0    0    0    0
    0    0    0    0    0   20   33   52   62   50   39   37   43   60   94  121  125  102   51    0    0    0    0    0    0
    0    0    0    0    0   18   35   51   57   61   47   55   53   80   95  104  103   72   23    0    0    0    0    0    0
    0    0    0    0    0    0   30   44   56   57   66   62   66   82   92   88   70   37    0    0    0    0    0    0    0
    0    0    0    0    0    0   15   32   48   56   62   64   68   71   67   52   29   11    0    0    0    0    0    0    0
    0    0    0    0    0    0    0   20   27   41   44   43   46   43   32   23   10    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0   12   14   22   22   22   18   13    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
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                                   VOLUME OF WATER COLLECTED IN CANS IN THE GRID NETWORK.(ML)

SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.559                       TEST SERIAL NO:  59
TEST NO:  20       REPLICATION NO:    2       TEST DATE: OCT  14       OPERATING PRESSURE (KPASCALS):556.50 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    2    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    3   14   23   29   26    8    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    2   12   39   46   49   75   71   30   24    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    5   26   72  140  135  145   91   97   61   65   19    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   34   85  125  160  170  157   93  107   95   96   39    5    0    0    0    0
    0    0    0    0    0    0    0    0    0   44  125  137  134  191  135  100   72  125  125   50   16    0    0    0    0
    0    0    0    0    0    0    0    0   12   59  138  152  166  132   69   72   68  130   95   61   20    0    0    0    0
    0    0    0    0    0    0    0    0   13   82  152  137   85   67   36   66   85  152   96   56   14    0    0    0    0
    0    0    0    0    0    0    0    0   18   77  115   77   59   34   34   70   98  135  100   57    2    0    0    0    0
    0    0    0    0    0    0    0    0   18   63   85   68   22   30   33  115  134  141   95   21    0    0    0    0    0
    0    0    0    0    0    0    0    0   18   52   55   28   22   48   69  120  119  140   73   20    0    0    0    0    0
    0    0    0    0    0    0    0    0   11   38   41   28   41   53  125  165  150   77   37    3    0    0    0    0    0
    0    0    0    0    0    0    0    0    4   27   32   48   58   69  105  100   63   32    4    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    2   15   26   38   45   52   45   35   10    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    3   11   14   11    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
SPRINKLER TYPE:  6 DEGREE LOW TRAJECTORY SPRINKLER      NOZZLE SIZE (CM OF DIA) : 0.559                       TEST SERIAL NO:  60
TEST NO:  20       REPLICATION NO:    3       TEST DATE: OCT  14       OPERATING PRESSURE (KPASCALS):558.20 TEST DURATION(MINT): 150.

    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    2    3    3    4    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    3   11   20   29   41   49   31   10    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    3   14   28   56   86   80  110   82   34   18    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0   14   35   87  125  153  147  100  125   80   53   12    0    0    0    0    0
    0    0    0    0    0    0    0    0    6   37   89  157  141  150  120  120  115  103   71   17    2    0    0    0    0
    0    0    0    0    0    0    0    2   24   79  145  165  121  140   95   98  145  135   95   31    6    0    0    0    0
    0    0    0    0    0    0    0    5   43   95  156  125  121   79   59   71   86  164   88   41    0    0    0    0    0
    0    0    0    0    0    0    2   13   50  131  165  123   57   43   37   81  110  163  121   29    0    0    0    0    0
    0    0    0    0    0    0    2   16   60  105  115   70   41   33   61   93  140  152  125   33    0    0    0    0    0
    0    0    0    0    0    0    3   17   54   88   90   45   34   48   66  143  155  160  101   16    0    0    0    0    0
    0    0    0    0    0    0    3   13   44   75   50   32   45   60   93  140  157  139   62    2    0    0    0    0    0
    0    0    0    0    0    0    2   12   38   63   50   53   45   69  125  143  137   78   21    1    0    0    0    0    0
    0    0    0    0    0    0    2   12   35   57   57   56   62   81  103   92   67   24    0    0    0    0    0    0    0
    0    0    0    0    0    0    1    8   21   43   51   50   56   69   69   41   16    2    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    5   13   24   26   30   32   33   21    9    3    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    3    8    8   10    9    8    3    1    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    2    1    1    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

APPENDIX B

UNIFORMITY COEFFICIENT VERSUS SPRINKLER SPACING FOR THE SPRINKLERS AND THE SPRAY NOZZLE

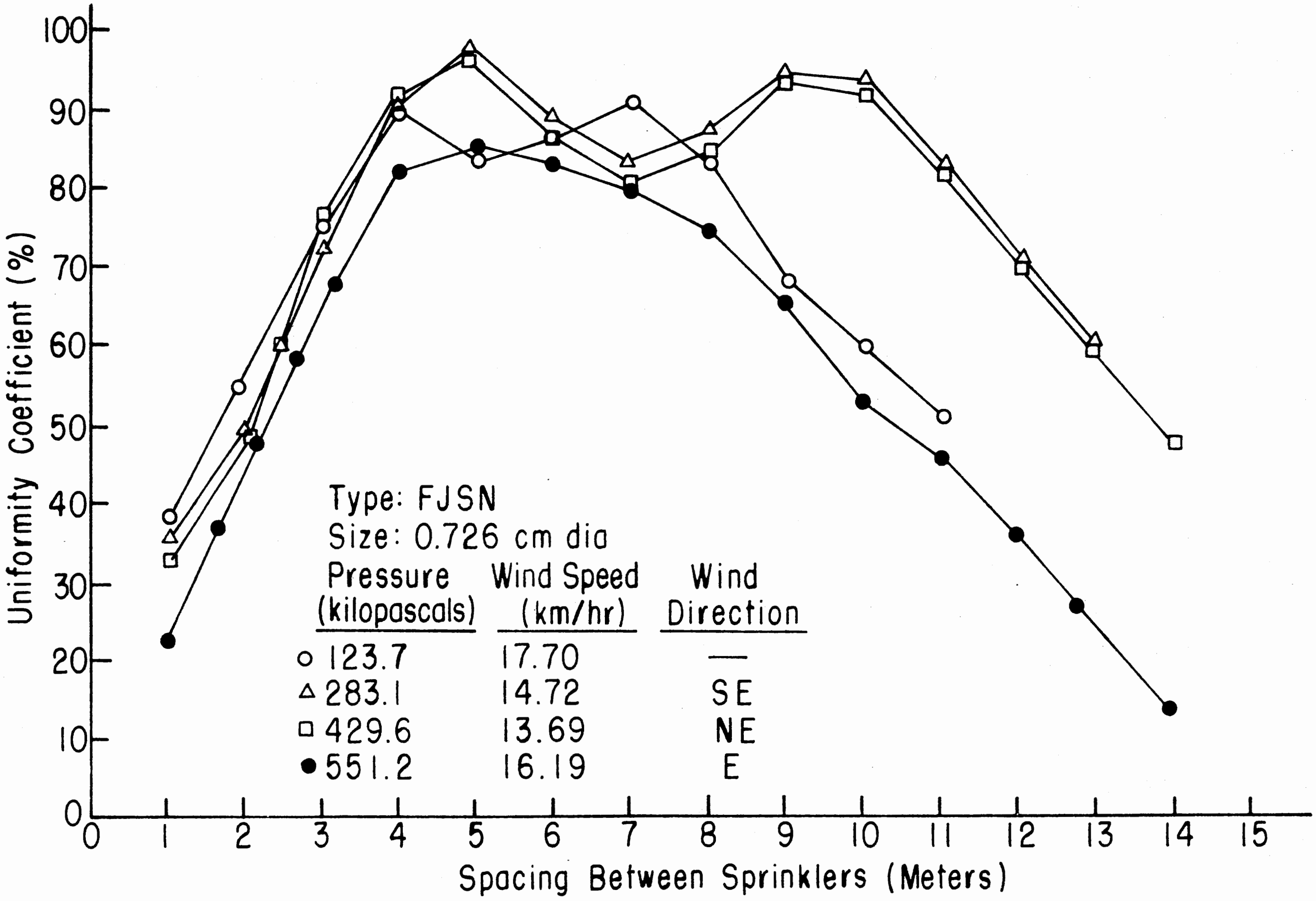

Figure 22. Uniformity Coefficient Versus Spacing Between Sprinklers for the Flood Jet Spray Nozzle, Repetition 2

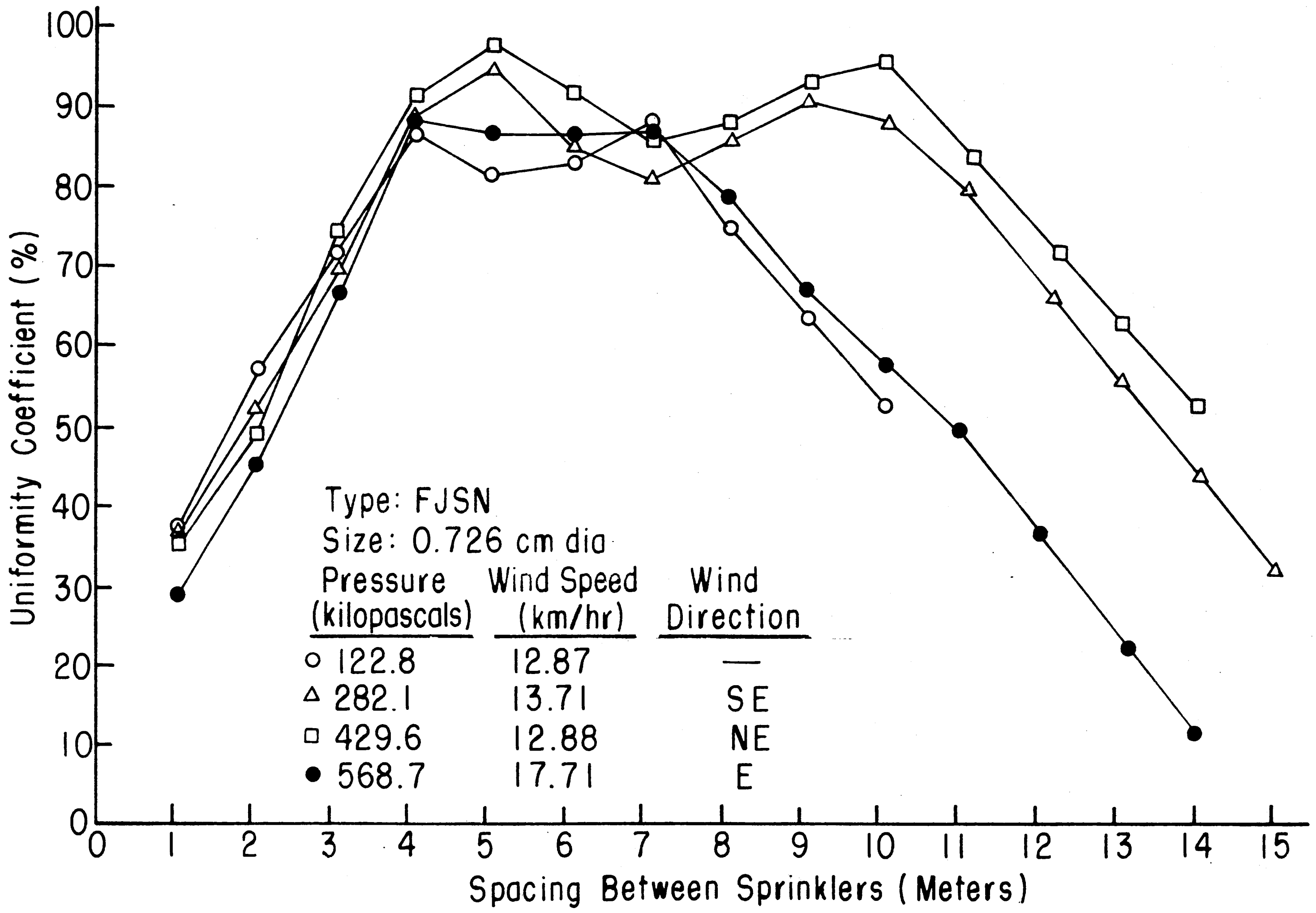

Figure 23. Uniformity Coefficient Versus Spacing Between Sprinklers for the Flood Jet Spray Nozzle, Repetition 3

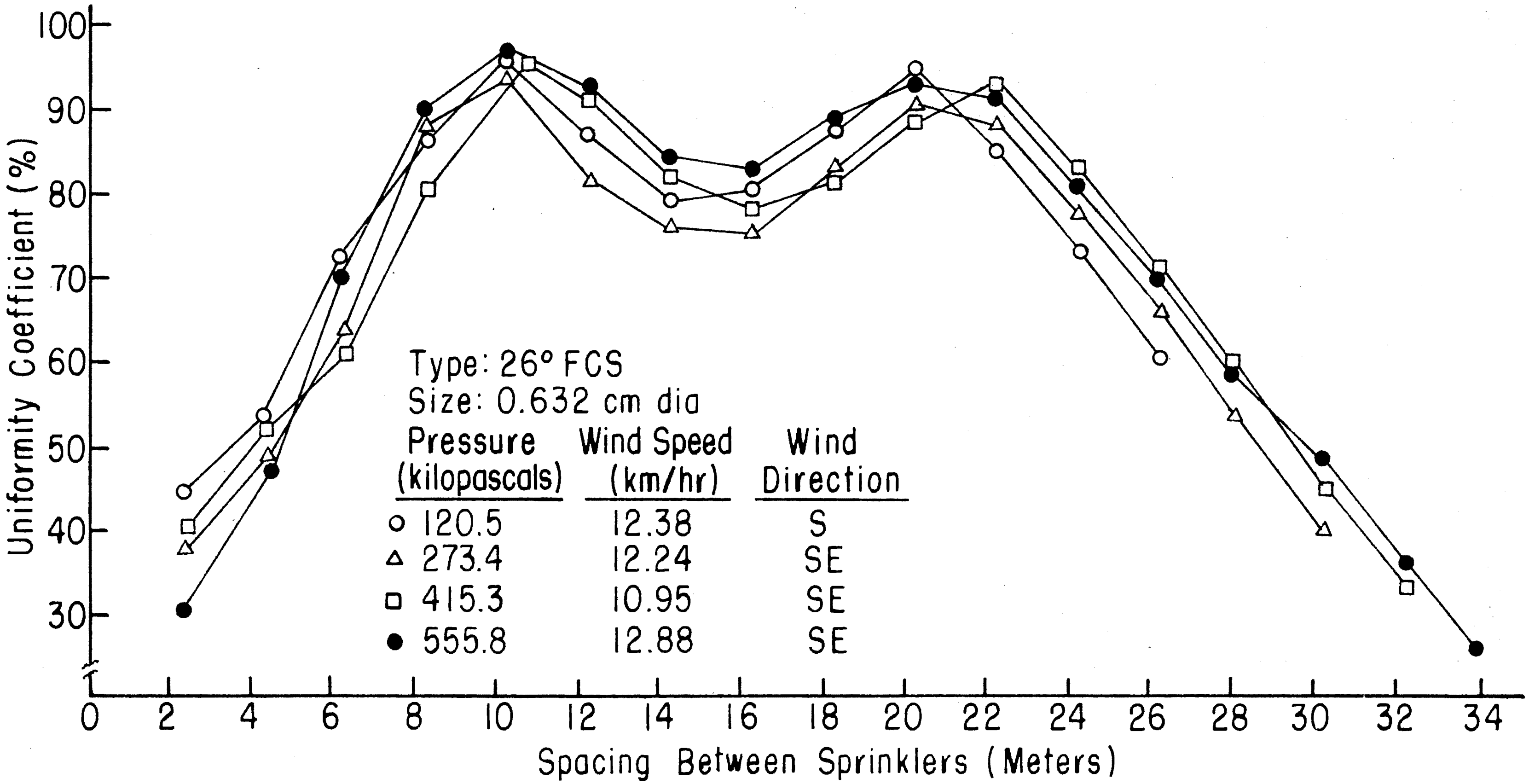

Figure 24. Uniformity Coefficient Versus Spacing Between Sprinklers for the 26° Full Circle Sprinkler, Repetition 2

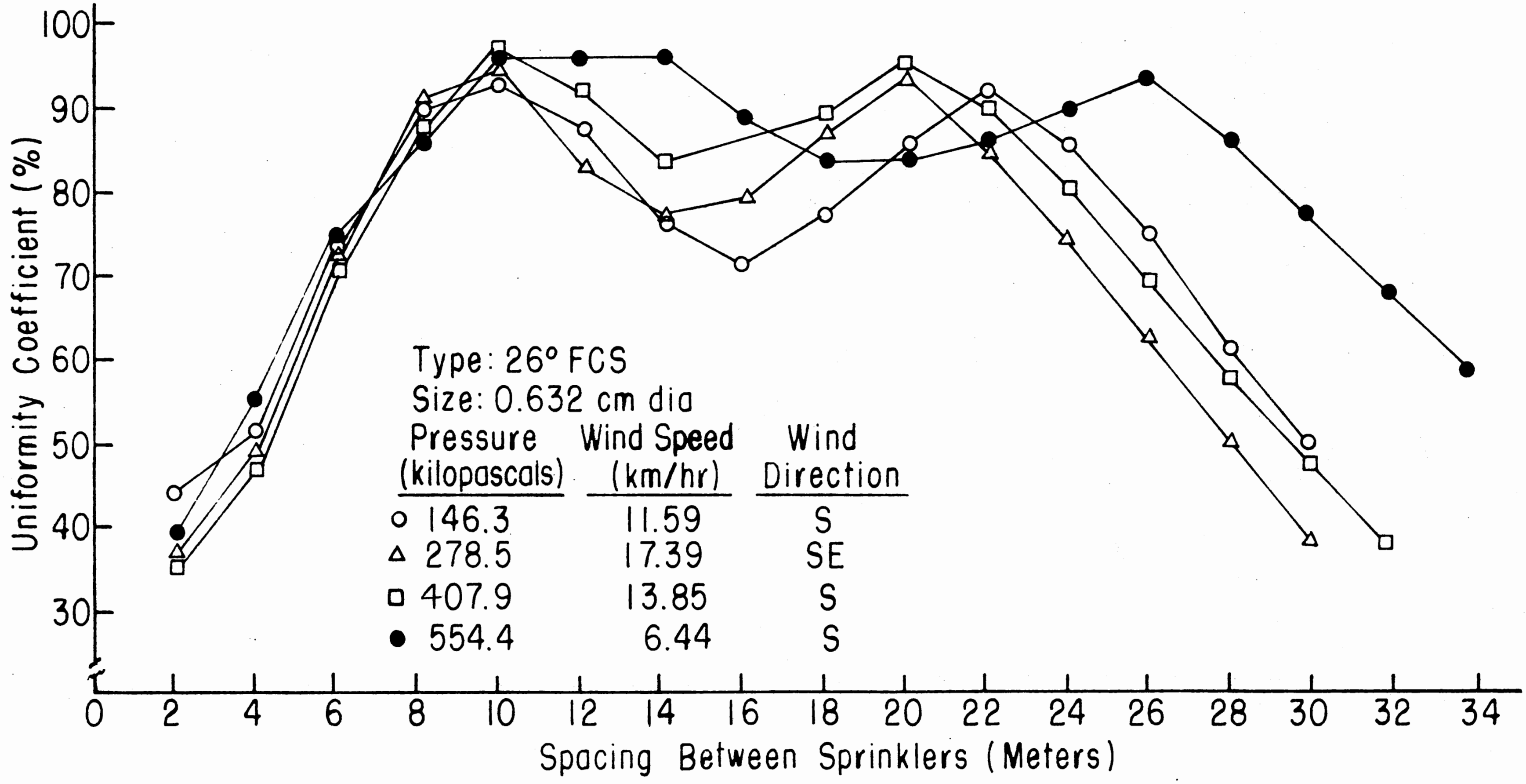

Figure 25. Uniformity Coefficient Versus Spacing Between Sprinklers for the 26° Full Circle Sprinkler, Repetition 3

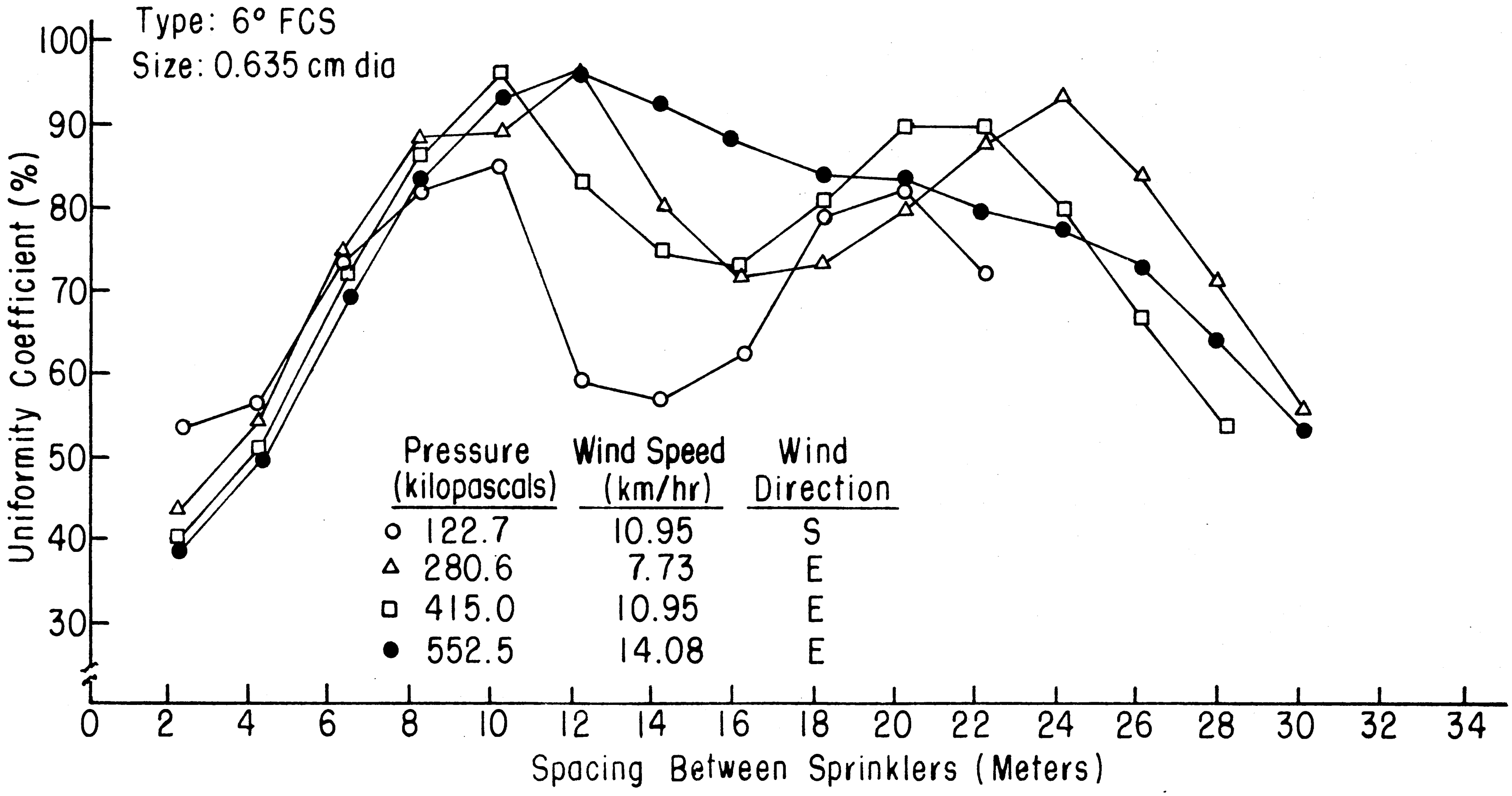

Figure 26. Uniformity Coefficient Versus Spacing Between Sprinklers for the 6° Full Circle Sprinkler (0.635 cm Diameter), Repetition 2

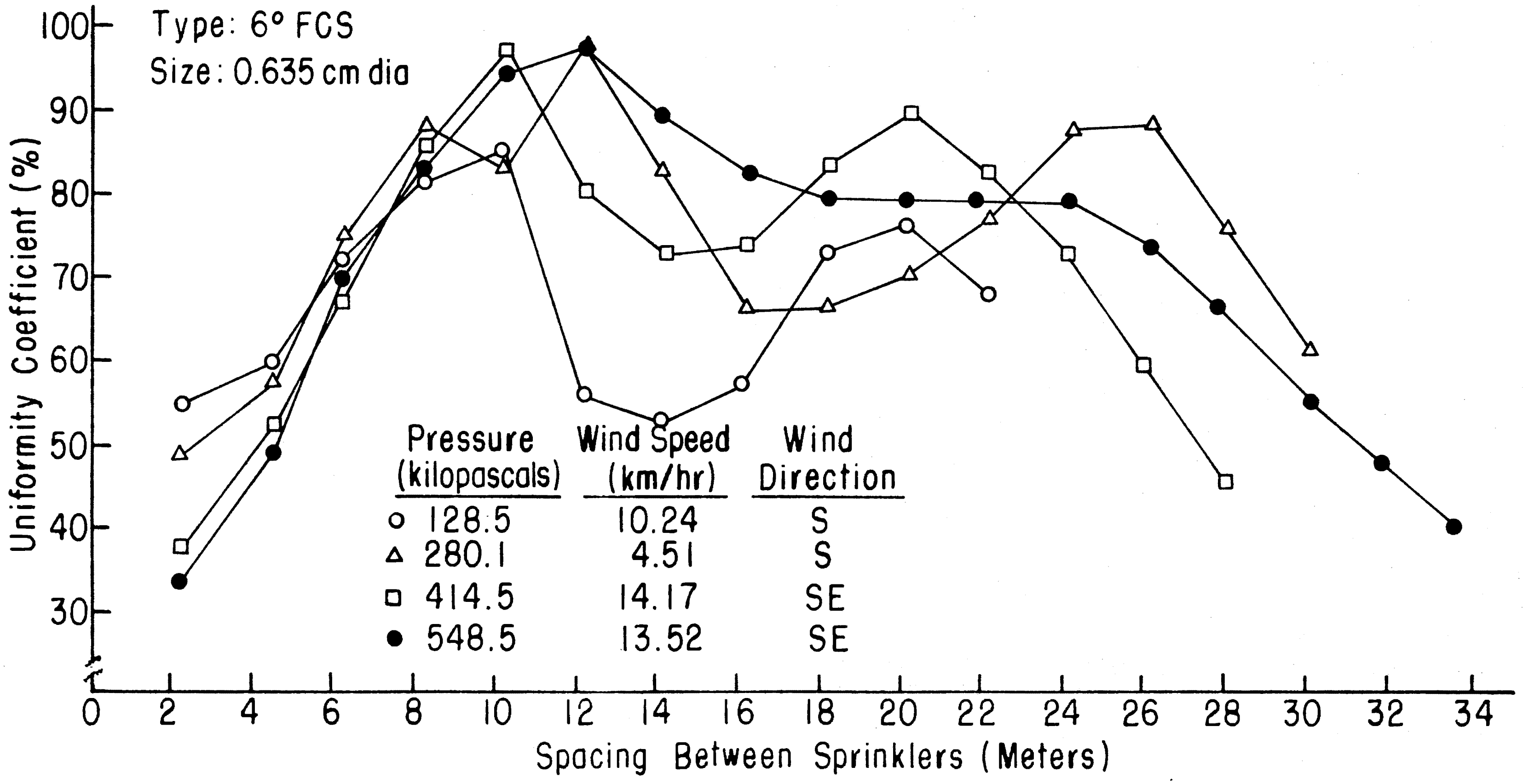

Figure 27. Uniformity Coefficient Versus Spacing Between Sprinklers for the 6° Full Circle Sprinkler (0.635 cm Diameter), Repetition 3

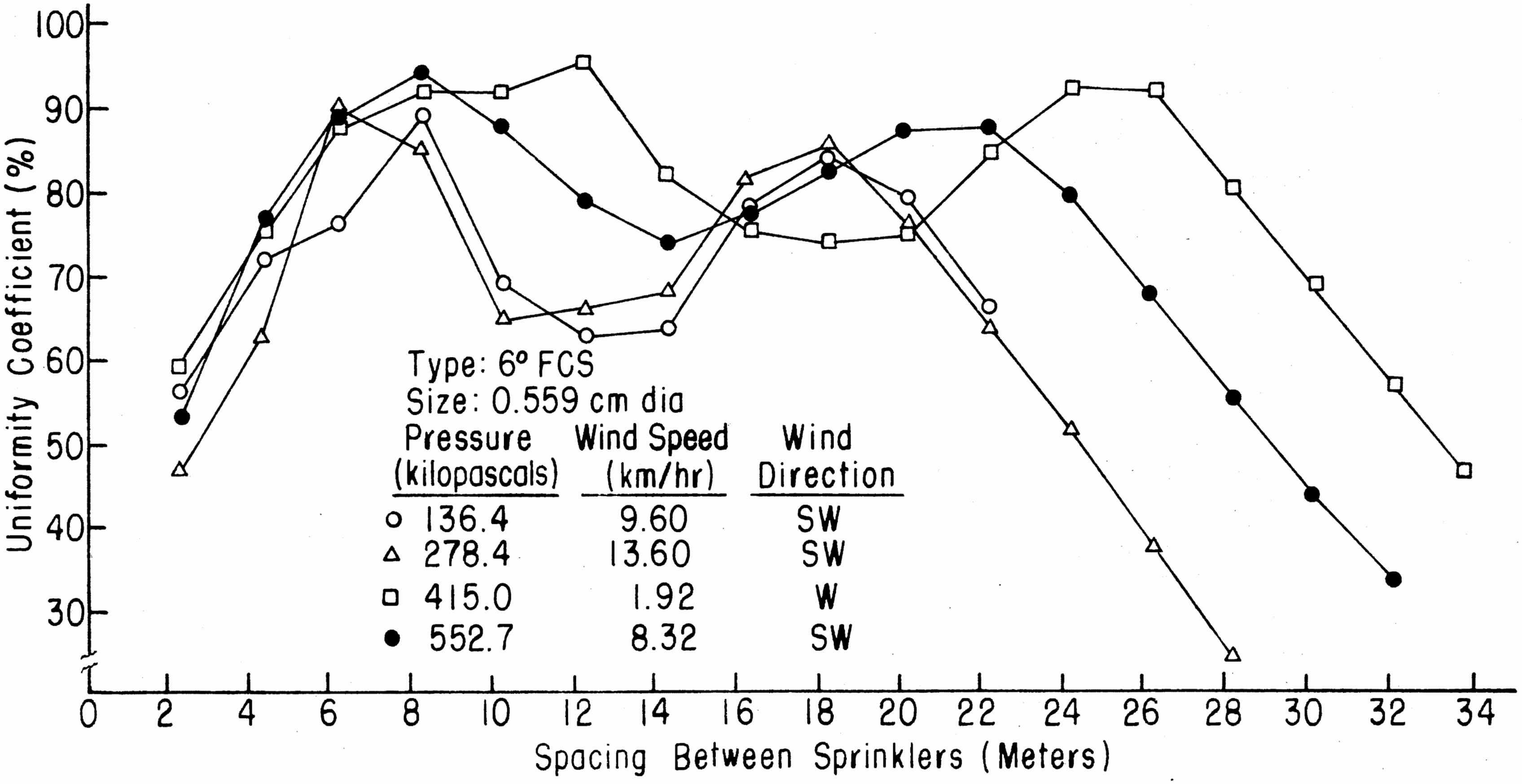

Figure 28. Uniformity Coefficient Versus Spacing Between Sprinklers for the 6° Full Circle Sprinkler (0.559 cm Diameter), Repetition 1

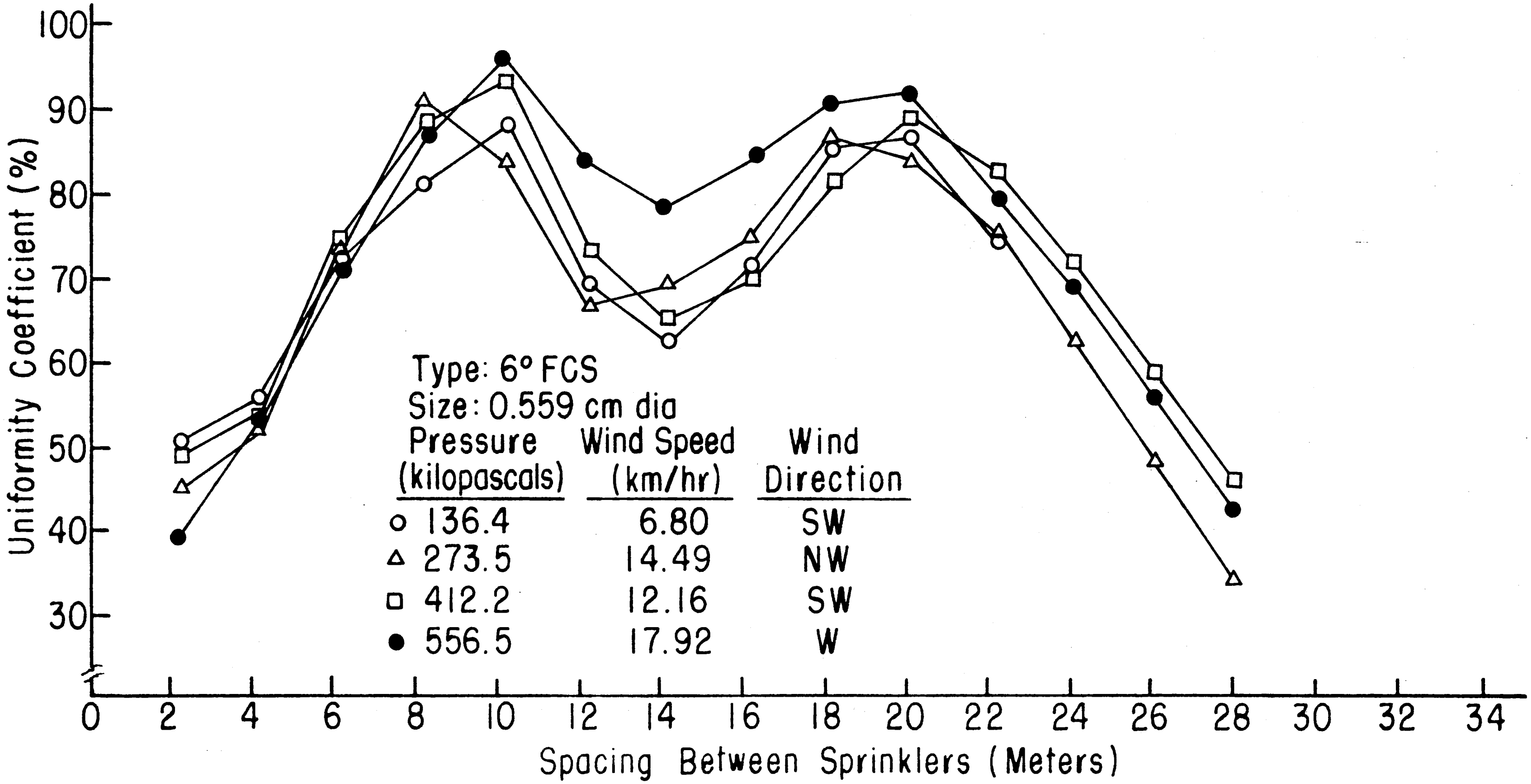

Figure 29. Uniformity Coefficient Versus Spacing Between Sprinklers for the 6° Full Circle Sprinkler (0.559 cm Diameter), Repetition 2

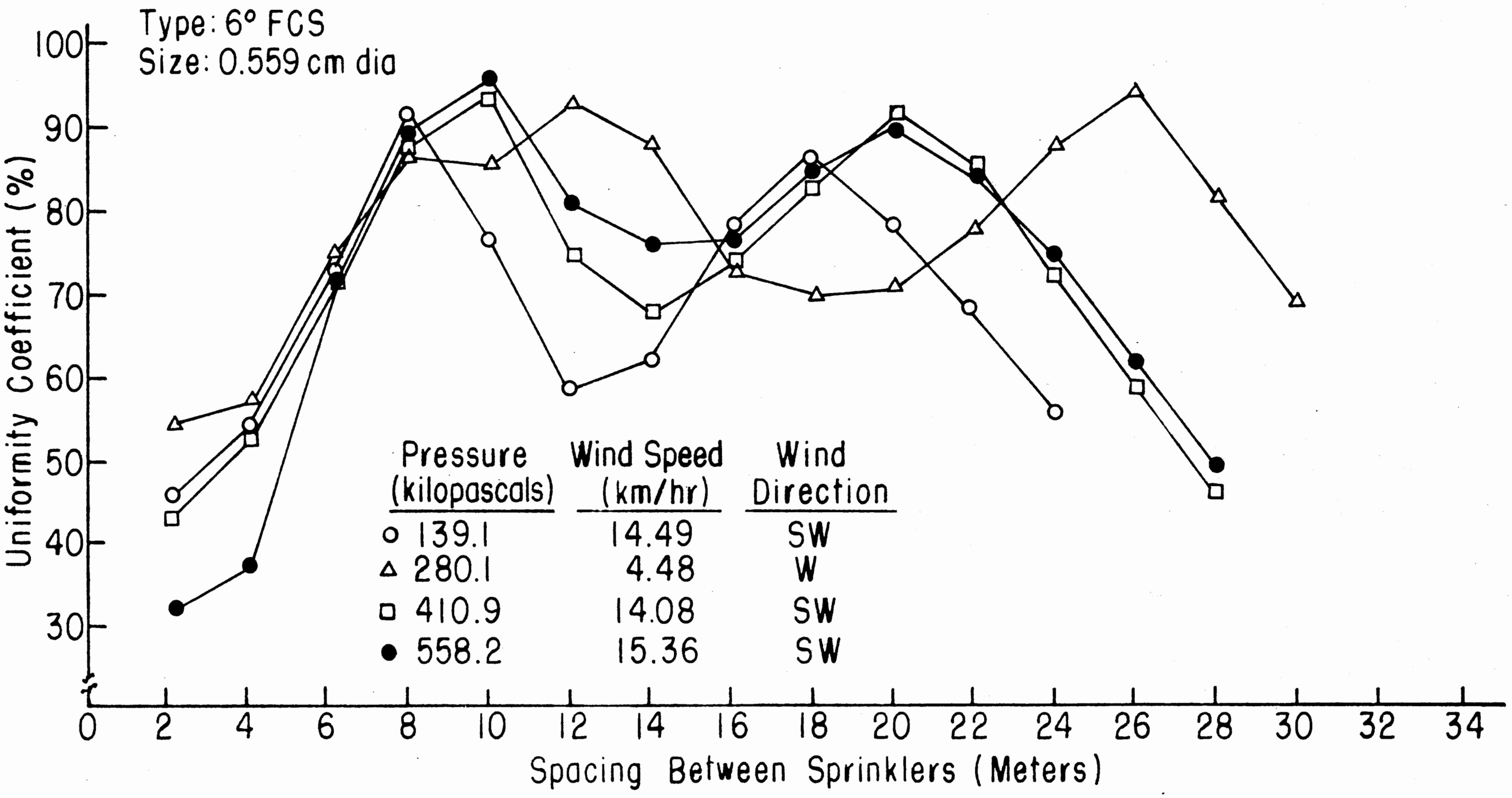

Figure 30. Uniformity Coefficient Versus Spacing Between Sprinklers for the 6° Full Circle Sprinkler (0.559 cm Diameter), Repetition 3

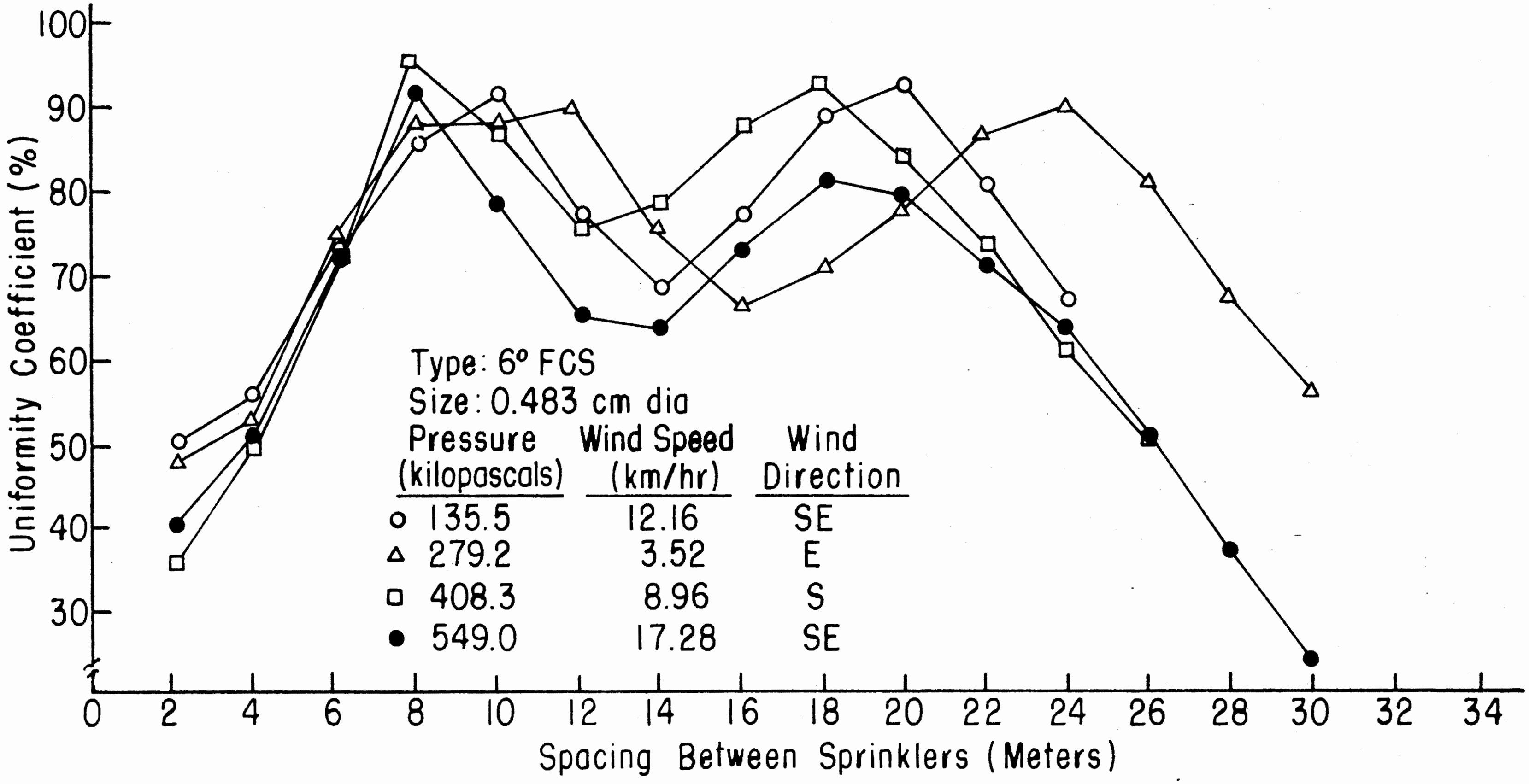

Figure 31. Uniformity Coefficient Versus Spacing Between Sprinklers for the 6° Full Circle Sprinkler (0.483 cm Diameter), Repetition 1

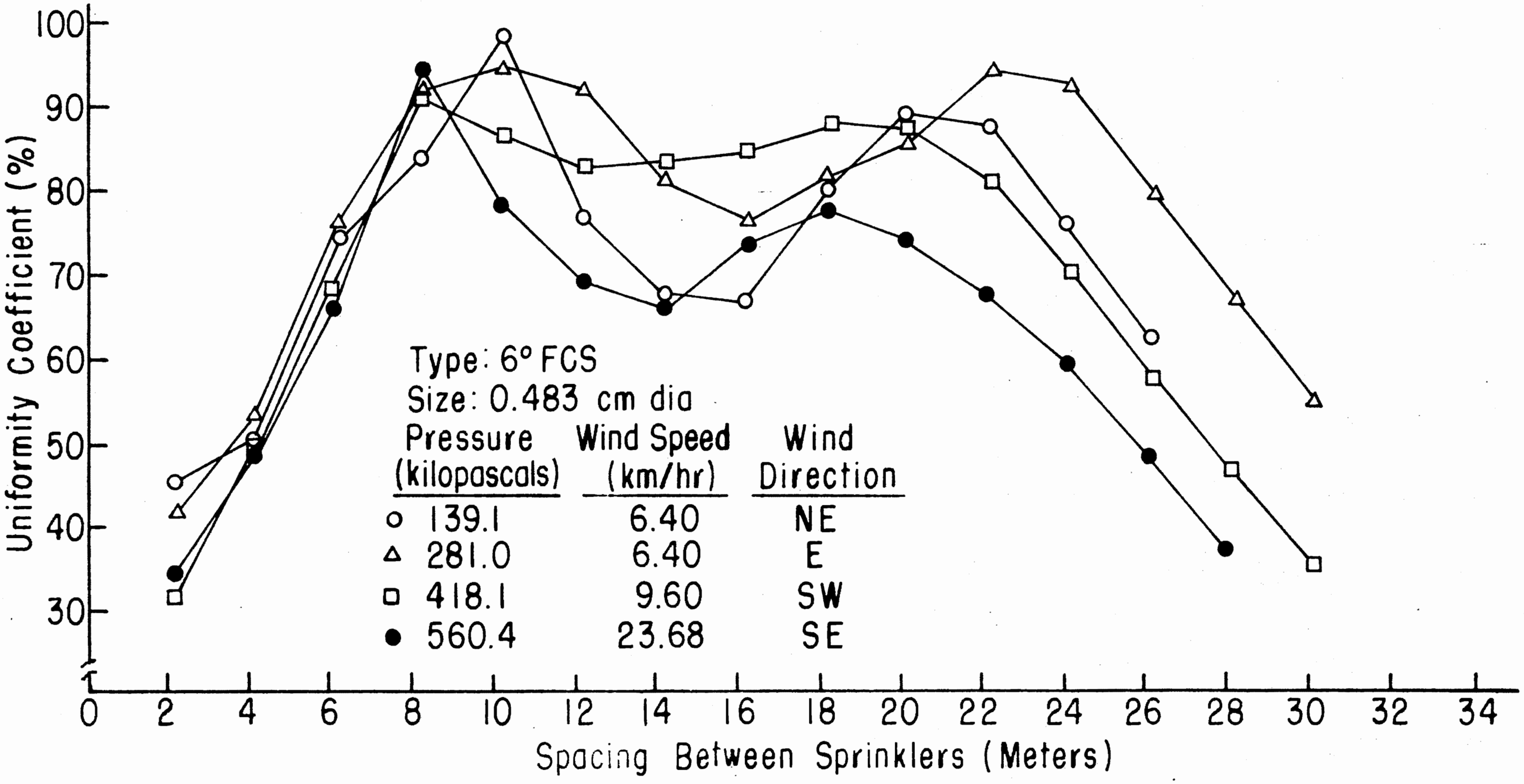

Figure 32. Uniformity Coefficient Versus Spacing Between Sprinklers for the 6° Full Circle Sprinkler (0.483 cm Diameter), Repetition 2

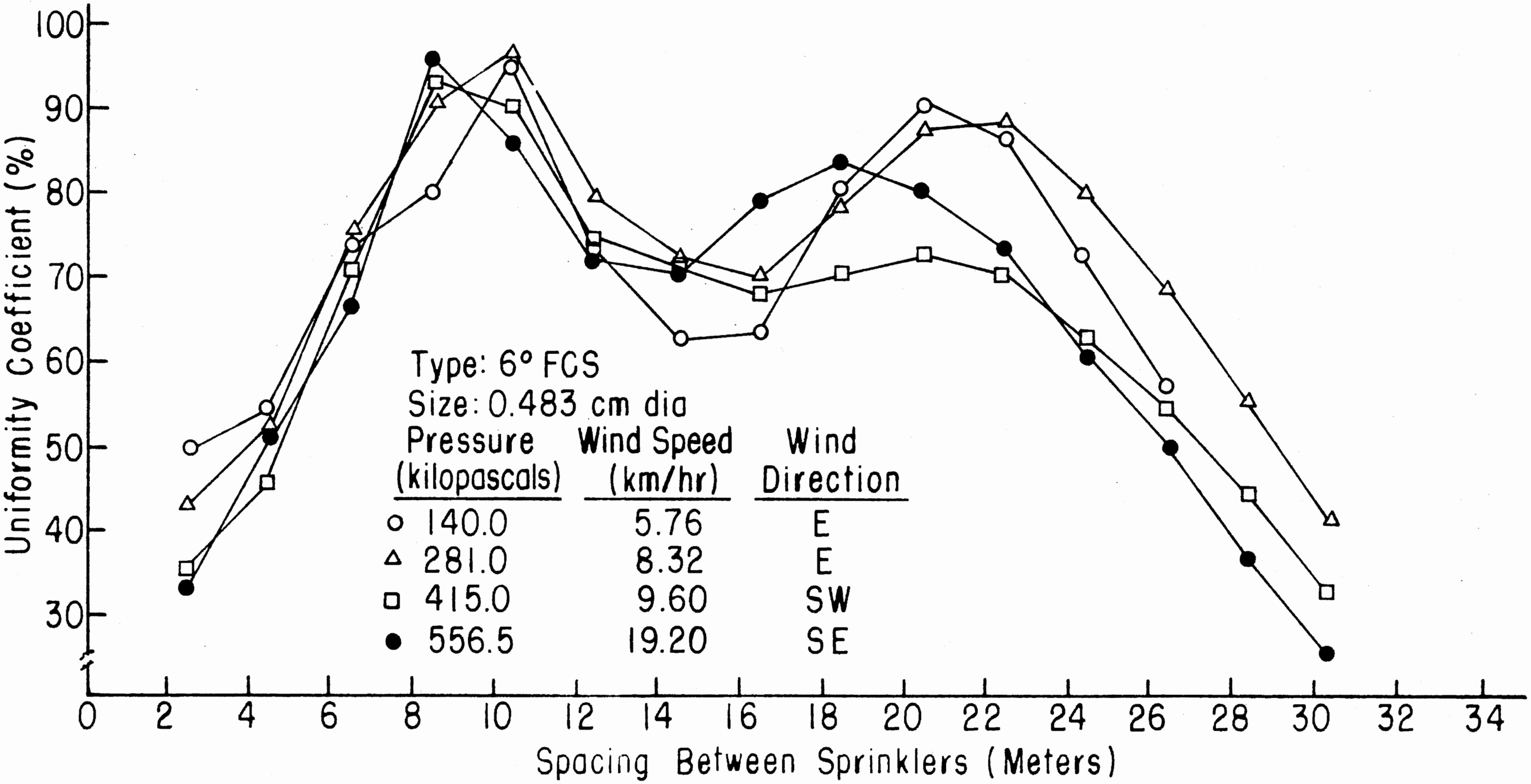

Figure 33. Uniformity Coefficient Versus Spacing Between Sprinkler for the 6° Full Circle Sprinkler (0.483 cm Diameter), Repetition 3

VITA[2]

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