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ENERGY SAVINGS AND IRRIGATION PERFORMANCE OF A MODIFIED CENTER PIVOT IRRIGATION SYSTEM

By

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THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Agricultural Engineering
Department of Agricultural Engineering

1989

ABSTRACT

ENERGY SAVINGS AND IRRIGATION PERFORMANCE OF A MODIFIED CENTER PIVOT IRRIGATION SYSTEM

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The goal of any modern irregation system should be to apply water with the maximum uniformity and minimal labor and energy costs, while increasing both the quality and quantity of food production for maximum economic benefit. Proper irrigation system design is important to achieve maximum possible application uniformity and energy savings.

The demand for energy in center pivot irrigation system changes with the change in the operating point of the pump curve because of the opening and closing of the end gun sprinkler. The primary objective of this research was to determine the possible energy savings of a modified center pivot irrigation system in which the operating point of the pump curve is fixed. Computer programs were written to simulate the design modifications that included auxiliary sprinklers in the system which open with the closing of the end gun sprinkler.

The results showed that there are time and energy savings after the modification in the design of the system. The amount of energy savings was the function of the steepness of the pump curve, with high values

for systems with steep pump curve. In addition, it was found that the capacity of the pump could also be reduced with the modified design.

The application uniformity of irrigation improved significanlty with the modified system. The increase in application uniformity was between 7% and 16% in systems with steep pump curve as compared with the values between 3% and 8% in system with flat pump curves. This increase in application uniformity increased the potential yield of crop by 3% to 17%.

Approved

Major Professor

Approved (

Department Chairperson

Dedicated to the Memory of my Grandfather Sardar Rudra Raj Pandey

ACKNOWLEDGEMENTS

My special thanks to my major professor, Dr. Vincent F. Bralts. I greatly appreciate his support, guidance, and patience in helping me to complete this research. I have very high esteem for him as a teacher, advisor, friend, and individual.

I thank the other members of my committee, Dr. L. J. Segerlind from Agricultural Engineering Department, Dr. David Wiggert from the Civil Engineering Department, and Mr. Austin Miller, P.E., for their helpful comments. Special thanks to Mr. Miller for his thoughts, advise, and encouragement during the analysis of the results. In addition, thanks to the graduate students of the Agricultural Engineering Department for their help and support when things did not look encouraging in those frantic hours.

My special appreciation to Mr. Jerold Bement for allowing me to use his center pivot irrigation system in Dowagaic, MI. Special thanks also to Mr. John Smith, MECP Irrigation Scheduling Technician in Cassapolis, MI, for helping to collect field data.

Special thanks to my wife, Shashi, for her understanding, encouragement, patience, and support because of which this work became possible.

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I INTRODUCTION

Irrigated agriculture has been practiced in various locations around the world for over 4000 years in the world. Most great civilizations started in river valleys of famous rivers such as the Tigris and Euphrates (Middle East), Nile (Egypt), Indus and Ganges (India), Hyuang-Ho (China). Over the years, great wars have been fought for the privilege of using water for irrigation. Worldwide in 1985, over one-third of the world food was grown on only 18% of cropland which was irrigated (Postel, 1985).

The most common form of irrigation worldwide has always been surface irrigation in its various forms (furrow, border, basin). The average irrigation efficiency of the surface (gravity) irrigation system is usually low. Worldwide average irrigation efficiency of surface irrigation is less than 37% (Postel, 1985).

Sprinkler irrigation and drip irrigation were developed in the more industrialized nations with the advent of plastic and aluminum pipes after World War II. These system of irrigation are capital intensive, less labor intensive, and have a greater energy demand than surface irrigation. Sprinkler and drip irrigation systems, however, allow for greater control of water delivery and thus have a greater water use

efficiencies than comparable surface irrigation systems. Sprinkler and drip irrigation systems also tend to irrigate more uniformly than gravity systems. Water efficiencies typically average 70% or greater (Postel, 1985).

Irrigation in the United States has experienced unprecedent growth in the last few decades. In most cases the land was brought into irrigation using a variety of high-pressure sprinklers designs. In some areas, farmers have used these systems to irrigate hilly and marginal lands unsuitable for gravity methods. Overall, sprinkler irrigation accounts for virtually all of the net increase in irrigated area in the United States between 1960 and early eighties. In 1980, 32% of irrigated land was under sprinkler irrigation (Jensen, 1982). Today sprinkler irrigation are used on about 35-40 percent of U.S. irrigated land with drip irrigation on only 2-3 percent.

One of most common sprinkler irrigation system is the center pivot system. A single center pivot system irrigates about 150 acres, and is now used in much of the U.S. High Plains. In addition, over 12000 center pivots have been installed in the desert nation of Saudi Arabia over the last several years (Postel, 1985).

The center pivot irrigation system, figure 1, consists of a lateral arm which rotates around the central pivot point. The water is supplied to the lateral under high pressure through the central pivot point. The lateral line sections are usually suspended on towers with the help of simple truss structures and consists of openings for sprinklers, through which water is discharged to the field. The sprinklers are spaced and designed to supply uniform depth of water in

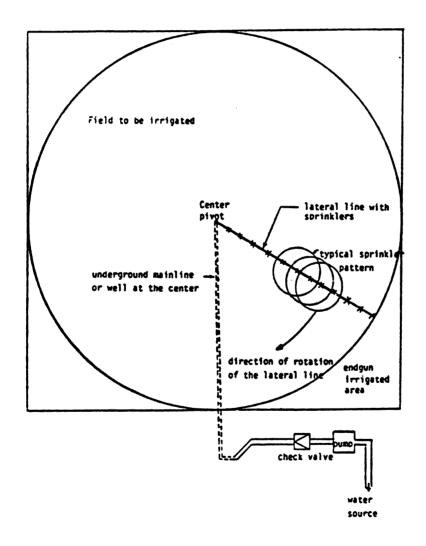


Figure 1. Layout of the Center pivot irrigation system.

the field being irrigated.

The most important advantage of the center pivot system when compared with other forms of sprinkler irrigation is that it requires minimal labor. Energy costs, however, are also an important parameter that could determine the viability of a center pivot irrigation system. Rising energy prices, especially when combined with falling water tables, can increase irrigation cost to prohibitive levels. Therefore the need to operate the center pivot system with maximum application and energy efficiency is becoming more and more important for the success of the irrigation systems.

A. SCOPE AND OBJECTIVES

The important factors that determine whether a center pivot irrigation system is properly designed are (1) Energy use,

(2) Application rate, (3) Uniformity of application, (4) Instantaneous application rate. Any improvement that can be made in the design of the center pivot irrigation system will require the improvement in one or more of the above mentioned factors, but not at the cost of compromising the other remaining factor(s).

Many researchers (Bermuth, 1982; Solomon and Kodoma, 1978; Heermann and Hein, 1968) studied and developed methods that improved the performance of the center pivot irrigation systems with regard to energy use, application rate, and/or application uniformity. Bermuth (1982), Solomon and Kodoma (1978) pointed out that the operating point of the pump shifts when the end sprinkler of the lateral (end gun) is switched on and off. The switching on of the end gun decreases the

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change the application rate, application uniformity, and energy efficiency in the system. Therefore it is best to keep the discharge and pressure in the system constant such that the system will perform with maximum efficiency throughout the period of irrigation.

Some researchers have suggested using the booster pump which is operated when the end gun is on. Pressure compensating sprinklers can also be used to keep the application rate and uniformity constant. But this does not help in operating the pump with maximum efficiency when the end gun is off.

The possibility of using auxiliary sprinklers to keep the pumping rate and pressure constant throughout the period of irrigation has not been studied by any researcher. The auxiliary sprinklers would operate along the lateral when the end gun is switched off. As soon as the end gun is switched on, the auxiliary sprinklers would stop operating. This method would help to operate the pump with maximum efficiency throughout the irrigation period, thus saving energy.

The overall goal of this research is to investigate the possible conservation of energy by modifying the design of a center pivot irrigation system. The effect on the application rate and application uniformity as a result of the proposed modification will be studied. The specific objectives are

- 1) Determine the relationship between energy saving and addition of auxiliary sprinklers in the center pivot irrigation system.
- 2) Make a comparative study of the application uniformity with and

without the introduction of auxiliary sprinklers in the center pivot irrigation system.

3) Study the effect of the introduction of auxiliary sprinklers on the water application rate on the field and the saving of time that is possible.

II. REVIEW OF LITERATURE AND THEORY

Any modification in the design of the center pivot irrigation system such as the introduction of auxillary sprinklers will call for a thorough look at the hydraulics, field uniformity, network analysis, and energy use in the system. Therefore, a literature review of the above aspects of center pivot irrigation system was undertaken. The following is a review of the literature related to the design aspects of a center pivot irrigation system:

A. GENERAL HYDRAULICS

1. General

The hydraulic principles of fluid mechanics are based on the classical equations of continuity and energy. A theoritical development on fluid hydraulics has been given by Garde and Mirajoakar (1977) and others. The continuity equation is based on the conservation of mass principle. Refering to Figure 2, the flow in the pipe is

$$Q = V_1 A_1 = V_2 A_2 = constant$$
 [1]

where Q = discharge,

V = velocity of flow.

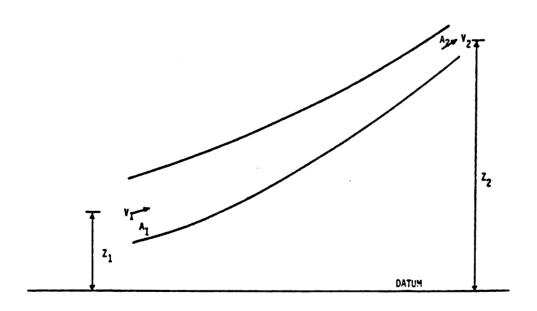


Figure 2. The discharge in the conduit with varying x-sectional area.

A = cross sectional area of the pipe, and the subscript 1 and 2 are the positions where Q, V, and A are measured.

The energy equation in fluid mechanics is commonly known as

Burnoulli's equation. Again referring to Figure 2, the energy balance
equation can be written as

$$P_1/\gamma + Z_1 + (V_1)^2/2g = P_2/\gamma + Z_2 + (V_2)^2/2g + \Delta H$$
 [2]

or

$$[(P_2-P_1)/\gamma] + (Z_2-Z_1) = [((V_1)^2-(V_2)^2)/2g] + \Delta H$$
 [3]

where P = pressure in the pipe.

Y .= specific density of water,

V = velocity of flow,

 $\Delta H=$ hydraulic head loss between position 1 and 2, and the subscripts again represent the positions where the values are evaluated.

The hydraulic design of sprinkler irrigation systems based upon the above two equations has been presented by several researchers including James (1988). Wood and Charles (1972). Perold (1977).

2. Center pivot system hydraulics

Hydraulics of a Sprinkler: When a fluid is discharged from a conduit into the athmosphere through an opening of any form, the pressure intensity along the issuing jet surface is athmospheric (Garde et al, 1977). In sprinkler irrigation, the opening is a nozzle. Nozzles are employed when a high velocity jet is desired from a pipe.

Considering a nozzle as shown in Figure 3 (Garde et al. 1977):

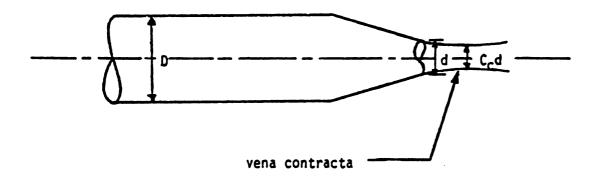


Figure 3. Discharge through the nozzle.

If section 1 is located in the undisturbed flow, while section 2 is located at the vena contracta. Bernoulli's equation gives

$$P_1/\gamma + (V_1)^2/2g = P_2/\gamma + (V_2)^2/2g$$
 [4]

The potential head ΔZ has been neglected in the above equation. Solving the above equation with the continuity equation gives

$$Q = [C_c/\sqrt{(1 - (C_c)^2(d/D)^4)]} [(\pi d^2/4)(\sqrt{2g})] [\sqrt{\Delta P/\gamma}]$$
 [5]

or

$$Q = C_d (\pi d^2/4) (2g)^{0.5} H^{0.5}$$
 [6]

where Cd = coefficient of discharge,

H = static head.

 C_c = coefficient of contraction,

d = diameter at the mouth of the outlet, and

D = diameter at section 1.

Perrold (1977), Karmeli(1977), and Bralts(1983) have written the equation of flow thru the sprinkler or emitter in the form of

$$q = kh^{X}$$
 [7]

where q = sprinkler or emitter discharge,

k = constant of proportionality,

h = pressure head at the sprinkler or emitter, and

x = sprinkler or emitter discharge exponent.

It can be seen by comparing [6] and [7] that the constant of proportionality, K, contains variables such as the coefficient of

contraction, geometry of the nozzle, and gravitaional acceleration.

The exponent x may be assumed to be 0.5 for fully turbulent flow from nozzle or orifice (Perrold, 1977). The nozzle with an x value of less than 0.5 would be pressure compensating in nature. A zero value for x would make the sprinkler fully pressure compensating (Bralts, 1983). All irrigation sprinkler manufacturers give the relation between discharge, q, and head, h, in tabuler form (Table 1).

Lateral line hydraulics: Water flow in a center pivot lateral line is considered to be hydraulically steady, spatially varied pipe flow with the flow being along the streamline. The total flow thru the lateral line decreases every time it passes a sprinkler nozzle. Taking into account the conservation of mass principle,

Q = V A

and the fact that A will remain constant, the velocity then decreases along the lateral line.

A large share of the energy loss is due to the friction in the pipe. In general, head loss due to friction can be written as

$$h_{f} = RQ^{m}$$
 [8]

where he = head loss due to friction,

R = constant depending upon the relation used,

Q = flow thru the pipe, and

m = discharge exponent.

Christensian (1942) used a generalized formula to calculate the

Table 1. Example sprinkler discharge-head relationships given by the manufacturers (Rain Bird; 1986).

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870"	60 264 110	0 613" 60 245 86	70 118 49 76 93
	70 275 118	70 255 93	90 122 52 81 99
	80 285 127	80 265 99	90 126 54 85 105
	90 295 136	90 275 105	100 129 56 88 111
	100 305 142	100 285 111	110 134 57 90 117
	110 315 150	110 295 117	120 138 58 92 122
	120 322 157	'20 305 122	0 690" 60 119 47 75 110
990	60 284 142	0 690" 60 269 110	70 125 50 80 118
	70 295 154	70 281 118	80 129 53 84 127
	30 306 164	80 291 127	90 133 58 88 136
	90 315 175	90 300 136	100 136 68 92 142
	100 326 185	100 310 142	110 140 60 95 150
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1.201"	60 318 226	0.890" 60 313 185	70 137 55 88 199
	70 332 243	70 324 199	80 142 59 95 214
	80 345 263	80 336 214	90 147 62 99 227
	90 358 276	90 347 227	100 149 65 103 235
	100 371 290	100 357 235	110 154 67 108 249
	110 382 305	110 365 249	120 157 69 109 262
	120 392 323	120 375 262	0,990" 60 138 51 85 226
1.293"	60 335 275	0.990" 60 329 228	70 145 58 91 245
	70 350 295	70 347 245	80 150 60 96 263
	80 364 315	80 357 253	90 153 64 101 276
	90 378 336	90 367 276	100 156 67 106 290
	100 390 352	100 377 290	110 161 67 110 305
	110 402 372	110 388 305	120 165 71 114 323
	120 412 392	120 395 323	1,090" 60 144 52 87 275
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1.450"	60 365 385	1 190" 60 368 331	70 155 59 97 354
	70 383 418	70 281 354	80 161 64 105 374
	80 398 447	80 395 374	90 165 68 110 400
	90 414 475	90 410 400	100 169 71 114 422
	100 425 500	100 420 422	110 171 74 117 444
	110 438 525	110 430 444	120 176 77 120 465
	120 450 550	120 440 465	1.290" 60 153 54 91 390
	-	1 290" 60 385 390 70 400 418 80 414 447 90 427 475 100 440 500 110 450 525 120 -65 550	70 160 60 98 418 80 166 65 105 447 90 170 70 111 475 100 175 73 116 500 110 179 76 120 525 120 182 79 124 550

head loss due to friction. This relation is commonly used in hydraulic design and analysis (Anon 2,1983; James, 1988)

$$h_{f} = KLQ^{m} / D^{2m+n}$$
 [9]

where K = coefficient depending upon the formulation and unit used,

m,n = exponents depending upon the formulation used,

L = length of the pipe (m, ft),

D = diameter of the pipe (mm, in), and

Q = flow rate (liters/min, gpm).

Comparing [8] and [9] gives

$$R = KL / D^{2m+n}$$
 [10]

Many semi-empirical equations are in use to calculate friction loss (h_f) in the pipe. Some of the more common equations are Darcy-Weisbach, Hazen-William, and Scobey.

The Darcy-Weisbach's equation for friction loss is

$$h_1 = fLV^2/2gD$$
 [11]

and

$$R = 8fL / g\pi d$$

where f = friction factor,

L = length of the pipe,

V = velocity of flow, and

D = diameter of the pipe.

The friction factor, f, in [11] depends upon the Reynold's number, R_e , and the relative roughness of the pipe, K = e/D (Garde et al. 1977;

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Jeppson, 1982; Swamee and Jain, 1978)

For commercial pipe, the Coolbrook equation can be used to determine the value of f (Garde et al, 1977). This equation is

$$1/\sqrt{f}$$
 - 2 log₁₀ R_e/K = 1.74 - 2log₁₀[1+18.7(R_e/K)/(R_e/f)]

or

$$1/\sqrt{f} = 1.14 - 2 \log_{10} (e/D + 9.35/(Re\sqrt{f}))$$
 [12]

Equation [12] has to be solved implicitely to determine f. Moody's diagram (Figure 4) is a plot of Equation 12. The drawback of the Moody's diagram is the difficulty of using in computer programming.

Swamee and Jain (1978) developed equations which could be solved for f explicitely. One of their equations is

$$f = 1.325 \left[\ln(0.27(e/D) + 5.72 (1/R_e)^{0.9} \right]^{-2}$$
 [13]

which is valid for a e/D range of

and a Reynolds number range of

Equation 13 has been shown to accurately represent the Coolbrook formula (Swamee et al, 1978).

The other popular expressions to determine pipe frictional loss are the Hazen-Williams and Scobey formulas. For the Hazen-Williams formula, $K = (0.285 \text{ C})^{-1.852}$, m = 1.85, and n = 1.17 in eq.15. In conventional units,

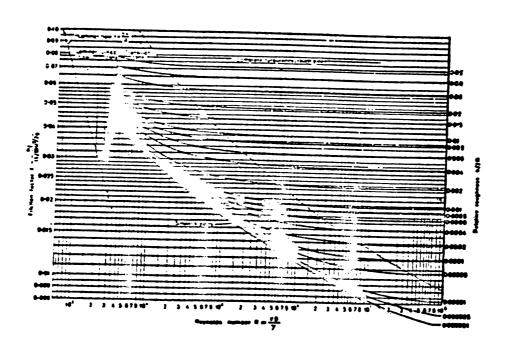


Figure 4. Moody's diagram showing the relationship between friction factor f, relative roughness e/D, and Reynold's number R_e based on the Coolbrook equation for commercial pipes (Garde et al; 1977).

$$h_c = L Q^m / (0.285 c)^{1.852} D^{2m+n}$$
 [14]

where C = Hazen-William's constant.

Similarly for Scobey's equation, n=1.10, m=1.90, and $K=K_S/348$. Scobey's equation was given in conventional unit in the following form by Anon 2 (1983)

$$h_f = Ks V^{1.9} / D^{1.1}$$
 [15]

where Ks = Scobey's constant, and

hr = head loss per 1000 ft of pipe.

Jeppson (1983) wrote that the values of Hazen-William's C and Scobey's K_S values should clearly be depended upon Reynold number. The limitation of these two equations is that their coefficients are weakly related to the diameter of the pipe. Besides this, they are not functions of the Reynolds number (Wiggert and Potter, 1989).

Since the flow in the lateral line is spatially varied with decreasing discharge, the energy grade line is an exponential curve rather than a straight line (Bralts, 1983).

Component loss: Besides friction, there is energy loss due to the presence of components in the system. This can include tees, connectors, elbows, valves, contraction and expansion joints. Component loss is generally denoted as minor loss and accounts for less than 10% of the total friction loss (James, 1988). It is a general practice to assume that minor losses are 10% of the friction loss in the network (James, 1988; Anon 2, 1983)

Though component losses are generally considered as minor losses, they can have a value more than what would be comfortably called a minor loss. The many outlets on the lateral line can increase the component loss in the system until it is substantial (Villemonte, 1977; Haghighi and Bralts, 1987; Saldivia, Bralts, and Segerlind, 1987)

Component head loss in the lateral line can be given by a generalized equation

$$h_m = K (V^2/2g)$$
 [16]

where K = loss coefficient, and

hm = component head loss.

The value of loss coefficient for some components are given in Table 2 as given by James (1988), and Jeppson (1983):

Table 2. Component loss coefficient for a few components.

Standard tee; Entrance to minor line	1.8
Gradual contraction	0.04
Abrupt Contraction	0.50

Kincaid and Heermann (1970) reported that with a diameter ratio $d_p/D < 0.2$ and q / Q < 0.3, the head loss in feet for the flow into the riser is given approximately by

$$h_r = V^2 / 2g e^{(9.2q/Q)}$$
 [17]

where h_r = riser entrance head loss,

q = branch discharge,

Q = discharge in upstream mainline section,

d_D = diameter of riser, and

D = diameter of main line.

B. UNIFORMITY AND APPLICATION EFFICIENCY

1. Hydraulic Uniformity

To obtain desired discharge and application patterns from center pivot irrigation, an adequate pressure must be maintained throughout the lateral of the center pivot system.

In the center pivot system, the water is introduced at the pivot point and flows outward thru the line, supplying each of the individual sprinkler heads. Since the water flows outward from the pivot, the pressure at the pivot point is higher than at the outer end of the lateral line. This is not the desired pressure distribution since the larger sprinklers at the outer end normally require higher operating pressures than the smaller sprinkler near the pivot point (Kincaid et al, 1970). To maintain adequate working pressure in the larger sprinkler, the pivot pressure must exceed the outer-end pressure by the amount of pressure drop in the lateral line (Kincaid et al, 1970).

Heermann and Hein (1968) reported that for practical purpose, the uniform distribution of depth of application is achieved by limiting the pressure drop on the lateral line to 20% of the higher pressure. The American Society of Agricultural Engineers (ASAE) also

recommends the pressure drop to be no more than 20% of the higher pressure in the system (Anon 1, 1986).

Because of the design of a center pivot system, the discharge of individual sprinkler heads must be increased in proportion to the area each sprinkler irrigates in order to obtain a uniform depth of water distribution over the entire field (Figure 5). If the sizes of the sprinklers are the same, the spacing of the sprinklers farther away from the pivot must be closer than the sprinklers near the pivot(Figure 6).

With approximately constant spacing of the sprinklers, the discharge of the sprinklers farther away from the pivot should be greater than that closer to it. Chu and Moe (1972) showed that

$$Q = Q_0 (1 - r^2/R^2)$$
 [18]

where Q = discharge from the sprinkler located at a distance of r from the pivot,

 Q_0 = total discharge excluding that from the end gun,

r = distance from the pivot to the sprinkler which is under consideration, and

R = distance from the pivot to the end of the system.

Chu et al (1972) showed that the distribution of discharge in the lateral line according to the above equation closely resembles experimental field discharge in the center pivot system (Figure 7a).

They also analytically derived an equation to determine the total pressure head loss in the system as

$$h_0 - h_r = h_m B(m+1,0.5)/2 - (V_0)^2/2g$$
 [19]
where h_0 = pressure head at the pivot point,

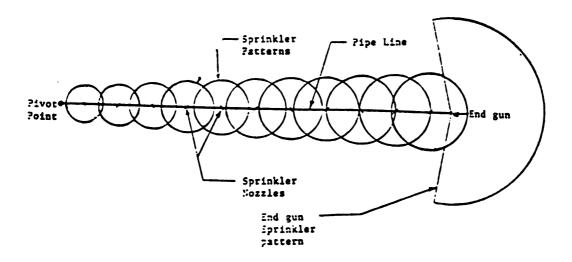


Figure 5. Distribution pattern from the center pivot irrigation system with increasing discharge away from the center pivot.

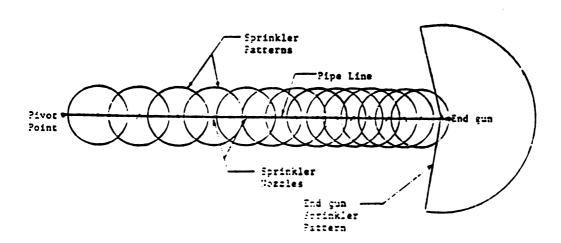


Figure 6. Distribution pattern in the center pivot irrigation system with uniform discharge from all sprinklers.

 h_r = pressure head ata distance r from the pivot,

 h_m = the friction head loss of the main line operating as a supply line,

B(n+1,0.5) = beta function, and

m,n = exponents from the Christensian general formula for head
 loss.

The above equation is also written as

$$(h_0 - h_r) / h_m = B(m+1,0.5)/2$$
 [20]

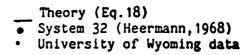
The above relation [20] does not include the potential head in the system. Taking into account the potential head in the system, [18] can be written as

$$h_0 - h_r = (h_m B(n+1, 0.5)/2) - \Delta Z$$
 [21]

where ΔZ = potential head.

Using [20], Chu et al (1972) showed that there is approximately a 50% pressure drop in the first 25% of the lateral line (Figure 7b).

There is a limiting factor as to the acreage that can be covered by a single center pivot system because of the the hydraulic uniformity. The total acreage covered by a system can be increased substantially by increasing the length of the pipe line and the total system discharge to maintain a constant discharge per acre. However, the total head loss will be larger because the extra discharge must be pumped thru the entire lateral. Kincaid et al (1970) showed that the 30% increase in area (from 140 acres to 180 acres) and discharge increased losses nearly 100%. This relatively high head loss may cause higher than necessary pumping costs and it also provides higher pressures than required for the



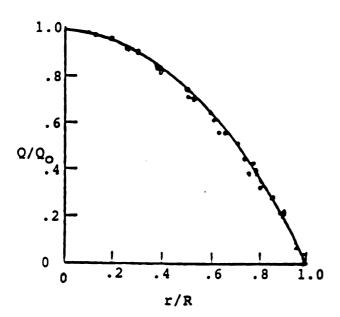
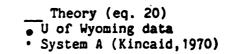


Figure 7a. Distribution of discharge in the lateral line.



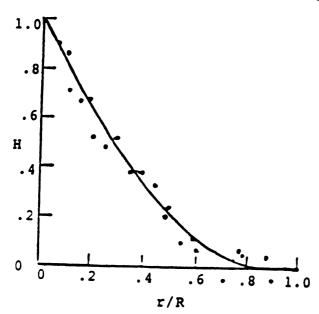


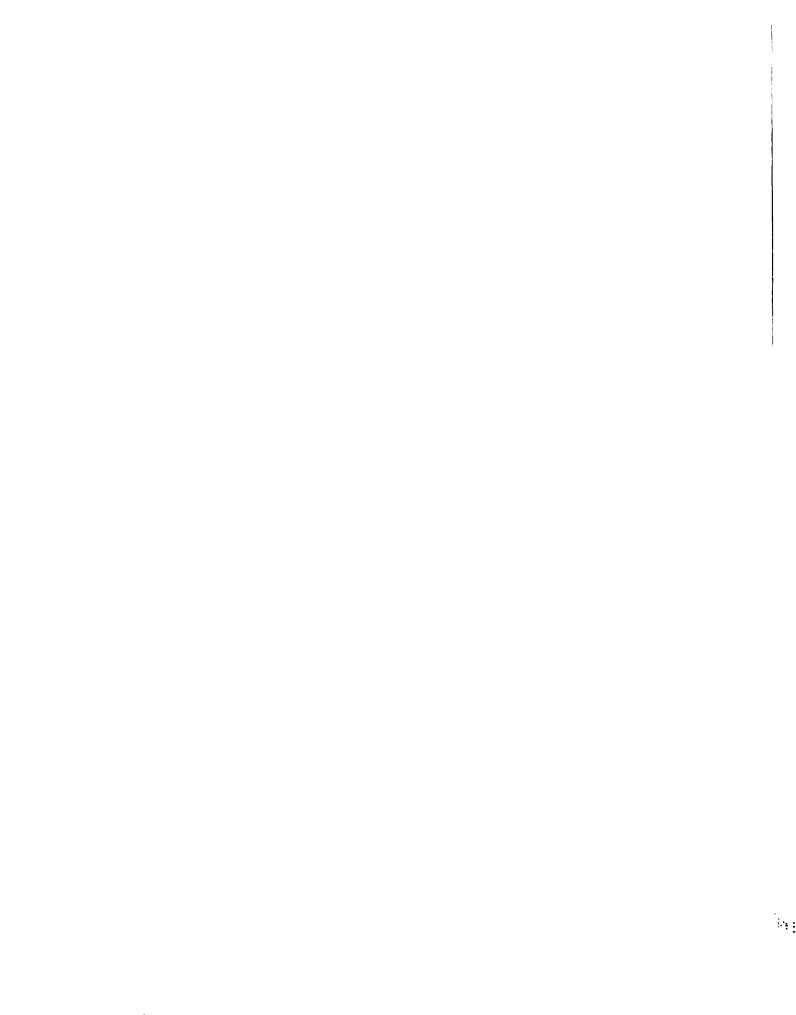
Figure 7b. Distribution factor of pressure head loss.

smaller sprinklers and lower than required for larger sprinklers. Besides this, the application uniformity can be drastically effected because of the high pressure loss in the lateral line (Kincaid et al, 1970).

2. APPLICATION EFFICIENCY

The water application rate to a point on the soil surface varies continuously with time during application by any moving sprinkler system (Kincaid, Heermann, and Kruse; 1969). In the center pivot system, the application rate must vary along the lateral length from a low value near the pivot to higher values at the outer end. Figure 8 illustrates why the application rate must increase toward the outer end of the lateral. The discharge and linear rate of travel of the sprinkler heads must increase in proportion to the area irrigated.

The water is thought to be applied in an elliptical or triangular pattern from the sprinkler to the field. Bittenger and Longenbaugh (1962) found that the triangular pattern with a spacing equal to the radius of the pattern itself will produce a more uniform distribution of water than the elliptical pattern when moved at a constant speed. But Kincaid et al (1969) conducted experiments and found that the assumption of elliptical rather than triangular-pattern sprinklers produced the accumulated application curve that agreed more closely with the experimentally determined curve. This means that the elliptical pattern has to be considered in obtaining the application rate and application depth in a center pivot system. Bittenger et al (1962) found that the most even distribution for the elliptical pattern exists at a spacing of about 1.4 times the radius of the pattern (r).



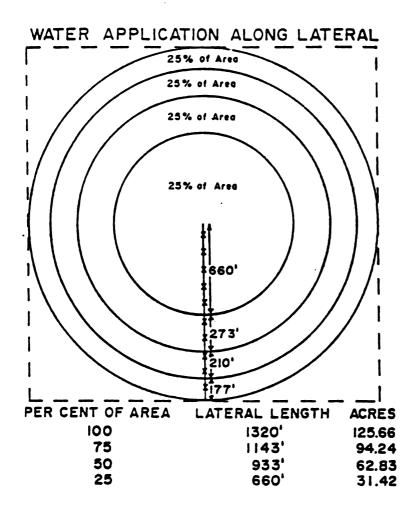


Figure 8. The relationship between the area of the field and the lateral line distance that irrigates it for a 125 acres field.

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The water distribution pattern from individual sprinklers greatly depends upon the pressure available at the nozzle. The distribution of water can vary a lot when the pressure is greater or less than the design pressure (Anon 2, 1983). When the end gun is switched off, the pressure in the lateral rises as a result of which the water distribution from a sprinkler can change to give a different application pattern in the field (Figure 9).

Heermann et al (1968) showed that the total depth $D_{\mathbf{S}}$ of water at a distance s from the pivot for one pass of the system for the elliptical pattern is

$$D_{S} = (4/w) \sum_{i=1}^{N} h_{i} (1-m_{i})^{1/2} \int_{0}^{wT_{i}/2} [1-\{4n_{i}(n_{i}+m_{i}) \sin^{2}\phi / (1-m_{i}^{2})\}]^{.5} d\phi [22]$$

where D_S = total depth of application from a sprinkler at a distance s from the center of rotation,

w = angular velocity of sprinkler lateral,

h = rate of application at center of sprinkler pattern,

m = ratio of distance from sprinkler to point P, measured along sprinkler lineto pattern radius (s-R)/r,

T = time required for one-half a single sprinkler pattern to pass point P.

n = ratio of radius of rotation to pattern radius, R/r,

 ϕ = angle of integration, equal to $(\pi/2 - \alpha/2)$,

a = angle of rotation about pivot.

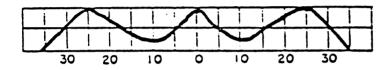
s = distance from pivot to point P,

R = distance from pivot to sprinkler,

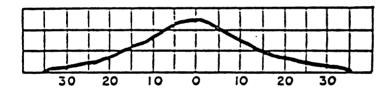
r = radius of sprinkler pattern, and

i = subscript referring to the ith sprinkler on the system.

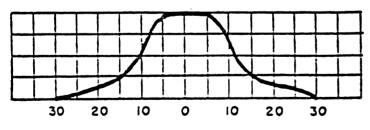
The numerical solution of [22] requires a considerable amount of



A-Pressure Too Low



B-Pressure Satisfactory



C-Pressure Too High

Figure 9. A typical application pattern from a single sprinkler with the change in pressure.

computer time. Heermann et al (1968) and Bittenger et al (1972) reported that the skewness for the circular path was less than 0.01 inches of water from the inner to the outer radius for a sprinkler at a radius of more than 650 feet. Therefore, when the radius of circular sprinkler motion is greater than 650 feet, the application pattern are essentially equivalent to those of linear motion and the depth of application can be found from

$$D_{S} = \pi / 2w \sum_{i=1}^{N} (h_{i} r_{i})/Ri * (1-m_{i})$$
 [23]

The maximum application rate which occurs at the center of the pattern was given by Dillon, Hilel, and Vittetoe (1972) as

$$h_1 = 2 q_1 / \pi r_1$$
 [24]

where h₁ = peak application rate at the center of the elliptical path,

q1 = flow per one foot wide band in gpm, and

r₁ = distance along the center line of the band from the center of the pattern.

Dillon, et al (1972) also gave the relation between the distribution of water by a sprinkler along the lateral and the percent of area covered. The water applied to a one foot band of land which encircles the pivot is proportional to the area of the band divided by the total area irrigated by the system. This was expressed as

$$q_1 = 2 L Q / R^2$$
 [25]

where L = distance from the pivot to the middle of the foot wide band in feet,

Q = flow at the pivot in gpm, and

R = radius of coverage of the system in feet

By substituting [24] into [25] and correcting for units, the following expression was obtained

$$h_1 = 122.5 \text{ QL } / R^2 r_1$$
 [26]

Since the maximum application rate occurs at the end of the system, Dillon, et al (1972) approximated the maximum application rate in the system as a whole from the following relation

$$h = 122.5 Q / Rr$$
 [27]

where h = maximum application rate at the last few sprinklers, and

r = radius of coverage of the last few sprinklers on the system excluding the end gun-type sprinklers.

The intake rate and the storage capacity of the soil are important parameters that determines the maximum application rate that is possible without runoff from the soil. It is possible to use one center-pivot system to irrigate two fields if the intake rate of the soil is relatively high, provided the discharge and the pressure in the lateral line is sufficient.

Potential runoff begins when the surface storage of the soil is satisfied. The surface storage is equal to the amount of water applied faster then the soil intake rate which eventually infiltrates into the soil. If surface storage is not considered, the feasibility of center pivot systems is limited (Dillon et al (1972).

The minimum speed of travel of the end tower \mathbf{v} , such that there is no runoff from the field, in feet per minute, is determined from the

expression

$$v = r / 30t$$
 [28]

where v = minimum speed of travel of the end gun, .

- r = the radius of coverage of the last few sprinklers on the system excluding the radius of the end gun-type sprinklers, and
- t = maximum time in hours for an elliptical pattern to pass a point before the surface storage is exceeded.

Dillon, et al (1972) determined the surface storage curves for 0.5 and 0.3 intake family soils (Figures 10 and 11). The value of t in [28] can be determined from these curves based on the surface storage and intake characteristic of the soil.

3. FIELD UNIFORMITY:

Karmeli (1978) estimated the sprinkler distribution pattern using linear regression. He noted that the use of linear regression, based upon the dimensionless cumulative frequency curve of the infiltration depth Y and the fraction of area (X) represented by Y= A + Bx, is an accurate method for describing sprinkler distribution pattern. This approximation proved to produce good estimates for both high and low quality distributions.

Christensian was the first to introduce a uniformity coefficient (U_C) to a sprinkler system (Karmeli, 1978).

$$U_{c} = [1 - (\Sigma \mid Y_{i} - \overline{Y}) / N \overline{Y}] 100$$
 [29]

or

$$U_{c} = [1 - \Delta Y / Y]100$$

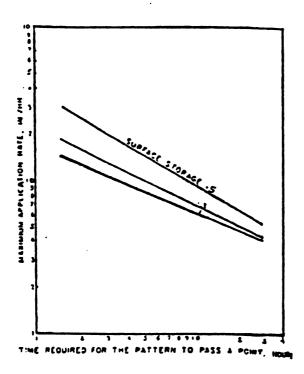


Figure 10. Surface storage curve for 0.3 intake family soil.

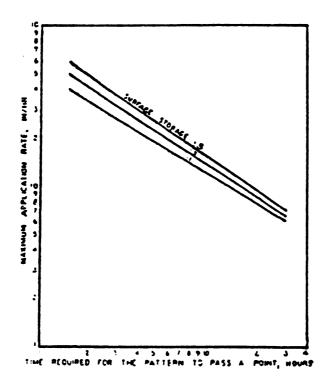


Figure 11. Surface storage curve for 0.5 intake family soil and Pullman soil.

where $\Delta \overline{Y}$ = mean deviation about the mean.

Hart(1961) and Hart and Reynold (1965) developed a uniformity coefficient (U_h) with the assumption that water distribution from commonly used sprinklers, under regular spacing conditions, may be described and approximated by the Gaussian distribution

$$U_{h} = [1 - (s \sqrt{2\pi} / \overline{Y})] 100$$
 [30]

where s = standard deviation, and

 \overline{Y} = mean of the sample.

Karmeli (1978) pointed out that, with a normal distribution, the mean of the absolute values of deviation equal 0.789s, and the uniformity coefficient can be written as

$$U_{h} = [1 - 0.789s / \overline{Y}]100$$
 [31]

Wilcox and Swailes (1947) first presented the statistical concept for the evaluation of sprinkler irrigation systems (Bralts, 1983). This statistical uniformity coefficient was based on the coefficient of variation, Vy, and is defined by the equation

or

$$U_W = [1-(S / \overline{Y})]100$$
 [32]

where Uw = coefficient of uniformity,

 V_y = coefficient of variation,

S = standard deviation, and

 \overline{Y} = mean of the sample.

Heermann and Hein (1968) have developed a method to calculate the uniformity coefficient for center pivot system based on the "coefficient of uniformity" concept proposed by Christensian.

This uniformity concept considers the ratio of a summation of the absolute deviation of the mean volume from observed volumes for sub areas to the total volume applied and is expressed as

$$U_c = 100 [1 - { [\Sigma S_s | D_s - (\Sigma D_s S_s / \Sigma S_s)]}]$$
 [33]

where U_C = Heermann and Hein uniformity coefficient,

 D_S = Total depth at a distance S from the center,

S = Distance from the pivot to the collector,

s = subscript denoting a point at a distance S from the center,
 and

 Σ = summation of the total number of catch containers.

The ASAE standard (Anon 1, 1986)) on the test procedure for determining the uniformity of water distribution of center pivot uses the above Heermann and Hein uniformity equation. The above equation is more commonly known as the Heermann and Hein modified equation.

E. NETWORK ANALYSIS:

The solution of the energy gradient in the irrigation lateral can be determined by approximation method or by iterative procedures.

1. Hardy-Cross Method:

One of the first and probably the most widely used method of

analysis is the Hardy-Cross technique (Wood and Charles, 1972).

This method was popular in the pre-computer days as a hand worked solution. This method has been incorporated into numerous computer algorithms for the solution of hydraulic network problem (Wood, 1972).

The method analyses the network by using the (i) head balance technique in the loops and (ii)flow balance technique at the nodes.

The energy equation of flow is used to write the head balance equation in each loop of the network, and it is written as

$$\Sigma h_{f} = \Sigma RQ^{m} = 0$$
 [34]

The continuity equation is used in the flow balance technique. In equation form, the relation at each node can be written as

$$\Sigma Q_{in} = \Sigma Q_{out} = 0$$
 [35]

The Hardy Cross method uses the combination of an assumed flow (Q_0) and a corrective flow (ΔQ) to solve the loop equations. The head loss equation around a loop that includes corrective flow is

$$\Sigma h_{f} = \Sigma R \left(Q_{i} + \Delta Q \right)^{m}$$
 [36]

Once the corrective flow is established, a new assumed flow is determined by using

$$Q_{i+1} = Q_i + \Delta Q_i \tag{37}$$

where i = iteration number.

The use of the Hardy Cross method was also described by Chenoweth and Crawford (1974) and Jeppson (1982). Using [8] to write discharge

in terms of head loss, [35] is written as

$$\Sigma(h_f/R)^{1/m}$$
 in - $\Sigma(h_f/R)^{1/m}$ out = 0 [38]

Jeppson (1978) reported that the number of simultaneous equation that must be solved is greatly reduced by using [38] instead of [35].

After substituting the junction pressure,

$$\Sigma[(H_{j-1} - H_j) / R]^{1/m} in = \Sigma[(H_j - H_{j+1}) / R]^{1/m} out$$
 [39]

where H_{j-1} = junction pressure at the upstream node,

 H_1 = junction pressure as the present node, and

 H_{1+1} = junction pressure as the downstream node.

The Hardy Cross solution for the corrective pressure ΔH at a node can be determined by using [8] and [36] to yield

$$\Delta H = \left[\{ (h_f / R)^{1/m} \} / \{ (1/m)(h_f/R)^{1/m} - 1 \} \right]$$
 [40]

Equation 40 is non-linear and iterative. As the calculation of ΔH proceed over the network, the value of ΔH should be calculated at each node and correction should then be applied to the energy and hydraulic grade line elevetion (Chenoweth et al , 1974).

The number of iterations required in the Hardy Cross method is dependent upon the accuracy of the initial guess. In some cases, Wood (1972) found that convergence was very slow and not at all.

2. Newton-Raphson Method:

This method overcomes the drawback of the Hardy Cross method by quadratic convergence. The development of the equation below is based

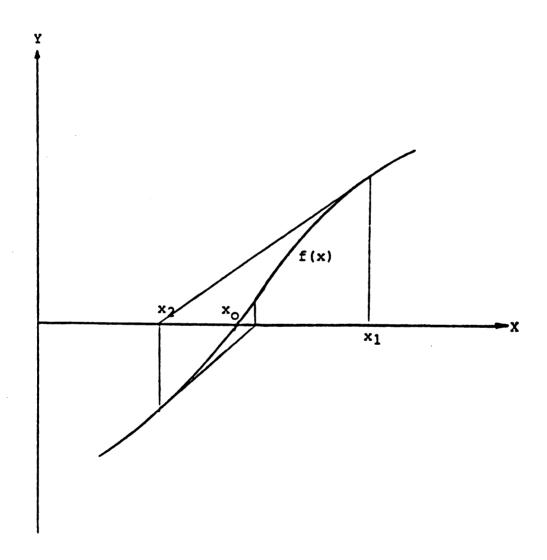


Figure 12. Illustration of solutions using the Newton Raphson Method

upon the method given by Shamir and Howard (1968).

Referring to Figure 12, the value $X_{\rm O}$ is sought for the solution such that

$$f(X_0) = 0$$

At the $k^{\mbox{th}}$ iteration, the approximation for X_0 is denoted by $X_{\mbox{\bf k}}.$ The next approximation is given by

$$X_{k+1} = X_k + \Delta X_k = X_k - f(X_k) / \{ df(X_k) / dx \}$$
 [41]

The equation for the $K^{\mbox{th}}$ improvement $\Delta X_{\mbox{k}}$ can be written as

$$\Delta X_{k} = f(X) + (\partial f/\partial X)\Delta X = 0$$
 [42]

in which both f(X) and $\partial f/\partial X$ are evaluated using the present value of X.

Because this method adjusts the flow rates in all the loops simultaneously, convergence using the Newton-Raphson approach is much quicker than using the Hardy Cross approach. However, both methods of analysis require initial guesses for the flow distribution and a very bad estimate of these values can lead to slow convergence or no convergence at all.

3. The Linear Theory Method:

This method was first proposed by Wood and Charles in 1972. Some of the special features of this method are that it is not necessary to estimate initial flow rates, convergence is extremely fast, programming is easier, and it can be used for optimization analysis.

The basic principle of this method is to transfer the loop

equations into linear equations by approximating head loss by using the following equation:

$$h_{1i} = R_i Q_{im} = R_i Q_{iom} - 1Q_i = R_i Q_i$$
 [43]

where Q_{io} = approximate discharge in line i, and

 $R_{i}' = modified pipeline constant.$

Reasonably accurate initial flow rate is calculated by assuming that the modified pipe line constant is independent of flow rate and, as a first approximation, is given by

$$R_i' = R_i \tag{44}$$

The solution of nodal equations obtained by applying this theory was highly accurate with fast convergence (Wood and Rayes, 1981). But in some cases convergence was never obtained.

The linear theory method was used by Wood et al (1972) to solve network consisting of 58 pipes. The comparision of this method with Hardy Cross and Newton-Raphson methods showed that the number of iterations in this method is the least (Table 3).

Table 3. Numerical methods and the number of iterations required for convergence.

Method	No of iterations		
Hardy-Cross	635		
Newton-Raphson	24		
Linear Theory	4		

4. Finite Element Method:

Bralts and Segerlind (1985) reported that the finite element method could be used for hydraulic network analysis if the head loss equation can be written in a linear form. Considering the pipe segment shown in Figure 13.

$$Z_1 + H_1 = Z_1 + H_1 + RQ^m$$
 [45]

where Z = elevation,

H = static pressure head,

 RQ^{m} = head loss due to friction, and

i and j are subscripts denoting upstream and downstream end of the pipe element.

Equation 45 can be rearranged to give

$$R^{1/m} = [(Z_1 + H_1) - (Z_1 + H_1)]^{1/m}$$
 [46]

or

$$Q = C_p [(H_i - H_j) + (Z_i - Z_j)]$$
 [47]

where $C_p = [(Z_i + H_i) - (Z_j + H_j)] / R^{1/m}$ is known as the pipe coefficient.

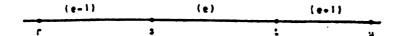
For the simple network in Figure 13, the nodal equations for element (e) can be written as

$$-Q_{S}(e-1) + Q_{S}(e) = 0$$
 [48]

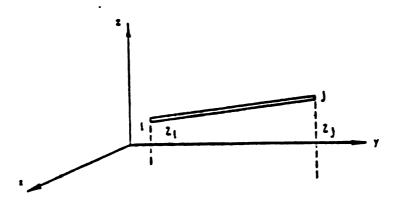
and
$$-Q_t(e) + Q_t(e+1) = 0$$
 [49]

where Q_S = flow to node s, and

Qt = flow to node t.



a. Straight pipe element



b. Simple one branch element

Figure 13. Element considered in the finite element method.

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Based on the definition given by Segerlind (1984), the contribution of element (e) to equations to the global stiffness matrix are simply $\mathbf{Q_S}$ and $\mathbf{Q_t}$ where

$$Q_t(e) = -C_p(P_s - P_t) - C_p(Z_s - Z_t)$$
 [50]

where H_S = static pressure head at node s,

Ht = static pressure head at node t,

 Z_S = elevation at node s, and

 Z_t = elevation at node t.

Equations 49 and 50 can be written in the finite element form as

$$\begin{cases}
Q_{\mathbf{S}}(\mathbf{e}) \\
Q_{\mathbf{t}}(\mathbf{e})
\end{cases} = \begin{bmatrix}
C_{\mathbf{p}} & -C_{\mathbf{p}} \\
-C_{\mathbf{p}} & C_{\mathbf{p}}
\end{bmatrix} \begin{Bmatrix}
P_{\mathbf{S}} \\
P_{\mathbf{t}}
\end{Bmatrix} + \begin{Bmatrix}
C_{\mathbf{p}} \Delta \mathbf{Z} \\
-C_{\mathbf{p}} \Delta \mathbf{Z}
\end{cases}$$
[51]

where $\Delta Z = Z_t - Z_s$.

Equation 51 has the standard finite element form

$${R^{(e)}} = {K^{(e)}} {P^{(e)}} - {f^{(e)}}$$
 [52]

where $[K^{(e)}]$ = element stiffness matrix,

{f^(e)} = element force vector,

 ${R^{(e)}}$ = residual vector, and

{H^(e)} = pressure head vector.

Haghighi and Bralts (1987) extended the above concept to include the component loss as a result of an elbow, a knee joint, a valve joint, an expansion/contraction joint, and a booster pump in the network.

Saldivia, Bralts, and Segerlind (1987) showed that the hydraulic design

of the sprinkler irrigation system could be done using the finite element approach. The sprinkler element and a pump was also considered in their analysis. The sequence of nodes and elements at the riser was considered as shown in Figure 14.

The major advantage of the finite element approach for the analysis of pipe network is that the matrix is banded and symetric which minimizes the computer storage requirement (Segerlind, 1984).

F. ENERGY USE

Irrigation is a major energy user in production agricultural, accounting fo 13% of all energy used on farms (USDA-ERS, 1977). In the Southern Plains of the U.S., irrigation pumping account for about 50% of the energy used on irrigated farm (Clark and Schneider, 1980)

Energy used in irrigation depends upon the method of irrigation.

Keller and Bliesner (1983) have shown that center pivot irrigation

system consumes less energy than the handmove sprinkler and traditional

surface irrigation system when the water is pumped from a well of 500 ft

deep. The main factor that makes the center pivot system compete with

other methods of irrigation is that it requires minimal labour energy.

The demand for the center pivot system increases with the increase in

the cost of labor energy (Heermann and Hein, 1968).

Massey, Skaggs, and Sneed (1983) suggested that the energy requirements for irrigation may be reduced by (i) improving pumping plant efficiency, (ii) increasing irrigation efficiency so that less water is required, and (iii) lowering the pressure head of the system.

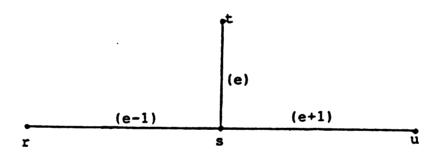


Figure 14. Sequence of the nodes and elements of a riser element.

183 ὶ; χ. • 11 :: :: :: ::: Energy in irrigation is used to lift water from one elevation to a higher level, to overcome friction loss during conveyance, and to provide pressure for sprinkler operation. Energy requirement in center pivot irrigation is normally supplied by a pump that either runs with electricity, diesel, or gas.

Capacity, head, power, efficiency, required net positive suction head, and specific speed are parameters that describe the performance of a pump. The power imparted to the water by the pump is called water power. Water power is (James, 1988)

$$WHP = QH / K$$
 [53]

where WHP = water horse power (hp, KW),

Q = discharge (gpm, m /sec),

H = head (ft, m), and

K = constant depending upon the unit used (K = 3960 for conventional unit; K = 0.102 for SI unit).

Pump efficiency (η_p) is the ratio of the energy delivered by the pump to the energy supplied to the pump shaft; that is, the ratio of the water horsepower to the brake horsepower(BHP), or,

$$\eta_D = WHP / BHP$$
 [54]

Overall efficiency (η_0) is the ratio of the energy delivered by the pump to the energy supplied to the input side of the pump driver; for example, the overall efficiency of a motor driven pump is the ratio of the liquid horsepower to the electrical horsepower (EHP) (Anon 3,1987), or,

Anon 2 (1983) gave the nomograph developed by Kenneth Frost that shows power requierments with other factors known (Figure 15).

The required net positive suction head (NPSH_a) is the amount of energy required to prevent the formation of vapor-filled cavities of fluid within the eye of the single-and-first stage impellers. Continued cavition can severely damage pumps.

James (1988) wrote that the net positive suction head required to prevent cavitation is a function of pump design and is usually determined experimentally for each type of pump. Cavitation is prevented when heads within the eye of single-and-first stage impellers waceeds the required NPSH (NPSH_r) values published by manufacturers.

A well designed irrigation system have pumps that operate with maximum efficiency for the design discharge and head. This pump efficiency is constant when the discharge and head are constant.

Curves relating head, efficiency, power, required net positive suction head to pump capacity are utilized to describe the operating properties (characteristic) of the pump. This set of four curves is known as the pump characteristic curves (Figure 16).

An operating irrigation system has water flowing thru the pipes.

The head under which the system operates is dynamic. The dynamic head is made up of several heads and is given by James (1988) as

$$H_S = SL + DL + DD + H_1 + H_0 + VH$$
 [56]

where H_S = dynamic head,

SL = suction side lift,

i.i.i.e

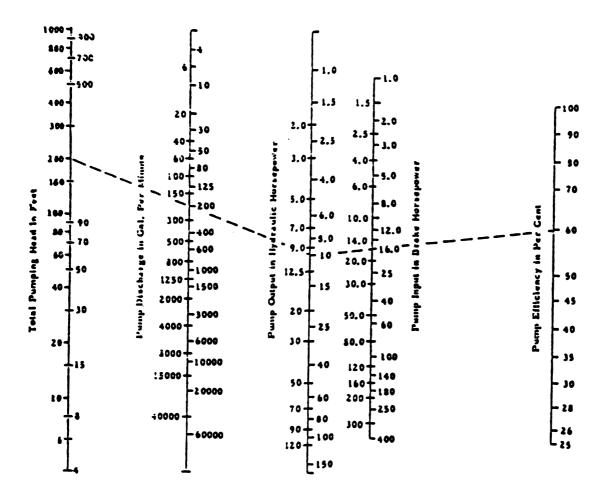


Figure 15 A power nomograph to be used to determine the horsepower required to pump water when the total head, discharge, and pump efficiency are known (Anon 2, 1983).

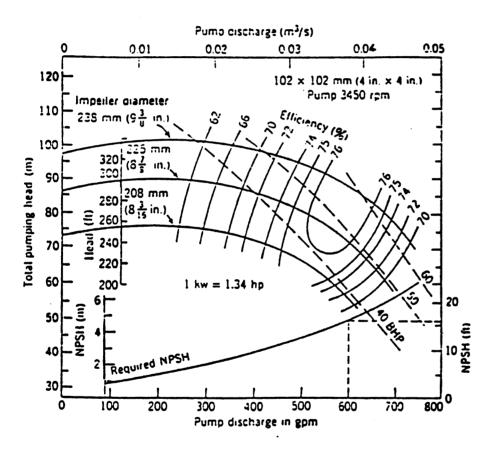


Figure 16. Pump characteristic curve.

DL = discharge side lift,

DD = water source drawdown,

H₁ = Head loss due to pipe friction,

M₁ = component head loss,

Ho = operating head, and

VH = velocity head.

Except for the suction side lift and the dynamic side lift, all the other heads are dependent upon the Q-H value in the system (James, 1988). Therefore any change in Q-H value will change the prevented when heads within the eye of single-and first stage impellers exceeds the required NPSH (NPSH_r) values published by manufacturers.

A well designed irrigation system will have pumps that operate at the optimum point of the pump curve. An example of the optimum operating point of the pump is shown in Figure 17.

Changing the diameter and/or speed of an impeller alters its characteristic curve (Anon 3, 1987). The changes in impeller performance resulting from changes in pump speed can be estimated using the following equations

$$Q_2 = Q_1 (N_2/N_1)$$
 [57]

$$H_2 = H_1 (N_2/N_1)^2$$
 [58]

$$BP_2 = BP_1 (N_2/N_1)^3$$
 [59]

where 1 and 2 are the subscripts denoting two different pump conditions.

There are two center pivot irrigation design philosophies (a)

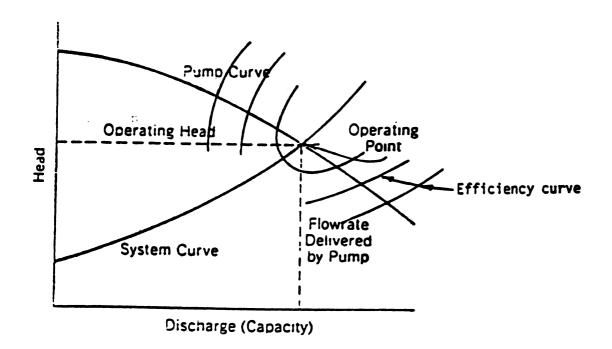


Figure 17. The plot of the operating point of the pump.

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design assuming that the end gun is in operation and (b) design assuming that the end gun is not in operation. Bermuth (1982) used a field verified computer computational technique and studied the effect of cycling an end gun on and off for a typical center pivot condition for consideration in selecting sprinkler nozzles for flow uniformity. Based on the flow uniformity concept, he found that the superior nozzling philosophy was to nozzle interior sprinklers assuming that the big gun is not in operation. But the difference between the flow uniformities for the two philosophies was extremely small. Besides this, the error induced as a result of the second philosophy was toward under irrigation. Bermuth did not consider the change in the performance characteristic of the pump in his study.

Most design engineers use the second design philosophy when considering the pump that is to be installed. The main reason for using the second philosophy is to make sure that there is no cavitation when the converse fashion of operation is used.

The end gun in the center pivot system is turned on when the corners of the field are irrigated. This will increase the discharge and decrease the head in the pump according to the performance curve (characteristics) of the pump. This means that the operating point of the pump will change. The change in operating point means a possible change in the efficiency of the pump (Figure 18).

Many researchers (Bermuth, 1983; Solomon and Kodoma, 1978) have written about the change in operating point in the pump curve as a result of turning the end gun on and off during irrigation. But no one has looked at the possibility of using auxillary sprinklers that

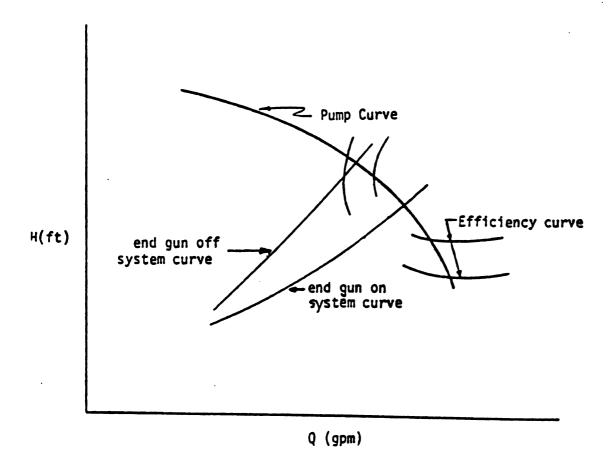


Figure 18. The change in the operating point of the pump with the change in the operating head.

turn on when the end gun is off end gun discharge. The sizing of these auxillary sprinklers can be such that their total discharge is equal to the end gun discharge. The use of auxillary sprinklers can keep the operating point of the pump constant so as to operate it with maximum efficiency throughout the irrigation period.

SUMMARY AND DISCUSSION:

The review of the literature related to hydraulics indicates that the Hazen-William and Scobey equations are widely used to calculate the friction head loss in a pipe even though it is known that the Hazen-William constant C and Scobey constant K_S does not accurately represent the friction factor in the pipe. The main reason for using these equations instead of the Darcy-Weisbach equation is because of the requirement to solve friction factor f implicitly for the later equation. This difficulty in solving for f can be overcome by using the Swamee-Jain equation that can be solved for f explicitly. The Swamee-Jain equation also contains the relative roughness, e/D, and the Reynolds number terms.

The review of the literature on hydraulics also provides the theoritical framework for the analysis of the center pivot system hydraulics.

The need to calculate the component head loss instead of assuming its value to be 10% of the total friction head loss is reflected in this section of the review.

The review of literature related to hydraulic uniformity indicates

the difficulty and importance of achieving uniformity of pressure in the center pivot lateral line. Though the best pressure distribution is to have higher pressure at the end of the lateral line, this can not be achieved. Therefore a standard has been set by the American Society of Agricultural Engineers (ASAE) limit the pressure drop in the lateral line to no more than 20% of the pressure at the pivot. This limitation in the pressure drop will allow a better water uniformity in the field. It will also limit the pumping cost per field area to a reasonable value.

The main focus of any irrigation system is the application of water to the field. Since the elliptical application pattern from the sprinkler produced the accumulated application curve that agreed more closely with experimental values, it is relevent to consider elliptical application pattern from the sprinkler.

The intake rate and the storage capacity of the soil determine the maximum application rate of water in the field. It is possible to use one center pivot system to irrigate two fields if the intake rate of the soil is relatively high. The addition of auxillary sprinklers, which operate when the end gun is shutoff, and the increase in the angular speed of the lateral line can increase the application rate as a result of which the total time required to irrigate the field is reduced.

The literature review of field uniformity was motivated by the need to know which field uniformity coefficient equation was the most valid for the center pivot irrigation system.

Heermann and Hein (1968) uniformity coefficient concept was developed from the basis Christensian uniformity concept. It takes into account the fact that the application rate in the center pivot irrigation system increases farther away from the pivot. Any change in the system design concept should not reduce the field uniformity significantly or below the minimum appraved level.

The literature review on the network analysis was required to incorporate the most efficient and accurate network analysis method in the development of the model. The linear theory model is an excellent tool for the analysis of pressure drop in a loop. But this method does not always give convergence in the flow calculation at a node. The Newton Raphson method is also a good technique to analysis networks. The Hardy Cross method requires the most iterations to solve the equations, though this does not necessary mean that it requires maximum computer time for the analysis.

The finite element method for network analysis is gaining in popularity. Basic research for its use in sprinkler irrigation has been completed by researchers. The major advantage of this method is in computer network analysis. This method cannot be used easily for analysis with the hand calculator.

The literature review on energy use is an important aspect in the cevelopment of the objectives that is to follow. Though many researchers have noted the fact that there is a change in the operating point of the pump with the switching of the end gun on and off, no one has looked into the possibility of providing auxillary sprinklers in the lateral line such that thes sprinklers operate only when the end gun is off.

This can keep the operating point of the pump constant so that it is possible to have maximum pump efficiency throughout the irrigation period. The energy saving with this design concept of the center pivot system may be substantial, especially if the pump characteristic curve is steep.

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III. METHODOLOGY

The review of the literature on the center pivot system in the previous chapter revealed that no one has looked into the possibility of energy conservation in the center pivot irrigation system by modifying its design to include auxillary sprinklers. There is a possibility of energy conservation by keeping the pump operating point constant throughout the period of irrigation. The application depth and application rate are also important parameters that are to be considered in any modification of the center pivot system. The following is a summary of the research approach to be followed in this study.

A. Research approach

The research approach that will be followed to achieve the major research objectives is proposed to be the following:

Objective 1. To determine the relationship between energy savings and the addition of auxillary sprinklers in the center pivot irrigation system.

The approach to be followed to achieve the above objective will be the development of computer simulation models. The hydraulic network

analysis model will be based on the finite element approach. This model will be used to simulate the best positions and specifications of the auxillary sprinklers in the modified design of the center pivot system. This simulation will be done to get the constant discharge and pressure head throughout the period of irrigation so as to operate the pump with constant maximum efficiency. Simulation will also be done to determine the water power (WP) for varying amount of end gun discharge that will be passed thru the auxillary sprinklers when the end gun is off. Some model results will be compared to field data collected on existing modified center pivot system.

Objective 2. To make a comparative study of the application uniformity and depth with and without the addition of auxillary sprinklers in the center pivot system.

It is proposed that the above objective will be achieved by using the Heermann and Hein theoritical concept on the depth of application on the field. The application depth for the following conditions will be studied (i) the end gun is on (ii) the end gun is off, and (iii) the end gun is off with the modification in the design to include auxillary sprinklers. The study of the application uniformity will be based on this simulated total application depth of water.

Objective 3. To study the effect of the introduction of auxillary sprinklers on the water application depth in the field and the speed of the lateral arm movement.

The approach to be followed to achieve objective 3 will be to

the relationship between the addition of the sprinklers and the application rate for different speed of the lateral in the model. The model will simulate the condition when the application rate after the design modification will be the same as without the change in the design. The calculation of the irrigation time that can be saved with the modification of the design will be studied with the help of the model.

B. Theoritical Development

The theoritical development section covers the (a) hydraulic analysis and irrigation performance evaluation section, (b) energy evaluation section, and (c) an example implementation section.

The hydraulic network analysis of the center pivot irrigation system network is based on the finite element approach. The pressure head difference between two sections of the network is the result of the friction head loss, the components head loss, and sprinkler head loss. Applying the energy balance between two points in the network, figure 19, gives

$$(Z_1+H_1) - (Z_1+h_1) = \Delta H$$
 [60]

where the subscripts i and j denote the upstream and downstream conditions respectively and all the other variables are as previously defined.

The head loss term, ΔH , of [60] can be further divided into three equations

$$\Delta H = RQ^m$$
 pipe head loss [61]

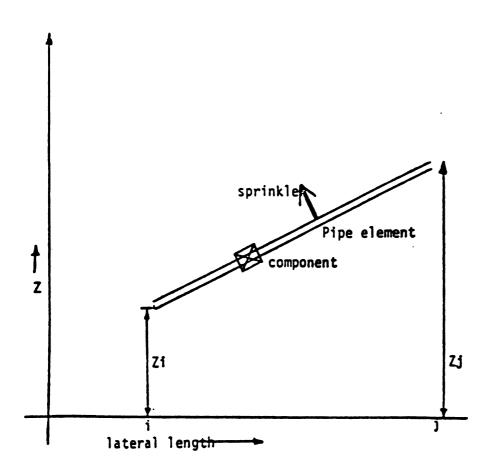


Figure 19. Network cosisting of a pipe, a component, and a sprinkler.

$$\Delta H = K_c Q^2 / 2gA^2$$
 component head loss [62]

$$\Delta H = K_{SD}Q^{a}$$
 sprinkler head loss [63]

Equation [61] can also be written as

$$Q = C_p (H_i + Z_i) - C_p (H_j + Z_j)$$
 [64]

where $C_p = \{ [(H_i + Z_i) - (H_j + Z_j)]^{1-m/m} \} / R^{1/m}.$

Similary [62] and [63] can be rearranged to give

$$Q = C_{pc}(H_i - H_1) + C_{pc}(Z_i - Z_1)$$
 [65]

where $C_{pc} = \pi^2 g D^4 / 8K_{ij}Q$,

D = diameter of the pipe,

 K_{ij} = component loss for the ij element, and

$$Q = C_{sp} (H_i - H_j)$$
 [66]

where $C_{sp} = (H_i - H_j)^{(a-1)} * K_{sp}$.

The elevation differences in the sprinkler element and the component element are neglected in [65] and [66].

The calculation of the head loss due to friction will be based on the Darcy Weisbach equation. The friction factor f will be calculated using the Swamee-Jain equation, [13], which has been explained in the literature review section.

The sprinkler head loss depends upon the sprinkler coefficient k and the exponent 'x' which is given by [7] as

$$q = kh^X$$

The values of q and h in [7] are given in the pressure-discharge chart provided by the sprinkler manufacturer (e.g. Table 1). The value of the exponent, x, is usually taken as 0.5 for a non pressure compensating sprinkler. The exponential value, x, and the coefficient, k, of [7] can be determined by linear regression of the known discharge-pressure relationship between q and h.

The pressure along the length of the pipe line of the center pivot irrigation system will be initialized using the model developed by Chu and Moe (1972). The initialized estimated pressure along the center pivot system pipe length using the Chu and Moe model is determined by using the beta function and is written as

$$h_0 - h_r = (h_m B(m+1, 0.5)/2) - \Delta Z$$
 [67]

where the variables are as explained in the literature review section. The distribution factor H is given by

$$H = (h_p - h_R)/(h_0 - H_R)$$

or

$$H = 1-B_x(m+1,0.5)/B(m+1,0.5)$$
 [68]

where x = r/R, and

 $B_{x}(m+1,0.05)$ = the incomplete gamma function.

The value of m in [68] is 2 when using the Darcy Waisbach's equation to determine the head loss in the pipe line. Therefore the distribution factor H in [68] can be estimated using the following equation (Cho and Moe, 1972)

$$H = 1 - (15/8)(x-2x^3/3+x^5/5)$$
 [69]

where x = r/R

Considering [60], [61], and [62], the discharge thru any element is

$$Q = (C_{p}+C_{sp}+C_{cp})[\Delta H]-C_{p}\Delta Z$$
 [70]

The global stiffness matrix can be built for the network of the center pivot system to solve the pressure head loss at the nodes on the basis of [70].

The Gaussian Elimination method will be used to determine the solution to the global stiffness matrix.

The irrigation depth in the field will be determined using the Heermann et al (1968) equations [22] and [23]. The irrigation application uniformity is estimated using equation [33] developed by Heermann et al (1968). The American Society of Agricultural Engineers (ASAE) also recommends using equation [33] to estimate the irriagtion application uniformity for the center pivot irrigation system.

A part or whole of the end gun discharge will pass thru the auxillary sprinklers when the end gun is turned off. This distributed discharge required at different segments of the lateral line will be calculated using the Cho et al (1972) relationship given as

$$q = Q(1-(r^2/R^2))$$
 [71]

- where q = extra discharge in the lateral line at a distance r from the pivot point,
 - Q = discharge from the end gun that is to be distributed along the lateral line, and
 - R = the distance from the pivot point to the radius of coverage of the system.

The auxillary sprinklers sizes and spacings will be determined based on the discharge required to pass thru it for the expected pressure in it. Once the auxillary sprinklers are included in the model, the pressure distribution along the pipe line will be calculated for the modified system.

Field performance evaluation will be done for cases when 33%, 50%, and 66% of the circle is covered with the end gun on.

The calculation of the power imparted to the water by the pump, i.e. water power (WP), is done using the following relation

WP = OH/K

where the variables are as defined in [52]. The total discharge, Q, and the total pressure head, H, in [52] are the values calculated by hydraulic analysis. The discharge and the pressure at the pump will be determined by plotting the system curve and the pump curve. The point of intersection of the system curve and pump curve is the operating point of the pump.

The pump efficiency η_p is determined using the pump curve (e.g. Figure 20). The pump efficiency is determined by plotting the efficiency curve. The efficiency curve that passes thru the operating point of the pump gives the efficiency of the pump. It is possible to determine the brake power of the pump by using equation [53] once the pump efficiency and water power are determined. The total energy required will be given by

Total energy required = $(BP/\eta)^{\frac{1}{2}}$ time of operation of the system

where η = electrical efficiency.

The field data is obtained for the verification of the model from Mr. Jerry Bemeant's farm in Cass county of Michigan. This farm has the option of operating the system with the auxillary sprinklers attached to the pipe line so a part of the the end gun discharge is passed thru these sprinklers when the end gun is turned off. This system is 787 feet long from the pivot point to the end gun sprinkler. It has 28 primary sprinklers manufactured by Nelson Irrigation Corporation. The pivot pressure and the spacing of the sprinklers are noted. The lateral speed of the end tower is also noted. The system is set up as shown in figure 20.

The model will be run to determine energy savings for three different pumps (i.e. three different types of pump curves). The two extreme cases will have horizontal and vertical pump curves as shown in figure 21 and figure 22. The pump with horizonatl pump curve as shown in figure 21 will have the operating pressure head always constant. The pump with vertical pump as shown in figure 22 will always give almost a constant discharge. The pump with the pump curve as shown in figure 23 was being used in Mr. Bemeant's farm in Cass county of Michigan.

Pumps with horizontal and vertical pump curves are included in the study to show the maximum possible energy and time savings that is possible for different type of pumps. The comparision of the results obtained for these three different pumps will give the range of energy savings that may be possible.

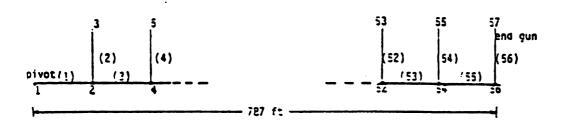


Figure 20a. Sequence of nodes and elements for the center pivot simulated model.

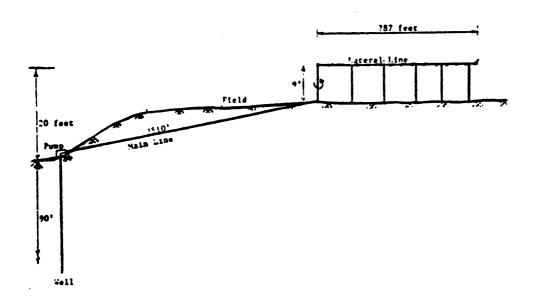


Figure 20b. The experimental network of a center pivot irrigation system.

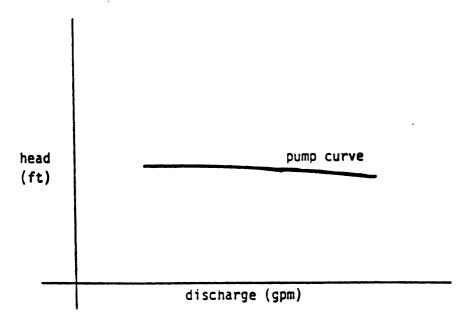


Figure 21. Pump curve to operate the pump at constant pressure.

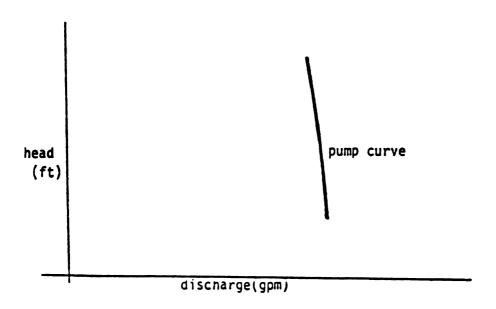


Figure 22. Pump curve to give a constant discharge for all pressures.

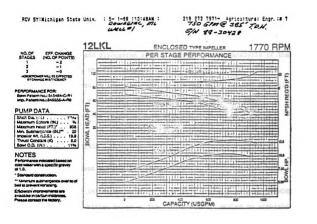


Figure 23. Pump curve for the pump used in the field.

IV RESULTS AND DISCUSSION

The results and discussion section consists of the analysis of the data generated by the four computer models, NETWORK, SYSTEM, AUXISPR, and FIELD. The results are presented for the hydraulic network analysis, field performance evaluation, and energy and time savings. The discussion follows the result of each section.

A. Hydraulic Analysis

1. Center Pivot NETWORK Simulation

As presented in the methodology section, a computer program NETWORK (Appendix A) was written based on the finite element method to simulate the discharge from the center pivot system when the end gun is on and when the end gun is off. The input data for the example system is given in Figure 24. In general, the center pivot system has a 787 feet long lateral line on which there are 28 sprinklers. The distance from the center pivot point to the last tower (not the end of lateral line) is 765 feet (Figure 20). The discharge-head equations for the sprinklers were obtained by regression analysis of the discharge-head relationship given by the manufacturer (Anon 4, 1986). Twenty five of the sprinklers have the exponent of pressure head between 0.49 and 0.51 which compares

DATA AND RESULTS

No of sprintlers in the system 28
Total length of laterals 787 ft
Distance to last towers 765 ft
Hamieum Allomable error in calculating pressure heads .5 ft

SPR	SPACING	DISTANCE FROM	CALCIL	ATED	REGRESSION		
MO	(44)	PIVOT (ft)	KC	•		EQUATION	
	28.0	28.0	0,2992	0.5094	3-	0.27 (H++0.51)	
2	:a.s	54.5	0.2843	0.4902	2-	0.39(He-0.49)	
3	28.5	85.0	0.4543	0.5031	C-	0.46 (He=0.50)	
4	28.5	113.5	0.9148	0.4568	Ç.	0.71 (He-0.46)	
5	32.5	144.0	1.2004	0.4428	8-	1.20 (Hee0.44)	
•	28.3	174.5	1.0171	0.5007	C=	1.02 (He+0.20)	
7	28.5	203.0	1.0171	0.5007	C-	1.02 (H++0.50)	
. 🛢	28.5	231.5	1.4853	0.4975	0-	1.47 (Heed.50)	
•	28.5	240.0	1.4175	0.5014	-	1.42(H000.50)	
10	28.5	283.5	1.3012	0.5003	0-	1.30 (H ++0 .50)	
11	32.5	321.0	1.4318	0.4887	-	1.43 (He-O.47)	
12	28.5	347.5	1.6175	0.5014	-	1.42 (Heed. 50)	
13	28.5	378.0	1.6173	0.5014	0-	1.42(H 0 .50)	
14	28.5	404.5	1.4380	0.5007	Q-	1.44 (H ++ 0.50)	
15	28.5	433.0	1.9721	0.5014	0-	1.97 (He-0.50)	
14	32.5	447.5	2.1241	0.5037	8-	2.13(H++0.50)	
17	28.3	476.0	2.1241	0.5037	0-	2.13(Hee0.50)	
18	23.5	524.5	2.1261	0.5037	0-	2.13(H++0.50)	
17	28.5	223.0	2.4427	0.4875	6-	2.44 (H++0.49)	
20	28.5	281.5	2.4177	0.4712	Ç	2.42(H++0.49)	
21	32.5	614.0	2.8755	0.4773	Q=	2.88 (He-0.50)	
22	28.5	44 2.5	2.2352	0.5187	0-	2.24(H++0.5 2)	
==	28.5	471.0	2.8755	0.4995	G=	2.88 (H++0.50)	
24	28.5	699.5	2.8755	0.4773	S-	2.88 (H ++ 0.50)	
23	28.5	728.0	3.1984	0.4971	0-	3.20 (H++0.50)	
24	28.5	754.5	3.1784	0.4971	2 -	3.20 (H 0.50)	
27	24.8	763.3	3.0514	0.5044	0-	3.05 (H 0 .51)	
28	2.7	787.0	13.9973	0.4990	Q-	14.00 (H-+0.50)	

DIAMETER	DISTANCE FROM	PIVOT(ft)
(inches)	FROM	70
5.79	0	745.C
2.78	743.0	787.0

PIPE RCUSHNESS=0.0004001nenes
SLCPE CF THE FIELD IS NEGLIGIBLE
RISER DIAMETER = 1.0000 inches
END GLM RISER DIAMETER = 2.0000 inches
< FOR TEE AND ELBOW COMPONENTS = 1.00

Figure 24. Data for the hydraulic network analysis of the center pivot irrigation system network.

DATA AND RESULTS No of sprinklers in the system Total length of laterals 787 ft Distance to last towers 745 ft Maximum Allowable error in calculating pressure heads .5 ft REGRESSION SPR SPACING DISTANCE FROM CALCULATED EQUATION NO PIVOT (#t) (62) KE • **28.0** :B. 0 0.2882 0.5074 0.29 (He-Q.51) :a.s 0.3843 0.4902 -0.39 (H-0.47) S4.5 28.5 85.0 0.4543 0.5031 0.46 (Hee0.50) 28.5 0.7148 0.4568 0.91 (He-0.46) 113.5 3 144.0 1.2004 0.4428 1.20 (Heed. 44) **6** 7 28.5 174.5 1.0171 0.5007 G-1.02 (He-0.30) 28.5 203.0 0.5007 1.02 (H--0.50) 1.0171 . 8 28.5 231.5 1.4853 0.4975 **-**1.47 (He-0.50) 1.42 (He-0.50) 1.30 (He-0.50) • 240.0 28.5 1.4175 0.5014 8888 10 28.3 288.5 1.3012 0.5003 0.4987 1.43(H==0.49) 11 32.5 321.0 1.4318 12 13 14 15 1.42 (Hee0.50) 28.5 347.5 1.4175 0.5014 28.5 378.0 1.6175 0.5014 1.42(H--0.50) 0.5007 28.5 404.5 1.4380 1.44 (He-0.50) 28.5 0.5014 0-0-1.97 (H-+0.50) 433.0 1. 7721 14 17 18 19 20 32.5 28.5 28.5 0.5037 2.13(He-0.50) 447.5 2.1241 494.0 0.5037 2.13(He-0.50) 2.1241 524.5 553.0 0.5037 9-2.13 (He-0.50) 2.1241 28.5 0.4875 Ğ= 2.44 (H++0.49) 2.4429 28.5 281.5 0.4712 Ç= 2.42 (He-0.49) 2.4177 32.5 28.5 0.4773 21222422 0-2.88 (He-0.50) 2.8755 614.0 642.5 0.5187 9-2.24(He-0.52) 3.3 671.0 2.8755 2.88 (He-0.50) 0.4975 2.88 (He-0.50) 28.5 0.4773 699.5 2.8733 3.20 (He-0.50) 28.5 728.0 0.4971 0-3.1784 754.5 28.5 3.1704 0.4971 Q= 3.20 (He-0.50) 763.3 3.0514 0.5044 0-3.05(He-0.51) 0.4990 Q- 14.00(H--0.50) DIAPETER DISTANCE FROM PIVOT (FE) FROM (Inches) 70 5.79 ٥ 745.0 2.78 745.0 787.0 PIPE RCUSHNESS-0.0004001 nenes SLOPE OF THE FIELD IS NEGLIGIBLE RISER DIAMETER . 1.0000 Inches END GUN RISER DIAMETER . 2.0000 INCRES

Figure 24. Data for the hydraulic network analysis of the center pivot irrigation system network.

< FOR TEE AND ELBOW COMPONENTS .

well with the usual turbulent flow equation

$$0 = kH^{0.5}$$
 [7]

As a preliminary test, the program NETWORK was run ten times each with given center pivot pressure. This pressure was increased from 80 psi to 125 psi in 5 psi increments with the end gun on, end gun off, and the modified center pivot system conditions. Figures 25a and 25b are the output from these runs for the end gun on and end gun off conditions. The reason for these preliminary runs was to establish the discharge-head relationship of the system at the center pivot point, making it possible to determine the pivot pressure for any given discharge thru the system.

The allowable error for the runs were 0.5 feet of head. The pressure drop along the lateral line with the end gun off is about half of what it is when the end gun is on. These results indicate that the pressure along the line increases when the end gun is off. It can also be seen that regardless of the pressure at the pivot point, the percentage of total flow passing thru the end sprinkler (end gun) when the end gun is on is constant (22.42%) for all the runs. In addition, the discharge Q, and the pressure head, H, at the pivot point illustrated a very strong association $(R^2=0.99999)$ as shown in Figure 26. Thus it can be shown that the total of all flows passing thru the sprinklers Q (discharge thru the pivot) is related to the pivot pressure P

$$Q = 57.007 \text{ H}^{0.502798}$$
 [72]

The Q-H relationship equation for the end gun off condition was

83.00 70.00 73.00 00.00 03.00 10.00 15.00 20.00	184.91 194.47 208.03 219.98 231.14 242.70 224.23 245.81 277.37 298.92	67.4 73.8 78.2 82.5 64.8 91.2 93.4	140.3 170.3 180.7 170.8 200.7 210.8	10.34 11.22 11.84 12.46	24.02 25.74 27.37	784.7 910.9 834.4	174.3 181.9	22.42 22.43	
83.00 70.00 73.00 00.00 03.00 10.00 15.00 20.00	196.47 208.03 219.58 231.14 242.70 254.23 245.81 277.37 256.92	73.8 78.2 82.5 86.8 11.2 75.6	170.5 120.7 170.8 200.7 210.8	11.22	22.44 27.37	010.7	181.9		
70.00 73.00 00.00 03.63 10.00 15.00 20.00 23.00	208.03 217.58 231.14 242.70 224.23 245.81 277.37 286.72	78.2 82.5 84.8 91.2 95.4 100.0	180.7 190.8 200.7	11.84	27.37			22.42	
73.00 00.00 03.60 10.00 15.00 20.00 23.00	219.58 231.14 242.70 254.23 2A5.81 277.37 286.92	82.5 64.8 71.2 73.4 100.0	190.8 200.7 210.8	12.46			187.2	22, 42	
03.69 10.00 15.00 20.00 23.00	242.70 234.23 243.81 277.37 298.92	11.2 73.4 100.0	210.8	13.18	20.81	657.4	172.4	≅. 42	
10.00 15.00 20.00 25.00	234.23 243.81 277.37 298.72	75.4 100.0	210.8		30.43	877.7	197.3	22.42	7
15.00 20.00 23.00	243.81 277.37 298.92	100.0		13.80	31.89	701.8	202.2	22.42	7
20.00 23.00	277.37 286.92		23.9	14.41	33.32	723.2	237.0	23.42	?
23.00	250.72	104.3	241.2	13.43	34.75 34.16	744.0 744.3	211.7	23.42 22.42	7
)		100.7	21.3	14.27	37.61	784.5	220.7	3.4	į
	76 H RELS	1710 12 2417 57.007(NOOD, 502	PIVOT 18 (798)	OTVEN	17			
		Pond	Hond	Paras	Heres	Colvet	0000	Cond	170
(PSI)	(FT)	(PBI)	(FT)	(P82)	(PT)	(SPN)	(GPM)	(S of Golvet)	
		74.6	172.4	3.42	12.52	422.2	0.0	0.00	_
		79.4	183.4	3.43	13.03	641.6	0.0	0.00	3
		94.1	194.3	3.74	13.73	440.4	0.0	0.00	3
									•
									4
									- 1
		107:4	248.7	7.42	17.15	747.1	0.0	0.00	4
			277. b	7.71	17.81	743.3	•••		
23.00	Z:::- 7 2	117.0	270.4	E-01	18.50	777.2	0.0	0.00	
VS H					DI 37				
ed e	nd gun	off							
Pivot (PSI)	Epivos (FT)	Pond (PSI)	Hend (PT)			Qpivot (GPM)	Qend (G7H)	(2 of Cpives)	175
		72.0	166.4	1.03	18.56	774.2	0.0	0.00	
			177.0	8.44	19.51		0.0	0.00	3
									3
									4
		94.3	219.0						ì
10.00	254.25	99.3	229.5	10.70	24.74	707.1	0.0	0.00	i
		103.8	240.0	11.16	25.80	929.7	0.0	0.00	•
									•
	Pives (PSI) 80.00 (PSI)	Pive Mpives (PSI) (PT) 80.00 184.91 80.00 219.47 90.60 223.03 92.00 219.88 80.00 223.03 92.00 277.37 20.00 277.37 80.00 284.79 80.00 184.91 80.00 184.91 80.00 184.91 80.00 219.88 80.00 219.88 80.00 219.88 80.00 219.88 80.00 219.88	Pivet Mpivet (PSI) 60.00 104.91 74.6 50.00 104.91 74.6 50.00 104.91 74.6 50.00 223.03 84.1 72.00 219.88 83.8 00.03 223.14 73.8 103.00 273.23 102.9 103.00 273.23 102.9 13.00 273.01 167.6 20.00 277.37 112.3 VS M RELATIDICHIP 6T Da. 44.870 Block (PSI) (PS) (PSI) 60.00 104.91 72.6 65.00 124.70 94.8 10.00 273.23 99.1 10.00 263.03 81.1 95.00 212.58 99.1 10.00 253.25 99.1 10.00 263.25 99.1 10.00 263.25 99.1 10.00 263.25 99.1 10.00 263.25 99.1	Pivot Mpivot Pone Hone (PSI) (PT) (PSI) (FT) 80.00 184.91 74.6 172.4 80.00 184.91 74.6 172.4 80.00 219.68 83.8 203.2 80.00 223.03 84.1 194.3 872.00 219.88 83.8 203.2 80.00 221.14 93.8 216.1 80.00 274.23 102.9 237.8 15.00 274.23 102.9 237.8 15.00 277.37 112.3 279.6 WE H RELATIDISHIP AT THE PIVE 04.44.870 Bioco. 803783 ed end gun off Pivot Spivot (PSI) (PSI) (FT) 80.00 184.91 72.0 166.4 85.00 196.47 76.6 177.0 90.00 208.03 81.1 187.5 90.00 219.58 85.6 198.0 90.00 231.14 90.2 208.3 05.00 242.70 94.8 219.0 10.00 251.51 103.8 240.0 20.00 277.37 108.4 250.5 213.00 288.32 112.9 261.0	Pivot Mpivot Pene Hone Peree (PSI) (PT) (PSI) 80.00 184.91 74.6 172.4 3.42 13.05 10.00 184.91 74.6 172.4 3.42 13.0 10.00 184.91 74.6 172.4 3.42 13.0 10.00 184.91 74.6 194.3 3.94 194.3 3.	PIVOE MPIVOE Pane Hone Parco Marco (PSI) (FT) (PSI) (FT) (PSI) (FT) 80.00 184.91 74.6 172.4 3.42 12.32 13.03 13.05 13.00 184.91 74.6 172.4 3.42 12.32 13.03 13.05	Pivot Mpivot Pene Hane Parce Harce Galvet (PSI) (PT) (PSI) (PT) (PSI) (PT) (PSI) (PT) (SPN) 80.00 184.91 74.6 172.4 3.42 12.52 422.2 63.03 18.47 79.4 183.4 3.43 13.03 441.6 70.60 273.63 84.1 194.3 5.94 13.73 407.4 79.60 273.63 84.1 194.3 5.94 13.73 407.4 79.60 273.63 84.2 116.34 672.8 792.60 219.88 83.8 203.2 4.21 14.34 672.8 792.60 223.63 84.2 116.1 4.51 13.05 494.8 792.8 792.60 272.14 93.5 216.1 4.51 13.05 494.8 792.8 792.60 272.75 100.00 274.25 182.9 224.9 4.62 13.76 713.7 130.00 274.25 182.9 237.8 7.12 16.43 730.6 13.60 274.25 182.9 237.8 7.12 16.43 730.6 13.60 274.25 182.9 237.8 7.12 16.43 730.6 13.60 274.25 182.9 237.8 7.12 16.43 730.6 13.60 274.25 182.9 277.37 112.3 270.4 6.01 18.80 779.2 792.00 277.37 112.3 270.4 8.01 18.80 779.2 792.00 222.00 227.37 112.3 270.4 8.01 18.80 779.2 792.00 222.00 2	Pivot Mpivot Pene Hone Parce Hone Gelvet Game (PSI) (PT) (PSI) (FT) (PSI) (FT) (BPI)	Part Paive Paive Part Part

Figure 25a, b, and c. Results obtained from the computer simulation model 'NETWORK' for the end gun on, end gun off, and modified end gun off conditions.

RUN	1 21	MO1 VOS						_		
*O	(P81)	(27)	(PEI)	(FT)	(P31)	(FT)	(CPH)	(8PM)	Cond (5 of Delvet)) TE
Ī		184.71	49.4	140.3	10.34	24.02	784.7	174.3	22.42	_
2		194.47	73.0	170.5	11.22	22.94	810.7	181.7	22.42	•
		217.58	78.2 82.5	150.7	11.84	27.37	834.4	187.2	22.42	•
3		231.14	64.8	200.7	13.18	20.81 30.43	837.4	172.4	23.42 23.42	7
•		242.70	91.2	210.8	13.60	31.09	701.8	202.2	22.42	į
7	110.00	234.23	45.4	220.7	14.41	23.32	723.2	237.0	2.42	,
•	113.00		100.0	231.1	13.03	34.75	744.0	211.7	22.42	į
10		277.37 288. 92	104.3	241.2 221.3	15.43	34.16 37.41	744.5 784.5	214.2	22.42 22.42	7
	THE B		1710:2011 57.007		PIVOT 18					·
	NA GP									
RLN NO	(PSI)	(FT)	(PSI)	(FT)	(P82)	(PT)	(SPN)	(SPR)	(S of Onlyot)	ITE N
1	80.00	194.91	74.6	172.4	3.42	12.52	422.2	0.0	0.00	
3		146.47	79.4	183.4	5.43	13.03	641.6	0.0	0.00	3
3		2:3.03	84.1	194.3	3.74	13.73	440.4	0.0	0.00	3
4		219.88		203.2	4.21	14.34	472.B	0.0	0.00	•
5	163.03	221.14	73.5	214.1	4.51	13.05	676.8	0.0	0.00	•
7		242.70	93.2	224.9	P.E.	13.76	713.7	0.0	0.00	4
.	113.60		102.9 167:4	237.8 248.7	7.12 7.43	14.43 17.15	730.6 747.1	0.0 0.0	0.00 9.00	1
÷	123.60		112.3.	Z77.6	7.71	17.81	743.3	6.0	0.00	•
10		2:2.72	117.0	270.4	8.01	18.50	777.2	0.0	0.00	•
ne	E 0 VB H		(2)13P AT			DI S Y				
Mod1	fied e	nd gun	off							
	Privot	HPLVOS (FT)	Pond (PSI)	Hend (FT)		##F09 - (77)	(CPM) Optvor	Qemi (CTH)	(2 of Chines)	172
RUTE NO	(PSI)					18.56	774.2	0.0	0.00	
AUTE		184.91		166-4	2.01					i
AUTE NO	10.00	184.91	72.0	166.4	8.03 8.44		798.4	0.0	0.00	
AUTH MO	80.00 83.00 90.00	184.91 196.47 208.03	72.0	166.4 177.0 187.5		19.51	798.4 821.7	0.0	0.00	Š
RUTE NO	80.00 85.00 90.00 95.00	184.91 196.47 208.03 219.58	72.0 76.6 01.1 85.6	177.8 187.5 198.0	8.44 8.90 9.36	19.51	798.4 821.7 844.4		0.00	3
2 3 4 5	80.00 83.03 90.00 95.00 100.00	184.91 126.47 208.03 219.58 231.14	72.0 76.6 81.1 85.4 90.2	177.0 187.5 198.0 208.5	8.44 8.90 9.36 9.78	19.51 20.56 21.63 22.62	921.7 944.4 966.6	0.0 0.0 0.0	0.00 0.00 3.00	3
RUTH MO 2 3 4 5	90.00 90.00 95.00 100.00	184.91 196.47 208.03 219.58 231.14 242.70	72.0 76.6 81.1 85.4 90.2 94.8	177.0 187.5 198.0 208.5 219.0	8.44 8.99 9.36 9.78 10.25	19.51 20.56 21.63 22.62 23.69	921.7 944.4 966.6 998.1	0.0 0.0 0.0	0.00 0.80 3.00 0.00	3 4 4
AUM NO 1 2 3 4 5 6 7	90.00 83.03 90.00 95.00 100.00 103.00	184.91 126.47 208.03 219.58 231.14 242.70 254.25	72.0 76.6 81.1 83.4 90.2 94.8 99.3	177.0 187.5 198.0 208.5 219.0 229.5	8.44 8.99 9.36 9.78 10.25 10.70	19.51 20.56 21.63 22.62 23.69 24.74	821.7 844.4 866.6 888.1 909.1	0.0 0.0 0.0	0.90 0.80 3.99 0.00 0.00	3 4 4
RUTH MO 2 3 4 5	90.00 83.03 90.00 95.00 100.00 103.00 113.00	184.91 126.47 208.03 219.58 231.14 242.70 254.25	72.0 76.6 81.1 85.4 90.2 94.8	177.0 187.5 198.0 208.5 219.0	8.44 8.99 9.36 9.78 10.25	19.51 20.56 21.63 22.62 23.69	921.7 944.4 966.6 998.1	0.0 0.0 0.0	0.00 0.80 3.00 0.00	3 4 4

Figure 25a, b, and c. Results obtained from the computer simulation model 'NETWORK' for the end gun on, end gun off, and modified end gun off conditions.

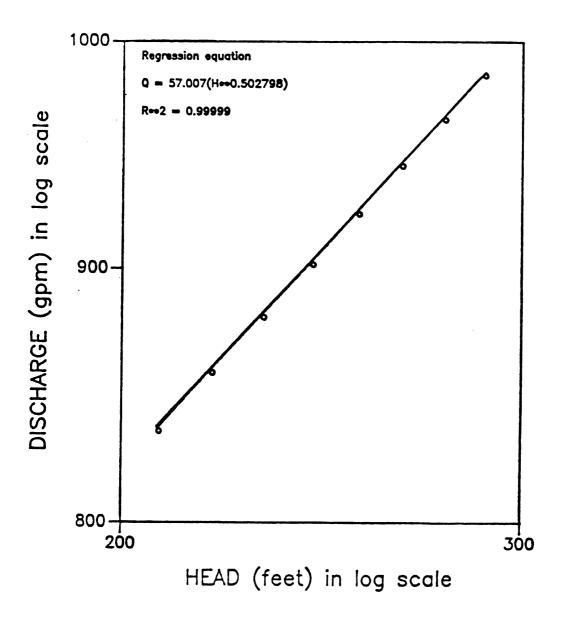


Figure 26. Graph showing the discharge-pressure relationship at the center pivot point for the end gun on condition.

similarly determined with a coefficient of determination (R^2) of 0.99996 (Figure 27). The regression equation for this condition is

$$Q = 44.890 \text{ H}^{0.503705}$$
 [73]

2. System Curve Simulation

Equations [72] and [73] were used to determine the system curve at the pump for the given elevation head (20 feet), lift from water level to the pump (90 feet), diameter of the main line (8 inches), and the length of the main line (3510 feet) (Figure 20). Program "SYSTEM" (Appendix C) was used to determine the Q-H relationship at the pump for the given data. The system curve based on the output results from "SYSTEM" (Figures 28a and 28b) were used to determine the Q-H relationship at the pump (Figure 29). These are the system curves for the system.

The energy savings and field performance evaluation were done for three different pumps: pump 'H' with the horizontal pump curve, positive displacement pump 'V' with the vertical pump curve, and the pump used in the field pump 'J'. Pump curves for pumps H and V are hypothetical. These are the two extreme cases for pump curves. They are included in the study to show the range of energy and time savings depending upon the type of the pump used. Figures 30, 31, and 32 show the pump curves for the pumps 'V', 'H', and 'J' and the system curves for the end gun on, end gun off, and the modified end gun off conditions. The intersection of the pump curve and the system curve is the operating point of the pump.

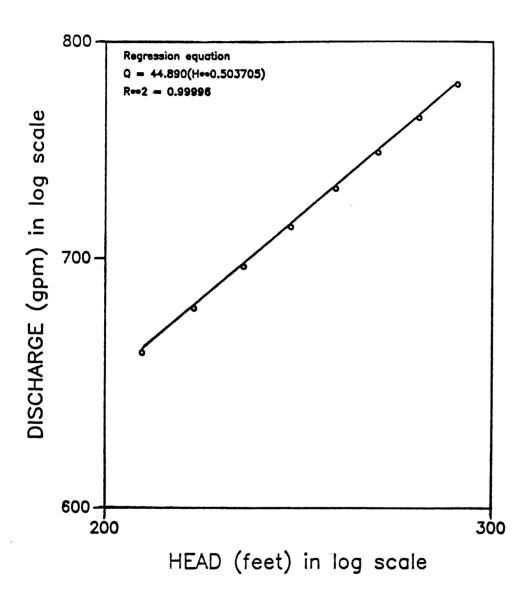


Figure 27. Graph showing the discharge-pressure relationship at the center pivot point for the end gun off condition.

ELIVERY HEAD (FT) - 34.6 HOCKHES OF THE PIPE (INCHES) - 0.0000 JILLYTH OF THE PIPE (INCHES) - 0.0000 LINCHET OF THE PIPE (INCHES) - 0.0000 LINCHET OF THE SISTEM AT THE PIPOTH ST. 0000 LINCHET OF THE SISTEM AT THE PIPOTH ST. 0000 LINCHET OF THE SISTEM AT THE PIPOTH ST. 0000 LINCHET OF THE SISTEM AT THE PIPOTH ST. 0000 JILLYTH OF THE SISTEM AT THE PIPOTH ST. 00000 JILLYTH OF THE SISTEM AT THE PIPOTH ST. 00000 JILLYTH OF THE SISTEM AT THE PIPOTH ST. 00000 JILLYTH OF THE SISTEM AT THE PIPOTH ST. 00000 JILLYTH OF THE SISTEM AT THE PIPOTH ST. 00000 J	DI (W 00								
STATUTE OF THE PIPE (INCIDENT)	LIFT	· ×ELD (FT1 - 94.6							
LINCTH OF THE DELIVERY PIPE (FERTI-)318.0 CERTIFICITY OF THE STRIPE AT THE PIVOT-0.5008 EXPORMET OF THE STRIPE AT THE PIVOT-0.5008 EXPORMET OF THE STRIPE AT THE PIVOT-0.5008 CREATER FIRE S FRICE RELEAD FRICE MEAN WILL DRAW OF READ TOTAL MEAN FY THE PIVOT-0.5008 CREATER FIRE S FRICE RELEAD FRICE MEAN WILL DRAW OF FY THE PIVOT-0.5008 CREATER FIRE S FRICE RELEAD FRICE MEAN WILL DRAW OF FY THE PIVOT-0.5008 INC. 13.000 11.000 0.0010 0.0017 1.0110 10.0101 10.0101 11.0101 10.0101 1	ROOCE	PRISOF TO	ME PIPE (IN	312410 6.866	•					
CASES FILES & FRIC READ FRIC PRINT TO TOTAL READ GRANT FT SECTION FOR THE STATE OF THE SECTION FT S	-	3 OF THE	DELIVERY PE	PR (PRETIA)	918.0					
110.00 11.00 1.0016 2.	LEPON	Est of the	E SISTEM AT	THE PLYOT-	***)				
110.00 110.00 10.0014 2.0010 0.1592 75.090 100.0099 1350 110.00 17.0310 0.0417 1.1110 97.762 110.100 10.0009 0.0771 0.1272 107.110 110.100 10.000 10.000 0.0771 0.1272 107.110 110.100 110.000 17.0110 0.0001			PRIC READ							
130 110-00 17-03-00 0-771 0-1279 107-101 110-1010 110-101			14.4016	******						
100 111-00 17-1110 10-1210 10-1210 110-	400	110.00	20.4990		3.1914 9.3378	10.762	138.8366			
130 131	700	110.00	27.8130	3.6153	0.2473 0.31 00	126-531	760.7900 206.6404			
100 110.00 11.00	400	110.00	33.2324	4.1212	0.4049	191.226	334.0633			
DELIVERY NEAD (FT)= 18.8	110	110.00	43.8479	4.1300	0.3124	241.703	394.0636	•		
DELIVERY NEAD (FF)= 90.0 ACCUMUNIZE OF THE PIPE (INCRESS=0.000000 DIAMATIC OF THE PIPE (INCRESS=0.0000000000000000000000000000000000	1000	110.00	13.3526	0.1018	0.6327		441.6343			
DELIVERY NEAD (FF)= 90.0 ACCUMUNIZE OF THE PIPE (INCRESS=0.000000 DIAMATIC OF THE PIPE (INCRESS=0.0000000000000000000000000000000000	1310 G	w off								
LIFT READ PTDS (INCRES) = 0.00400										
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### Common Page	DIT	DILUTET OF THE ENTRICE PERFACE AREA								
SET SECRET SOCTION FT FT FT	DILE	~ ~ 0 ~	DELLVEST PI	PS (FEET) - 1	310.0					
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### ##################################	DIA:	TIME B	PARE TERMINED OF THE PARENTS OF THE	PS (PET)) AT THE PIVOT THE PIVOT	910.0 707- 44.890(10.8037 YEL EEAB	071 REAS				
780 119.46 27.5130 0.0912 0.2100 233.203 371.3052 710 119.06 31.2360 5.1879 9.3359 27.627 409.407 810 119.06 31.2326 0.1212 0.4019 104.401 406.0700 810 119.08 31.4216 6.1232 0.4571 123.277 409.2640 930 110.00 31.4216 5.1232 0.4571 123.277 409.2640 930 110.00 41.4079 3.1300 3.5124 150.402 537.0021 130 110.00 41.4095 3.1654 5.5710 428.227 107.2070 130 110.00 41.4095 3.1654 5.5710 428.227 107.2070 1400 110.00 53.3326 0.1015 3.6327 474.132 036.1170 DIASTRIA OF TEX PIPE (NCKES -0.000600 DIASTRIA OF TEX PIPE (NCKES -0.0006000 DIASTRIA OF TEX PIPE (NCKES -0.0006000 DIASTRIA OF TEX PIPE (NCKES -0.000600000000000000000000000000000000	OSTEN COSTON COS	TURN OF THE COLUMN OF THE COLU	PRIC WEAD DELIFY) 14.8016	PS (PET) - 1 AT THE PIV THE PIVOT- PRIC HEAD SOCT (FT) 0.0330	910.0 970 44.8900 9.3437 YEL HEAD IT 0.1513	072 MEAS PT 112.746	244.7060			
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Figure 28a, b, and c. Discharge pressure relationship of the center pivot system at the pump for the end gun on, end gun off, and modified end gun off condition.

2

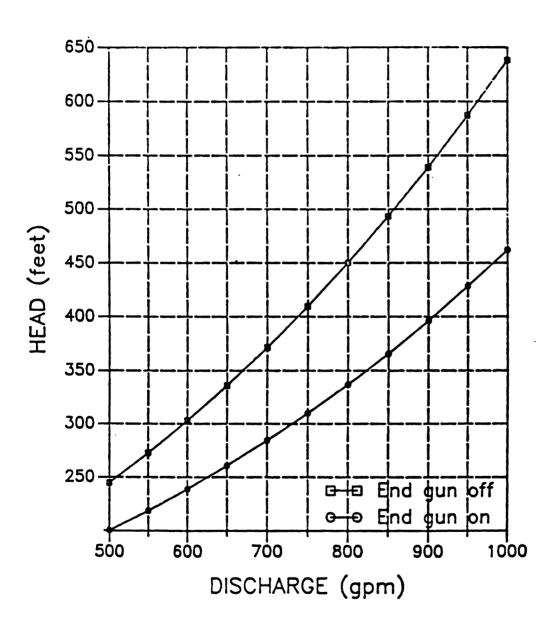


Figure 29. System curves of the center pivot irrigation system for the end gun on and end gun off conditions.

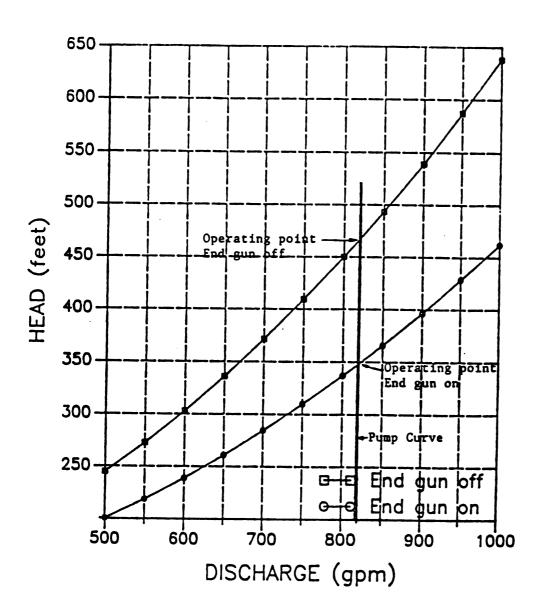


Figure 30. Pump curve for pump 'V' plotted with the system curves to determine the operating points of the pump.

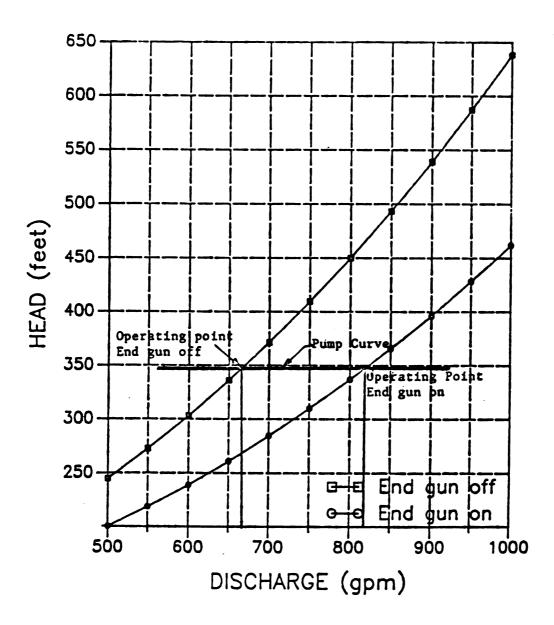


Figure 31. Pump curve for pump 'H' plotted with the system curves to determine the operating points of the pump.

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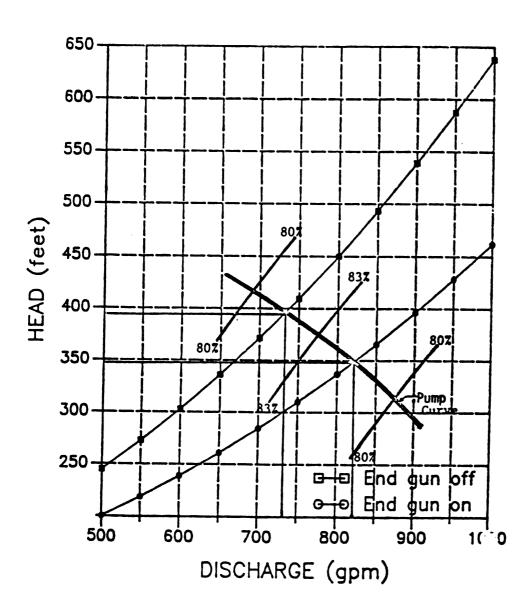


Figure 32. Pump curve for pump 'J' plotted with the system curves to determine the operating points of the pump.

The data collected from Mr. Jerry Bement's field (Appendix G) showed the operating head and discharge to be 349 feet (151 psi) and 830 gpm respectively for the end gun on condition. The simulated model discharge is 825 gpm for a head of 349 feet when the end gun is on [Figure 28], which is 0.602% different from the field observation value.

The discharge and head at the pumps when the end gun is turned off are obtained from Figures 30, 31, and 32 for pumps H, V, and J respectively. The pressure head at the pump for a given discharge can also be determined Figure 28. Table 4 gives the discharge from different pumps for the end gun off conditions as obtained from the Figures 30, 31, 32. It also gives the operating pressure at the pumps.

Table 4. Discharge from example pumps when the end gun is turned off.

Pump	Discharge (gpm)	Pressure (psi)	
н	670.5	92.84	
V	825.0	140.00	
J	730.5	110.00	

From Figure 30 for the vertical pump curve, it is evident that if the discharge is constant, the pressure will increase when the end gun is shut off. This means more power will be required to operate the pump when the end gun is off. In this case, the time required to apply a certain depth of water will be less.

With the discharge of 825 gpm when the end gun is on, the pressure head at center pivot point using [72] is 88 psi. The hydraulic analysis

of the system from the pivot to the end end gun gave an end gun discharge of 185.2 gpm. This is 22.42% of the total discharge. Figure 25 gives the same percentage of discharge as passing thru the end gun. This shows that a constant percentage of total discharge passes thru the end gun sprinkler irrespective of the pivot pressure.

The design of the center pivot irrigation system is modified to distribute this end gun discharge of 185.2 gpm along the lateral line with the addition of sprinklers which are automatically turned on when the end gun is turned off. This will keep the total flow passing thru the system constant when the end gun is on or off.

3. Auxiliary sprinkler simulation

Program "AUXISPR" (Appendix C) was written and used to simulate the positions of and discharge from these auxiliary sprinklers so as to distribute the water with maximum uniformity. Figure 33 is the output obtained from AUXISPR. A total of nine auxiliary sprinklers are required to discharge a minimum of 164.4 gpm to irrigate the field upto the point of the last auxiliary sprinkler. When the radius of coverage of the sprinklers are considered, the actual total discharge passing thru the auxiliary sprinklers will be more than 164.5 gpm. Figure 33 also shows the auxiliary sprinklers models and nozzle diameter that will be used as auxiliary sprinklers at the distances shown. The spacings and discharge of the auxiliary sprinklers are based on their uniform spacing and the locations of the plugs in the existing system. Figure 34 shows the characteristic of the regular sprinklers and the auxiliary sprinklers.

The Nelson Agricultural Impact Sprinklers chart (June 1986) was used to

DESIGN DATA: SYSTEM LENGTH • 781.1 FT										
DISCH	ARGE T	HRU THE END GUN		RINKLERS = 7	G2H					
жо	91.UG NO	DISTANCE FROM PIVOT (FT)	DISCHARGE (GPH)	SPRINKLER MODEL	NOZZLE SIZE	PRES (PSL) GPM				
ì	:1	155.5	7.31	F33APY	11/64	84.7 8.1				
2	16	222.0	7.59	F33APV	11/64	83. 7 B.⊥				
3	21	302.0	12.67	<u>F43 APV</u>	<u> 7/32 °</u>	<u>82:2</u> J2:5				
4	26	368.5	13.48	E43APY	<u>12/84.</u>	81.3 14.2				
5	31	444.5	18.68	F43A	江水"	80.2 18.3				
6	36	515.0	20.45	F43A	1-1/4 2/2	<u> </u>				
7	41	591.0	25.41	F43AY	164 × 1/2	78:9 26:1				
	46	561.5	26.70	F43AV	<u> </u>	78.5 73.7				
9	51	737.5	12.15	<u>F43APV</u>	3/9"	28.2 34.4				
		DISCHARGE DISTR DISCHARGE DISTRI				.4 GPH .0 GPH				

Figure 33. Auxiliary sprinklers models and nozzle sizes used for the modification of the center pivot irrigation system.

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determine the auxillary sprinkler type. Figure 35 gives the Q-H relationship of the sprinklers by linear regression and also their spacings after the modification in the design of the center pivot system.

The Q-H relationship at the pivot for the modified system is shown in Figure 36. It has the coefficient of determination of 0.99999. The system curve at the pump for the modified system is shown in Figure 37.

The modified end gun off system curve shows that the Q-H relationship after the modification of the system is very close to the end gun on system curve. This can also be understood by comparing the regression equation of the modified end gun off system

$$Q = 55.855(H^{0.503705})$$
 [74]

equation [72].

Figure 38 shows the intersection of the pump curves (pumps H, V, and J) and the system curves for the condition when the end gun is on, end gun is off, and the end gun is on with the modification of the center pivot system.

B. Field performance evaluation

The flow and radius of coverage from the sprinklers and their spacings are required for the field performance evaluation of the center pivot irrigation system. The evaluation of the system was done for the following cases:

P1901	1111	, 6:400	5P811	PELES 100	219001	\$ PO 10		:1	5701m	4142 =0	11	freinglige m	
25	14.4		••	195.6	1.0						3.950		_
36 35	30.0		45	104.0	10.0	46	194.6	:1.: 14.0	3; 46	4i.i	:4.6 20.8	** :8% ** :13.4 ** :3:.	:3.7
••	31.0	; .;	33	113.6	11.0	30 31	134.0-	18.4	3 C	78.0	13.3	15 121.2	12.: 21.1
*3	33.0	1.:	45	120.0	12.0	60	124.6	19.2	79	71.0	27.6	44 129.8	34.2
33 66	34.8	2.1 1.4	70 75	134.6	13.6	76 73	132.8	20.0 20.7			- 29 - 3	*: :34.8	33.3 34.1 37.8
679.TH	34.0	3.4	10	124.0	ii.;	**	134.0	31.5 32.3	PIPE	٠	33	1 134.4	27.8
719011	-) ()	87821 7190	-	٠	87941	- a	16-	23	71.0	11.1	171175	• 11
70	27.0	2.3	_	_	91980)	11.0	13.3	P10011 818	11 0100
23 36	31.0	1.8	• • •	76.0 72.0	1.4	44	102.0	1.8 18.4	•	11.0	11.3	30 64.0 00 70.0	23.2
35	32.0	1.1 1.3	30	74.4	1.1	30	104.0	11.0	36	91.0	17.1	36 17.1	30.0
1	11.0	1.5	**	76.0	4.4	66	111.0	11.1 12.0 11.1	33	11.0 10.0	17.9	10 11.0	33.4
33	34.0	4.2	70	97.6	1.1	45	114.0	12.5 13.0	63 70	100.0	19.5	10 15.0	39.6
•	35.0	4.3	-	****	1.3	75	138.0	13.4	?3	142.0	11.0	17010020	• 13
710011		,	71901		10	170		17			22.6	Pinoti bit	_
***	14.4	019701		107.0	14.1	7 1963	1 1150		71001		54 54	10 10.0	33.4
45	44.4	::;	**	112.0	11.0	•	100.0	:3.7	31	47.4	10.0	30 77.0 40 00.0 75 01.0	33.0
33	11.4	3.0	33	122.8	14.4	45 38	114.0	14.4	**	45.4	28.6	*t 11.9	34.3
43	11.1	::	***	134.0	17.3	33	134.6	14.4	40 70	75.0	33.3		
70 75	91.0	5.0	75	138.0	16.7	45	130.0	20.0 20.7	88		29.3	719011 BIE	
Þě	25.4	4.3	16	134.0	10.0	75	134.0	31.5	-		25	10 71.0	- ****
PIRAL	-	•	PIPEL		H_			11-1	P1903	_	*****	50 76.8 50 81.0 70 84.0	33.6
	21541	****	**		*****	PIPOA		10 0107=0	30	43.0 87.0	19.4 22.4	88 89.0	44.1 43.8
43	13.8 14.8 14.8	7.3	45	186.6 114.6 129.0	15.7	30	·	13.7	30	72.8 77.8 71.0	11.4 15.1 17.5	10 11.0 10 17.0 100 77.0	47.0
34 33 44	P4.4 97.6	1.1	30 33	134.0	14.4 17.5 18.4	***	44.0	13.4	79	71.0	29.7		
*	77.0	1.4	44	131.0	10.2	949 70	71.0 74.0	15.4			34.7	Pipoli Bif	
45 1 70 1	80.6 81.6 82.6)))	76 73	131.0	20.7	~	76.0	70.1 23.4	Pipel		34 21 00-1 1	* #:	- <u></u>
~ :	41.6 44.6	1.6 1.4	**	134.0	11.5 11.7		-	19	30		23.0	44 44.4 30 73.4	34.3 27.0
-	:			-	12	Pipel	Butu	010701	## \$#	44.0 73.0	34.3 27.6	60 75.0 70 90.0	29.4 31.9
15001	DIEC:	910001	11001	-		30 60	61.0	14.5		70.0	29.4	20 13.0	21.1
45 1	96.0 91.0	4.4	40	110.0	12.5)) 	70.0	19-1	**	00.0	31.9 24.1	-	
30 II	83.8	1.4	3 0 3 3	114.0	14.4	7	74.0 77.0	11.4 11.3 13.3	-	-	11	P19011 B1F	_
14 14	95.0 57.0	10.4	66	124.0	15-4	4	79.0	37.0	71703	-	910001	46 73.8 90 74.0	30.4 33.6
60 10 65 10 70 10	M.4 D.1	11.4	70	136.0	14.6	PIPEL		31	**	106.0	18.3	90 74.0 60 61.0 70 84.0 80 89.0	21.2
75 11	14.0 14.0	11.7	75	133.0	17.1	25	74.0	-	30	120.0	20.4	90 98.0	44.1 43.0
		****			ม	>6 25	70.0	10.1	14	134.0	31.4 13.3	100 17.0	47.7
10011	IIR)	*****	Pipel	Attal	******	**	84.4	11.0	65 70	134.0	33.3 34.1	**************************************) M
•• 1	M	1.4	40	16.0	1.,	45 50	M.4 M.4	11.3	75	134.0	24.9 25.8	/1mai 818	***************************************
***	10.0 12.0 14.0	1.4 1.7 1.6 1.3	30	102.0	1.4	55	12.0	14.9			20	20 31-0	33.4
		1.1	**	116.e	10.0	44 43	94.4 96.0 100.0	16.3	PIPEL		**	30 44.6 40 13.2 30 17.6	36.4 36.4 33.8
70 .	4.0 7.0	4.8	4 h	111.0	14.3	79	100.0 103.0	17.4	30	4.0	23.5	40 14.0	31.2
	-	13	75	114.0	11.7		163.0	16.0	30	70.0	77.6 30.0	10 13.0	43.8
	, ,				n.1	PIPEL		81 0147 =1	66 78	77.6 86.6 83.6	30.0 33.0 34.5	100 100.0	45.4 47.8
	ALPEN	*****	71201		14 •• ••••	30		19.0	••	••••	30.0		
45 10	3.4 4.1	9.0	**	100.0	14.1	**	11.0	10.0 22.3			31	F19041 B121	0197
30 10	• • •	11.0	45 30	114.0	11.1	10	71.0	73.4	Pipol		019901	10 234.0	134.0
4 11		11.5 13.6 13.5	11	134.0	17.3	**	••••	27.8	30 44	41.0	70.) 22.0	10 273.0 40 284.0	190.0 104.0 177.0
70 11	1	3.8	66 63	130.0	11.3				**	73.0 79.0	15.7 70.8	70 302.0 00 314.0	177.0
75 131	•••	1.4	13	132.0	19.1		•		76	81.0	30.0	100 334.0	301.0
	•		••	134.0	11.1				••		****	110 304-0	33.

Figure 34. Sprinkler characteristics showing the pressure (P), radius of coverage (R), and discharge (Q) for the regular and auxiliary sprinklers (Nelson Agricultural Impact Sprinklers, 1986).

F19411		9:500	1701s	HLES 100	319001	3P010		:1	5 P B 1 D C		9.000. 15	177100	PIETE	31 40 Aug
:0	34.0	:::	••	193.6	1.1	-16	194.4	:3.:	3;	4:.:	:4.6	•	: 0	:1.
30	30.0	i.i	43	100.0	10.4	13	H4.6	14.0	46	41.8	20.0		111.1	28.9
25	31.4		13	117.0	11.0	30 31	134.0	:7.5 18.4	36	78.0	23.3	13	:25.8	12.:
*1	33.0	1.9 1.:	45	120.0	12.0		120.0	19.3	79	78.0	27.6	44	129.8	34.2
33	33.8	2.1 3.4	70	124.6	13.6	10	132.8	20.0 20.7	90	••••	- 29 - 3	••	: 34.8	24.1
••	34.0	1	75	134.0	13.4	73	134.0	21.5 22.3	PRIM		23 01 000 1		134.6	17.6 27.7
*19011	- , ,	910001	07031 71904			SPRE	-	14	23	74.0	11.1	1771	-	31
7.	27.0	1.3		10.0	01000		LIEL BUILD)4)}	**.*	13.3	Pimi	4.0	23.0
23	31.0	1.8	•13	72.0	3.4	40	183.8	1-6	**	**.*	16.7	38 46	70.0	27.6
35	32.0	3.3	30 33	14.0 15.0	6.4 6.3	30	111.0	11.0	36	11.0	17.1	56 60	11.1	10.6 11.6
45	31.4	1.5	10	94-4	4.4	40	134-0	12.0	60	94.8	14.7	70	82.0	36.3
30 33	34.6	4.0	10	97.6 96.0	1.1	45	114.0	11.5	45 70	100.0	19.3	••	85.0	39.6
**	33.3	4.3	75	21.0	1.3	73	130.0	13.4	73	102.0	31.0	199185		32
-	-	,	FIRE	-	10		111.0	11.1	79	104.0	21.4	710011		
7100	A154)	0199001	-		*****	7190		17 010001	879216 7 1964		21	30 40	****	33.9 33.4
40	84.8	1	••	167.0	14.1		_	-				30	77.8	30.6 33.6
**	88.4	4.7	10	118.0	13.0	49	100.0	15.7	30	61.6	38.6	40	00.0 11.0	34.3
33	90.4	3.2	11	123.8	14.3	30	130.8	16.6 17.3 16-4	10	70.0	23.3	90	85.6	29.0
43 70	11:1	1.7	43	134.0	14.4	14	134.0	13.2	70	75.0	23.3	man	-	33
70 75	91.0	3.0	75	131.0	16.7	15	130.0	20.0 20.7	••	94.0	20.5	/19-11	AILE	*****
	22.4	::;	86	134.0	19.9	75	134.0	11.3	-		85	10	71.0	36.4
-			17216		11				715-1		010001	60	81.0	37.2
PIPOLI	B1561	-	-	ALEST	-	PIRM		10 0107=0	30 40	63.8 67.8	19.4 22.4	76 84	84.0	44.1
**	••••	7.3	**	100.0	14.7		_		34	72.0	ij.;	90	11.0 11.0 11.0	45.4
**	14.4 14.4	7.6	45 30	114.0	14.4	30	60.0 64.0	13.7 14.6)4 14 79	77.8 71.8	15.3 17.5 19.7	100		47.5
38	97.4 77.4	1.4	15	114.0	18-4 19-3	# # # 70	48.0	13.6 17.7 13.6	**	63.0	11.7	PIPOLI		914
45 1		8.8 9.1	45	110-0	30.0 30.1	70	74.0	20.0		88 ×	34	-		_
70 1	91.0 91.0	1.3	70 73	134.0 134.0	30.7 21.5	•	76.0	22.4	Pipol		010001	>0 00	64.6 13.8	22.0 24.3 27.0
* 1	83.0	1.6 1.6	84	114.6	11.1	Pin		10	30	44.0	21.0)4 60	73.0	27.0
-			***		12	-			## ## ## 70	73.0	34.3 37.0	70	99.0 13.0	11.1 14.1
PIPOLI	BIEL	(100)	/1001	-	010000	***************************************	61.0	16.6 19.1		78.0	20.4 31.9	. 20	13.0	24-1
44	20.0	1.1	40	104.0	12.3	36	70.0	21.4	**		34.1			25
30 1	01.0 03.0	1.4 7.7	30	114.0	14.6 .	79	74.0	11.) 11.1			27-	Pipeli		
35 I	05.0 67.0	10-0	33 66	170.0	14.7 15-4	80	79.0	27.0	Pipel	1 1100	6 (400)	40 30	74.0	30.4 33.0
**	 	10.0	43 70	134.0	14-0	07.0		>>	40	104.0	18-3	**	81 -0 94 -0	21.2
75 1	18.8	11.0	73	131.0	14.6	7100		******	45	114.0	19.3	••	***	44.1
96 I	11.0	11.0	••	130.0	17.7	23	74.0	10.1	11	124.0	11.3	100	11.4	43.4
		-	-		ม	36 35 60	76.0	11.0	10	134.0	33.3		••••	
71501	Biffi	-	PIPEL		******	45	64.6 94.6 99.0	12.7	70 73	132.0	34.1 34.7	7180A		× ••
40	10.0 12.0	3.4	46	103.0	4.3	10	M -4	11.1	80	134.0	33.1			
39 (M-A	3.7 4.0	50	14.0	1:1	55 60	92.0 92.0	14-9 13-6	-		20	20 30	99.0 44.0 73.0	33.4 34.4 30.4
30	75.0 74.0	1.3	11	144.6	10.0	43	94.0 94.0 160.0 163.0	36.3 36.0	Prpa	1110	010000	40 30	13.0	11.4
65	77.0	1.4	65 70	111.0	18.9	70 71	100.0	17.0	70	4	23.1		84.8	37.2
7 1	11.0 11.4	7.3	73	114.0 114.0 110.0	11.3		163.0	16.0	••	70.0	77.6 30.6	••	11.0	43.4
			••		11.1	Pipe		81	50 60 70		33.8	100	14.6	45.4 47.8
19-11		, 1100-		1 11(1)	14_				70	11.0 11.0	36.5 38.6			27
49 21	12.4	1.1	-			30	11.0	10.0	(B) (1)		29	PIPOLI		
44 15	4.6	18.4	40	106.0	14.9	10	76.8 71.6 78.8	11.1	7190		010000		234.0	Dave
33 13	12.0	11.0	30	130.0	15.0 14.4 17.5	70	70.7	28.5	>0	- 45	20.3	10	373.0	190.0
**	4.8	13.0	11	134.0	17.5 18.3	**	₩.0	20.1	**	73.0	22.0	30	344.0	177.0
79 11		11.0	15	130.0	11.0				#	79.6	24.7	10	314.0	189.0
	10.0	13.4	73	134.0	19 - 1 20 - 4				70	81.0 84.0	30.0 32.9	100	334.0	301.0
			••	134.0	11.1							110	104.0	333.0

Figure 34. Sprinkler characteristics showing the pressure (P), radius of coverage (R), and discharge (Q) for the regular and auxiliary sprinklers (Nelson Agricultural Impact Sprinklers, 1986).

. . .

PRINCIPLES NO 1 1 1 1 1 1 1 1 1	(Principle of 10 00 00 00 00 00 00 00 00 00 00 00 00
	Prod. Bill Property Prod. Pr
10 10 10 10 10 10 10 10	60 : 00 19.7 61 :131.5 30.9 51 :121.5 13 53 :123.8 13 66 :123.8 24 63 :133.8 25 71 :134.8 31 73 :134.8 31
10 10 10 10 10 10 10 10	11 121.2 12.1 15 123.8 23.1 66 179.8 24.2 65 123.6 25.2 71 124.0 26.1 73 124.0 27.6
10 10 10 10 10 10 10 10	15 125.8 22.3 - 66 125.8 24.2 65 125.8 25.2 *: 126.0 26.1 *5 126.0 27.0
10 11-0 1-1 11-0 11-	65 137.6 25.3 ": ;31.0 26.1 "5 134.6 27.0
13 34-0 3-0 70 134-0 13-0 70 131-0 21-1 1940 1940 21-1 1940 21-1 1940 21-1 1940 21-1 1940 21-1 1940 21-1	13 134.6 27.6
## SPAINMAN NO 128.0	
Primary Prim	
10 17 2 1.5 1.	1701002.00 00 31 710011 21711 010001
23 23 24 24 25 25 25 25 25 25	
33 32.0 3.3 30 10.0 1.3 30 10.0 11.0 30 11.0 17.1 31 31.0 11.0 11.0 11.0 11.0 11.0 11.0	18 64.8 73.9 66 78.8 77.8
10 10 10 10 10 10 10 10	36 11.1 30.8 60 00.0 33.0
35 33.6 6.3 75 91.0 7.1 70 111.0 13.4 75 110	10 83.0 36.5
Prince P	** *** ***
Property	170 151 3.23 => 3 2
	710011 31(1) 01000
## 18.6 1.6 1.6 1.1 1.	30 00.0 23.9 00 70.0 27.6
10 10 10 10 10 10 10 10	. 10 77.0 30.0
10 1.0 1.2 1.0 1.0 1.2 1.0 1.2 1.0	44 00.0 11.0 'C 01.0 14.3
## 1 12.0 1.7 77 12.0 16.0 16.0 16.2 12.1 79 12.0 17.0 17.0 17.0 17.0 17.0 17.0 17.0 17	00 03.0 33.0
70 91.0 1.9 73 131.0 18.7 41 130.0 70.0 40 60.0 21.1 73 131.0 18.3 70 131.0 70.7 70.7 70.0 70.0 70.0 70.0 70.0 7	(FR/1918 00 1)
FYRITE DE 4	*1901) B1(%) Q19904
Prince 10 13 13 13 13 13 13 13	10 71.0 30.4
Property	1 50 76.8 33.8 - 60 81.0 37.2
30 94.0 1.0 10 110.0 12.0 10.0 10.0 10.0 10.0	70 44.0 40.1
10 10 10 10 10 10 10 10	86 89.8 42.8 99 92.8 49.4
10 17.0 1.0	100 97.0 47.0
10 101.0 2.1 70 131.0 20.7 70 76.0 23.4 P(pa1) BIEST 0 (1990) 70 101.0 1.0 7.0 73 134.0 21.1 80 76.0 23.4 P(pa1) BIEST 0 (1990) 80 101.0 5.0 9.0 9 134.0 21.1 80 80 80 80 80 80 80 80 80 80 80 80 80	WATERLES IN 14-100
70 101.0 0.2 7.2 70 131.0 20.7 80 76.0 12.4 P(pol) B(EU) 010000 77 101.0 12.0 12.0 12.0 12.0 12.0 12.0 12.	Pipeli Lifti Him
77 102.0 0.0 131.0	30 64.6 23.8 . 40 64.6 24.3
Print Sign 19 1 100 100 10 100 10 100 10 10 10 10 10	- 00 00.0 30.3 30 71.0 27.0
00 90.0 0.0 0.0 0.0 10.0 10.1 10.0 10.0	60 78.0 29.0 70 90.0 31.9
99.0 8.4 45 131.0 131.3 30 70.0 131.3 1	70 00.0 31.9 80 83.0 34.5
30 103.6 5.0 10.6 10 10.0 10 77.0 23.3 EVENERAR ON 21	073 MILES 19 33
35 105.6 10-4 44 135.0 13-4 50 75.0 37.8 Pipeli Bifti Quepel 60 107.0 10.0 10.0 10.0 10.0 10.0 10.0 10	Pipali Bift) Olgo
101.0 10.0 10.0 10.0 10.0	73.0 30.0
AL-1 AA AA WEARNESS OF ST UT 15545 1544	- 18 76.0 33.0
to teach II'V at the part to the part of t	70 06.0 40.3
80 111.0 13.0 00 124.0 17.7 25 74.0 10.1 35 124.0 21.4	10 13.8 43.4
20 70.0 11.0 40 120.0 23.3	100 17.0 47.0
FIRMAL RICOL A FIFTH DISTRICT OF SAID 12-1 10 113-0 14-1	mental w
40 M.A 13.0 M.A 13.1 73 134.0 24.0	****** ***** ******
48 49.4 171 77 171.0 1.1 10 12.0 14.4	20 31.0 23.0
30 that 4 27 100-0 10-0 th bank 16-1 person acts Atomis	, 40 41.0 20.4 , 40 73.0 20.4
60 Mag 45 40 110.0 10.0 10.0 10.0 10.0	
70 98.0 7.1 70 114.0 11.3 70 183.0 18.0 40 79.0 77.0	10 64.0 31.3 70 07.0 00.1
79 00.0 7.3 75 114.0 11.7 10 77.6 10.0 10.0 10.0 10.0 10.0 10.0 11.0 10.0 10.0 11.0	00 13.0 43.8 70 14.4 45.4
P(max 3/fu 010mm) 79 03.0 36.5	100 100.0 47.0
Pipell Birth Pipel	DATES IN 170000
40 182.0 1.0 00 108.0 14.0 10 10.0 10.0 DEFINE SD 27	PIPELI BIELI
10.0 11.0 11.0 11.0 11.0 11.1	- 48 334.0 134.0
40 114.4 11.4 11 124.0 17.5 00 00.0 20.1 40 40.0 12.6	10 373.0 190.0 40 384.0 164.0 70 302.0 177.0
49 Li4.0 12.3 40 124.0 15.5 30 73.0 23.5	
75 130.0 13.4 27 433.0 10.1	10 174.0 261.0
90 131.0 13.0 75 131.0 76.0 00 04.0 33.5 00 04.0 33.5	100 336.0 213.0
***************************************	114 1444 0004
**** denotes auxillary sprinklers	

Figure 34. Sprinkler characteristics showing the pressure (P), radius of coverage (R), and discharge (Q) for the regular and auxiliary sprinklers (Nelson Agricultural Impact Sprinklers, 1986).

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CATA AND RESULTS
No of sprinklers in the system: 37 Total length of lateral: "37 ft Distance to last tower: 765 ft
Maximum Allowable error in calculating pressure head= .5 ft
      SPACING DISTANCE FROM
                                       CALCULATED
                                                               REGRESSICH
        (ft)
                 PIVOT (ft)
                                                                EGUATION
                                                           Q- 0.29(H**0.51)
Q- 0.39(H**0.49)
        28.0
                       28.0
                                     0.2882
                                                0.5094
        28.5
                       56.5
                                     0.3863
                                                 0.4902
                     85.0
                                     0.4563
                                                 0.5031
                                                                28.5
                                     0.9148
                                                 0.4568
                                                              0.91(#**0.46)
        32.5
                     146.0
                                     1.2G06
0.5715
1.0171
                                                 0.4428
                                                              1.20(8**9.44)
                                                 0.4951
                                                           Č•
                                                              C.57(H**0.50)
         :9.0
                      174.5
                                                 0.5007
                                                               1.02(11**0.53)
         28.5
12.0
3.5
                      203.0
                                     1.0171
                                                 9.5007
                                                              1.32(H**9.50)
                      222.0
                                     3.5715
                                                 3.4951
                      231.5
                                     1.4853
                                                 0.4975
                                                                1.49 (H ** ? . $ 3)
        28.5
                      260.0
                                     1.6195
                                                 0.5014
                                                              1.6:(#**9.50)
                      288.5
                                     1.3012
                                                 0.5003
                                                              1.30(#**0.50)
         13.5
                      202.0
                                     0.8931
                                                 0.4988
                                                               0.89 (H . . 0 . 50)
         19.0
                      321.0
                                     1.6318
                                                 0.4887
                                                                1.63 (#**2.49)
         28.5
                      349.5
                                                 0.5014
                                                               1.62(11000.50)
         19.0
                      368.5
                                     1.0171
                                                 0.5007
                                                              1.02 (80-0.50)
 17
          9.5
                      378.0
                                     1.6195
                                                 0.5014
                                                              1.62(H**9.50)
                                                              1.64 (H**0.50)
1.97 (H**0.50)
 18
         28.5
                      406.5
                                     1.6380
                                                 0.5009
 19
        28.5
                      435.0
                                     1.9721
                                                 0.5014
*20
         9.5
                      444.5
                                     1.3228
                                                 0.5001
                                                               1.32(H**9.50)
 21
        23.0
                      467.5
                                     2.1261
                                                 0.5039
                                                               2.13(H**0.50)
         28.5
                      496.0
                                     2.1261
                                                 0.5039
                                                               2.13 (H .. 0.50)
*23
        19.0
                     515.0
                                     1.5910
                                                 0.5001
 24
                     524.5
                                     2.1261
                                                 0.5039
                                                                2.13(H**0.50)
 25
        28.5
                                                                2.46(H**0.49)
                      553.0
                                     2.4629
                                                 0.4895
                      581.5
                                     2.6199
                                                 0.4912
                                                                2.62(H**0.49)
          9.5
                      591.0
                                     1.8905
                                                 0.5004
                                                              1.89 (11 - 0.50)
                                                           0.
 28
         23.0
                      614.0
                                     2.8755
                                                 0.4995
                                                               2.88 (H .. 0.50)
                                                           Ç.
         28.5
                      642.5
                                     2.2352
                                                 0.5187
                                                               2.24 (H**9.52)
*10
                                     2.0346
                                                 2.5017
                                                                2.03 (H . . 0.50)
 31
          9.5
                      671.0
                                     2.8755
                                                 0.4995
                                                                1.88 (110-9.50)
        28.5
                                                                2.88(H**7.50)
                      699.5
                                     2.8755
                      728.0
                                     3.1986
                                                 0.4971
                                                               1.20 (H .. 9.50)
          7.5
                      737.5
                                     3.1986
                                                 2.4912
                                                           2- 1.62(H***2.49)
2- 3.23(H***0.56)
         19.0
                      756.5
                                                 0.4971
 36
         26.8
                      783.3
                                     3.0516
                                                 0.5064
                                                           C- 3.05(H**9.51)
 37
                     787.0
                                    13.9973
                                                           G. 14.00(H...).50)
                                                 0.4990
* auxillary sprinklers
DIAMETER
                   DISTANCE FROM PIVOT(ft)
(inches)
                         FROM
    5.79
                                       765.0
                            ٥
                          765.0
                                       727.0
PIPE RCUGHNESS-0.0006001nches
SLOPE OF THE FIELD IS MEGLIGIBLE
FISER DIAMETER . 1.0000 :nones
FISER DIAMETER . 1.0000 Inches
END GUN PISER DIAMETER . 2.0000
A FOR THE AND LLBOW COMPONENTS .
```

Figure 35. Design data for the hydraulic network analysis of the modified center pivot irrigation system.

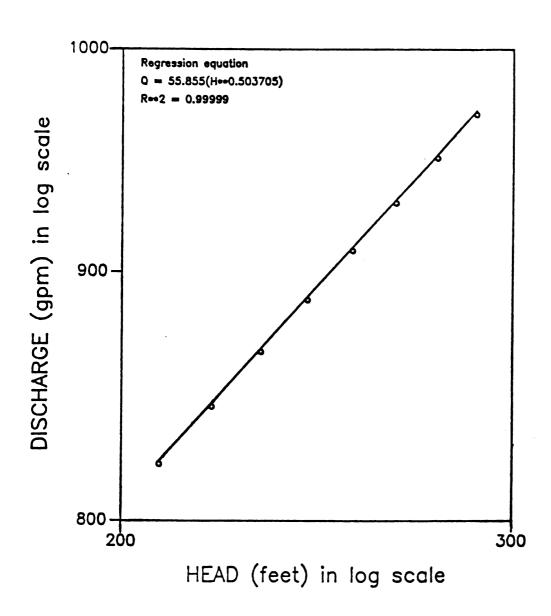


Figure 36. Graph showing the discharge-pressure relationship at the center pivot point for the modified end gun off condition.

i-10 3

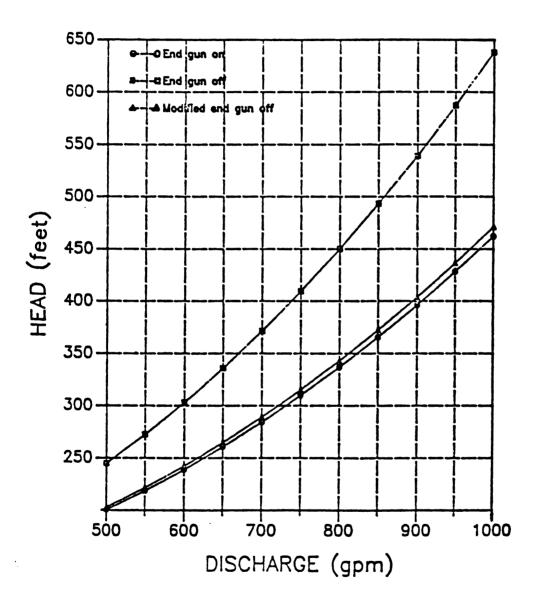


Figure 37. System curves for the modified end gun off condition with respect to the end gun on and end gun off conditions.



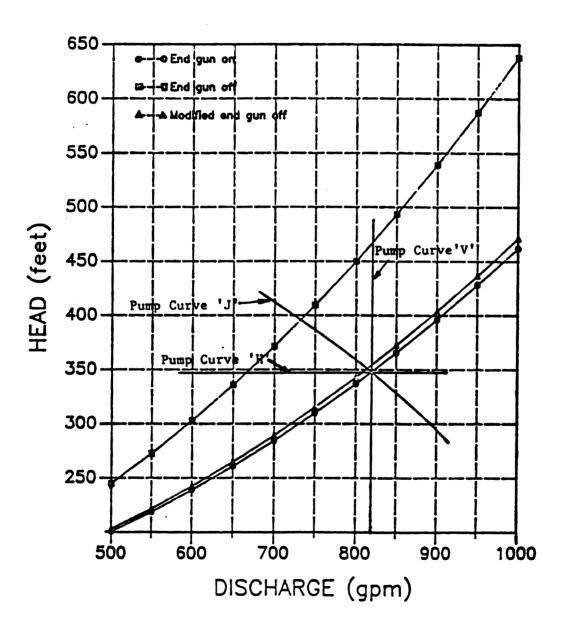


Figure 38. System curves and pump curves for different operating conditions and pumps.

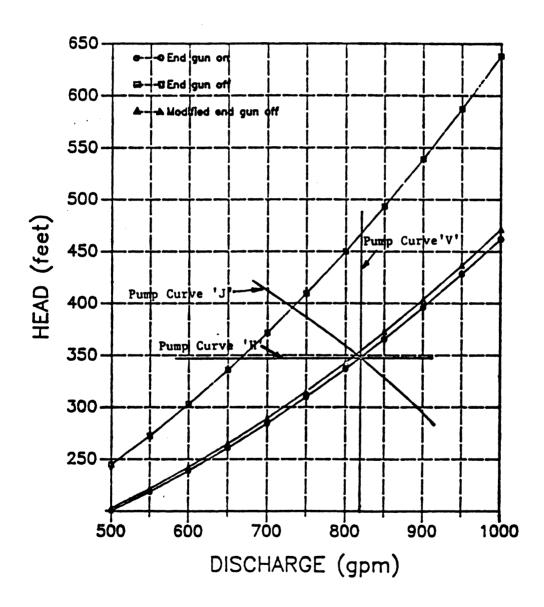


Figure 38. System curves and pump curves for different operating conditions and pumps.

Case No	Description					
1	End gun on.					
2	End gun off. Pump J					
3	End gun off. Pump V					
4	End gun off. Pump H					
5	End gun off. Modified design					

Figures 39 thru 43 are the results from NETWORK program using the finite element analysis method for case 1, case 2, case 3, case 4, and case 5 respectively. The detail simulation output of NETWORK is given in appendix B.

1. Field Performance Evaluation Simulation Model

Program "FIELD" (Appendix E) determines the depth of application of irrigation water 25 feet apart in the field. The speed of the last tower is 922.05 ft/hr at 100% timer setting (field data). The depth of application at spacings of 25 feet starting from the pivot point was obtained for all five cases for timer settings of 100%, 75%, 60%, 50%, 42%, 34%, 29%, 24%, 21%, 18%, 16%, 14%, 11%, and 9%. The application depth for the above timer settings for the five cases is given in Appendix F. The average application depth was obtained by taking the mean of the simulated application depth along the lateral line of the system (e.g. for 50% timer setting; Figure 45). Figure 44 is a plot showing the average application depth of water for different timer settings for the five different cases. The rate of change of in the average application depth of water with respect to the percentage timer setting is given by the slope of the graph. It is seen that the rate of

END BUN ON:

PRESSURE AT THE PIVOT = 88 PSI (203.4 FT)
TOTAL DISCHARGE = 825.2 GPM
PRESSURE DROP IN THE LATERAL LINE = 11.59 PSI (24.79 FT)
NO OF SPRINGLERS = 28

SP	SPACING	PRES	HEAD	CR13	RADCOV
NO	(FT)	PS I	FT	GPH	FT
-					
1	28.0	87.43	202.09	3.011	32.472
2	28.5	84.85	200.75	2.718	33.743
3	28.5	84.28	199.43	4.535	64.534
4	28.5	85.72	178.13	7.038	90.431
5	32.5	85.0 8	174.00	8.731	97.452
•	28.5	84.54	175.41	9.737	101.554
7	28.5	84.01	174.18	11.477	118.044
	28.5	63.49	172.70	13.503	102.448
•	23.5	82.99	171.83	15.124	104.040
10	28.5	62.51	190.72	17.977	134.000
11	ℷ.5	61.77	189.51	21.147	138.000
12	29.5	81.55	183.50	22.397	133.000
13	29.5	61.14	187.34	22.341	133.000
14	28.5	80.74	184.47	22.490	74.000
15	28.5	80.40	185.84	27.047	77.000
16	₩.5	80.02	184.97	27.507	80.000
17	29.5	79.72	184.27	27.453	77.750
10	28.5	79.45	163.64	27.402	79.877
17	28.5	77.20	183.07	31.543	81.764
20	28.5	78.76	182.54	33.817	62.417
21	32.5	78.76	162.05	38.701	84.761
22	28.5	78.40	181.48	33.202	84.000
23	28.5	78.44	181.36	28.627	84.702
24	28.5	78.33	181.07	28.577	84.679
23	28.5	78.24	180.86	42.370	88.523
24	28.5	7 8.19	180.72	42.332	88.502
27	24.6	76.56	176.97	41.957	91.752
28	3.7	76.41	174.42	185.102	310.102

Figure 39. Field performance evaluation data obtained from the simulation model 'NETWORK' for the end gun on condition.

DOGUN OFF:

PRESSURE AT THE PIVOT = 110 PSI (254.24 FT)
TOTAL DISCHARGE = 720.6 GPM
PRESSURE DROP IN THE LATERAL LINE = 7.01 PSI (16.2 FT)
NO OF SPRINGLESS WITH DISCHARGE = 27

40	SPACING	PRES	HEAD	CRIS	PADCOV
	(FT)	PSI	FT	GP11	FT
-					
1	28.0	107.55	23.21	3.370	33.814
2	28.5	107.07	252.15	4.167	23.000
3	28.5	108.64	221.10	5.077	87.405
4	:9.5	108.17	250.07	7 .907	75.349
:	32.5	107.67	248.71	7.845	102.777
•	29. S	107.24	247.93	10.771	107.937
7	29.5	104.85	244.97	13.169	124.847
	29.5	104.45	244.05	13.247	113.851
•	29.5	104.07	245.17	17.098	117.322
10	28.5	105.71	244.55	20.374	134.000
11	32.5	105.22	243.43	23.725	128.000
12	28.5	103.00	242.49	3.422	128.000
12	28.5	104.70	242.01	25.387	133.000
14	28.5	104.44	241.39	25.532	74.000
15	28.5	104.17	240.82	20.553	77.000
16	32.5	103.94	240.24	33.444	60.000
17	28.5	103.75	237.80	55.453	80.000
10	28.5	103.58	239.41	22.404	80.000
19	. 28. 5	103.44	237.08	33.944	82.000
20	28.5	103.32	232.80	38.580	82.000
21	32.5	103.20	228.55	44.275	85.000
==	28.5	103.13	238.38	78.224	94.000
23	28.5	103.08	230.23	44.267	83.000
24	28.5	103.04	230.16	44.257	85.000
23	28.5	103.01	228.11	44.574	97.000
24	28.5	103.00	238.00	48.571	97.000
27	26.6	102.71	237.86	44.733	100.000

Figure 40. Field performance evaluation data obtained from the simulation model 'NETWORK' for the end gun off with pump 'J' condition.

DIO GUN OFFI

PRESSURE AT THE PIVOT = 140.07 PSI (323.76 FT)
TOTAL DISCHARGE = 925.2 GPM
PRESSURE DROP IN THE LATERAL LINE = 8.85 PSI (20.5 FT)
NO OF SPRINKLERS WITH DISCHARGE = 27

v 0	SPACING			****	
~0		se£2	HEAD	2815	PADCOV
	(FT)	23 I	FT	GPM	FT
:	28.0	137.50	322.45	3.603	34.000
2	28.5	138.93	321.13	4.702	75.000
3	28.5	138.37	317.83	5.730	92.227
4	28.5	137.81	318.54	8.724	77.546
5	32.5	137.17	317.10	11.112	108.039
•	28.5	134.66	313.67	12.405	115.422
7	28.5	136.14	314.60	14.845	128.000
	28.5	133.64	313.53	17.211	1 23. 533
7	29.5	135.17	312.43	17.302	129.255
10	28.5	134.72	711.38	23.002	134.000
11	32.5	134.23	310.24	26.936	1 38.000
12	29.5	: 33. 83	309.34	28.712	138.000
13	28.5	133.47	308.50	28.672	128.000
14	78.5	133.13	307.72	28.870	74.000
15	28.5	132.83	307.01	34.226	77.000
10	32.5	132.51	306.29	38.047	80.000
17	28.5	132.27	305.74	38.012	80.000
l 🗷	23.5	132.04	3 05.25	37.782	50.000
17	29.5	131.89	304.64	40.485	82.000
20	29.5	131.74	304.50	43.461	83.000
21	32. S	131.60	334.16	50.013	93.000
22	29.5	131.51	303.97	43.342	84.000
23	28. 5	131.44	303.81	44.462	85.000
24	28.5	131.37	303.70	49.973	85.000
23	29.5	131.34	303.43	54.813	97.000
24	29.5	131.35	303.40	54.810	77.000
27	24.8	131.22	303.31	35.118	100.000

Figure 41. Field performance evaluation data obtained from the simulation model 'NETWORK' for the end gun off with pump 'V' condition.

DIO GUN OFFI

PRESSURE AT THE PIVOT = 140.07 PSI (323.76 FT)
TOTAL DISCHARGE = 923.2 SPH
PRESSURE DROP IN THE LATERAL LINE = 8.85 PSI (20.5 FT)
NO CF SPRINKLERS WITH DISCHARGE = 27

40	SPACING	POES	MEAD	2815	RADCEV
	(FT)	251	FT	GPH	FT
:	28.0	: 37.50	322.45	3.803	34.000
2	28.5	138.93	321.13	4.702	75.000
3	28.5	138.37	317.83	5.730	92.227
4	28.5	137.81	318.54	6.724	99.546
3	32.5	137.19	317.10	11.112	108.037
•	28.5	134.44	315.67	12.405	115.422
7	28.5	136.14	314.40	14.845	128.000
•	28.5	133.64	313.53	17.211	1 23. 533
7	29.5	133.17	312.43	19.302	128.233
10	28.5	134.72	711.38	23.002	134.000
11	32.5	134.23	310.24	26.936	138.000
12	29.5	: 33. 83	309.34	28.712	138.000
13	28.5	133.47	308.50	28.672	138.000
14	78.5	133.13	307.72	28.870	74.000
15	28.5	132.83	307.01	34.226	77.000
1.	25.2	132.51	306.27	38.047	80.000
17	28. S	132.27	305.74	38.012	80.000
18	29.5	132.04	3 05. 25	37.982	90.000
19	29.5	131.89	204.64	40.485	82.000
20	29.5	131.74	304.50	43.461	63.0 00
21	32.5	131.40	304.16	30.013	93.000
22	29.5	131.51	303.97	43.342	84.000
23	28.5	131.44	303.81	44.982	85.000
24	79.5	131.37	303.70	49.973	85.000
23	29.5	131.34	303.43	54.813	97.000
26	29.5	131.35	303.40	54.810	77.000
27	24.8	131.22	303.31	35.118	100.000

Figure 41. Field performance evaluation data obtained from the simulation model 'NETWORK' for the end gun off with pump 'V' condition.

END BUN OFF:

PRESSURE AT THE PIVOT = 92.84 PSI (214.59 FT)
TOTAL DISCHARGE = 670.8 GPH
PRESSURE DROP IN THE LATERAL LINE = 6.19 PSI (14.31 FT)
NUMBER OF SPRINGLESS WITH DISCHARGE= 27

NO	SPACING	PRES	MEAD	2815	•ADCCV
	(FT)	P31	FT	3PH	FT
ı	78.0	72.44	213.67	3.096	33.000
3	29.5	72.04	212.75	3.827	34.000
3	28.5	71.45	211.83	4.443	87.579
4	29.5	11.25	210.72	7.242	72.452
5	32.5	90.82	207.71	7.041	77.313
•	28.5	90.44	207.05	10.092	102.974
7	28.5	40.08	708.21	12.092	120.348
•	29.5	87.73	207.41	13.778	104.227
•	28.5	87.40	206.63	15.697	107.701
.10	28.5	87.08	205.90	18.702	134.000
11	22.5	68.74	205.11	22.004	138.000
12	28.5	68.44	204.47	23.527	138.000
12	28.5	69.20	203.87	23.275	13B.000
14	28.5	87.97	203.33	23.474	74.000
15	28.5	87.75	202.83	28.197	77.000
16	32.5	67.53	202.32	30.873	80.000
17	28.5	87.34	201.73	30.843	80.000
18	29.5	87.22	201.60	30.817	80.000
17	28.5	87.09	201.31	33.044	82.000
20	29.5	84.77	201.06	35.441	83.000
21	32.5	54.27	200.84	40.447	85.000
22	:8.5	84.83	200.49	34.942	84.000
23	28.5	84.78	200.58	40.421	23.000
24	28.5	86.75	200.21	40.413	83.000
23	29.5	84.73	200.46	44.571	91.754
Zb	29.5	84.72	200.44	44.587	91.752
27	26.8	84.45	200.27	44.669	45. 157

Figure 42. Field performance evaluation data obtained from the simulation model 'NETWORK' for the end gun off with pump 'H' condition.

BED GUN OFF (MODIFIED SYSTEM)

PRESSURE AT THE PIVOT = 90.78 PSI (209.83 FT)
TOTAL DISCHARGE = 824.9 GPM
PRESSURE DROP IN THE LATERAL LINE = 9.08 PSI (21.21 FT)
NO CF SPRINKLERS WITH DISCHARGE = 36

SP NO	SPACING (FT)	PSI	HENO FT	ORIS CPM	PADCOV (FT)
1	28.0	90.16	208.40	3.058	32.932
2	28.5	89.56	207.02	3.776	34.000
3	28.5	88.97	205.65	4.596	87.078
4	28.5	88.35	104.22	7.148	91.850
5 6	22.5	87.67	102.64	8.888	98.482
	9.5	87.50	202.25	8.132	109.683
7	19.0	87.10	201.32	9.911	102.371
8	28.5	86.52	199.98	11.863	119.178
9	19.0	86.26	199.39	8.074	108.905
10	9.5	85.96	198.68	13.541	102.759
11	28.5	85.41	197.41	15.482	106.502
12	28.5	84.84	196.10	18.293	138.489
13	13.5	84.82	196.05	12.442	121.636
14	19.0	84.21	194.65	21.512	140.829
15	28.5	83.75	193.59	22.775	141.576
16	19.0	83.81	193.73	14.226	124.861
17	9.5	83.38	192.72	22.724	141.258
18	28.5	83.C3	191.91	22.883	77.639
19	28.5	82.49	190.67	27.562	80.644
20	9.5	82.79	191.37	18.351	103.987
21	23.0	82.04	189.63	30.050	81.491
22	28.5	81.80	189.07	30.005	81.369
23	19.0	82.03	189.61	21.986	105.857
24	9.5	81.59	188.58	29.966	81.263
25	28.5	81.29	197.89	32.145	83.151
26	28.5	81.CO	197.23	34.482	83.930
27	9.5	81.40	188.16	26.105	139.631
28	23.0	80.56	186.20	39.495	86.079
29	28.5	50.81	186.78	33.927	86.622
30	19.0	81.07	187.38	28.248	141.744
31	9.5	80.40	185.84	39.457	85.996
32	28.5	80.36	185.74	39.446	85.973
33	28.5	80.08	185.09	43.314	89.790
34	9.5	20.63	136.38	34.405	83.743
35	:9.0	80.06	185.06	43.211	89.786
36	26.8	81.58	188.57	43.370	93.657
			•		

Figure 43. Field performance evaluation data obtained from the simulation model 'NETWORK' for the modified end gun off condition.

change of application depth is high at lower timer settings as compared at upper timer settings. The average application depth for a particular timer setting is lowest when the end gun is on. It is highest with pump 'V' when the end gun is off. After the modification of the design, it can be seen that the application depth increases for pumps H and J when the end gun is off. The depth is very close to the that given by the pump V. This implies that there is definitely some time savings to apply the same depth of water with the modification of the design when pumps \boldsymbol{H} or J are used. It also shows that for a given \$ timer setting, say 30%, the application rate is significantly reduced when the end gun is on (i.e. 1.0 inch down to 0.8 inch or 20% drop; Figure 46). This causes the distribution efficiency to be low. The curve also shows that to compensate with the modified center pivot system, the percentage timer setting must be increased by approximately 4% with the end gun off to get a constant application depth thoughout the revolution of the lateral line. This implies that the distribution efficiency can be increased and less time will be required for irrigation by increasing the speed of the lateral line movement with the end gun off.

The model 'Field' was run to simulate the performance of the system with the end gun covering 33%, 50%, and 66% of the circular movement of the lateral line pipe (Figure 47). The effect of the change in the end gun on coverage on the application uniformity, time saving, and energy savings was studied by varying the end gun coverage.

Figures 48, 49, and 50 show the total time required to apply certain depth of water without modification in the system using pumps V, J, and H respectively. Figure 51 shows the total time required to apply

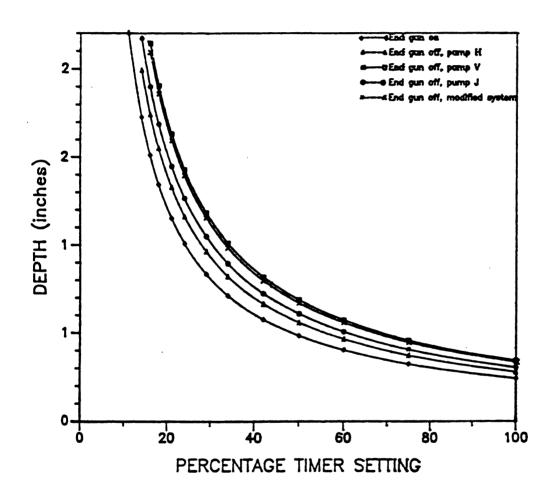


Figure 44. Graph showing the application depth of water for different timer settings.

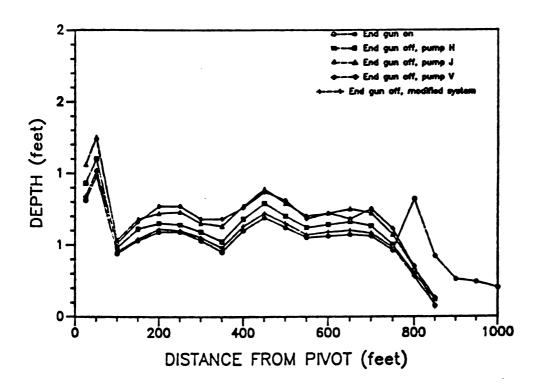


Figure 45. Graph showing the application depth along the lateral line in the field for 50% timer setting.

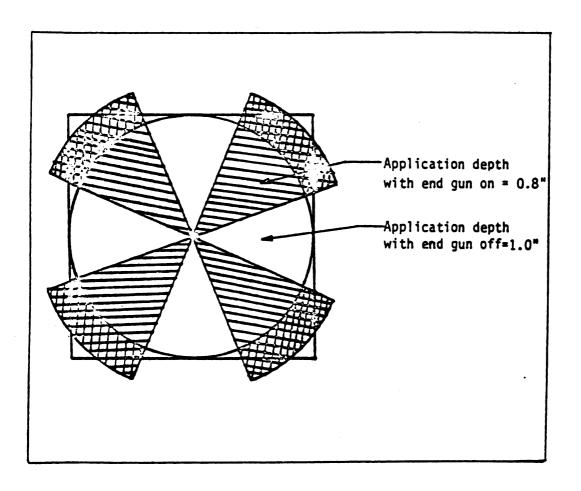


Figure 46. Example of the variation in the application depth for the end gun on and end gun off conditions for the same timer setting.

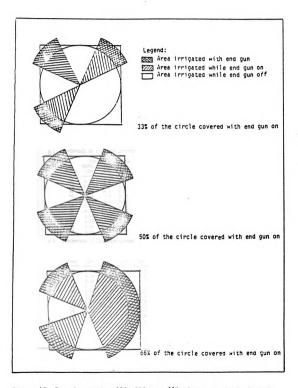


Figure 47. Example showing 33%, 50%, and 66% of the circle irrigated with the end gun on.

UNCOFFIED SYSTEM WITH CONSTANT TIMER APPLICATION UNIFORMITY (END GLM ON) #81.3 APPLICATION UNIFORMITY (END GLM OFF)=74.4

d) PERCENTAGE OF DISTANCE COVERED WITH END GUN ON . 33

	CAN CH		CUN	CUN OFF		NCE .			
1	DEPTH	TIME	DEPTH	TIME	CEPTH	TIME	UNIFORMITY		
TIMER	(1241)	(HER)	(EN)	(HPL)	(124)	(1CR)			
100	0.24	2.6	C.34	5.2	0.31	7.8	68.793		
75	0.32	3.4	0.46	7.0	0.41	10.4	68.793		
60	0.40	4.3	0.57	8.7	0.52	13.0	68.793		
50	0.48	5.2	0.69	10.5	0.62	15.6	68.793		
42	0.50	6.1	0.82	12.5	0.74	18.6	68.793		
34	0.71	7.6	1.01	15.4	0.91	23.0	68.793		
29	. 0.83	1.9	1.18	18.1	1.07	27.0	68.793		
24	1.01	10.8	1.43	71.8	1.29	32.6	68.793		
21	1.15	12.3	1.63	24.9	1.47	37.2	68.793		
18	1.34	:4.3	1.91	29.1	1.72	43.4	68.793		
16	1.51	16.1	2.14	32.7	1.94	48.9	68.793		

b) PERCENTAGE OF DISTANCE COVERED WITH END COM ON . 50

	CON ON		CUN	GUN OFF		ACE			
1	DED:H	TIME	DEPTH	TIME	DEPTH:	TIME	UNIFORMITY		
TIMER	(IN)	(HJR)	(124)	(HR)	(DI)	(HIR)	•		
100	0.24	3.9	0.34	3.9	0.29	7.8	65.890		
75	0.32	5.2	0.46	5.2	0.39	10.4	65.890		
60	0.40	6.5	0.57	6.5	0.49	13.0	65.890		
50	0.48	7.8	0.69	7.8	0.58	15.6	65.890		
42	0.58	9.3	0.82	9.3	0.70	18.6	65.890		
34	0.71	11.5	1.01	11.5	0.86	23.0	65.890		
29	0.83	13.5	1.18	13.5	1.01	27.0	65.890		
24	1.01	16.3	1.43	16.3	1.22	12.6	65.890		
21	1.15	18.6	1.63	18.6	1.39	37.2	65.890		
18	1.34	21.7	1.91	21.7	1.62	43.4	65.890		
16	1.51	24.4	2.14	24.4	1.83	48.9	65.890		

C) PERCENTAGE OF DISTRICE COVERED WITH END GLM ON - 66

	CON	QN	CUN	CFT	AVER	NCZ.			
TIMER	(124)	TIME (HR)	(EN)	TIPE (HR)	(124)	TIPE (HR)	ANTI-COMITY.		
100	0.24	5.2	0.34	2.7	0.28	7.8	63.158		
75	0.32	6.9	0.46	3.5	0.37	10.4	63.158		
60	0.40	8.6	0.57	4.4	0.46	13.0	63.158		
50	0.48	10.3	0.69	5.3	0.55	15.6	63.158		
42	0.58	12.3	0.82	6.3	0.66	18.6	63.158		
34	0.71	15.2	1.01	7.8	0.81	23.0	63.158		
29	0.83	17.8	1.18	9.2	0.95	27.0	63.158		
24	:.01	21.5	1.43	11.1	1.15	32.6	63.158		
21	1.15	24.6	1.63	12.7	1.32	37.2	63.158		
18	1.34	28.7	1.91	14.8	1.53	43.4	63.158		
16	1.51	32.3	2.14	16.6	1.73	48.9	63.158		

Figure 48. Application uniformity and time required to irrigate the field using pump V without the modification in the design of the system.

UNCOIFTED SYSTEM WITH CONSTANT THEM APPLICATION UNIFORMITY (END CAN ON) +81.3 APPLICATION UNIFORMITY (END CAN OFF)+74.2

a) PERCENTAGE OF DISTANCE COVERED WITH END GAN ON = 13

	CLIN	CH .	GJN.	OF:	AVER	X	
TIMER	(DI)	TIME (HR)	CEPTH (IN)	TIPE (HR)	(12E) HIZED	TINE (JOH)	THISCHALL
100	0.24	2.6	0.30	5.2	0.28	7.8	71.671
75	0.32	2.4	0.41	7.0	0.38	10.4	71.071
60	0.40	4.3	0.51	9.7	C.47	13.0	71.071
50	0.48	5.2	0.61	10.5	0.57	15.6	71.071
42	0.58	6.1	0.72	12.5	0.67	18.6	71.071
34	0.71	7.6	0.89	15.4	0.83	23.0	71.071
29	0.83	8.9	1.05	18.1	0.98	27.0	71.071
24	1.01	10.8	1.27	21.8	1.18	32.6	71.071
21	1.15	12.3	1.45	24.9	1.35	37.2	71.071
18	1.34	14.3	1.69	29.1	1.57	43.4	71.071
16	1.51	16.1	1.90	32.7	1.77	48.9	71.071
14	1.73	18.4	2.17	37.4	2.32	55.9	71.071

b) PERCENTAGE OF DISTANCE COVERED WITH END GAN ON . 50

	CON	QH .	GN	OFT	AVE		
•	CEPTH	THE	CEPTH	TIME	KITEES	TIME	UNIFORMITY
TUER	(EN)	(HR)	(IN)	(HDL)	(IN)	(HPU)	•
100	0.24	3.9	0.30	1.9	0.27	7.8	69.465
75	0.32	5.2	0.41	5.2	0.36	10.4	69.465
60	0.40	6.5	0.51	6.5	0.45	13.0	69.465
50	0.48	7.8	0.61	7.8	0.55	15.6	69.465
42	0.58	9.3	0.72	9.3	0.65	18.6	69.465
34	0.71	11.5	0.89	11.5	0.80	23.0	69.465
29	0.83	13.5	1.05	13.5	0.94	27.0	69.465
24	1.01	16.3	1.27	16.3	1.14	32.6	69.465
21	1.15	18.6	1.45	18.6	1.30	37.2	69.465
18	1.34	21.7	1.69	21.7	1.52	43.4	69.465
16	1.51	24.4	1.90	24.4	1.71	48.9	69.465
14	1.73	27.9	2.17	27.9	1.95	55.9	69.465

C) PERCENTAGE OF DISTANCE COVERED WITH END GUN ON = 66

	CIN	QV	CON	CFT	AVER	VCZ	
TIMER	DEPTH (DN)	TUE (HR)	(IN)	TDE	DE2734 (I24)	TDE (HR)	A CONTRACTOR OF THE PROPERTY O
100	0.24	5.2	0.30	2.7	0.26	7.8	67.953
75	0.32	6.9	0.41	3.5	0.35	10.4	67.953
60	0.40	1.6	0.51	4.4	0.44	13.0	67.953
50	0.48	10.3	0.61	5.3	0.53	15.6	67.953
42	0.58	12.3	0.72	6.3	0.63	18.6	67.953
34	0.71	15.2	0.89	7.8	0.77	23.0	67.953
29	0.83	17.8	1.05	9.2	0.91	27.0	67.953
24	1.01	21.5	1.27	11.1	1.10	32.6	67.953
21	1.15	24.6	1.45	12.7	1.25	37.2	67.953
18	1.34	28.7	1.69	14.8	1.46	43.4	67.953
16	1.51	32.3	1.90	16.6	1.64	48.9	67.953
14	1.73	36.9	2.17	19.0	1.88	55.9	67.953

Figure 49. Application uniformity and time required to irrigate the field using pump J without the modification in the design of the system.

CHOOCIFIED SYSTEM WITH CONSTANT TIMER SEITING APPLICATION UNIFORMITY (DAD GAN GN) #81.3 APPLICATION UNIFORMITY (DAD GAN OFF) #74.1

() PERCONTAGE OF DISTANCE COVERED WITH END CUN ON . 13

	CN		CLIN	OFF .	AVER	NCZ			
•	DEPTH	TIPE	DEPTH	TIPE	CEPTH	TIME	UNIFORMITY		
TIMER	(IN).	(HJR)	(104)	(HJR)	(IN)	(HPR)	•		
100	0.24	2.6	0.28	5.2	0.27	7.8	72.889		
75	0.32	3.4	0.37	7.0	0.36	10.4	72.889		
60	0.40	4.3	0.46	8.7	0.44	13.0	72.889		
50	0.48	5.2	0.56	10.5	0.53	15.6	72.889		
42	0.58	6.1	0.66	12.5	0.64	18.6	72.889		
34	0.71	7.6	0.82	15.4	0.78	23.0	72.889		
29	0.83	9.9	0.96	18.1	0.92	27.0	72.889		
24	1.01	10.8	1.16	21.8	1.11	32.6	72.889		
21	1.15	12.3	1.33	24.9	1.27	37.2	72.889		
18	1.34	14.3	1.55	29.1	1.48	43.4	72.889		
16	1.51	16.1	1.74	32.7	1.67	48.9	72.889		
:4	1.73	18.4	1.99	37.4	1.91	\$5.9	72.889		
:1	2.20	23.5	2.54	47.6	2.43	71.1	72.889		

b) PERCENTAGE OF DISTANCE COVERED WITH END GUN ON . 50

	CUN	QN	CUN	OFF	AVER	NCZ.	
TIMER	DEPIH (IN)	TIME (HR)	CEPTH (IN)	Time (HR)	DEPTH (IN)	Time (HPL)	UNIFCHITY
100	0.24	3.9	0.28	3.9	0.26	7.8	72.282
75	0.32	5.2	0.37	5.2	0.35	10.4	72.282
60	0.40	6.5	0.46	6.5	0.43	13.0	72.282
50	0.48	7.8	0.56	7.8	0.52	15.6	72.282
42	0.58	9.3	0.66	9.3	0.62	18.6	72.282
34	0.71	11.5	0.82	11.5	0.77	23.0	72.282
29	0.83	13.5	0.96	13.5	0.90	27.0	72.282
24	1.01	16.3	1.16	16.3	1.09	32.6	72.282
21	1.15	18.6	1.33	18.6	1.24	37.2	72.282
18	1.34	21.7	1.55	21.7	1.45	43.4	72.282
16	1.51	24.4	1.74	24.4	1.63	48.9	72.282
14	1.73	27.9	1.99	27.9	1.86	55.9	72.282
11	2.20	35.5	2.54	35.5	2.37	71.1	72.282

C) PERCENTAGE OF DISTANCE COVERED WITH 2ND GUN ON . 66

	CUN	CN	CUN	OFF	AVER	KE			
TIMER	DEPTH (IN)	Tipe (LR)	(DI)	Tire (HR)	(NI)	Tipe (HR)	CHIPCHUTY		
100	0.24	5.2	0.28	2.7	0.25	7.8	71.711		
75	0.32	6.9	0.37	3.5	0.34	10.4	71.711		
60	0.40	1.6	0.46	4.4	0.42	13.0	71.711		
50	0.48	10.3	0.56	5.3	0.51	15.6	71.711		
42	0.58	12.3	0.66	6.3	0.61	18.6	71.711		
34	0.71	15.2	0.82	7.8	0.75	23.0	71.711		
29	0.83	17.8	0.96	9.2	0.88	27.0	71.711		
24	1.01	21.5	1.16	11.1	1.06	32.6	71.711		
21	1.15	24.6	1.33	12.7	1.21	37.2	71.711		
18	1.34	28.7	1.55	14.8	1.41	43.4	71.711		
16	1.51	32.3	1.74	16.6	1.59	48.9	71.711		
14	1.73	26.9	1.99	19.0	1.82	55.9	71.711		
11	2.20	46.9	2.54	24.2	2.31	71.1	71.711		

Figure 50. Application uniformity and time required to irrigate the field using pump H without the modification in the design of the system.

	1981: 111114	9J84449 1 841 71 2011 11:	AST TO-	. Tale	5 31% . - ve ?yee (*	36 men:	*14.70	
	APPLI	ATION JN	FCR-: T	Y END S	25. (0) 28. 277)	·16.1 •74.4		
a)	+SRCEH!	16 3541	: BTANCE	COVERED	with S	CH 20 · 11 ·		
	SEPTK	two ou	w Ox	THO COM				
	: 30030	· inta	nA .	TIMES	MA	INIFORMITY	DRIT LISTE	
	2.34	12.74	3.55	:::::::	1.14	76.00 76.00 76.00	4.79	
	3.4-	60.50	4.24 5.3;	15.3:	4.14	74.40	10.40	
	0.12 ن.ن	40.50	6.36	67.78 56.22	9.32	76.40	13.00 15.60	
	4.78	34.68	7.44	67.78 56.22 48.00 41.87 37.60 33.54 30.59 26.00 25.37 23.92	13.90	76.40	10.34	
	3.40 3.90	33.3 0	0.12	31.60	12.51	:6.40 :6.43	.:.60	
	1.60	24.23	11.69	33.54	15.62	76.40	26.27	
	1.15	20.25	12.74	30.59	17	76.40 76.48	:0.01)1.42	
	:.35	:1.45	13.8:	:5.37	:5.:0	76.40	13.98	
	1.40	15-14	14.00	23.92	21.90	76.4 0 76.4 0	36.79 39.36	
	1.60	15.10	16.99	20.93	25.03	76.40	42.02	
	1.70	14.26	16.10	19.00	26.46	76.4 0 76.4 0	44. 56 47.12	
	:0	12.90	20.00	22.41 20.93 19.80 18.67 17.65	29.60	76.40	49.68	
	2.56	12.27	71.03	16.79	31-30	76.46	31.30	
b)	PERCENT	PAGE OF D	ISTANCE	COVERER	WITH G	20 OH . 50 Y		
	JEPTH IN	EMD GO	M ON	END CON	077			
	(MCH	TIMER	HR	TIMER	TIME	GMIPONMITT 9	TOTAL TIME	
	3.33	*****	••••	100.00 05.37 67.78 56.22	••••	77.64 77.64 77.64 77.64	••••••	
	0.40	60.10	6.45	100.00	4.50	77.64	9.20 11. 03	
	0.50	41.60	1.05	67.78	\$.77	77.64	13.01	
	0.70	34.60	11.27	40.00	1.13	77.64	16.59 19.41	
	0.80	30.39	12.06	40.00	1.34	77.64	22.20	
	1.30	24.23	16.14	33.54	11.66	77.64 77.64	24. 82 27.79	
	1.10	22.00	11.27 12.86 14.42 14.14 17.71 19.31 20.92	30.60	12.70	77.64 77.64	30.40	
	1.30	13.69	20.92	25.07	15.04	77.64	33.28 33.90	
	1.40			23.92	16.35	77.64	38.90	
	1.60	13.10	24.22	20.93	19.60	77.64 77.64	41.67	
	1.73	14.26	27.42	19.00	19.75	77.66	47.17	
	1.90	12.90	30.30	41.87 37.40 33.54 30.59 28.06 25.07 23.92 22.41 20.93 19.80 18.67	22.15	77.64 77.64	49.81 52.45	
	2.00	12.27	31.87	14.79	23.29	77.64	15.15	
c)	PERCENT	10 1041	LSTANCE	COVERED	W178 6	81 80 · 66 1		
	DEPTH :N	TIMES OF	U DW	TIMER	TIRE	DMIFORWITT	TOTAL TIME	
	IPCR		MR	•	70.00	•	NA	
	0.33		7.09	100.00	1.66	78.62	9.75	
	0.10	40.40	1.52	100.00 85.37 67.78	3.11	78.62	11.63	
	0.60	40.50	12.72	56:22	4.73	70.02 70.02 70.03	17.45	
	0.70	34.60	14.80	56:22 44,88	4,41	74,42	30.41	
	0.10 0.10	30.38 27.11	16.00		7.87	78.87	23.33 26.11	
	1.39	24.23	19.04 21.30 23.37 25.49 27.62	33.54	7.93	70.07	29.23	
	:.19	22.25	23.37	30.59 20.05	1.45	78.82	32.06 34.97	
	1.33	:0.69	27.62	25.97	10.34	78.88	37.06	
	:.55	: 6 . 1 4	29.70 31.97 33.99	23.77	11.17	78.82 78.82	40.09 43.03	
	1.63			20.93	12.78	11.62	46.60	
	1.00	13.54	36.19	20.05 25.97 23.92 22.41 20.93 19.80 18.67 17.65	14.24	78.82	49.62 52.25	
	:	::.90	10.00	: 7 - 68	: 4 . 24	78.82	15.05	
	::::		48.07			78.62	17.90	

Figure 51. Application uniformity and time required to irrigate the field with the modification in the design of the system.

certain depth after the modification of the system. These figures also give the distribution efficiency for the end gun on and end gun off conditions.

The uniformity of application for the end gun on and end gun off conditions are about 81% and 74% respectively. This is based on the theoretical assumption that all sprinklers apply water in the field in an elliptical pattern.

The overall distribution efficiency depends upon the percentage of circle covered with the end gun on, and application uniformities and average application depths for the end gun on and end gun off conditions. The overall distribution efficiency for different cases are shown in Figures 48, 49, 50, and 51. The value of the overall distribution efficiency decreases as compared to the end gun on and end gun off system distribution efficiencies. This can also be understood by looking at the example given in Figure 46. The application depth for the given timer setting reduces from 1 inch to 0.8 inch when the end gun is turned on. This 20% change in the application depth reduces the overall distribution efficiency. Considering the application uniformity for the system with pump J, the uniformity for the end gun on and end gun off conditions are 81.3% and 74.2% respectively. But the overall uniformity reduced to 71% for the 33% end gun on coverage condition as a result of the reduction in the application depth from 1.05' to 0.83" for 29% timer setting (Figure 49).

The modification in the design of the center pivot system is such that the system operates with dual timer settings for the end gun on and end gun off conditions (Figure 51). Though the application uniformity

using pump J is 74% for the end gun off conditions, the overall application uniformity is more than 76%. The timer setting is changed from 24% to 33.5% to apply an inch of water with the end gun off.

Comparing the results of the unmodified system with the modified system, it is seen that the application uniformity increases from 71% to 76%, 69% to 78%, and 67% to 79% for the end gun covering 33%, 50%, and 66% of the circle respectively. This is an increase of 7 to 17% in the distribution efficiency of the system.

Wallace (1987) showed that for 50% soil water depletion schedule with rainfall,

$$\Delta Y = 1.08\Delta X \tag{75}$$

where ΔY = change in the coefficient of variation of yield, and

 ΔX = change in the coefficient of variation of irrigation.

Similarly for 50% soil water depletion schedule without rainfall, the relationship of the variation in the yield with the variation in the uniformity was given by

$$\Delta Y = 0.42\Delta X \tag{76}$$

where ΔY and ΔX are as defined earlier.

These equations for corn show that the yield can be increased by improving the distribution efficiency of the irrigation system. Table 5 gives the overall view on the possible increase in the yield of corn with the modification in the design of the center pivot system using [75] and [76].

Table 5. Change in the yield of corn with the improvement in the irrigation application uniformity after the modification of the design of the center pivot system.

System with pump	# distance with end gun on	<pre># change in distribution efficiency</pre>	<pre>1 change in the without rainfall</pre>	e <u>yield of corn</u> with rainfall
V	33	7.61	8.22	3.20
	50	11.75	12.69	4.94
	66	15.66	16.91	6.58
J	33	5.33	5.76	2.24
	50	8.17	8.82	3.43
	66	10.87	11.74	4.57
Н	33	3.51	3.79	1.47
	50	5.36	5.79	2.25
	66	7.11	7.68	2.99

Table 5 shows that with an improvement in the distribution efficiency by 10% by using pump J, the yield can be increased by upto 11%. The maximum improvement in the distribution efficiency with the modification in the design of the center pivot design is for the system with steep pump curve.

As discussed above, it is clear that the yield of corn would be increased by upto 8.8% with a 8.17% increase in the application uniformity for the system with pump J. Assuming a yield of 140 bushels per acre, the 8.8% increase means an increase of 12.3 bushels per acre. The area of irrigation has been assumed to be 55 acres. Therefore the total increase in yield as a result of an increase in application uniformity would result be 676 bushels. This translates to \$ 1691 at \$2.50 per bushels.

C. Energy and Time Savings

The summary of the power required by the pumps for the conditions when the end gun is on, end gun is off, and the end gun is off with modifications is given in table 5. The efficiency of pump J with the end gun on is 82%. Since the pumps H and V are hypothetical, their efficiency are not known. Therefore their efficiencies at the operating points was assumed to be the same as that for pump J. The electrical power efficiency is assumed to be 70% for all the pumps. The total electrical power required is obtained by dividing the brake power by the electrical efficiency.

Pump V requires the most power when the end gun is off. This is also understood from Figure 30. With the end gun is off, the modification of the design of the system reduced the power requirement of pumps V and J by 30 hp and 1 hp respectively. The power requirement for pump H increased by 18 hp. But the power required after this increase is only 3 hp more than the end gun on condition. It is possible to replace pump V by a pump of 30 hp less capacity after the modification of the system.

Table 7 shows the energy required for the pumps to operate with the end gun on, end gun off, and end gun off with modifications in the design. Table 8 gives the total energy required for the pumps to operate for the modified system. Table 9 compares the total time and energy required to apply 0.5", 1.0", 1.5", and 2.0" of water between the modified and unmodified system. The values of energy and time given in Table 9 was obtained from Tables 7 and 8.

Table 6. Electrical power required to operate example pumps for the end gun on, end gun off, and modified end gun off conditions.

PUNCP	OPERATIES	Q	Н	VATER	EFF	BRATE	ELECTRICAL	ELECTRICAL
TYPE	COMPTTIONS	(gpm)	(IL)	POLER(hp)	\$	POLES (hp)	POLCE (hp)	POWER (hp)
Н	END CUR ON	825.0	349	72.71	82	88.67	126.67	94.50
	DID CILI OFF	670.5	349	59.09	81.5	72.51	103.58	77.27
	(modified) DID CIM OFF	819.5	350	72.43	82	88.33	126.18	94.13
J		825.0	349	72.71	82	88.67	126.67	94.50
ł	Dad Chi Cel	730.5	395	72.87	81.5	89.41	127.72	95.28
	(modified)	819.5	352	72.86	82	88.86	126.93	94.69
	END CUN ON	825.0	349	72.71	82	88.67	126.67	94.50
1	Dad Can off	825.0	470	97.92	81.5	120.14	171.63	128.04
	(modified) DED CIN OFF	825.0	354	73.77	82	89.96	128.51	95.87

Table 7. Energy and time required for irrigation using different pumps without the modification in the design.

VATER CEPTH (IN)	PUNCP	1 C:RCLE	APPLICATION UNIFORMITY		331 01		α	JI OFF		:01	TAL.
(CUNOFF)	USED	ON	\$	POVER	T:HE HOL	EV-HR	POVER	TIME	EXERCT EV-101	DrEDGT EV-HOL	TIME
0.5	H	33	72.9	94.5	5.31	501.80	77.27	10.90	842.24	1344.04	16.14
		50	72.3	94.5	8.07	762.61	77.27	8.07	623.57	1386.18	16.14
		66	71.7	94.5	10.62	1003.59	17.27	5.30	409.53	1413.12	15.93
	٧	33	44.8	94.5	5.31	501.80	128.04	10.90	1375.64	1877.44	16.14
		50	65.9	94.5	3.07	762.61	128.04	8.07	1033.29	1795.89	16.14
		66	63.2	94.5	10.62	1003.59	128.04	5.30	678.61	1682.22	15.93
	J	33	71.1	94.5	5.31	501.80	95.28	10.90	1038,55	1530.35	16.14
		50	69.5	94.5	8.07	762.61	95.28	8.07	768.91	1531.52	16.14
			68.0	94.5	10.62	1003.59	95.28		504.98	1508.57	15.93
1.0											
1.0	H	33	72.9			1006.43			1668.26	2679.69	32.24
		50	72.3		16.14	1525.23			1247.14	2772.37	32.20
		"	71.7	94.5	21.30	2012.85	77.27	10.99	649.20	2862.05	32.29
	Y	33	64.8	94.5	10.65	1006.43	128.04	21.59	2764.38	3770.81	32.21
		50	65.9		16.14	1525.23	128.04		2066.56	2571.79	32.28
		66	63.2	94.5	21.30	2012.85	128.04	10.99	1407.16	3420.01	22.21
	1	33	71.1	94.5	10.65	1006.43	95.28	21.59	2057.09	3063,52	32.24
		50	69.5		16.14	1525.23	95.28	16.14	1537.82	3063.05	2.2
		- 66	4.0	94.5	21.30	2012.85	95.28	10.99	1047.13	3059.98	32.21
1.5	×	33									
•••	~		72.9		15.99	1511.06	77.27	32.49	2510.50	4021.56	4.4
		50 66	72.3			2288.79			1873.02	4161.81	48.14
		•	71.7	94.5	31.97	3021.17	17.27	16.49	1274.18	4295.35	48.44
	7	33 50	64.8		15.99	1511.06	128.04	32.49	₹160.@	5671.08	4.4
		7 0	65.9			2288.79	125.04	24.24	3099.86	5368.65	48.4
		•	63.2	94.5	31.97	3021.17	125.04	16.49	2111.38	5132.55	48.4
	J	33	71.1		15.99	1511.06	95.28	32.19	3095.65	4606.71	4.4
		50 66	69.5			2288.79	95.28	24.24	2309.59	4598.38	48.46
			44.0	94.5	31.97	3021.17	95.28	16.49	1571.17	4592.34	48.44
2.0	ĸ	33 50	72.9			1987.33			3342.70	5330.03	4.19
		~	72.3		31.87				2485.78	5197.50	4.0
			71.7	94.5	42.07	3975.62	π.21	21.99	1699.17	5674.79	4.0
	•	n	44.8		21.03	1987.33	128.04		5539.01	7526.34	4.19
		50 66	65.9		31.87	3011.72			4119.05	7130.77	4.0
		••	63.2	94.5	42.07	3975.62	128.04	21.99	2815.60	6791.22	4.0
	J	33	71.1		21.03	1987.33			\$121.81	6109.14	4.19
		50 66	69.5			3011.72			3065.16	6076.88	4.0
		••	44.0	94.5	42.07	3975.62	95.28	21.99	2095.21	6070.83	44.00

Table 8. Energy and time required for irrigation using different pumps with the modification in the design.

VATER DEPTH (IN)	PUMP TYPE		APPLICATION UNIFORMITY		CUM ON		G	UN OFF		10	TAL
(CUNOFF)	USED	ON	3	POVER	TIME HR	ENERGY EV-HR	POVER	TIME HR	EVERCY EV-HR	ENERGY EV-HR	TIME
0.5	Н	33	76.4	94.5	5.31	501.80	94.1	7.73	727.39	1229, 19	13.04
		50	77.6	94.5	8.05	760.73	94.1	5.77	542.96	1305.57	13.81
		66	78.8	94.5	10.62	7003.59	94.1	3.92	368.87	1372.46	14.54
	٧	33	76.4	94.5	5.31	501.80	94.7	7.73	732.03	1233.83	13.04
		50 66	77.6	94.5	8.05	760.73	94.7	5.77	546.42	1309.03	13.81
		••	78.8	94.5	10.62	1003.59	94.7	3.92	371.22	1374.81	14.54
	J	33 50	76.4	94.5	5.31	501.80	95.9	7.73	741.31	1242.80	13.04
		66	77.6	94.5	8.05	760.73	95.9	5.77	553.34	1315.95	13.81
	·		78.8	94.5	10.62	1003.59	95.7	3.92	375.93	1379.52	14.54
1.0	н	33	76.4	94,5	10.65	1006,43	98.1	15.62	1469.84	2476.27	26.27
		50	77.6	94.5	16.14	1525.23	94.1		1097.21	2622.44	27.79
		66	78.8	94.5	21.30	2012.85	94.1		746.21	2759.06	29.23
	. A	33	76.4	94.5	10.65	1006.43	94.7	15.62	1479.20	2485.63	26.27
		50	77.6	94.5	16.14	1525.23	94.7	11.66	1104.20	2629.43	27.79
		66	78.8	94.5	21.30	2012.85	94.7	7.93	750.97	2763.82	27.23
	J	33	76.4	94.5	10.65	1006.43		15,62	1497.95	2504.38	26.27
		50 44	77.6		16.14	1525.23	95.9		1118.19	2643.42	
			78.8	94.5	21.30	2012.85	95.9	7.93	760.49	2773.34	29.23
1.5	×	33	76.4	6R E	15.99	1511.06	94.1	99 9 8	2200.06	3711.06	39.36
		50	17.6		24.22	2283.79	94.1		1641.10		41.67
		66	78.8		31.97	3021.17	94.1		1116.03	4137.20	43.63
	٧	33	76.4	94.5	15.99	1511.06	94.7	23.38	2214.09	3725.15	39.36
		50	17.6	94.5	24.22	2268.79	94.7		1651.57	3940.36	41.67
		66	78.8	94.5	31.97	3021.17	94.7	11.86	1123.14	4144.31	43.83
	J	33	76.4		15.99	1511.06	95.9	23.38	2242.14	. 3753.20	39.36
		50 66	77.6		24.22	2288.79		17.44	1672.50		41.67
			78.8	94.5	31.97	3021.17	95.9	11.86	1137.37	4158.54	43.83
2.0											
V	M	33	76.4		21.03	1987.34	94.1		2935.92		52.24
		50	77.6		31.87	3011.72	94.1		2191.59	5203.25	55.15
		66	78.8	94.5	42.07	3975.62	94.1	19.09	1489.60	5465.22	57.90
	٧	33	76.4		21.03	1987.34	94.7		2954.64		92.29
		50	77.6	94.5	31.87	3011.72	94.7		2205.56	5217.28	55.15
		66	78.8	94.5	42.07	3975.62	94.7	15.56	1499.10	5474.72	57.90
	J	33	76.4		21.03	1987.34	95.9		2992.08	4979.41	52.24
		50	77.6		31.87	3011.72	95.9		2233.51		55.15
		66	78.8	94.5	42.07	3975.62	95.9	17.49	1518.10	5493.72	57.90

Table 9. Energy and time savings with the modification of the center pivot system.

VETER	Pag	ALLA PODMES	101 M		707A		OWICE N	HOD HODIFICA	rice of the s	13104
(IE)		(2000)	DESCT	TIME	DEDCT	TIME	0	OCT .	71	×
			D-10	HCR.	0⊢4	HA.	Or-NB	. 3	•	1
0.5		n	1344.00	16.19	1229.10	13.00	-110.99	4.95	-1.10	-19,21
		90	1306.18	16.19	1305.57	13.81	-80.61	-5.82	4.11	-14,44
		ü	1413.12	15.93	1372.44	14.54	-40.66	-2.88	-1.39	4.7
	•	39	1877,00	16.14	1233.83	13.04	-443.61	-34.28	-3.10	-19.2
		Z.	1795.00	16.10	1309.03	13.81	-44.84	-27.11	٠٤.33	-14.4
			162.2	15.93	1374.81	14.54	-307.41	-18.27	-1.39	4.7
	J	n	1530.35	16.14	1242.80	13.04	-235.70	-15.40	-3.10	-19.21
		2	1531.52	16.14	1315.95	13.81	-215.57	-14.08	٦.١٦	-19,64
			1506.57	15.93	1379.52	14.54	-129.05	4.55	-1.39	-4.17
1.0		22	2479.44	12.24	2976.27	26.27	-196.42	-1. L 2	4.97	-11.5
		99	2772.37	2.2	7122.44	27.79	-109.93	4.01	3.99	-13.9
		44	2012.05	12.29	2759.06	23.23	-102.99	-3.44	-3.06	-4.4
	•	n	3770.81	32.24	2495.63	24.27	-1205.18	-34. 66	-5.97	-18.9
		2	3571.19	32.26	2629.43	27.79	-442.36	4K.36	4.49	-13.9
			3430.01	12.24	2763.62	31.23	-456.19	-19.19	-3.66	-9.4
	J	n	361.52	22.29	2501.38	26.27	-999.18	-18.25	-3.97	-14.5
		Ξ	3063.05 3051.98	12.26 12.20	243.42	27.79	-219.63 -286.64	-13.70	4.89	-13.9
			27,1.75	<u> </u>	2773.34	27.23		-9.37	-3.66	4.4
1.5		n	4021.56	48.44	3711.06	39.36	-310.50	-7.72	-9.12	-18.8
		90	4161.81	4.4	1929.89	41.67	-731.92	-3.57	-4.79	-14.8
		44	4275.25	4.4	4137.20	43.43	-158.15	-3.44	4.4	-1. 9
	•	12 24	9671.08	48.44	3725.15	39.36	-1995.93	-34.31	4.12	-18.8
		<u> </u>	5364.65	4.4	3940.36	41.47	-1443.28	- ₩ .₩	4.79	-14.0
	_		\$122.55	4.4	4144.31	43.63	-143.29	-19.25	4.6)	4.5
	J	ŭ	466.71	44.44	3753.20	29.36	-953.51	-18.53	4.12	-14.8
		7	1998.38	4.4	3960.93	41.67	→37.45	-13.86	4.19	-14.0
			1542.34	4.4	4158.54	43.63	-433.80	-9.45	4.43	4.9
2.8		n	5130.03	4.11	1923.25	2.2	-405.78	-7.63	-11.95	-18.4
	-	~	5497.50	4.00	9201.11	93.15	-394.19	-4.15	-1.59	-12.5
		2	9414.79	4.6	944.22	57.99	-201.51	-1.49	4.4	4.9
	•	n 9	7526.34	64.19	9961,97	72.N	-7534.37	-34.34	-11.95	-10,6
		59	7130.77	64.66	9217.28	55.15	-1913.09	-24.43	-4.07	-13.4
			6791.22	64,64	914.72	57.90	-1376.50	-20.27	4.14	-9.9
	J	13 26	6109.14	4.19	0979.81	52.29	-1129.73	-18.49	-11.95	-14.6
		77	6076.26	64.04	5245.23	55.15	411.14	-13.69	-4.20	-12.0

Table 10 summarizes the energy and time savings for different conditions. It is seen that the percentage of energy and time savings is independent of the depth of application of water per irrigation. The saving of time is the same for all the pumps because the timer setting of the unmodified system was fixed on the basis of application depth when the end gun is on. The timer setting in this case is not changed when the end gun is switched off.

There is time and energy savings using the modified design for all pumps. Time savings vary from a low of 9% to a high of 19%. There are less savings in time and energy with the increase in the end gun on percentage coverage.

Conservation of energy increases with the increase in the pump curve steepness. There is savings of upto 34% in the energy cost for the system using pump V. The energy savings for the flat pump curve (pump H) is about 8% with the end gun covering 33% of the circle. Considering pump J, the energy and time savings for the end gun covering 33% of the circle are about 18% and 19% respectively.

This simulation model shows that any center pivot irrigation system can be modified to save time and/or energy. The capital cost in the installation of the pump can also be reduced when the pump has a very steep pump curve (e.g. reduction in pump capacity for the steep pump curve, pump V, by 30 hp with the modification in the design).

The changes in total energy and time for the season with the modification of the design of the center pivot system to irrigate corn, soybean, and potatoes are shown in Table 11. The unit cost of electrical

Table 10. Change in the energy and time requirements with the modification of the design of the center pivot system for different pumps.

~~~	APPLICATION	DATE CON C	N 335 CIR	ar.	END CON ON	505 CIRCLE	END CUM ON	65 CINCLE
TYPE	DEPTH	DIERGY VALUE 5	TIME		ENERGY VALUE \$	TIME VALUE \$	ENERGY VALUE \$	TIME S
					****			
H	0.5	-114.9 -	9 -3.1	-19	-80.6 -6	-2.3 -14	-40.7 -3	-1.4 -9
	1.0	-198.4 -		-19	-149.9 -5		-103.0 -4	-3.1 -9
	1.5			-19	-231.9 -6		-158.1 -4	-1.6 -10
	1.9	-106.8			-294.2 -5		-209.6 -4	-6.1 -10
v	0.5	-643.6 -3	14 -3.1	-19	-486.9 -27	-2.3 -14	-307.4 -18	-1.4 -9
	1.0	-1285.2 -			-942.4 -26		-656.2 -19	-3.1 -9
	1.5	-1945.9 -		-19	-1448.3 -27		-988.2 -19	-1.6 -10
	1.9	-2584.7 -			-1913.5 -27		-1376.5 -20	-6.1 -10
,	0.5	-287.6 -1	19 -3.1	-19	-215.6 -14	-2.3 -14	-129.0 -9	-1.4 -9
ľ	1.0	-559.1 -		-19	-419.6 -14		-286.6 -9	-3.1 -9
i	1.5	-853.5 -		-19	-637.4 -14		-433.8 -9	-4.6 -10
	2.0	-1129.7 -			-831.6 -14		-577.1 -10	-6.1 -10

Table 11. The total energy and time changes to irrigate three crops for the whole season after the modification of the design of the center pivot system.

	TOTAL	PLEASE TELES	SCINCLE VITH DID GAN	0.5	inenes			ICATION Inches	DEPTH	PER		ATION Incres		2.	O Inche	•
	(18)	USED	ON .	TIME	W-4	-	7116	E0-11	<u> </u>		TIME	LA-H		TIME	CV-4	
COMM	20	H	33	-124	5746	-340	-119	-3968			-122	-4140	-418	-126	~383	-43(
			50	-+3		-322	-10	-2999			-31	- 3092		-94		-316
			66	-56	-1626	-163	<b>→1</b>	-3000	-306		-42	-2109	-211	-65	-2206	-22
		٧	33	-129	-25764	-2579	-119	-25704	-2570		-122	-25946	-2595	-126	-27204	-272
			50	-43	-19676	-1947	-40	-18847	-1885		-91	-19311	-1931	-94	-20142	-2014
			66	-56	-12296	-1230	-61	-13124	-1312		-42	-13177	-1318	-+5	- 14489	-144
		J	33	-128	-11504	-1150	-119	-11183	-1118		-122	-11380	-1138	-126	-11892	-1181
			50	-13		-442	-90	-4393			-91	-8499		-44	-8754	
				-44	-5162	-516	41	-5733	-513		-42	-5784	-578	-45	-4075	-404
											•					
<b>TOTAT</b>	DES 15	М	23	-93		-345	-40		-298		-41	-3105		-44	-3211	-321
ļ .			50	-70		-343	-47		-275		-4		-232	-70	-223	
			66	3	-1220	-122		-1545	-195			-1581	-158	-4	-1454	-165
		٧	33	-93	-19308	-1931	-90	-19278	-1928		-91	-19459	-1946	-94	-20403	-204
i			50	-70	-14606		-61	-14135				-14483		-70	-15107	
l			66	~3	-4222	-922	-46	-4643	-984			-9882	-968	-48	-10667	-1061
l		J	33	-43	-8429	-063	-10	-8387	-839		-91	-8535	-854	-94	-8919	-842
l			50	-70		-647	-47		-429		-44	-6374		-70	-4566	-451
<u> </u>				<del></del>	-3471	-357	-46	-1299	-130		<u> </u>	<b>→338</b>	34	-4	<b>-19%</b>	-194
DATE:	ME 25	M	33	-155		-575	-189		-196		-152	-5175		-157	-5352	
ł			50 44	-116 -70		-103	-112		-375		-113	-3865 -2636		-117 - <b>3</b> 1	-3671	
1			•	-10	-4077	-303	-17	~01)	-258		-11	-44.50	-364		-राज	-270
1		٧	33	-155	-32181		-149	-32130				-32432		-157	-34005	
l			50	-116	-24343			-23559				-24138		-117	-25178	
1			44	-70	-15370	-1537	-17	-16405	-1604		-11	-16471	- 1647	41	-1111	-151
1		J	33	-195	-14390		-109	-13979	-1398			-14225			-14865	
}			50	-116		-1078		-10491				-10624		-117		
ı			66	-76	-4452	-605	-17	-7166	-717		-77	-7230	-723	-31	-7594	-77

power is taken as 10 cents/Kw-hr. The dollar value is only for the energy and not time. Consideration the irrigation of corn, Table 11 shows that it is possible to save upto \$ 2700.00 per season with the modification in the design of the center pivot system using pump V. The maximum time saving is about 124 hours. For the system used in Mr. Bement's farm (pump J), the possible saving in energy cost is in the range of \$1100.00. The maximum possible time saving is about 124 hours. Considering a capital investment of \$2000 to modify the existing system, the pay back period for the 50% circle-with-end gun-on system is about two years. Besides this, there is a saving in time (90 hours) per irrigation season which would increase the life of the pump and irrigation system as a whole . As discussed earlier, the other important and major improvement will be the increase in the application uniformity and potential yield. When the potential yield increase is combined to the annual possible savings of energy, the possible savings increases to more than \$2500.00 and the payback period for the modification is less than one season.

## D. Summary

The result and discussion section have demonstrated the possibility of energy and time conservation with the modification in the design of the center pivot irrigation system using auxiliary sprinklers which operate when the end gun is switched off. The range of energy savings depended on the type of pump used in the system. The time savings was independent of the type of pump used. Energy and time savings were independent of the irrigation interval. Besides time and energy, the capital investment could be significantly reduced with steep pump

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curves. There could be a significant improvement in the application uniformity with the modification in the design, especially for steep pump curves, as a result of which the yield would also increase.

## V. CONCLUSION AND RECOMMENDATIONS

The objectives of the proposed research have been addressed in full. Four computer programs were developed for the hydraulic and field performance analysis of the center pivot irrigation system. The possibility of energy and time savings with the modification in the design of the center pivot system were determined using these computer models.

The specific conclusion of the research are:

- 1. There will be energy savings when the center pivot irrigation system is modified to include auxiliary sprinklers.
- a. The range of possible energy savings with the end gun covering 33% of the circle is between 8% and 34% depending upon the steepness of the pump curve. Energy savings increase with the steepness of the pump curve.
- b. The required pump capacity can be significantly reduced for pumps with very steep pump curves.
- 2. The application uniformity will improve significantly with the modification in the design of the center pivot irrigation system. The

application uniformity increases upto 11% depending upon the steepness of the pump curve. This will increase the potential yield of crop upto 12%.

3. The irrigation time saving with the modification in the design of the system ranges between 9% to 19% depending upon the percentage of circle covered with the end gun on. The savings in time is not dependent on the type of the pump used.

The overall conclusion of the research is:

The modification in the design of the center pivot irrigation system will save time and energy and will increase application uniformity and yield, with the possible return in investment in the first season itself.

Recommendation for further research include:

- 1. Determine the energy and time savings that is possible by varying the timer setting between the end gun on and end gun off conditions without introducing the auxiliary sprinklers.
- 2. Study the contribution of the change in the pump curve efficiency and dual timer setting independent of each other.

## APPENDIX A

SOURCE CODE OF THE HYDRAULIC NETWORK ANALYSIS MODEL "NETWORK"

```
PROGRAM NETWORK
REM .
REM ·
REM THIS PROGRAM ANALYSES THE CENTER PIVOT SYSTEM NETWORK STARTING FROM
REM . THE PIVOT POINT TO THE END SPRINKLER. THE INPUT IS THE PIVOT
REM . PRESSURE, LENGTH OF THE SYSTEM, DIAPETER OF THE PIPE, AND THE
                         SPRINKLERS CONFIGURATION
REM .
REM .
                         WRITTEN IN TURBO-BASIC
REM .
REM INPUT FILE : GENDATA.DAT
                                     ---- CAN BE SUPRESSED
REM OUTPUT FILE :FIELD.DAT
                                     ---- CAN BE SUPRESSED
               DETAIL.DAT
                MODEL DAT
   MV$=80
   NV1=20
   DIM PRES(HV$), SPACING(HV$), PLAT(HV$, HV$), RADCOV(HV$, NV$)
   DIH QSPR(MV$,MV$),SIZE(MV$),LATEMD(20),LATSM(MV$),QLAT(MV$),H(MV$)
   DIM Z(MV$),P(MV$),R(MV$),CP(MV$),SAMEDIA(20),LATDIA(MV$),AREALAT(MV$)
   DIH VELLAT (HVS), REIO(HVS), PRICT (HVS), COUSTR (HVS), ELEV (HVS), KC (HVS)
   DIH CSP(EVS), KHAIH(EVS), KERAHCH(EVS), CPC(EVS), AREARIS(HVS)
   DIH DIARISER(HVZ), ESP(HVZ), EC(HVZ, HVZ+1), CRIS(HVZ), G(HVX),
   DIH FRICTICU(HV$), IFLG(HV$), OLDEC(HV$, HV+1), EXPO(26), LIMIT(26), ECC(26)
   DIN EXPON(MVS), FRSTRC(MVS, MVS+1), EBYD(MVS), Q(MVS)
    COMP=2
    WHILE COMP=2
   CLS: INPUT DO YOU WANT TO SUPRESS THE OUTPUT FILE ? (Y/N) ", COMPR$(1)
    IF COMPR$(1)="Y" OR COMPR$(1)="y" THEN COMP = 0
   IF CO:PR$(1)="N" OR CO:PR$(1)="n" THEN COMP = 1
    MEND
    FIRST=2
    WHILE FIRST=2
    INPUT"DO YOU WANT PRESSURE AT ALL THE SPRINKLER NODES? Y/N ",FRST$(1)
    IF FRST$(1)="Y" OR FRST$(1)="y" THEN FIRST = 0
   IF FRST$(1)="N" OR FRST$(1)="n" THEN FIRST = 1
    CHANGE=4
    WHILE CHANGE=4
    INPUT "RUN BOTH THE END GUN ON AND END GUN OFF CONDITION :(Y/N)", CH$(1)
    IF CH$(1)="Y" OR CH$(1)="y" THEN CHANGE = 0
    IF CH$(1)="N" OR CH$(1)="n" THEN
      CHANGE = 3
      WHILE CHANGE=3
      IMPUTTRUM END GUN ON CONDITION :(Y/N)",CHH$(1)
      IF CHH$(1)="Y" OR CHH$(1)="y" THEN CHANGE = 2
      IF CHH$(1)="N" OR CHH$(1)="n" THEN CHANGE = 1
      MEND
```

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```
END IF
    WEND
    INPUT"ALLOWABLE ERROR IN SIMULATE PRESSURE HEAD IN FEET (DEFAULT IS 1)"_
          , ALLERR
    IF ALLERR=0 THEN ALLERR=1
    NORUN = 1
    CHEKSPAC : 0
    ITER=0
    OFFGUN = 0
    INPUT "NUMBERS OF RUN TO BE MADE = ", RUMM
    OPEH "I", #9, "GENDAT. DAT"
    OPEN "O", #10, "FIELD. DAT"
    OPEN "O", /12, "DETAIL.DAT"
    OPEH "O". #14. "MODEL. DAT"
REA INPUT PIVOT PSI, TOTAL LENGTH (FT), DISTANCE TO LAST TOWER (FT)
         NUIDER OF SPRINTLERS, AND ESTIBLIED EN SPRINKLER PSI
Real
INPUT #9, PSUM, LATLETI, S, SPRINCELE, OPPRES
    IP RULLI-1 THEI INPUT PRESSURE AT THE PIVOT-", PSUM: OPPRES-PSUM-10
    PE=PSUM: OP=OPPRES
    PRINTO 14, CHR$(19);:PRINTO 14, CHR$(27) "E";:PRINTO 14, CHR$(27) "G";
    PRINTO 12, CHES (18);:PRINTO 12, CHES (27) "E";:PRINTO 12, CHES (27) "G";
    PRINTO 14, TAB(25) "DATA AND RESULTS" : PRINTO 14, : PRINTO 14, : PRINTO 14,
    PRILTS 14, TAD(12) "No of sprinklers in the systems "; sprinkle
    PRINT# 14, TAD(12) "Total length of laterals "; latlen; " ft"
    PRINTS 14, TAB(12) "Distance to last towers ";s;" ft"
    PRINT# 14, TAB(12) "Nazimm Allowable error in calculating pressure;
             Allerr:" ft
    PRINTS 14, :PRINTS 14,
    ELEMENT = SPRINKLE®2
    MNODE = ELEMENT+1
    HSUM = 2.3114 PSUM
    H(1)=HSUM:P(1)=PSUM:OPHEAD=OPPRES*2.3114
  CALL DIFFSPRINKLER(PLAT(), RADCOV(), QSPR(), SPACING(), CHEKSPAC, ELEMENT, IFLG())
    IF CHEKSPAC (> LATLEN THEN
       CALL CHECKLENGTH (CHEXSPAC, LATLEN)
10
    END IF
    IF CHANGE : 1 THEN
       ELEXENT : ELEXENT-2
       NNODE = NNODE-2
       SFLG=1
   END IF
   CALL SPRINKLERCOEFF(PLAT(),QSPR(),SPACING(),ELEMENT,IFLG(),KC(),EXPON(),1)
```

```
20 CLS: INPUT Is the diameter of the lateral line constant throught? (Y/N)",
             DiaCon$
     GOTO 40
  30
     INPUT DIACONS
  40
    IF DIACONS = "Y" OR DIACONS = "y" then
         IMPUT Diameter of the lateral line pipe in inches = ",SIZE
       ELSEIF DIACONS = "N" or DIACONS = "n" then
         CALL PipeDiameter(size(), samedia())
       ELSE
        PRINT*The only possible choice is (Y)es or (N)o*
        GOTO 30
     END IF
     SUMSPACE=0
     J=1
     PRINTA14 .: PRINTA14 .:
     PRIMITS 14, TAB(12) "DIAMETER
                                 DISTANCE FROM PIVOT(ft)
     PRILITA14, TAB(12) "(inches)
                                     FROM
                                                TO
     PRILT#14, TAB(12) -----
     IF DIACCHA = "Y" or DIACOHS = "y" THEN
       FOR I = 1 TO ELEKENT STEP 2
          LATDIA(1) = SIZE/12
      · NEXT I
       PRIMT#14, TAB(12) USING ##.##
                                                     ####.#";_
                          SIZE, LATLEY
      ELSE
       FOR I = 1 TO ELEMENT
          IF 1/2<>INT(1/2) THEN
             SUPERACE = SPACING(I) + SUMSPACE
             LATSUM(1) = SUMSPACE
             IF SUMSPACE > SAMEDIA(1) THEN
               J = J + 1
               IF J > 1 THEN
                  PRINT#14, TAB(12) USING
                          " ##.##
                                                      ####.#";_
                                            ****.*
                            SIZE(J), SAMEDIA(J-1), SAMEDIA(J)
               END IF
            END IF
            LATDIA(1) = SIZE(J)/12
            IF I = 1 THEN
               PRINT#14, TAB(12) USING ##.##
                      SIZE(J), SAMEDIA(1)
              GOTO 45
            END IF
         END IF
45
      NEXT
   END IF
```

```
REH Relative Roughness of all the elements
   INPUT"Roughness of the pipe in inches (default is 0.0006) = ",E
   IF E = 0 THEN E = 0.0006
   PRINT#14,:PRINT#14, TAB(12) USING"PIPE ROUGHNESS=#.#####inches";E
   FOR I = 1 TO ELEMENT
      IF 1/2 <> INT(1/2) THEN
         EBYD(I) = E / (LATDIA(I)^{2}12)
      END IF
   NEXT
REMODERATION AT DIFFERENT POINTS IN THE FIELD ...
50 INPUT Is the field assumed to be plain, i.e. negligible slope? Y/N ",Z$
   GOTO 70
60 LOCATE 16,25:INPUT"Please press 'Y' or 'N' ", Z$
70 IF 2$ = "Y" OR 2$ = "y" THEN
      PRINT#14, TAB(12) "SLOPE OF THE FIELD IS NEGLIGIBLE"
      FOR I = 1 TO NNODE
         Z(I) = 0
     MEXT I
     ELSEIF Z$ = "N" OR Z$ = "n" THEN
     CALL ELEVATION(NNODE.SPACING(),2())
    ELSE
     GOTO 60
   END IF
REMESSORED DIAMETER AND AREA OF THE RISER SESSORES SESSORES
INPUT Diameter of the risers (excluding end sprinkler) in inches: ",_
        DIARISER
   FOR I = 1 TO ELEMENT
      IF 1/2 = IMT(1/2)THEN
         AREARIS(I) = (3.14/4)^{4}((DIARISER/12)^{2})
         DIARISER(I)=DIARISER/12
      END IF
   NEXT I
   PRINT#14, TAB(12) USING"RISER DIAMETER = ##.### inches"; DIARISER
   INPUT"Diameter of the end sprinkler riser: ",DIARISE:CLS
  PRINT#14, TAB(12) USING
                "END CUN RISER DIAMETER = ##.### inches"; DIARISE
  AREARIS(ELEMENT) = (3.14/4)*((DIARISE/12)^2)
  DIARISER(ELEMENT) = DIARISE/12
```

```
REMODES THE PRESSURE AT THE NODES
REHERENALID DISCHARGE FROM THE SPRINKLERS
80 HEADLOSS= PSUM-OPPRES:sumlen=0
   FOR I = 1 TO ELEMENT
      IF 1/2 = INT(1/2)THEN
        SUPLEN = SPACING(I-1) +SUMLEN
        X=SUFLEN/LATLEN
REM DISTRACT IS CALCULATED USING THE BETA DISTRIBUTION FUNCTION
        DISTRACT = 1 - (15/8)*(X- (2*(X^3)/3) + ((X^5)/5))
        P(I) = HEADLOSS DISTFACT + OPPRES
        IF P(I-2)-P(I)=0 THEN P(I) = P(I-2) - 0.0001
        H(I) = P(I) = 2.3114
        P(I+1) = P(I)-0.5 : H(I+1)=P(I+1)*2.3114
        QRIS(I) = KC(I)^{\#}H(I+1)^{*}EXPON(I)
      END IF
   NEXT I
REMOSSION CALCULATE THE FLOW IN THE LATERAL LINE TO CALCULATE FRICTION LOSSOS
QLAT(ELEMENT) = 0
   FOR J = 1 TO ELEMENT
      IF I/2 <>INT(I/2) THEN
        IF I=1 THEN
           OLAT(ELEMENT-J)=QRIS(ELEMENT)
         ELSE
           QLAT(ELEMENT-J)=QRIS(ELEMENT-J+1) + QLAT(ELEMENT-J+2)
        END IF
      EMD IF
   NEXT J
   IF COMP = 1 THEM
     IF ITER=O THEN
                        INITIALISED DISCHARGE®
        PRINT#12."
                                   DISCHARGE*
                        ELEXENT
        PRINT#12."
        PRINT#12,"
        FOR I=1 TO ELEMENT
           IF I/2<>INT(I/2) THEN
                                            ###.##";I,QLAT(I)
                                  ***
             PRINT#12, USING"
                                             ###.##";I,QRIS(I)
                                  111
             PRINT#12, USING"
           END IF
        NEXT
     END IF
   END IF
```

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REMARKABLE VELOCITY, REYNOLD NO. FRICTION LOSS IN THE LATERAL LINE CONTROL OF THE LATERAL CO
   REM KINEMATIC VISCOSITY = 0.00001059 CU FT / SEC AT 68DEG FAR (20 DEG C)
           TOTFRIC = 0
   90 FOR I = 1 TO element
                    IF 1/2<>INT(1/2)THEN
                          AREALAT(I) = (3.14/4) \cdot (LATDIA(I)^2)
                          VELLAT(I)=QLAT(I)/(448.8*AREALAT(I))
                          RENO(I) = (VELLAT(I)^*LATDIA(I))/(0.00001059)
                          FRICT(I) = 1.325 \cdot (LOG(0.27 \cdot EBYD(I) +
                                                                                                 5.72^{\frac{1}{2}}((1/RENO(1))^{0.9})^{-2})
                          R(I) = 8*FRICT(I)*SPACING(I) /
                                                                    32.20(448.8~2)0(3.14159~2)0((LATDIA(1))^5))
                          FRICTION(I)=R(I)=((QLAT(I))^2)
                   END IF
                   TOTFRIC=FRICTION(1)+TOTFRIC
          MEXT I
  REMARKS DETERMINE COEFFICIENT TO BUILD THE GLOBAL STIFFNESS MATRIXERS
  REM VALUE OF m FOR THE DARCY'S METHOD = 2
          H = 2 ·
 110 FOR I = 1 TO ELEMENT
                  IF 1/2<>INT(1/2) THEN
                         CP(I) = 0
                         IF I = 1 THEN
                               NUMER = (2(1)+H(1) - 2(2)-H(2))^{(1-H)/H}
                               GOTO 120
                        END IF
                        DELTAh=Z(I-1)+H(I-1)-Z(I+1)-H(I+1)
                        IF DELTAH = 0 THEN DELTAH = 0.0000001
                        NUMER = DELTAh ((1-H)/H)
120
                        CONST = (R(I))^{(1/M)}
                        CP(I) = NUMER/CONST
                 END IF
         NEXT I
REMARKS COEFFICIENT
         FOR I =1 TO ELEMENT
                 IF I/2 = INT(I/2) THEN
                       CSP(I) = (Kc(I)) / ((H(I+1))^(1-EXPON(I)))
```

```
END IF
           NEXT I
REMASSESSECALCULATE THE TEE AND ELBOW LOSS COEFFICIENT KPC
            IF FLAGG=0 THEN
                     PRINT#14, TAB(12) USING"K FOR TEE AND ELBOW COMPONENTS = ##.##"; KCP
            END IF
            FOR I = 1 TO ELEMENT
                        IF I/2=INT(I/2) THEN
                                 KSP(I)=(8°ECP)/(32.2°(3.1412^2)°(DIARISER(I)^4)°(448.8^2))
                                 CPC(I)=((H(I)-H(I+1))^{-0.5})/(KSP(I)^{0.5})
                        END IF
            NEXT I
REMASSON MATRIX STIFFIESS MATRIX STATES MATR
ROW=NNODE
            COL=NNODE+1
            LOCATE 6,23:PRINT"Building global stiffness matrix"
            LOCATE 7,30:PRINT" Please Wait
            FOR R = 1 TO ROW
                        G(R) = 0
                        RC(R,COL)=G(R)
                        OLDRC(R,COL)=H(R)
                        IF ITER=O THEN FRSTRC(R,COL)=H(R)
                        FOR C = 1 TO col
                                    RC(R,C) = 0
                                    RC(C,R) = 0
                       NEXT C
            NEXT R
            FOR I=1 TO ELEMENT
                        IF 1/2 <> INT(1/2) THEN
                                 IF I=1 THEN
                                         RC(1,1) = CP(1)
                                         RC(1,2) = -CP(1)
                                         RC(2,1) = -CP(1)
                                         RC(2.2) = CP(1)
                                         G(1)=CP(1)*(Z(2)-Z(1)) + G(I)
                                         G(2)=-CP(1)*(2(2)-2(1)) + G(I)
                                       ELSE
```

```
RC(I-1,I-1) = CP(I) + CPC(I) + RC(I-1,I-1)
            RC(I-1,I+1)=-CP(I) - CPC(I) + RC(I-1,I+1)
            RC(I+1,I-1)=-CP(I) - CPC(I) + RC(I+1,I-1)
            RC(I+1,I+1) = CP(I) + CPC(I) + RC(I+1,I+1)
            G(I-1) = CP(I)^{\bullet}(Z(I+1)-Z(I-1)) + G(I-1)
            G(I+1) = -CP(I)^*(Z(I+1)-Z(I-1)) + G(I+1)
         END IF
        ELSE
         RC(1,1)
                  = CPC(I) + RC(I,I)
         RC(I,I+1) = -CPC(I) + RC(I,I+1)
         RC(I+1,I) = -CPC(I) + RC(I+1,I)
         RC(I+1,I+1) = CPC(I) + CSP(I) + RC(I+1,I+1)
       END IF
   NEXT I
   LOCATE 6,23:PRINT
   LCCATE 7.30:PRINT®
RC(1,1)=1
RC(1,COL)=HSUM
FOR I = 2 TO ROW
   RC(1,I) = 0
NEXT I
REMINISTRATIONS
   IF ITER = 0 THEN
     FOR I=0 TO ITR
        LOCATE 13+1,31:PRINT
     NEXT I
  END IF
 LOCATE 11,11:PRINT"NO OF EQUATIONS "; ROW
 LOCATE 11,47:PRINT"SOLVING EQUATION "
 LOCATE 13+ITER,31:print"ITERATION NO ";iter
 LOCATE 10,30:PRINT"***Please Wait***
 IF ITER = 0 THEN
    IF CHANGE = 1 THEN
      LOCATE 13,68:PRINT"END GUN OFF"
      LOCATE 14,68:PRINT"RUN NO ";NORUN
      IF CHANGE=1 AND SFLG<>1 THEN LOCATE 15,1:PRINT"RUN COMPLETE"
     ELSE
      LOCATE 13,1:PRINT"END GUN ON"
      LOCATE 14,1:PRINT"RUN NO ";NORUN
   END IF
 END IF
```

```
FOR L = 1 TO ROW
                  LOCATE 11,64:PRINT L
                  PP=RC(L,L)
                  FOR J = 1 TO COL
                            RC(L,J)=RC(L,J)/PP
                  NEXT J
                  FOR K = 1 TO ROW
                            PP=RC(K.L)
                            IF L-K=0 OR PP=0 THEN GOTO 130
                            FOR J=1 TO COL
                                     RC(K,J) = RC(K,J) - PP^*RC(L,J)
                            NEXT J
 130
                  NEXT K
          NEXT L
          ITR = ITER
REMODERATION NO AND IF COMDITION FOR MORE ITERATIONS
ITERFLAG = 1
          FOR I = 1 TO ROW
                     IF ABS(RC(I,COL)-OLDRC(I,COL))>ALLERR THEN
                            ITERFLAG = 0
                    END IF
          NEXT
          FOR I = 1 TO ROW
                     IF ITERFLAG = 0 THEN
                            OLDRC(I,col) = RC(I,col)
                     END IF
          NEXT I
REM -----CALCULATION OF DISCHARGE FROM THE SPRINKLERS
FOR I=1 TO ROW
                    H(I)=RC(I,COL)
                     P(I)=H(I)/2.3114
                     IF I/2=INT(I/2)THEN
                            QRIS(I)=KC(I)=(H(I)^EXPON(I))
                    END IF
          NEXT I
REM CALCULATION OF DISCHARGE IN THE LATERAL ELEMENT CONTROL OF DISCHARCE CONTROL OF DISCHARGE IN THE LATERAL CONTROL OF DISCHARGE IN THE LATERAL CONTROL OF DISCHARCE CONTROL OF DISCHARCE CONTROL OF 
          QLAT(ROW)=0
          FOR I=1 TO ELEMENT
                    K = ELEMENT-I+1
                     IF K/2 (> INT(K/2) THEN
                            QLAT(K) = QRIS(K+1)+QLAT(K+2)
                    END IF
          NEXT I
```

13 E3 E3

67 63 63

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```
ITER=ITER+1
   IF ITERFLAG = 0 THEN GOTO 90
   FOR I = 1 TO ROW
      IF I/2=INT(I/2) THEN
        Q(I)=QRIS(I)
       ELSE
        Q(I)=QLAT(I)
      END IF
   NEXT I
REMOSSPRINT PRESSURE AT THE HODES AND DISCHARGE FROM THE SPRINKLERS
IF FIRST = 0 THEN
     PRINT#12, "TOTAL ITERATION = "; ITER:print#12,
     PRINT#12, chr$(15);
     PRINT#12."
                             HEAD(FT)
                                           DIFFERNECE
     PRINT#12. "NODE
                                   FINAL
                    INITIAL
                                      (psi) (ft)
                                (ft)
     PRIMT#12." NO
                 (ft)
                        (psi)
     PRINT#12,"----
     FOR I = 1 TO ROW
        DIFF=100@((FRSTRC(I,COL)-H(I))/FRSTRC(I,COL))
        PRINT#12,USING
                           ***.*** ***.** **.** **.*
             480.04 700.000
        I,FRSTRC(I,COL),frstrc(i,col)/2.3114,H(I),h(I)/2.3114,DIFF,_
        (diff=100)/(frstrc(1,col)),I,Q(I)
     NEXT I
REMARKABLE RESULTS IN THE DATA FILE TO BE USED FOR IRRIGATION
FOR I=1 TO ELEXENT
        PRINT#10,USING*##,###.###,####;I,P(I);H(I)
        IF 1/2=11/T(1/2)THEN
          IFLG=IFLG(I):Q=QRIS(I)
          CALL INTERPOLATION (QSPR( ), RADCOV( ), I, IFLG, Q, SOLU)
          PRINT#10, USING ###.###,###.###"; QRIS(1), SOLU
          PRINT#10, USING ** ### . ### . ### ; QLAT(I), SPACING(I)
        END IF
     NEXT
   END IF
IF COMP = 1 THEN
PRINT#12.
                                             H LOSS TLOSS"
              QLAT VELOCITY REYNOLD FRIC(f) R
"EL LATDIA AREA
PRINT#12,_
"-- ----
FOR I=1 TO ELEMENT
   PRINT#12, USING
```

```
I,LATDIA(I), AREALAT(I),QLAT(I), VELLAT(I), RENO(I), FRICT(I), R(I), FRICT(I),-
  TOTFRIC
NEXT
PRINT#12,:PRINT#12,:PRINT#12,
                                                                                          ELEV
                                                                                                              R(I)
                                                                                                                                  LATDIA""
PRINT#12," NODE HEAD(ft) HEAD(PSI)
PRINT#12." ----
               FOR I = 1 TO NNODE
                       PRINT#12. USING
                                                                                                 44.44 44.4444444 44.44":
                                                                       444.444
                                       *** . * * * * * * *
                    I.H(I).H(I)/2.3114.Z(I),R(I),LATDIA(I)
               NEXT I
PRINT#12.:PRINT#12,:PRINT#12,
                                                                                          CSP
                                                                                                                  CPC
                                                                                                                                           CP
                                                                                                                                                            ,,
PRINT#12, "ELEM NODE
                                                                   FRIC
                                                 DISC
PRINT#12. "----
               FOR I = 1 TO NHODE
                        IF I=1 THEN PRINT#10, USING
                                                                                                                                           ###.# ###":.
                                                                                           ****.**
                                                                                                                   **** . * * *
  " ## ##
                                ###.#
                                                 ##.##
       1,1,2,QLAT(1),FRICTION(1),CPC(1),CP(1),H(1),H(2)
                        IF I>1 THEN
                               IF I/2=INT(I/2) THEN
                                     PRINT#12.USING
                                                                                                                                           ###.# ###":_
                                                                                          4444.444
                                                                 1111.111
                                   I,I,I+1,QRIS(I),CSP(I),CPC(I),H(I),H(I+1)
                                   ELSE
                                   PRINT#12.USING_
                                                                                           ****.**
                                                                                                                  ****.**
                                                 ##.##
                                   I, I-1, I+1, QLAT(I), FRICTION(I), CPC(I), CP(I), H(I-1), H(I+2)
                               END IF
                        END IF
               NEXT I
         END IF
         IF RUNN=1 THEN GOTO 140
         IF OFFGUNEO THEN EUDPLO-ORIS(ELEMENT)
         IF CHANGE=1 THEN ENDFLO=0
         ITERR(MORUM)=ITER : PSUMR(2, NORUM)=PSUM : HSUMR(2, NORUM)=PSUM#2.3114
         PENDR(NORUM)=P(ELEMENT) : QENDR(NORUM)=ENDFLO :
         HENDR(NORUM)=PENDR(NORUM) 2.3114 : QSUHR(2,NORUM)=QLAT(1) :
         PDROPR(NORUM)=PSUM-P(ELEMENT) : HDROPR(NORUM)=PDROPR(NORUM)=2.3114
         QEBYQP(HORUH) = 100 (QENDR(NORUH)/QSUAR(2, NORUM))
REMASSES AND FLOWS AND FLO
140 INK$(1)="Y"
           IF NORUN=RUNN AND (CHANGE=1 OR CHANGE=2) THEN INK$(1)="N"
           IF INK$(1)="Y" then
                  EMDS$(1)="Y"
```

```
IF (NORUN=RUNN AND CHANGE=0) OR CHANGE=1 THEN ENDS$(1)="N"
        IF CHANGE = 2 THEN ENDS$(1)="Y"
        IF CHANGE = 0 AND ENDS$(1)="N" THEN GOTO 160
150
        NORUN = NORUN + 1
        ITER=0
        PSUH1=PSUM+5
        OPPRES=4+P(ELEMENT)
        OPHEAD=OPPRES*2.3114:P(HNODE)=OPPRES:H(ELEMENT)=OPHEAD
        PSUM = PSUM1 :HSUM= PSUM*2.3114 :P(1)=PSUM:H(1)=HSUM
        IF CHANGE=1 OR OFFGUN = 1 THEN
           NRIODE = NNODE+2
           ELEMENT = ELEMENT+2
          LATLEN = LATLEN + SPACING(ELEMENT-1)
        END IF
        IF ENDS$(1)="Y" THEN GOTO 80
        LATLEN = LATLEN - SPACING(ELEMENT-1)
        IF OFFGUN=0 THEN
           NORUN=1
           PSUH = PE :HSUM= PSUM22.3114 :P(1)=PSUH:H(1)=HSUM
           OPPRES=OP:OPHEAD=OPPRES 2.3114:H(ELEXENT)=OPHEAD
           P(ELEHENT)=OPPRES
        END IF
        ELEXENT = ELEMENT - 2
        NEODE = NNODE - 2
        CHANGE = 1
        OFFGUN = 1
        GOTO 80
    ELSE
IF RUNN=1 THEN GOTO 170
        IFLGG(2)=NORUM:DUMMY(2)=0:KCCC(2)=0:EXPP(2)=0
160
        CALL SPRINKLERCOEFF
               (PSUNER(),QSUNER(),DUNOMY(),2,IFLGG(),KCCC(),EXPP( ),2)
        KCCC=KCCC(2) :EIPP=EIPP(2)
        PRINT#14,:PRINT#14,:PRINT#14,
        IF CHANGE = 0 OR CHANGE=2 THEN PRINT#14,_
                                                        END GUN ON"
        IF CHANGE = 1 THEN PRINT#14,_
                                                        END GUN OFF"
        PRINT#14.
        PRINT#14, TAB(12)
                                                    Qpivot Qend :_
                                      Pdrop Hdrop
"RUN
       Ppivot Hpivot
                       Pend
                             Hend
PRINT#14, TAB(12)
                                                            (GPM)";_
                                                     (GPH)
                                      (PSI) (FT)
                       (PSI)
                             (FT)
"NO
       (PSI) (FT)
 PRINT#14, TAB(12)
FOR I = 1 TO NORUN
    PRINT#14.TAB(12)USING
                                                    111.1
                                      11.11 11.11
       141.11 111.11
```

```
I,PSUMR(2,I),HSUMR(2,I),PENDR(I),HENDR(I),PDROPR(I),HDROPR(I),QSUMR(2,I),_
    QENDR(I).QEBYQP(NORUN).ITERR(I)
      NEXT I
      PRINT 14. PRINT 14. TAB(12)
                      "THE Q VS H RELATIONSHIP AT THE PINOT IS GIVEN BY"
       PRINT#14, TAB(25) USING
                      " Q=###.###(H###.######)";KCCC.EXPP
      IF CHANGE=0 OR CHANGE=2 THEN LOCATE 15,1:PRINT"RUN COMPLETE"
170
       IF CHANGE=1THEN LOCATE 15,68:PRINT"RUN COMPLETE"
      IF INK$(1) ="y" or INK$(1)="Y" then GOTO 150
      STOP: END
   END IF
SUB DIFFSPRINKLER
        (PLAT(2), RADCOV(2), QSPR(2), SPACING(1), CHEESPAC, ELEMENT, IFLG(1))
                                         ***************
                SUB DIFFSPRINKLER(NMODE)
DIH FLAG(30)
   COLUM=1:FLAG=2
INPUT PSI, GPM, AND RADIUS OF COVERAGE FROM THE FILE
FOR K=1 TO ELEHENT
       IF K/2 = IMT(K/2) THEN
         POSN=FLAG
         SELECT CASE COLUM
           CASE 1
                POSI = 2: COLUM=2
           CASE 2
                POSI=28:COLUM=3
           CASE 3
                POSI=56:COLUM=1
         END SELECT
         LOCATE POSY. POSI:LPRINT
         LOCATE POSH+1, POSI:LPRINT
         LOCATE POSI+2, POSI:LPRINT, "SPRINKLER NO "; K/2
         LOCATE POSN+3, POSI:LPRINT, "P(psi) R(ft) Q(gpm)"
180
         FOR I=1 TO 100
             INPUT #9.PLAT(K,I)
             IF PLAT(K,I)=999 THEN IFLG(K)=I-1:I=100:GOTO 190
             INPUT 49, RADCOV(K, I), QSPR(K, I)
             LOCATE POSN+1.POSI:
             PRINT#14, USING
                          ###";PLAT(K,I),RADCOV(K,I),QSPR(K,I)
                   ###.#
             " ! ! !
             PRINT USING
                          ###";PLAT(K,I),QSPR(K,I),RADCOV(K,I)
                   111.11
             ****
             POSN=POSN+1
190
         NEXT I
```

```
END IF
        IF COLUM=1 THEN FLAG=POSN+2
    NEXT K
    FOR I=1 TO ELEMENT
       IF I/2 <>INT(I/2)THEM
         INPUT #9, SPACING(I)
       END IF
    NEXT I
    INPUT #9, CHEKSPAC
 END SUB
SUB CHECKLENGTH (CHEXSpac, LATLEN)
REMORPHUS TO SUM OF ELEMENT LENGTH IS EQUAL TO SUM OF ELEMENT LENGTHES
PRINT"The total length of the lateral does not match with the summation"
 PRINT" of the distances given above. Input the spacing of the sprinklers"
 PRIMT"Calculated length of the lateral line = "; latlen
 PRINT user input summation of the lateral elements = "; chekspac
 PRINT"PROGRAM TERMINATED":STOP:END
END SUB
SUB INTERPOLATION(PLAT(2), VARI(2), I, IFLG, H, SOLU)
REMOSSISSISTERPOLATION OF Q.H. AND RADIUS OF CURVATURESSESSESSESSES
EXACT = 0:LFLG=0:HFLG=0
   FOR J = 1 TO IFLG
       IF PLAT(I,J)<H THEN
         LFLG =J
       ELSEIF PLAT(I,J)>H THEN
         HFLG =J: J=IFLG
       ELSE
         EXACT = J
      END IF
   NEXT J
   IF EXACT<>0 then
       SOLU = VARI(I, EXACT)
     ELSE
       SOLU =(((VARI(I,hflg)-VARI(I,lflg))*(H-plat(I,lflg)))/
                       (plat(I,hflg)-plat(I,lflg))) + VARI(I,lflg)
   END IF
END SUB
```

```
SUB_SPRINKLERCCEFF(P(2),Q(2),SPACING(1),ELEMENT,IFLG(1),KC(1),EXPON(1),FLA)
 REMOSSIONEDEFINING OR CALCULATING SPRINKLER COEFFICIENTS
 DIM X(60, 13), Y(60, 13)
                  IF FLAG = 1 THEN
                                                                                                                                                                                                                                                                                                                  REG"
                                                                                                                                                                                                                         CALCULATED
PRINT#14, TAB(12) "SPR SPACING DISTANCE FROM
                                                                                                                                                                                                                                                                                                                      EQ"
                                                                                                                                           PIVOT (ft)
                                                                                                                                                                                                                     KC
                                                                                                          (ft)
PRINT#14,TAB(12)"NO
 PRINT#14, TAB(12)"---
                  END IF
REMORDS SECTION SECRESSION SECRESION SECRESSION SECRESS
                  POSN=3:LATLEN=0
                  FOR I=1 TO ELEMENT
                                    SUMY=0 :SUMY=0
                                    SUMX2=0:SUMY2=0:SUMXY=0
                                     IF 1/2=INT(1/2)THEN
                                                  FOR J=1 TO IFLG(I)
                                                                   X(I,J)=LCG(P(I,J)=2.3114)
                                                                   Y(I,J)=LOG(Q(I,J))
                                                                   SUPEX=X(I,J)+SUMX
                                                                   SUMY=Y(I,J)+SUMY
                                                                   SUPERIOR + 
                                                                   SU:172=Y(I,J)^2 + SUMY2
                                                                   SUIXY=X(I,J)=Y(I,J)+SUMXY
                                                  NEXT J
                                                  N=IFLG(I)
                                                  MEANX=SUMX/N
                                                  MEAHY=SUHY/N
                                                  CBASEX=(SUMX^2)/N
                                                  SUHX2BAR=SUNX2-CBASEX
                                                  CBASEY=(SUMY^2)/N
                                                  SUNY2BAR=SUNY2-CBASEY
                                                  CBASEIY=(SUMX SUMY)/N
                                                  SUMXYBAR=SUMXY-CBASEXY
                                                 SLOPE=SUHXYBAR/SUMX2BAR
                                                   INTERCPT=HEARY-SLOPE*HEARX
                                                  KC(I)=EXP(INTERCPT)
                                                  EXPON(I)=SLOPE
                                                  POSN=POSN+1
                                                  LATLEN = SPACING(I-1)+LATLEN
                                                   IF FLAG = 1 THEN
                                                               PRINT#14, TAB(12) USING
                                                                                                                                           ###.#### ###.#### Q=###.##(H###.##)";_
        "###
                                              11.1
                                                                                             111.1
                                                                   I/2,SPACING(I-1),LATLEN,KC(I),EXPON(I),KC(I),EXPON(I)
                                                  END IF
                                    END IF
                 NEXT I
```

```
REM THE FIRST NINE SPRINKLERS IN THE SYSTEM CONSIDERED HAVE PRESSURE
    REM REGULATING VALVES THAT HAVE THE CHANGE THE COEFFICIENTS TO
    REM THE FOLLOWING :
               IF FLAG = 1 THEN
                     KC(2) = .2118
                     KC(4) = .2624
                     KC(6) = .3204
                     KC(8) = .5
                     KC(10) = .624
                     KC(12) = .698
                     KC(14) = .838
                    KC(16) = .972
                    EC(18) = 1.092
                    FOR I = 2 TO 18
                               IF I/2=INT(I/2)THEN
                                       EXPON(I)=0.5
                               END IF
                    NEIT
            END IF
   END SUB
  SUB ELEVATION (NNODE. SPACING(1). ELEV(1))
   REH SPRINKLER POINT SPRINK SPRINK POINT SPRINK SPRINK POINT SPRINK POINT SPRINK SPRINK POINT SPRIN
   CLS:PRINT
       "FIELD SLOPE AT VARYING DISTANCE FROM THE PIVOT (DOWNHILL IS NEGATIVE)"
           PRINT: PRINT"Distance from pivot
                                                                                                              Elevation"
           PRINT"
                                       (feet)
                                                                                                  (feet)
           PRIMT"---
           PRINT" At the pivot
                                                                                                         0
           POSN = 7
           ELEV(1)=0: IF FLAG<>1 THEN LATSUM=0
           FOR I = 1 TO ELEMENT
                     IF I/2<>INT(1/2)THEM
                            IF FLAG = 1 THEN
                                    CLS:PRINT"Distance from pivot
                                                                                                                                 Elevation"
                                    PRINT"
                                                              (feet)
                                                                                                                          (feet)"
                                    PRINT"----
                                    FLAG = 0 : POSN = 4
                                 ELSE
                                   LATSUM = SPACING(1)
                              END IF
                              LOCATE POSN, 6: PRINT LATSUM: LOCATE POSN, 30: INPUT, elev(I)
                              POSN = POSN+1 : LATSUM=LATSUM+SPACING(I)
                             ELEV(I+1)=ELEV(I)
                              IF POSN = 25 OR POSN =50 THEN FLAG=1:GOTO 200
                     END IF
500
                     NEXT I
END SUB
```

```
SUB PipeDiameter(size(1), samedia(1))
     REMARKS OF THE PIPERSON OF THE
    REMORTER TERROR TO THE RESERVE TO TH
                              INPUT"How many sizes of pipe are there in the lateral line? ", sizeNo
                              POSI = 6
                              Print"Pipe No.
                                                                                                                                                  Size in inches
                                                                                                                                                                                                                                                                            Distance from Pivot in feet "
                             PRINT"----
                                                                                                                                                                                                                                                                                               START
                                                                                                                                                                                                                                                                                                                                                                                                                    END*
                            PRINT*
                            PRINT:FOR I = 1 TO SIZENO
                                                       LOCATE POSI, 4: PRINT POSI-5
                                                      LOCATE POSI, 17: INPUT, SIZE(I)
                                                       IF I=1 THEN
                                                                                      LOCATE POSI, 36: PRINT 0:LOCATE POSI, 52: INPUT, SAMEDIA(I)
                                                                   ELSEIF I>1 THEN
                                                                                      LOCATE POSI, 36:PRINT SAMEDIA(I-1):LOCATE POSI, 52
                                                                                                    INPUT, SAMEDIA(I)
                                              END IF
                                                     POSI = POSI + 1
                         NEXT I
                         SIZENO=2
                         SIZE(1)=5.79:SAMEDIA(1)=765
                         SIZE(2)=2.78:SAMEDIA(2)=787
END SUB
```

## APPENDIX B

OUTPUT RESULTS FROM THE SIMULATION MODEL "NETWORK"

Case 1 : end gun on TOTAL ITERATION . . . FT

	,	-EAD (FT)				01804	700
:NITIA	- 1SED	(ft)	(991)	SIFFER	MECE	DLD/D/T	TOW (gpa)
:03.40	28.000	203.403	88.00	0.00	0.0	ı	123.
201.42	\$7.230	202.084		<b>-0.23</b>	-0.1	2	3.
200.47	E4. 730	202.061	87.42	-0.79	-0.4	3	122.
177.82	64.451	200.755		-0.47	<b>-0.</b> 2	4	3.
190.47	163. 751	200.717		-1.03	-0.5	3	<b>418.</b>
198.04	€3.479	199.455		-0.70	-0.4	•	4,
174.69	63.179	199.579		-1.27	-0.6	7	814.
74.20	84.720	193.128		→0.94	<b>-0.5</b>	•	7.0
175.13	84.420	197.996		-1.47	⊸.• ⊸.•	10	904.
14.5	84.074 83.574	176.444		-1.70	-0.₹	11	7 <b>78</b> .
173.17 172.66	63.37 <b>-</b>	193.406		-1.42	→.7	12	9.1
171.51	62.53	193.153		-1.90	-1.0	iŝ	700.
171.05	62.457	194.177		-1.64	-0.9	14	:1.
87.70	82.157	193.817		-2.04	-1.1	is	774.
07.31	81.723	192.902		-1.83	-1.0	10	13.
12.3	81.453	197.534		-2.21	-1.2	17	743.
CO.03	81.349	191.027	€.79	-2.02	-1.1	10	13.
184.67	80.849	191.233		-2.33	-1.2	19	748.
84.43	63.744	190.714		-2.19	-1.2	20	18.
: 63.48	80.244	160.873		-2.37	-1.3	21	730.
123.14	63.078	127.503		-2.34	-1.3	22	21.
IC. 19	79.590	103.25		-2.57	-1.3	23	708.
EZ. 72	79.572	1(2).533		-2.49	-1.4	24	22.
122.77	79.072	167.212		-2.43	-1.3	25	•
C2. 80	79.097	167.557		-2.50 -2.53	-1.4	26 27	22.
181.45	78.597	105.274 105.670		-2.69	-1.3	20	44. 22.
161.70	78.644 78.144	103.370		-2.43	-1.5	27	441.
ය. <b>ස</b>	78.244	163.640		-2.76	-1.5	30	27.
79.70	77.744	103.972		-2.38	-1.3	31	614.
79.92	77.842	164.947		-2.80	-1.4	**	<b></b>
78.77	77.242	102.75	77.07	-2.28	-1.2	23	565.
79.21	77.535	184.270		-2.82	-1.6	34	27.
78.06	77.033	162.071		-2.23	-1.3	22	<b>333.</b>
73.40	77.271	183.438		-2.82	-1.6	· 34	27.
177.45	76.771	181.444		-2.25	-1.3	37	326.
78.09	77.050	163.046		-2.79	-1.6	38	31.5
74.94	76.230	180, 554		-2.04	-1.2	34	494.
77.47	74.849	187.541		-2.75	-1.3	40	13.
74.52	76.369	177.663		-1.79	-1.0 -1.3	41 42	460. 38.
77.30	76.70 <b>0</b> 76.20 <b>8</b>	178.321		-1.23	-0.7	43	422.
74.15	71.405	101.679		-2.61	-1.3	14	33.
75.71	76.105	178.904	77.40		-1.6	45	387.
74.90	74.533	181.837		-2.22	-1.4	44	10.
73.74	76.053	177.437		-1.08	-0.6	47	730.
74.79	76.486	181.073		-2.43	-1.4	40	19.4
73.44	73.906	177.778	74.74	-0.77	- <b>6. 5</b>	4•	301.0
76.73	76.461	190.881	78.26	-2.35	-1.3	50	42.
174.71	76.452	100.721		-2.27	-1.3	22	47.
175.55	73. 752	174.281		-0.41	٠٠.٤		227. 42.
176.71	74.450	174.470		~. 15	-0.1 1.0	<b>34</b>	183.
173.53	73. 730	172.014	74.64			34	163.
:76.71	<b>~6.450</b>	174.420	74.41	0.05	0.0		

Case i : end gun on

	WEA	247	VOLCE ITY	menas mic	710-	m L088	107 = L056
F*.	10 -	· (****)	· 67/0EC1	40 /407	G1F1	1971	•••
: 9.40	3.10	123.20	:0.00	120140 0.01	4443 0.000007	1.33	:.23
3 0.40	2. 10 2. 18	822.19 818.48	10.03	434787 0.01	4457 0.000007	MO 1.25 MO 1.34	2. e0 4. 02
* 0.40 :1 2.40	3 <b>0</b>	913.99	•. •3	446377 0.01	4402 0.000000	3 1.40	1.23 1.63
13 0.40	3.10 3.10 0.18	790.16 700.40 776.73	*.72 *.61 *.47	G2019 0.01	4723 8.000000 4723 8.000000 4749 8.000000	0 1.3	9.11 •.25 19.87
17 0.40	9. 18	743.22	9.31 9.12	424034 0.01	4700 0.000001	9 1.17	11.74
21 0.44 23 0.46	0.18 2.18	730.10 708.93	0.90 0.44	402/537 0.01 393379 0.01	6710 0.000003 6915 0.00003	1.23 1.07	14. 1 <b>0</b> : 3. 17
75 0.44 77 0.45	0.10	•44.17	6. 10	341032 0.01	4775 0.000007 2003 0.000002	0.90	16.00
77 0.40 31 0.40 33 0.40	0.18 0.18 0.10	641.70 614.64 903.13	7.30	341079 0.01	5103 0.00000  0190 0.00000  0777 0.000001	M 8.87	17.63 16.73 19.44
33 0.40 37 0.40	0.18 0.18	53.47 54.27	6.78 6.42	303743 0.01	111 0.000	1 0.45	20.00 20.07
37 0.48 41 0.48	0.18 0.18	440,73	4. 63 3. 42	274916 9.01	THE CONTE	7 0.57	21.19 21.72
45 0.40	0. 10 0. 18	422.21	3.15 4.73	234840 0.01	6017 0.000000 6017 0.000000	3 6.39 3 6.33	22.10 22.44
3	0.10	311.78	4.27 3.80	173310 0.01	6779 0.00000 6779 0.00000	3 4.22	2.71 2.44
51 0.44 55 0.25 55 0.25	0.10	27.04	12.62	242737 0.01	7127 0.000000 6443 0.000000 7074 0.00001	4.22	23.11 27.43
S 4.2	3. 86	183.10	1.86	214370 0.01	7074 0.00001		27.63
G.D: 1000		MIC	-	æ	•	-	
		ععص		_		<u> </u>	
1 1 2 3 3 3 3 4	1.0 23.1	,	0.018	120.460	430.600	203.4 202.1 202.1 202.1 202.1 200.8	
3 4 5	3.7	,	0.017	40.271	614.346	200.0 200.7	
; ; ;	4. <b>8</b>	1.22	0.003	01.236	417.453	199.4 199.4	
	7.0	1.40	9.634	2.00	343.407	170.1 170.0	
10 10 11 11 10 12 12 12 13	746.3 746.3	1.2	0.000	42.745	439.455	196.7 196.8 196.7 196.4 195.4 198.3	
13 12 14	700.4	1.23	0.000	2.49	435.449	193.4 194.2	
19 14 16	774.7 13.8	1.21	0.670	28.200	.44.045	193.0 193.8	
17 16 18 10 10 19 19 18 20	743.3 19.1 746.1		0.677	33.276	484.247	173.0 171.8	
20 20 21	18.0		0.073	21.349	****	191.0 190.7	
2 3 5	739.1			21.25	597.043	190.7 189.9	
3 2 M	730.1 21.3 706.9	1.23	0.112	10.374	:77.043 478.484	190.7 199.5	
20 20 20 20 20 20 20 20 20	71.3 700.4 23.4	1.23	0.112 0.119	18. <i>3</i> 74 17.311		190.7 197.8 197.8 198.3 197.3 198.8 188.8 197.2 198.8 187.4	
2 2 10 20 10 20 20 10 10 21 10 11 27 10 20	21.2 700.9 22.4 66.9 ::.3	1.23	0.117 0.119 2.1 <b>20</b>	18.274 17.311 17.333	418.460 *!*.253 744.846	190.7 189.8 189.8 180.8 189.8 189.8 180.8 187.2 180.8 187.4 187.4 184.3	
3 2 1 70 70 20 71 70 70 71 70 70 71 70 70 71 70 70 71 70 70 71 70 70	21.2 700.9 22.4 104.2 12.3 44.2 23.8 41.7	1.23	0.117 0.119 2.120 0.121	18.374 17.311 17.333 17.342	418.104 1:1.283 744.846 764.665	190.7 199.8 199.8 188.8 199.8 189.8 180.8 187.6 180.8 187.6 187.6 186.3 187.6 186.7 186.7 185.6	
22 22 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25	21.3 708.9 23.4 084.3 ::.3 084.2 23.8 041.7 27.1	1.23	0.117 0.117 2.120 0.121	18.274 17.311 17.333 17.242 14.435	100.000 117.283 740.046 764.063	190.7 199.8 199.8 198.8 199.8 197.2 198.8 197.2 198.8 197.6 197.6 196.7 197.6 196.7 196.7 198.4 196.7 198.6 195.8 196.8	
24 24 25 23 24 24 24 25 27 27 24 28 29 29 29 29 20 31	21.2 700.9 22.4 064.2 244.2 241.7 27.1 014.4 27.8 27.9	1.23 1.62 2.46 3.46 0.60 0.60	0.112 0.117 2.130 0.121 0.146	18. 274 17. 311 17. 323 17. 242 14. 425 13. 386	119, 900 119, 283 740, 846 764, 863 676, 284 827, 438	190.7 199.9 199.8 166.3 199.8 167.2 160.8 167.2 160.3 187.0 167.0 160.3 167.0 160.7 160.7 165.0 160.8 184.0	
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	21.2 700.9 22.4 104.9 12.3 04.2 21.8 11.7 27.1	1.23 1.62 2.46 3.46 0.60 0.60	0.117 0.117 2.120 0.121	18.274 17.311 17.333 17.242 14.435	448.486 *19.383 744.846 744.843 676.344 829.438	190.7 199.3 199.3 198.3 199.3 198.3 199.3 197.2 198.3 197.2 197.4 196.3 197.4 196.7 196.7 196.8 197.8 196.9 197.8 197.9 197.8 197.9	· .
2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	21.3 700.9 100.9 11.3 100.2 11.3 101.7 101.1 101.1 101.1 101.1 101.1 101.1 101.1 101.1 101.1 101.1 101.1	1.23 1.02 2.96 9.90 0.08 0.07 0.71	0.112 0.117 2.120 0.121 0.140 0.161	18.274 17.311 17.323 17.242 14.428 13.286	478.496 *19.283 744.646 764.643 679.284 627.438 846.323 *11.376	190,7 199,3 199,8 189,3 199,8 199,8 199,3 197,2 199,3 197,4 199,4 199,4 197,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4 199,4	
34 34 35 33 34 34 34 34 37 37 36 38 38 38 37 31 38 44 44 41	21.2 700.9 20.9 21.3 040.9 21.8 041.7 27.1 014.0 27.9 923.7 28.3 31.3 40.7 31.3	1.23 1.02 3.90 9.90 0.88 0.87 0.71 3.48 0.37	0.112 0.119 2.120 0.121 0.140 9.161	18. 274 17. 311 17. 323 17. 242 14. 425 13. 386 13. 311 13. 323	478.486 *19.383 744.846 744.663 676.364 827.438 846.323 911.376	190,7 109,3 199,3 109,3 199,3 109,3 199,3 197,2 193,3 197,4 197,4 104,3 197,4 104,3 104,7 105,4 105,7 105,4 105,6 104,3 105,6 104,3 105,6 104,3 105,6 101,4 105,1 105,6 105,1 105,6 105,1 105,6 105,1 105,6 105,1 105,6 105,1 105,6	
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Case 2: end gun off, pump 'J'

TOTAL ITERATION - S ALLOHABLE ERROR - .S FT

			HEAD '	•			01804	ABE
4000	111	ITIAL	FIN	4	DIFFER	MECE.	BLD:ED(T	<b>~</b>
×	(48)	(862)	(66)	(803)	(#8)	*	NO	(990)
			294.294	110.00	0.00	0.0		770.0
1 2	334.25 23.18	110.000	23.209	107.55		-0.0	1 2	730.S 3.4
3	<b>₹</b> 22.02	107.033	=3.172	107.53		-0.2	3	727.1
Ă	22.04	107.641	252.147	109.09		-0.0	4	4.2
5	Z3. 73	103.541	223.097	109.07	-0.47	-0.2	3	722.7
•	≃1.∞	103.573	211.100	102.44		-0.0	•	5.1
7	244.65	103.073	251.027	100.40		<b>-0.</b> 2	7	717.9
•	249.94	100.155	223.047	103.19		⊸.o ⊸.z	•	7. <b>9</b> 71 <b>0.0</b>
10	249.78 249.75	107.433	269. <b>695</b> 262.913	107.49		<b>⊸.</b> .0	10	7.0.0
11	247.60	107.120	243.450	107.53		-0.2	ii	700.1
12	247.74	107.184	247.928	107.24		-0.0	12	11.0
:3	244.37	104.464	247.602	107.12	-0.41	⊸.2	13	487.1
: 4	:44.77	104.742	246.972	104.65		<b>-</b> 7.0	14	13.2
:5	245.41	104.242	244.510	104.45		<b>-0.1</b>	15	474.0
16	245.63	103.354	244.050	104.45		<b>-0.0</b>	14	18.2
17 10	244.48 244.94	103.554	249.457 249.14 <b>8</b>	104.17		-0.1 -0.0	17 18	17.1
19	243.78	103.447	244.402	103.74		-0.1	17	43.4
20	244.07	103.402	244.527	105.71		-0.0	20	20.4
21	242.73	103.102	243.254	103.24		-0.1	21	423.2
22	243.10	163.211	243.426	105.32		<b>-0.0</b>	22	23.9
23	242.03	104.711	241.742	104.48		0.0	23	577.3
24	242.45	104.072	242.491	105.00		<b>⊸</b> 0	24	23.4
23	241.27	104.572	241.046 242.013	104.29	0.10	0.0 <b>-0.0</b>	23 24	573. 9 23. 4
24 27	241.77 240.61	104.078	240.573	103.77	0.10	0.0	<del>27</del>	340.8
28	241.15	104.330	241.371	104.44		-0.0	29	23.4
27	237.77	103.639	237.724	103.71	0.11	0.0	27	522.9
30	240.59	104.008	240.E22	104.17		-0.0	30	30.4
. 31	237.43	103.268	233.479	103.18		0.2	31	492.4
33	240.02	103.843		103.74		⊸	=	33.7 4 <b>56.</b> 7
33 34	239.87 237.57	103.343	257.425 257.798	102.72	0.40	0.3 -≎.0	33 34	2.4
73	238.44	103.257	234.740	102.53	0.41	0.3	3	425.1
34	:37.22	103.490	237.411	:03.28		→3.0	33	<b>3.4</b>
27	228.07	192.990	734.401	192.34	0.42	0.3	<b>:7</b>	371.5
38	228.91	:03.344	237.080	:03.44	<b>-0.07</b>	<b>-0.0</b>	:3	3.1
24	257.76	102.844	233.682	102.05	0.7	0.3	24	33.5
40	23.4	103.294	223.503	103.32		<b>-0.0</b>	40	33.4
41	237.50	102.754	223.141	101.73	1.00	0.4 -0.0	41 · 42	314.9 44.3
42 43	228.44	103.157	238.547 233.787	:01.15	:.47	0.4	43	272.6
44	258.27	:03.094	238.377	: 93. 13		-0.0	44	34.2
45	237.14	:02.574	234.784	101.28	0.74	0,4	45	234.4
44	238.19	103.050	238.249	:03.08		-0.0	44	44.3
47	237.03	:02.550	233.495	101.02	1.49	0.6	47	190.1
40	738.13	123.02	728.161	123.34		<b>-1</b> .0	46	44.3
47	136. 47	102.322	273.409	100.76	1.33	4.6	4 <b>9</b>	(45.7 40.4
50 51	233.09 236.93	103.007	238.107 232.438	103.31	1.30	-0.0 8.8	31	97.3
32	233.08	103.001	238. c91		-0.00	0.0	52 52	10.1
22	234.72	102.301	232.413	1:0.55	1.70	<b>5.</b> 3	33	49.7
25	234. 72	102.500	237.467	102.74	⊸.∷	-0.1		

Case 2: end gun off, pump 'J'

		30 FT.	241	-CAEITY		PHICTION			- LOSS	707 (
= .		-	10001	W/MC)		PACTORIE	· · · · · · · · · · · · · · · · · · ·			(**)
	2.48		70.40	4.91	403774	0.014040	8.0000	120	1.00	1.04
į	9. 40	3.10	····	0.67		0.014846			1.07	:.:
	3. 48 0. 48	3.18 3.18	17.80	0.01 0.73		0.01487			1.00 :.05	4.20
	0. 46	3.10	*04. *6	4.00		0.014913			1.17	1. 40
	2.46	3.18	*00.11	8.34		0.014730			1.00	0. 00
	0.40	3.10	<b>•••</b> 12	4.40		0.01494			8. 47	7.37
	0, 4 <b>0</b> 0, 4 <b>0</b>	3.1 <b>8</b>	673.93 660.70	8.24		0.012003			1. 17 1. P	0.30 1.20
	0.40	0.18	443.41	7.83	27723	0.015048	8. 00000	221		10.05
21	0.46	0.18	423.23	7.60	344775	0.0131%	0.0000	:34	0, 71	10.70
2	1.40	0.10	377.31	7.31	==716	0.01241	0.000C	Ø1	0.73	11.71
	0.4 <b>0</b> 0.4 <b>4</b>	0.1 <b>8</b> 0.1 <b>8</b>	573.84 548.30	7.00		0.015334			1.47 1.43	12.40
24	0. 44	0.18	22.77	<del></del>	290481	0.01527	0.00000	221	1.2	13.01
31	0.40	0.18	472.34	4.00	272:09	0.01547	6.0000	:34	4.57	14.20
	0.40	0.10	453.70	3.57		0.011717			6.45	14.45
	0.40 0.40	0. 1 <b>0</b>	423.67 371.44	3.18 4.77	256174	0.016173	0.00000	 -35	6.37 6.34	13. M 13. W
	0.40	0. 16	733.52	4.5	197449	0.014434	0.00007	3	i. <del>S</del>	13.00
	0.46	0.10	314.93	3.64	176033	0.016734	0.0000	224	0.24	12.73
	0. 4 <b>9</b> 0. 4 <b>9</b>	0.10	772.43	1.23		0.017123			0.17	14.10
	0.46	0.18 0.18	234.41 190.14	2. <b>A</b> 2. <b>32</b>		0.017603 0.015257			0. 67 0. 13	14.23
40	0.40	0.10	148.00	1.70		0.017177			6.00	14.30
	0.46	0.18	47.31	1.19	84674	6. CC 2313	8, 80000	<b>38</b>	0.63	10.00
_	3. 23	a. 🏎	44.74	2.30	SANIO	0.031071	4.00014	-	4.25	10.66
9					_	_	_			
			MIC		•	T	•	-		
*		=	<u>.</u>	_	_	_		_		
-:	-1 3	730.8	1.00	_	_	•	72.123		23.2	
:	2 3	3.4		0.013	101.	739			23.3	
	3 4	727.1	1.87				12.699	<b>E</b>		
•	4 5	4.2 723.9	1.00	0.017	•••		M.217		<b>31.1</b>	
•	• 7	3.1		4. 630	٠٠.	<b>201</b>		231.1	231.0	
7	• •	717.7	1.00				10.900		20.1	
	• •	7. <del>0</del> 71 <b>0.</b> 0	1.17	1.033	43.	<b></b>	11.516		248.7	
		/10.0				•				
10	10 11			4.000	57.	377		246.4		
11	10 11	700.1		4.000	37.	377	M. 962	248.1	242.7	
11	10 12	700.1 11.0	1.00	0.044		.377 .713	N. 962	348.1	248.7 247.7 267.6	
13	10 12 12 13 12 14	700.1 11.0 467.1		0.004	23.	.377 .713 7		348.4 347.4 347.4	245.7 247.9 267.6 247.0	
12	10 12 12 13 12 14 14 15	700.1 11.0 457.1 13.2	1.00		23.	.377 .713 .445	16.064	248.9 247.9 247.9 247.4	245.7 247.9 267.6 267.6 246.8	
11 12 13 14 15	10 12 12 13 12 14	700.1 11.0 467.1	1.40 0.97 0.93	0.004	33. 28.	.377 .713 .446 .7	14.04 14.04 18.40	348.4 347.9 347.6 247.6 247.6	247.0 247.0 247.0 247.0 244.8 244.1 248.4	
11 12 13 14 15 16	10 12 12 13 12 14 14 19 14 16 10 17	7.8 700.1 11.0 467.1 13.2 474.0 19.2	1.00	0.000 0.003 0.002	23. 29. 24.	.377 .713 .714 .446 .7. .821	16.064	348.4 347.9 347.9 247.6 344.1 244.1	245.7 247.0 247.0 247.0 244.8 244.1 248.4 248.4	
11 12 13 14 15 16 17	10 12 12 13 12 14 14 19 14 16 16 17 16 18 18 17	7.8 700.1 11.0 457.1 13.3 474.0 19.2 440.7	1.40 6.97 6.93 6.67	0.040	23. 29. 24.	.377 .713 71 446 71 621 71	14.664 18.466 13.231	248.4 247.4 247.4 247.6 246.1 246.1 243.2	245.7 247.0 247.0 247.0 245.8 246.1 245.4 245.3 244.4	
11 12 13 14 15 16	10 12 12 13 12 14 14 19 14 10 10 17 10 18 18 19 18 20	7.8 700.1 11.0 a00.1 13.2 676.0 13.2 660.7 17.1	1.40 0.97 0.93	0.000 0.003 0.002	2. 2. 2. 2.	.377 .713 71 446 71 621 71	14.04 14.04 18.40	243.4 247.4 247.4 247.4 244.1 244.1 243.2	245.7 247.0 247.0 247.0 244.8 244.1 248.4 248.4	
13 13 14 15 16 17 18 17 20 21	10 12 12 13 12 14 14 19 14 16 16 17 16 18 18 19 18 20 70 21 20 22	9.8 780.1 11.0 489.1 13.2 474.0 19.2 440.7 17.1 443.4 423.2	1.40 6.97 6.93 6.67	0.044 0.053 0.042 0.070	23. 24. 23. 18.	.377 .713 .713 .7146 .71 .821 .71 .722 .837 .71	14.664 18.466 13.231	248.4 247.4 247.4 247.6 247.6 246.1 248.2 243.2 243.2	246.7 247.0 247.0 247.0 246.8 246.1 248.4 248.3 244.3 244.3 243.3	
13 13 14 15 16 17 18 17 20 21	10 12 12 13 12 14 14 19 14 16 16 17 16 18 18 20 70 21 20 22 27 23	9.8 780.1 11.0 489.1 12.3 576.0 19.2 480.7 17.1 443.6 433.2	0.97 0.93 0.69 0.69	0.044 0.053 0.042 0.070	23. 24. 23. 18.	377 713 717 713 713 7146 77 821 71 71 71 71 71 71 71 71 71 71 71 71 71	14.664 18.466 13.231 14.652	248.4 247.9 247.6 247.6 247.6 248.1 248.2 248.2 248.3 244.3	248.7 247.0 247.0 247.0 240.8 240.1 248.4 243.8 244.3 244.3 243.4 243.4	
11 12 13 14 19 10 17 18 19 20 21	10 12 12 13 12 14 14 15 14 16 16 17 16 16 18 19 18 20 20 27 22 27 23 24	9.8 700.1 11.0 499.1 13.2 474.0 19.2 440.7 17.1 443.6 20.4 423.2 21.9	1.00 0.97 0.93 0.07	0.044 0.053 0.042 0.079 0.004	23. 26. 22. 18.	377 713 7146 77 821 77 77 77 77 77 77 77 77 77 77 77 77 77	14.444 18.444 18.231	248.4 247.9 247.6 247.6 246.1 248.2 248.2 248.3 248.3	248.7 247.0 247.0 247.0 246.1 248.4 248.4 244.3 244.3 244.3 244.3 243.3 243.4 243.6	
11 12 13 14 15 16 17 18 17 20 21 22 22 22 22 22 22 22 22 22 22 22 22	10 12 12 13 12 14 14 15 14 16 16 17 16 18 18 19 18 20 20 27 27 27 27 27 27 27 27 27 27 27	9.8 780.1 13.0 487.1 13.2 474.0 19.2 440.7 17.1 443.2 53.4 423.2 53.4	1.60 6.47 6.43 6.69 6.49 6.73	0.044 0.053 0.042 0.070	23. 26. 22. 18.	377 713 717 713 713 714	10.002 10.004 10.400 13.231 14.652 16.164 19.717	248.4 247.9 247.6 247.6 247.6 246.1 248.2 248.2 248.3 248.3 248.3 248.4	246.7 247.9 247.9 247.9 246.8 246.8 246.4 246.4 246.3 246.3 246.3 243.4 243.3 243.6 243.6	
11 12 13 14 19 19 19 19 19 19 19 19 19 19 19 19 19	10 12 12 13 12 14 14 15 14 16 16 17 16 18 20 20 22 22 23 22 24 24 24 24 22 24 24 24 27	9.8 780.1 11.0 489.1 13.2 474.0 19.2 445.0 30.4 453.2 30.4 453.2 31.4 970.3	1.60 6.97 6.97 6.69 0.83 6.91 2.73	0.044 0.053 0.042 0.079 0.004	25. 26. 26. 18. 18.	377 713 717 713 71 713 71 713 71 71 71 71 71 71 71 71 71 71 71 71 71	10.052 10.064 15.400 15.231 10.432 10.432 10.144 10.717	248.4 247.9 247.6 247.6 248.1 248.2 248.2 248.3 248.3 248.3 248.3 248.3 248.4 243.4 243.4 243.4	246.7 247.0 247.0 247.0 247.0 240.8 240.1 248.4 248.4 248.3 248.3 248.3 248.3 248.7 248.7 248.6	
11 12 13 14 19 19 19 20 21 22 22 22 22 22 22 22 22 22 22 22 22	10 12 12 13 12 14 14 19 14 10 16 17 16 18 18 19 18 20 20 23 22 23 24 25 24 25 24 22 24 22 24 22 24 22	*.8 780.1 11.0 489.1 13.2 470.0 19.2 400.7 17.1 443.6 28.4 27.2 21.9 273.9	1.60 6.47 6.43 6.69 6.49 6.73	0.000 0.003 0.002 0.070 0.000 0.000 2.100	25. 26. 26. 28. 18. 18.	.377 .713 .713 .7146 .721 .722 .722 .732 .7432 .7442 .7442 .7442 .7442 .7442	10.002 10.004 10.400 13.231 14.652 16.164 19.717	248.4 247.4 247.4 247.6 244.1 248.2 248.2 248.3 248.3 248.4 248.4 248.4 248.4 248.4	246.7 247.0 277.0 267.0 245.8 245.8 245.3 245.3 245.3 245.3 245.4 242.0 242.0 242.0 242.0 242.0 242.0	
11 12 13 14 19 19 19 20 21 22 22 22 22 22 22 22 22 22 22 22 22	10 12 12 13 12 14 15 14 16 16 17 18 17 19 20 22 22 22 23 24 24 24 27 24 27	*.8 700.1 11.0 400.1 13.2 404.0 19.2 404.0 20.4 435.2 31.9 570.3 31.4 572.9 31.4 31.6 31.6 31.6 31.6 31.6 31.6	1.60 6.97 6.93 6.69 6.91 2.73 3.69	0.044 0.063 0.042 0.070 0.004 0.000	25. 26. 26. 28. 18. 18.	377 713 713 7146 71 821 712 712 712 712 714 712 714 712 714 712 714 715 71 713 714 715 71 713 714 715 71 713 71 713 71 713 71 713 71 71 71 71 71 71 71 71 71 71 71 71 71	Ma. 662 18. 664 18. 666 18. 231 16. 652 16. 164 16. 717 16. 686	248.4 247.9 247.6 247.6 240.1 240.1 240.3 240.3 240.3 240.3 241.4 242.7 242.7 242.0 243.2	246.7 247.0 247.0 247.0 247.0 240.8 240.8 240.3 240.3 241.4 241.0 242.0 242.0 242.0 242.0 242.0 242.0 242.0 242.0	
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277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6 277.6	

Case 3: end gun off, pump 'V'

TOTAL ITERATION - 6 ALLCHARLE ERROR - .S FT

			-EAD(FT)				01804	280
*UDE	LN	ITIAL	FIN	AL	SIFFER	NECE	ELEMENT	LOH.
40	145)	9911	1663	.067 1	.68)	*	*0	19901
-:	323.74	:40.070	323.758	140.07	0.00	0.0	1	824.0
:	322.82	:27.665	322.450	137.50	0.12	9.0	2	3.0
2	321.67	:37.145	322.410	139.49	-0.23	-0.1	3	620.8
4	321.08	137.254	321.130	138.43	0.23	0.1	4 :	4.7 814.1
•	320.72	:38.754	=1.070	130.91	-0.11	-0.0 0.1	Ī	3.7
7	320.94 319.78	: 23.220	319.825 319.734	133.57	0.01	0.0	7	810.3
é	320.02	138.451	318.537	137.81	0.44	0.1	•	8.9
•	318.64	137.751	318.323	137.72	0.17	0.1	•	801.4
10	318. **	:25.007	317.09	137.19	0.57	0.2	10	11.1
11	317.83	:37.507	314.773	137.05	٥.33	0.1	11	790.3
12	318.11	137.428	315.870	134.44	0.71	0.2	12	12.4
13	314.94	: 37. 128	315.445	134.48	0.47	0.1	13	777.9 14.9
14	217.27	:37.242	314.678	136.14	0.82	0.3 7.3	14 13	743.G
:=	314.1: 214.45	:34.742 :24.910	314.100 313.229	122.64	0.64	7.3	1.6	17.2
1 <b>a</b> : 7	3:5.23	:36.410	312.757	3.31	0.81	3.3	:7	745.8
:	:15.46	:24.575	212.429	135.17	1.03	j. 2	18	:7.8
; •	214.52	: 24.075	311.443	134.75	0.97	0.3	1♥	724.5
20	314.94	:24.257	311.291	134.72	1.13	0.4	20	23.0
21	313.79	: 23. 757	310.020	134.13	1.20	0.4	<u> </u>	703.5
12	314.14	:39.917	310.257	134.23	1.24	0.4	22	24.9
23	313.00	135.417	303.402	125.45	1.47	0.5 0.4	23 24	474.4 28.7
24	313.52	133.441	30 <b>9.341</b> 307.240	123.83	1.55	0.5	23	647.9
25 24	312. <del>24</del> 312.73	133.141	300.497	132.92	1.42	0.5	24	28.7
27	211.78	134.634	304.401	132.54	1.72	3.4	27	617.2
20	112.39	133.153	307.72	133.13	1.50	0.5	28	28. 7
27	2:1.24	134.453	305.573	132.21	1.81	0.4	27	570.3
20	311.71	134.943	307.013	132.63	1.57	0.5	30	34.2
31	210.75	134.443	304. ಛರಿ	131.54	2.16	0.7	31	554.1
23	311.42	134.731	306.271	132.51	1.45	0.5	3	38.0 318.0
$\mathbf{z}$	310.24	134.231	302.452	130.94	2.45	0. <b>5</b>	33 34	28.0
34 33	211.05	134.570	303.734 302.104	132.27	2.51	0.8	23	480.0
36	310.73	134.432	103.23	132.06	1.76	0.4	34	38.0
37	309.57	: 33. 732	301.428	130.50	2.57	0.8	<b>37</b>	442.0
:8	310.40	:34.315	304.842	:31.49	1.81	7.6	<b>38</b>	40.5
39	309.20	:3.815	300.733	130.11	2.77	0.9	34	401.4
40	310.24	134.220	304.497	:31.74	1.85	0.6	40	43.5
41	329.CB	: 33.720	299.780	127.70	3.01	1.3	41	<b>338.</b> I
42	3:0.04	: 34 . 134	304.179	131.40	1.87	•••	42	50.0 508.1
43	308.89	: 33. 434	297,997	120.72	3.53 1.72	l.;	43 44	43.4
45	109.92 508.74	:34.001	303.967 299.278	131.51	3.07	1.0	45	244.7
46	309.83	134.043	303.807	131.44	1.74	0.6	46	50.0
4.7	J:0.07	133.543	197.433	128.77	J. 38	1.2	47	214.7
48	379.77	134.019	303.479	131.39	1.76	0.6	40	30-0
44	3:8.62	133.519	377.524	129.72	B. 59	1.2	49	164.7
30	309.74	134.006	303.431	131.34	1.77	•.•	20	54.6
51	308.54	173.204	276.226	128.17	4.00	1.3	51 52	109.9 24. <b>2</b>
:2	307.73	34.001	203.578	131.35	1. <b>78</b> 4.60	4.6 1.3	22 22	55.1
?3 ?4	3:8.27 3:7.77	133.201	296.22 <b>3</b> 203.359	128.16	2.07	<b>6.7</b>	34	33. i
	<b></b>					₩. /	<del>-</del> -	

Case 3: end gun off, pump 'Y'

G (ATP)	10 FT1	2.AT	-0.000) -0.00174		P167104 *46708 (F)	•	- \000 /71	**************************************
1 2.40	6. 10 C. 18	174. T7 170. 77	10.03		2, 314444 0. 014432			1.33
. 0.40	7. 10 7. 10	\$14.67 \$10.34	7. 93 9. 88	42224	0.014647 0.014674	6.00000	20 1.23	1.01 1.22
9.40	6.18 3.18	901.41	7.77	04(°~ 34	8.014494 6.014718	0.00000	<b>33</b> 1.47	1.77 1.64
:3 0.48	7. 18	80	•. ••	432171	0.014744	0.0000	30 1.2	7.24
15 0.40	2. 10 2. 10	*45. 62	*.30 *.67	414371	0.014791 0.014827	•.∞∞∞	. 1.12	10.43
21 0.40	7.1 <b>6</b> 7.1 <b>8</b>	724.53 703.31	1.24	395 '49	0.014F29 0.014 <del>729</del>	0,0000	23 1.13	12.42
3 0.4	). 1 <b>0</b>	174. <b>50</b> 147. <b>87</b>	1.2	275×09	0.012793	6.00000 6.00000	21 0.84	14.76
7 0.40	3.10 7.10	619.19 770.31	7.50	344574	0.015173	0.00000	<b>₹3 0.79</b>	10.36
31 0.40	2.18	734. <b>60</b>	e. 70	:00-77	0.01577 0.01577	0.00	~ 0.74	17.82
2 0.4 2 0.4	3. 10 3. 10	318.43 490.42	1. ES	24/7.3	0.011713	o. 000000	21 0.47	10.09
37 0.46 37 0.46	0.1 <b>0</b>	42.04 401.25	3.37 4.90	277174	CS1610.0	<b>0.00</b> CS:	:3 0.23	17.31
41 0.44	2. 1 <b>8</b>	:::3. 67 :03. 66	4. <i>57</i> 3.74	171127	0.016410 6.016213	6.000037	73 4.22	19.99 30.21
46 0.40	9. 1 <b>8</b>	254.70 214.71	1.23	147037	0.017240	0.00000	:3 0.16	20. 37 70. 44
40 0.40	3.18	. 64. 74	2.31	61223	0.016759	0.00353	36 0.67	23.22
11 0.44 13 0.23	:. 1 <b>8</b> 7. <b>34</b>	:04.43 :3.13	:.34		0.030270 0.030467			70.57 70.90
						_		
49 v	3 9195	ale	<b>39</b>	<b>5</b>	•	<b>~</b>	- I	!
7		1.8				3	23.0 ED.	
1 1 1	120.8	1.34	0.013	73.		7.762		<b>a</b>
• • • •		1.3	0.012	78.		o. 901	III.1 III.	
7	3.7	1.31	-010	•4.	<b>167</b>	4.677	317.8 319.	
	9. ♥		4.436	48.	101	3.412	318.8 316. 318.8 317.	8
10 10 11	:1.1		4.63	34.	<b>1</b>	B. 969	317.1 314. 317.1 318.	•
13 13 13	12.4		4.631	30.	162		312.9 312.	8
13 13 14	14.9	1.2	0.007	· 23.	<b>194</b>	8.010	312.7 314	8
18 14 14		1.17		22.		7. 244	314.7 313.	
17 14 16	745.6	1-13	0.003		67	2.478	313.8 312.	
17 18 26	774.3	1.67	9.074		10	9.467	312.4 311.	•
21 20 22	703.5	1.18			•3	1.130	311.4 310. 310.3 300.	3
7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	674.4	t. 94	7. 667		.2	3.673	310.3 309.	3
20 24 23 23 24 24		7.80	3.643		••	1.427	307.3 307.3 309.3 308.	8
26 26 27		2.79	C. 943	3.	بر س	7. <b>3</b>	:38.8 304. 208.8 307.	
27 14 28 29 29 29 29 29 29 29 29 29 29 29 29 29	:9.7	0.73	3.000	13.		6-111	307.7 306.	
20 20 31 31 20 33	34.2	2,74	3.113	11.	•••	<b>3.</b> 181	307.0 304. 307.0 304.	l .
2 2 2 2	18.0		0. LZ3	10.	207		204.3 292.	,
3 R H	38.0	3. 57	9.129	:9.	300	3. 371	:34.1 308. :00.7 302.	1
3 14 14 15 15 15 15 15 15 15 15 15 15 15 15 15	460.8 18.0	3. 00	2. 123	:0.	407	0.346	208.7 308.2	
37 34 38 38 38 39	447.8	1.42	7. 134		106	1.260	104.8 304.	
37 38 40 40 40 41	401.0	c. 23			: : <b>S</b>	2. 253	304.8 304.	
41 40 47	378.1	ə. 3 <b>3</b>	4.144		*11	4. 491	134.5 334.	2
47 47 43	100.1	:.≅	7. 100			2.762	104.2 278.0	•
13 14 19	254.7	3 14	7.100			9.7~6	134.0 379.1	8
10 40 47	Sc. a	7.44	i.:46	2	<b>309</b>	1.299	103.8 297.6 303.8 343.	
49 17 17	:: 0	<b>3</b> 27	. 198	4.	613	7 762	103.7 277	3
50 19 91	34 0	-	, 123	٠,	3 34		33.6 284.	8
31 30 37	-1 •	; = 1	• 101	7-	759	4. 52B	103. 6 103. 6 193. 6 196.	2
10 20 73	.3 :	2 31	, ·ez		21 <del>8</del>	0 641	103.4 263.1	
:7 ;4 %	•	<b>)</b>			,	9 8:0	193.3 242.	).

Case 4: end gun off, pump'H'

TOTAL ITERATION . 4 ALLOMABLE ERROR . . S FT

			HEAD(FT)				01804	ABE
NODE	IN	ITIAL	FIN	N.	DIFFER		DEPOT	7.04
40	(48)	1961/	(14)	(981)	(44)	<u> </u>	40	(496)
1	214.57	72.840	214.590	72.84	0.00	0.0	1	€70.S
2	213.23	72.231	213.672		-0.21	-0.1	2	3.1
3	212.07	71.731	213.441		-0.74	-0.3	3	<b>₩7.</b> 4
4	211.65	91.454	212.745		-0.42	-0.2	4	3.8
3	210.49	91.154	212.498		<b>-0.75</b>	⊸.5	5	143.4
•	210.48	71.044	211.827		-0.44	⊸.3 ⊸.4	<b>6</b> 7	4.7 438.9
7	207.33	90.544 90.403	211.760 210.924		-0.85	→0.4	•	7.3
	207.99	87, 903	210.748		-1.34	-0.4	į	451.7
10	207.44	67.033	209.914		-1.07	-0.5	10	7.0
11	204.49	87.333	209.479		-1.54	-0.7	11	642.4
:2	:04.57	87.294	209.052	10.44	-1.30	-0.6	12	10.1
:3	:05.21	99.784	200.742		-1.73	<b>⊸∍.</b> ■	:3	<b>.33.5</b>
: 4	225.14	88.750	:03.215		-1.50	-0.7	14	12.1
:5	203.90	89.250	207.809		-1.89	<b>-&gt;.</b> ♥	15	<b>420.4</b>
16	203.75	90.238	207.408		-1.49	<b>-</b> ↑.8	16	14.0
17 18	202.80	67.733 67.730	204.674 264.633		-2.01 -1. <b>83</b>	-1.0 -0.7	17 1 <b>8</b>	13.7
17	201.47	67.250	202.773		-2.13	-1.1	17	570.7
20	201.73	07.254	263.099		-2.05	-1.0	20	18.7
21	200.40	84.784	204,501		-2.17	-1.1	21	572.0
22	200.41	64.792	203.110	83.74	-2.24	-1.1	22	22.0
23	177.45	64.273	203.544	E3.20	-2.21	-1.1	23	550.0
24	197.45	64.370	204.467		-2.40	-1.2	24	23.3
23	179.53	E3. 890	203.000		-2.27	-1.2	25	524.7
24	190.02	66.017	203.674		-2.54	-1.3	24	23.3 903.4
27 28	177.47	63.519 63.460	202.491 203.329		-2.44 -2.47	-1.2 -1.3	27 28	23.8
27	174.69	<b>63.180</b>	201.724		-2.54	-1.3	27	477.7
30	197.33	63.373	202.631		-2.79	-1.4	30	28.2
31	:76.18	84.873	200.857		-2.39	-1.2	31	451.7
32	176.42	83.045	202.324	97.53	-2.90	-1.5	32	30.7
77	175.44	84.545	199.990		-2.32	-1.2	22	420.7
34	174.00	84.830	201.934	97.24		-1.5	34	:0.6
:3	194.92	84.330	199.605		-2.40	-1.2	33	370.0
:4	195.41	94.629 64.129	201.596 1 <b>99</b> .270	a7. ≃	-3.04	-1.4	36 87	30.8 737.2
:7 :3	194.45	44.457	201.307	24.2: 27.09	-2.4 <b>8</b> -3.12	-1.3 -1.6	19	<b>77.0</b>
	174.00	83. 757	170.437		-2.37	-1.2		324.2
40	174.90	84.320	201.044		-3.14	-1.0	40	35.5
41	193.74	83.820	178.047		-2.22	-1.1	41	290.7
42	174.61	64.198	200.842		-3.20	-1.6	42	40.6
43	193.46	42.448	194.763		-1.81	-0.9	43	250.0
44	194.43	84.117	230.694		-). Z	-1.7	44	13.0
45	193.28	63.419	197.757 200.582	86.78	-2.32	-1 - 2	45	713. i 40. <b>a</b>
47	194.3C	84.063 23.263	176.707		-3.23 -1.84	-1.7 -1.8	46 47	174.5
4.0	194.22	24.028	200.304	86.72	-3.24	-1.7	40	10.6
40	173.07	03.328	174.633	85.07		-1.6	49	136.0
:0	194.18	£4.00 <del>9</del>	200.459	e6.73	-3.23	-1.7	50	44.0
21	1-3.02	62.504	1 -5. 861		-1.47	-0. B	51	97.3
52	174.16	<b>6</b> 1.001	200.436		-7. 51	•1.7	52	44.
53	173.50	63.501	195.937	<b>⊶.</b> 73	-1.47	·•.	53	14. :
:5	1•3.00	£2.300	199.922	26.49	-3.39	-1.9		

Case 4: end oun off, pump 'H'

		13 64.	2.47	PARE:	3	-		- <del> </del>	127
	0.40	2. 10	.70.20	9.17		0.01302			3, 90
	2.00	1.10	<b>∞</b> 2.40	1.13		0.01203			
:	0.40		J. 38	0.00		0.01504			
•	0.40	:.:0 :.:0	638.91 631.63	1.0: • • •		0.01303			3.00
::	0. 46		631.63 642.61	. 83		0.01507			4.00 2.04
: :	0.40	2. 10	.12.22	7.71		0.01313			4.27
	3.46		ai0. 43			0.01317			7.00
;;	0.40	3.10	000.43	39		0.015219			7.62
•	0.48	۵. ۱۵	:90. 73	7. 20		0.01327			0. 22
:1	0.40	0.10	572.03	61 97		0.01533			
	0.40	3.10	230.63	4.70		0.01342			9, 94
	0.40	3. 18	524.70	4.42		0.01571			
<b>.</b> 7	0.48	9.16	303.40	4.13	279400	0.01541	0.0000	CI 0.34	11.00
	8.48	0.16	479. 93	1.63	24:370	0.01571	6.000		11.57
31	0.44	0.18	451.73	3.30	253717	0.01523	4 6,000		12.00
23	0.48	0.18	470.06	3. 13	2237791	0.01403	•. ecc:		12.44
23	0.48	0.18	390.01	4.73		6.01422			12.04
37	9.4	0. 18	277.370	4.30		0.01041			13.00
24	9.4	0.18	E4. 15	3. 77		0.01444			13.33
• 1	0.40	0.10	290.64	3.54		0.01477			13.88
43	0.44	0.18	:30. <b>65</b>	3. 05		0.01741			13.70
	0.40	0.16	213.00	2. 42		0.01797			13.01
47	1.40	0.18	174.4	2. 13		0.015			13.00
••	0.46	0.18	123.60	1.43		0.01732			13.73
31	0.44 0.22	0.18	97.24	1.00		0.02119			13.94
	1.23	0.64	4.67	2.36	21634	o. 621 45	0.000	657 4-21	14.17
4		9 9100	wie	-	c	PC	•		
_			-		-		_		
1		670.3	9, 70				74.231	214.6 213.	,
3	2 3	3.1		0.014	97	. 763		213.7 213.	
3			0.71				14.23	213.7 212.	•
4				0.018	81	. 384		212.7 212.	7
8			0. 90				117.623	212.7 211.0	
,	• 7		9.00	0.022	•	.443	724.390	211.8 216.	

7	v						<b>9</b>
_							
1	1 2	470.3	9.99			724.221	214.4 213.7
3	2 3	3.1		0.014	97.983		213.7 213.6
	2 4	₩7. ĕ	0.71			714.223	213.7 212.7
4	4 8	3.8		0.018	81.384		212.7 212.7
	• •	***	0.90			717.623	212.7 211.0
•	• 7	4.7		0.022	16.443		211.0 211.0
7	• •	480.7	9.57			724.300	211.8 210.9
•	• •	7.3		0.634	44, 475		210.7 210.8
•	. 10	461.7	0. 🕶			M1.234	210.9 200.9
10	10 11			9.843	30. 374		201.1 201.7
11	10 12	₩2.4	•. 🖝			744.714	204.4 204.1
12	12 13	10.1		0.040	34.684		207.1 206.6
13	12 14	42.5	1.22			731.273	209.1 200.2
14	14 15	12.1		0.000	27.742		200.2 207.6
18	14 10	430.4	0.77			704,244	209.2 207.4
10	16 17	14.0		0.000	26.157		227.4 204.9
17	10 10	<b>606.</b> 4	0.74			774.774	207.4 206.6
18	18 17	18.7		0.074	23.600		204.4 204.6
10	10 20	270.7	0.72			770.070	204.4 208.9
39	20 21	18.7		0.071	20. 342		205.9 208.0
21	20 22	572.0	0.70			719.987	208.7 206.1
2	22 23	22.0		0.100	17.484		705.1 202.9
23	22 24	230.0	4. 43			944. <b>Sal</b>	703.1 704.8
:4	24 25	; :3.3		0.115	14.781		204.8 205.1
23	24 24	224.7	6. <del>57</del>			<b>562.047</b>	704.8 205.9
24	24 27	23.3		0.113	: 6. 601		703.9 702.8
27	24 20	903.4	1.84			•17.305	703. • 703. 3
:	22 27	<b>33.3</b>		9.116	i 0.067		203.3 201.9
	<b>*</b> *	479. 0	0.49			774. 985	703.3 XX2.8
*	30 31	29.2		0.140	14.237		772.8 200.9
31	20 22	481.7	•.			<b>134. 344</b>	202.0 202.3
2	3 3	20.1		0. 184	13.139		222.3 200.0
22	<b>22</b> 24	430.9	0.39			1672.240	702.3 201.9
ŝ	24 25	30.0		0.184	13.170		201.4 144.9
	24 24	370.0	0.34			1144.000	701.9 201.4
77	2 2	30.0		0.134	13.100		201.4 199.3
<u>"</u>	2 Z	334.2	1.27			1237.44	201.4 201.3
5	# #	<b>3.</b> 0		9. 1 <b>45</b>	: 2. 405		201.3 190.7
4	3 7	P4.2	0.24			: 233. 253	201.3 201.1
•	<del>=</del> ;;	3.3 79.7		0.176	11.471		201.1 190.0
17	77 72	40.6	0.22			: 373. 465	201.1 200.0
• 3	47 44	230.0		294	19.379		290.8 197.8
44	44 45	3.0	:. : <b>5</b>	3.170		:674.879	200.0 200.7 200.7 197.8
19	44 40	213.1	3.11	2.170	11.621	: 904. 301	200.7 700.6
4	40 47	40.6	****	3. 2 <del>0</del> 3		:	
• 7	40	174.3	3.00	*****	: 3. 385	2273.122	700.4 194.7
•	40 40	40.0		3. 20 <b>5</b>	. 3. 386		
	• 9 30	: 33. 8	1.02			7538.943	:20.3 196.6 :20.3 700.3
::	:3 11	44.		:. 225	1. 283		:20.3 193.9
31	:0 3:	99.3	:.62	•••••	1. 003	:*43.3*0	120.5 700.4
12	<b>#</b> ##	44.		:. 272	7 304		20.4 193.8
13	:: ::	•	:. 21	•••••		2*1.822	130.4 100.3
7.4	34 32	44.7	••••	:. 229	127.943		::0.3 :00.3
73	10 30	6.3	2.00	*****		0.300	20.1 20.1

Case 5: end gun off , design modified

			HEAD(FT)				> t SC	CONAI
3001:	INITIAL		FINA		I:FFER		ELEMENT	FLOW
13	\:\t\)	:51)	((2)	.FS11	(!t:	1	NO	(350)
1	:69.78	+2.750	209.783	90.76		a. <b>s</b>	į.	124.9
3	::8.21	::.393	208.436 208.397		-9.09 -9.63	-0.3 -3.3	; ;	3.1 321.9
4	257.09	53.593 63.419	207.075	29.59	-7.19	-0.1	4	3.3
5	:55.53	i1.313	:37.018		-v.:3	-).4 -).:	£	318.1
<b>\$</b>	195.14 293.58	:8.751 68.251	135.726	39.01	-0.82	-9.4	:	113.5
3	:63.62	28.093	:34.392	38.43	-0.38	-0.2	<b>3</b> '	7.1
, ,	192.46	17.593	204.219		-0.48 -0.48	-9.4 -0.2	:3	306.4
::	201.93	37.361 36.861	202.898 202.644	17.67	-0.93	-0.5		797.5
:2	231.44	37.151	:32.470	87.60	-9.51	-9.3	•	3.1
:3 :4	200.28	#6.651 86.737	202.252 201.630		-0.98 -0.57	-3.5 -3.3	:3	789.3
:3	139.33	16.237	201.322	87.10	-1.00	->. <b>5</b>	:5	779.4
: 6	199.09	86.134	200.401			-0.3 -0.5	: <b>6</b> : 7	11.9 767.6
17 18	197.93	85.634 35.745	199.980 199.605		-1.03 -0.71	-3.4	: 3	A.1
. 9	197.03	45.245	199.390		-1.20	-9.6	: 9 : 3	759.5 13.5
20 21	137.75	85.554 85.054	199.215		-0.74 -1.36	).4 -0.5		746.0
22	:36.47	45.002	190.C84	35.70	-0.82	) . 4	12	15.5
:3	135.32	24.502	197.414	15.41	-1.57	-9.5 -9.5		30.5 3.3
:4 :5	135.26	24.478 33.378	196.999		-1.33	-9.5	::	712.2
: 5	134.71	34.240	126.509	35.32	-0.92	-y • §	. 5	12.4
27	133.56	03.740	196.651		-1.29 -0.97	).7 -0.5	:7 29	699.7 21.5
20 29	193.97	83.91 <b>0</b> 33.41 <b>8</b>	195.842		-0.95	-0.5	: ?	678.2
36	132.92	83.463	:34.898	34.32	-1.03	-v.5	::	:2.8
31	191.76	12.963	193.585		-0.95	-0.5 -0.6	31 32	655.5 14.2
32 33	192.26	33.179 32.679	194.308 193.730		-1.36	-9.7	33	641.2
34	191.95	83.043	194.026			-0.6	34	22.7
35	190.79	32.543	192.718		-1.01	-0.5	25 36	618.5 22.9
36 37	191.06	32.660 02.160	193.232 191.908		-1.i4 -1.05	-0.6 -0.6	27	595.6
38	190.26	32.314	192.495		-1.17	-0.6	38	27.6
39	189.10	81.814	130.666		-0.83	-0.4	39	568.1 18.4
40 41	190.01	82.207 31.707	192.270 191.368			-0.6 -0.7	40 41	549.7
42	189.45	31.965	191.758		-1.22	-0.6	42	30.0
43	138.30	i:.465	189.634		-0.71	-9.4	43 44	519.7 30.0
44 45	.28.84 .87.68	31.699 31.199	191.:08		-1.24 -0.74	-0.7 -).4	15	419.7
46	138.48	31.543	130.848	i2.57	-1.26	-v.7	4.6	22.0
47	187.32	6:.543	:89.613		-1.:2 -1.:6	-9.7 -9.7	47	467.7 33.0
4 <b>8</b> + 9	188.31	41.471 40.971	190.692 Lab.573	12.30	-0.76	-9.4	49	437.7
55	187.87	81.279	130.278	i2.32	-1.23	-0.7	: )	32.1 405.6
51	186.71	60.779	187.891		-0.63 -1.29	-0.3 -0.7	5 1 5 2	34.5
52 53	187.51	31.122 30.622	189.922 187.227		-0.47	-0.3	53	371.1
54	187.40	31.078	189.821	32.12	-1.29	-0.7	5.4 5.5	:6.1 :45.0
5.5	136.25	10.578	188.156	81.40	-1.02	-9.6 -9.7		39.5
56 57	187.13	60.384 50.484	136.224		-0.09	-3.1	57	305.5
5.8	136.98	50.894	:39.337	31.94	-1.29	-9.7	: 3 : 9	33. <b>9</b> 271.6
5 9	135.82	50.394	186.779 .39.205		-9.51 -1.23	-9.3 -9.7	; ; ; ; ;	28.2
50 51	196.88	#3.#50 #:.}£3	127.377	1:7	-0.59	-7.5	51	:42.2
52	125.43	33.231	:39.239	11.27	-1.:3	-ů.;	, ;	39.5 203.8
53 54	135.68	13.331 80.772	185.841		-9.57 -1.28	-0.; -;.:	3.4 8.4	32.4
÷ 5	: 45.57	10.232	185.744	:0.16	-0.23	<b>-⊹.:</b>	• •	164.4
÷ 6	.36.69	\$2.776	129.074		-1.26	-0.7	• <b>6</b> 5 7	43.3
	155.54	80.270 55.756	125.087	4:.:8 !:.::	0.24	9.1 -2.7	÷&	34.4
: •	135.52	83.265	156.377	aC. 12	-0.46	-0.2	a <b>9</b>	96.7 41.3
25	186.67	69.761	137.248	31.79 66.25	-L.27	-0.7 3.1	7 <b>0</b> 71	43.4
	165.32	85.261 55.266	105.061	11.74	-1	-9.4	7;	43.4
7.1	11.51	43.765	:38.566	81.13	-1.65	-?.;	7;	:.6

# APPENDIX C SOURCE CODE OF THE SIMULATION MODEL "SYSTEM"

```
REM .
                             PROGRAM SYSTEM
REM .
REM . THIS PROGRAM CALCULATES THE DISCHARGE-HEAD (Q-H) RELATIONSHIP AT
          THE PUMP FOR THE CENTER PIVOT SYSTEM BASED ON THE KNOWN
      RELATIONSHIP OF Q-H AT THE PIVOT POINT (CALCULATED BY PROGRAM
REM .
          "NETWORK") , SUCTION HEAD, LELIVERY HEAD, AND THE LENGTH
REM .
                          OF THE KAIR PIPE LINE
REM •
REM THE Q-H RELATIONSHIP DATA OBTAINED FROM THIS PROGRAM IS USED TO
            PLOT THE SYSTEM CURVE SO THAT THE OPERATING POINT OF
                        THE PUMP CAN BE DETERMINED
REM •
REM .
                          WRITTEN IN TURBO-BASIC
REM •
CLS: INPUT DELIVERY HEAD (FT)=", DH
INPUT"SUCTION HEAD (FT)=",SH
FIXED=SH+DH
IMPUT ROUGHNESS OF THE PIPE (INCHES)=",E
IMPUT"DIANTER OF THE PIPE (INCHES)=".D
IMPUT DIAHETER OF THE SUCTION PIPE (INCHES)=",DS
MAINDI=D/12:SUCTDI=DS/12
AREA = (3.14/4)@(MAINDI^2):AREAS=(3.14/4)@(SUCTDI^2)
EBYD=E/D:EBYSD=E/DS
INPUT"LET:GTH OF THE DELIVERY PIPE (FEET)=",L
IMPUT"COEFFICIENT OF THE SYSTEM AT THE PIVOT=", K
IMPUT"EXPONENT OF THE SYSTEM AT THE PIVOT=", A
VHC=385.9*(D^4)
OPEH "O", #1, "SYSTEM. DAT"
IMPUT"LOWER RANGE OF DISCHARGE IN GPM=",GPM1
INPUT"UPPER RANGE OF DISCHARGE IN GPM=",GPM2
QSUM=GPM1-((GPM2-GPM1)/10)
CLS
PRINT#1, CHR$(18);:PRINT#1, CHR$(27) "E";
PRINT#1, CHR$(27) "G":PRINT#1,
PRINT#1, TAB(12) USING"ELEVATION HEAD (FT)=###.#"; DH
PRINT#1, TAB(12) USING"LIFT FROM WATER LEVEL TO GROUND LEVEL (FT)=###.#";SH
PRINT#1, TAB(12) USING ROUGHNESS OF THE PIPE (INCHES) =#.#####; E
PRINT#1, TAB(12) USING"DIAMETER OF THE PIPE (INCHES)=##.###";D
```

```
PRINT#1, TAB(12) USING"DIAMETER OF THE SUCTION PIPE=##.####;DS
PRINT#1, TAB(12) USING"LENGTH OF THE DELIVERY PIPE (FEET)=####. L
PRINT#1, TAB(12) USING"COEFFICIENT OF THE SYSTEM AT THE PIVOT=###.####";K
PRINT#1, TAB(12) USING EXPONENT OF THE SYSTEM AT THE PIVOT=#.#### A
PRINT#1,:PRINT#1,
PRINT#1, TAB(12)
"QSUM FIXED H FRIC HEAD FRIC HEAD VEL HEAD
                                                 OPR HEAD TOTAL HEAD*
PRINT#1, TAB( 12)_
"GPM
                 DEL(FT)
                                                     FT
                                                                FT
                            SUCT(PT)
                                           FT
         FT
PRINT#1, TAB(12)_
FOR I=1 TO 11
    QSUM=QSUM+((GPH2-GPM1)/10)
    VELO=QSUM/(448.89AREA)
    VELOS=QSUH/(448.8#AREAS)
    REMO = (VELO^2 MAINDI)/(0.00001059)
    RELICS= (VELOSSSUCTDI)/(0.00001059)
    FRICT = 1.325 \cdot (LOG(0.27 \cdot EBYD + 5.72 \cdot ((1/RET:0)^0.9))^(-2))
    FRICTS=1.325 * (LCG(0.27°EBYDS+ 5.72*((1/REI:OS)^0.9))^(-2))
    R=8*FRICT*L / (32.2*(448.8^2)*(3.14159^2)*(MAINDI^5))
    RS=8°FRICTS*SH / (32.2°(448.8°2)°(3.14159°2)°(SUCTDI°5))
    FHEAD=1.1ªRª(QSUM^2)
    FHEADS=1.1*RS*(QSUM^2)
    VELHEAD=(QSUM^2)/VHC
    SPRHEAD=(QSUM/K)^(1/A)
    HEAD(I)=FIXED+VELHEAD+SPRHEAD+FHEAD+FHEAD2
    PRINT#1, TAB(12) USING_
  ###.#### ####.### ####.####<u>";</u>
   QSUM, FIXED, FHEAD, PHEADS, VELHEAD, SPRHEAD, HEAD(I)
PRINT"RUN COMPLETE. OUTPUT FILE IS 'SYSTEM.DAT'"
STOP
END
```

# APPENDIX D SOURCE CODE OF THE AUXILLARY SPRINKLER SIMULATION MODEL "AUXISPR"

```
REM .
                             PROGRAM AUXISPR
REM .
REM THIS PROGRAM DETERMINES THE POSITION AND REQUIRED CAPACITY OF
REM .
             THE AUXILLARY SPRINKLERS THAT ARE TO BE ADDED IN THE
REM *
                 CENTER PIVOT IRRIGATION SYSTEM FOR THE
REM .
                     KODIFICATION OF THE DESIGN SO
REM •
           THAT THE PUMP ALWAYS OPERATES AT A FIXED OPERATING POINT
REM .
REM .
                              WRITTEN IN TURBO-BASIC
REM STATEMENT 500 CONTAINS THE DISTANCE OF THE PLUGS FROM THE PIVOT POINT
REN IN THE SYSTEM
    DIM L(100), TOTL(100), QOUT(50), Q(100)
    OPEN "O", #1, "OUTLET. DAT"
    IMPUT"END GUN DISCHARGE = ":QE
    IMPUT"LENGTH OF THE LATERAL LINE = ";TL
    INPUT"MINIMUM DISCHARGE TO PASS THRU THE AUXILLARY SPRINKLERS = ";QMIN
REM INPUT THE POSITION OF THE PLUGS IN THE SYSEM AT DATA STATEMENT 500
    RESTORE 500
   TOTL(0)=0
   FOR I = 1 TO 100
        READ TOTL(I)
        IF TOTL(I) = 999 THEN OUTNO=I-1:I=100: GOTO 10
10 NEXT I
   FOR I = 1 TO OUTNO
       Q(I)=QE^*(1-((TOTL(I)/TL)^2))
   NEXT I
   J=1:QUP=QE:FLAG=0
   PRINT#1, TAB(12) "DESIGN DATA: ": PRINT#1,
   PRINT # 1. TAB(12) USING "SYSTEM LENGTH = ###.# FT":TL
   PRINT#1, TAB(12) USING"DISCHARGE THRU THE END GUN = ###.# GPM";QE
   PRINT#1.TAB(12) USING
                   "MINIMUM DISCHARGE THRU THE SPRINKLER =## GPM"; QMIN
```

```
PRINT#1,:PRINT#1,TAB(12)
        PLUG DISTANCE FROM DISCHARGE
                                           SPRINKLER
                                                        NOZZLE
                                                                 EXPECTED "
PRINT#1, TAB(12)
        NO
             PIVOT (FT)
                                             MODEL
                                                        SIZE
                                (GPM)
                                                                 PRES(PSI)
PRINT#1, TAB(12)_
    FOR I = 1 TO OUTNO-1
        Q=QUP-Q(I)
        IF Q<QMIN THEN GOTO 20
        IF QUP<>QE AND FLAG>I-NO THEN GOTO 20
        QUP=Q(I)
        QCUT(J)=0
        L(J)=TOTL(I)
        IF J = 2 THEN FLAG=I-NO
        NO=I
        PRINT#1.
PRINT#1, TAB(12) USING" ##
                             ##
                                       144.1
                                                    ###.##;J,I,L(J),QOUT(J)
        J=J+1
20 NEXT I
    QTOTAL=0
    FOR I=1 TO J-1
        QTOTAL = QOUT(I) + QTOTAL
    NEXT I
    PRINT#1,:PRINT#1,TAB(12) USING
    "DISCHARGE DISTRIBUTED ALONG THE LATERAL LINE = ###.# GPM";QTOTAL
    PRINT"OUTPUT IN FILE : OUTLAET.DAT"
500 DATA 9, 18, 37.5, 47, 66, 75.5, 94.5, 104, 123, 132.5, 155.5, 165, 184, 193.5, 212.5,
         222,241,250.5,269.5,279.302,311.5,330.5,340,359,368.5,387.5,397,
         416,425.5,444.5,458,477,486.5,505.5,515,534,543.5,562.5,572,591,
         600.5,623.5,633,652,661.5,680.5,690,709,718.15,737.5,747,769.3,
         776.3.999
```

# APPENDIX E SOURCE CODE OF THE FIELD PERFORMANCE EVALUATION SIMULATION MODEL "FIELD"

```
REM ***
REM .
                              PROGRAM FIELD
REM .
REM THIS PROGRAM SIMULATES THE DEPTH OF APPLICATION OF WATER IN THE
REM "FIELD BASED ON THE GIVEN DISCHARGE AND RADIUS OF COVERAGE FROM THE"
REM • FROM HIDIVIDUAL SPRINGLERS IN THE CENTER PIVOT IRRIGATION SYSTEM.
REM . IT ALSO DETERMINES THE TOTAL TIME REQUIRED FOR ONE REVOLUTION OF
REM • THE CENTER PIVOT IRRIGATION SYSTEM FOR DIFFERENT IRRIGATION DEPTH•
REM .
                        AND S OF END GUN ON CONDITION
REM .
REM .
                         WRITTEN IN TUREO-BASIC
REM ....
    MV3=40
    DIM SPAC(HV$,2),L(HV$,2),Q(HV$,2),R(HV$,2)
    DIN QUANTINO, P(50), mRATIO(MV$), nRATIO(MV$), DEPTH(50)
    DIH UNIF(2), DEPTHS(HV$,2), TIMES(15), TIMEX(HV$,2), DEPT(MV$)
    DIM VEL(MV$,2),TIMEEG(3,MV$,2),TIMETOT(MV$,3),EG(3),EGL(3),EOL(3)
    INPUT"NO OF SPRINKLERS = ",SPR
    IL'PUT"SPEED OF THE LAST TOWER AT 100% MOVEMENT (FT/HR) = ",U
    IMPUT DISTANCE FROM PIVOT TO LAST TOWER (FT) = ",TL
    U=922.05/1.5:TL=765
    TLEY=293.1415926549TL
   W1=U/TL : L(0,1)=0:L(0,2)=0
   OPEN "I". #1. "a:\FIELD.DAT\CEOFMOD.DAT"
   OPEN "O", #2, "D:\SRP2\TB\\DATA\FHODD.DAT"
   FOR J = 1 TO 2
       IF J=1 THEN SPR=36
       IF J=2 THEN SPR=28
       FOR I = 1 TO SPR
            INPUT #1.DUPMY.SPAC(I.J).DUM.DUMM.Q(I.J).R(I.J)
           L(I,J)=L(I-1,J)+SPAC(I,J)
       NEIT I
   NEXT J
   RESTORE 900
   FOR I=1 TO 15
       READ TIMES(I)
   NEXT I
   ALL=19:FLG1=0
```

```
FOR L = 1 TO 2
      IF L = 1 THEN PRINT#2, TAB(12) "END GUN OFF": SPR=36
      IF L = 2 THEN PRINT#2,:PRINT#2,TAB(12) "END GUN ON":SPR=28
      IF L=2 THEN QLAST=Q(SPR,L)
      CLS:LOCATE 12,28:PRINT" *** PLEASE WAIT***
      LOCATE 14,29:PRINT"CO:PUTING SET ":L
     COVER=L(SPR,L)+R(SPR,L)=0.75
     N=INT(COVER/25)
     IF N-(COVER/25)>0.5 THEN N=N-1
     DSUM=0
     FOR K=1 TO 15
         IF K=1 THEN:LOCATE 12,28:PRINT"***PLEASE WAIT***
         SUPPA=0:VAR=0:VAR1=0:VAR2=0:CONS=0:RESULT=0:DSUM=0
         W=U10(0.010TIHES(K))
         PRINT#2,
         PRINT#2, TAB(12) USING"TIMER SETTING =### $"; W= 100/W1
         PRINT#2, TAB(12) " S
                              DISTANCE
                                           DEPTH"
         PRINTS2.TAB(12)" NO
                                (FT)
                                          (INCH)
         PRINT#2, TAB( 12) ---
         FOR J= 1 TO N
             P(J)=J*25:SUPM=0:VAR=0:VAR1=0:VAR2=0:COXIS=0:RESULT=0
             FOR I = 1 TO SPR
                 IF L=2 AUD P(J)<787 THEN
                    Q(SPR,2)=0
                   ELSEIF L=2 AND P(J)=>787 THEN
                    Q(SPR.2)=OLAST
                 END IF
                 mRATIO(I)=(P(J)-L(I,L))/R(I,L)
                 IF mRATIO(I)=<-1 THEN GOTO 30
                 IF mRATIO(I)=> 1 THEN GOTO 10
                 COSN=(L(I,L)^2 + P(J)^2 - R(I,L)^2)/(2*L(I,L)*P(J))
                 SINN=(1-(COSN-2))-0.5
                 WT=ATN(SINN/COSN)
                 QMAX(I,L) = (61.2789 Q(I,L) - .375)/(WT R(I,L) L(I,L))
                 nRATIO(I) = L(I,L)/R(I,L)
                 VAR = (4=(nRATIO(I)*(nRATIO(I)+mRATIO(I))))/(1-(mRATIO(I)^2)
                 CALL INTEGRATION (WT, VAR, RESULT)
                SUMM = QMAX(I,L)*((1-mRATIO(I)^2)^0.5)*RESULT + SUMM
10
             NEXT I
30
             DEPTH(J) = (4/W)^{2}SUMM
             PRINT#2, TAB(12) USING"### ########; J, J*25, DEPTH(J)
             DSUM = DSUM + DEPTH(J)
         NEXT J
         AVGD=DSUM/N
         DEPTHS(K,L)=AVGD
         IF AVGD>2 THEN K=15
   NEXT K
```

```
IF L=2 THEN
   VALU=SPR-1
  ELSE
   VALU=SPR
END IF
   COVER=L(VALU,L)+R(VALU,L)=0.75
   N=INT(COVER/25)
   IF N-(COVER/25)>0.5 THEN N=N-1
CALL APPuniformity(N,K,DEPTH(),P(),UNIFORM)
UHIF(L)=UNIFORM
PRINTEZ, "$ TIMER
                       AVERAGE*
PRINT#2, "SETTING
                     DEPTH(IN)
PRINT#2. "----
FOR K = 1 TO 15
    PRINT#2, USING" ###
                               ##.###":TIMES(K).DEPTHS(K,L)
    IF DEPTHS(K,L)>2 THEN K=15
NEXT K
DEPT(0)=0.1
FOR I=1 TO 19
    DEPT(I)=DEPT(I-1)+0.1
NEXT I
ADDS=0:K=1
   FOR I=1 TO ALL+1
        IF FLG1=1 THEN
           ADDS=ADDS+0.10
           DEPT(I)=ADDS
        END IF
        IF FLG1=1 AND I=1 AND L=2 THEN
           DEPT(1)=DEPTHS(1,1)
           ADDS=0.1*INT(DEPT(1)*100/10)
        END IF
        IF I=1 AND L=1 AND DEPTHS(1,1)>DEPT(1) THEN
           DEPT(1)=DEPTHS(1,L)
           ADDS=0.1*INT(DEPT(1)*10)
           FLG=1:FLG1=1
           IF L=1 THEN ALL=ALL-((ADDS-0.2)*10)
       IF DEPTHS(K,L) < DEPT(I) THEN
          IF DEPT(I)>2 THEN
             K=K-1
```

40

```
GOTO 45
                END IF
                GOTO 40
             END IF
"5 TIMEX(I.L)=TIMES(K-1)-((TIMES(K-1)-TIMES(K))/(DEPTHS(K,L)_
       -DEPTHS(K-1,L)))*(DEPT(I)-DEPTHS(K-1,L))
             IF FLG=1 THEN FLG=0
             VEL(I,L) = U=TIMEX(I,L)/100
        NEXT I
    NEXT L
    EG(1)=0.33 : EG(2)=0.50 : EG(3)=0.66
    PRINT#2,
PRINT#2.TAB(12) USING APPLICATION UNIFORMITY (END GUN ON) =##.#":UNIF(2)
PRINTA2.TAB(12) USING APPLICATION UNIFORMITY (END GUH OFF) = # . # ": UNIF(1)
PRINT#2, :PRINT#2, TAB(12) "UNMODIFIED SYSTEM WITH CONSTANT TIMER"
    FOR P = 1 TO 3
        EGL(P)=TLEN*EG(P)
        EOL(P)=TLEN®(1-EG(P))
    PRINT#2.
 PRINT#2, TAB(12)
"PERCENTAGE OF DISTANCE COVERED WITH END GUN ON = ":EG(P) 100
 AVERAGE*
PRINT#2, TAB( 12)_
        DEPTH TIME DEPTH
                                     DEPTH
                                             TIME UNIFORMITY"
                              TIME
PRINT#2, TAB( 12)_
" TIMER
                 (HR)
                                      (IN)
        (IN)
                        (IN)
                               (HR)
                                             (HR)
PRINT#2, TAB(12)
        FOR I=1 TO 15
            AVGAPP=EG(P)*DEPTHS(I,2)+(1-EG(P))*DEPTHS(I,1)
            TIME2=EGL(P)/(0.01*TIMES(I)*U)
            TIME1=EOL(P)/(0.01*TIMES(I)*U)
            AVGTIM=TIME1+TIME2
            AVGUHI=((DEPTHS(1,2)*EG(P)*UNIF(2) +
                        DEPTHS(I,1)*(1-EG(P))*UNIF(1))/(DEPTHS(I,1)))
            PRINT#2, TAB(12) USING_
                            11.1 1.11
                                                  1.44 44.4 44.444";_
            " ###
                     1.11
                                          ##.#
            TIMES(I), DEPTHS(I,2), TIME2, DEPTHS(I,1), TIME1, AVGAPP,
                             AVGTIM, AVGUNI
            IF DEPTHS(I,1)>2 THEN I=15
       NEXT I
       FOR I=1 TO ALL
           TIMEEG(P,I,2)=EGL(P)/VEL(I,2)
```

```
TIMEEG(P.I.1)=EOL(P)/VEL(I,1)
        TIMETOT(I,P)=TIMEEG(P,I,1)+TIMEEG(P,I,2)
    NEXT I
NEXT P
PRINT#2.:PRINT#2.
PRINT#2, TAB(12) USING" NO OF SPRKNKLERS INCLUDING END GUN= ##":SPR
PRINT#2.TAB(12) USING
    " SPEED OF THE LAST TOWER AT 100% MOVEMENT (FT/HR) = ###.##";U
PRINT#2.TAB(12) USING
    " DISTANCE FROM PIVOT TO LAST TOWER (FT) =###.# ";TL
PRINT#2.TAB(12) USING
    " APPLICATION UNIFORMITY (END GUN ON) =##.#";UNIF(2)
PRINT#2.TAB(12) USING
    " APPLICATION UNIFORMITY (END GUN OFF)=##.#";UNIF(1)
PRINT#2.:PRINT#2.
FOR P = 1 TO 3
    TOTUMIF = EG(P) UNIF(2)+(1-EG(P)) UNIF(1)
    PRINT/2.
    PRINTIZ, TAB(12) USING
      " PERCENTAGE OF DISTANCE COVERED WITH GUN ON = ### 5";EG(P)=100
    PRINTO2, TAB(12)
                              END CUN OFF
                END GUN ON
      "DEPTH
    PRINT#2.TAB(12)
                                               UNIFORMITY TOTAL TIME"
                                      TIME
                       TIME
                              TIMER
      " IN
               TIMER
    PRINT#2, TAB(12)_
                                                              HR
                                                   8
                                8
                                       HR
                        HR
      "INCH
    PRINT#2, TAB( 12)_
    FOR I = 1 TO ALL
      PRINT#2, TAB(12) USING
               111.11 11.11 111.11 11.11
                                                              ###.##";_
                                                 ##.##
       DEPT(I), TIMEX(I,2), TIMEEG(P,I,2), TIMEX(I,1), TIMEEG(P,I,1),_
                TOTUNIF, TIMETOT(I,P)
    NEIT I
print#2,:print#2,
NEXT P
PRINT"DONE":STOP
END
SUB APPuniformity(N,K,D(2),P(1),UNIFORM)
SUH1=0 : SUH2 = 0 : SUH3 = 0
FOR J = 1 TO N
    SUM1 = P(J)*D(J,K) + SUM1
    SUM2 = P(J) + SUM2
NEXT J
CONS = SUM1/SUM2
FOR J = 1 TO N
    SUM3 = P(J)*(ABS(D(J,K)-CONS)) + SUM3
```

```
UNIFORM = 100*(1.0 - (SUH3/SUH1))
     END SUB
     SUB INTEGRATION (WT, VAR, RESULT)
     H = WT/50
     SUM=0
     SUM = (1-VAR^*SIN(0)^*SIN(0))^*0.5
 50 FOR I = 1 TO 50
          IF I = 50 THEN
               A=(1-VAR^{\bullet}SIN((I^{\bullet}H)/2)^{\bullet}SIN((I^{\bullet}H)/2))
               IF A<0.0 THEN A=0
               SUM = SUM + A^0.5
            ELSE
               A=(1-VAR^{\circ}SIN((I^{\circ}H)/2)^{\circ}SIN((I^{\circ}H)/2))
               IF A(O THEN A=O
               SUM = SUM + 2^{\bullet}(A^{\circ}0.5)
          END IF
      NEXT I
      RESULT = SUM*(H/2)
     END SUB
 REM DATA OBTAINED FROM HEERMANN AND HEIN ASAE PAPER
 500 DATA 40,50.3.2.5.40.83.4.2.8.40.115.4,3.0,44,
     DATA 147.4,4.8,44,179.4,4.7
     DATA 47,211.4,5.7,49,243.4,6.7,49,275.4,6.8,49,
     DATA 307.4,6.9,50,339.4,7.9
     DATA 52,371.4,9.3,51,403.4,9.1,51,435.4,9.1,53,
     DATA 467.4,11.6,53,499.4,11.4
     DATA 53,531.4,11.2,53,563.4,11.2,53,595.4,11.4,62,
     DATA 627.4,13.9,62,659.4,13.9
     DATA 61,691.4,13.5,61,723.4,13.5,61,755.4,13.5,58,
     DATA 787.4,14.1,58,819.4,15.1
     DATA 58,851.4,15.1,60,833.4,16.3,60,915.4,16.3,61,
     DATA 947.4,17.7,61,979.4,17.9
     DATA 61, 1011.5, 17.7, 61, 1044.6, 17.9, 61,
     DATA 1068.6,20.2,63,1092.6,20.8
     DATA 63, 1125.7, 20.8, 63, 1149.7, 20.8, 63, 1173.6, 23.1, 63,
     DATA 1206.7.23.1.63,1230.7,14.3
     REM $ OF TIME END GUN IS ON
900 DATA 100,75.60,50,42,34,29,24,21,18,16,14,11,9,7
```

NEXT J

# APPENDIX F OUTPUT FROM THE SIMULATION MODEL "FIELD"

DID CAN O

	R SETTING			SETTING		TIME 3	کارتیک ج کندین	• 42 % DEPTH
.xo	OISTANCE (FT)	(DICH)	\$ %C	DISTANCE (ET)	(INCHI)	×	(171)	(INC)(I
_			_	~~~	0.671	1	25.00	0.959
;	25.00 50.00	0.403 0.491	1	25.00 50.00	0.818	:	50.00	1.169
3	75.00	0.303	3	75.00	0.505	3	75.00 100.00	0.721 0.518
4	100.00 125.00	0.217 0.219	4 5	125.00	0.362 0.398	•	125.00	0.568
6	:50.00	0.265	6	150.00	0.442	•	150.00	0.631 0.673
:	175.00 200.00	0.283 0.296	7	175.00 200.00	0.471 0.494	7	175.00 200.00	0.706
ij	225.00	0.301	ý	225.00	0.502	,	225.00	0.71 <b>8</b> 0. <b>69</b> 7
10	250.00 275.00	0.293 0.280	10 11	250.00 275.00	0.4 <b>88</b> 0.466	10 11	250.00 275.00	0.666
11	300.00	0.30	12	300.00	0.439	12	300.00	0.627
13	125.00	0.219 0.227	13 14	125.00 350.00	0.366 0.378	13 14	325.00 350.00	0.522 0.540
14 15	350.00 375.00	0.256	15	375.00	0.427	15	375.00	0.609
16	400.00	0.301	16	400.00 425.00	0.502 0.539	16 17	400.00 425.00	0.718 0.770
17 18	425.00 450.00	0.323 0.346	17 18	450.00	0.576	18	450.00	0.823
19	475.00	0.337	19	475.00	0.561 0.512	19 20	475.00 500.00	0.802 0.732
20 21	500.00 525.00	0.307 0.279	<b>20</b> 21	500.00 525.00	0.465	21	525.00	0.665
22	550.00	0.274	22	550.00	0.454	22 23	550.00 575.00	0.651 0.653
23 24	575.00 600.00	0.274 0.2 <b>9</b> 0	23 24	575.00 600.00	0.457 0.467	24	600.00	0.667
23	625.00	0.283	25	625.00	0.471	25	625.00	0.673 0.679
26 27	650.00 675.00	0.285 0.294	26 27	650.00 675.00	0.475 0.473	26 27	650.00 675.00	0.673
28	700.00	0.278	28	700.00	0.463	28	700.00	0.661
29	725.00 750.00	0. <b>266</b> 0.232	29 30	725.00 750.00	0.443 0.3 <b>8</b> 6	29 30	725.00 750.00	0. <b>632</b> 0.551
31 30	775.00	0.184	31	775.00	0.307	31	775.00	0.438
33	800.00	0.203	32	800.00	0.339 0.250	. 32	800.00 825.00	0. <b>48</b> 4 0.357
)) )4	825.00 850.00	0.150 0.103	33 34	825.00 850.00	0.171	34	850.00	0.244
35	875.00	0.067	35	875.00	0.112 0.106	35 36	975.00 900.00	0.159 0.151
36 37	900.00 925.00	0.063 0.061	36 37	900.00 925.00	0.101	37	925.00	0.145
38	750.00	0.058	38	950.00	0.096	38 39	950.00 975.00	0.138 0.129
39 40	975.00 1000.00	0.054 0. <b>0</b> 69	39 40	975.00 1000.00	0.090 0.062	40	1000.00	0.118
•••		******	••	••••				
					- 60 0	9716	DOTTO:	. M L
	R SETTING		THE	DISTNICE	CEP1S	\$	DISTACE	CEPTE
TDE S NO	DISTACE (FT)	- 75 % (2273) (2420)						
S 10	DISTNO	(E) DI	\$	015724CE (PT) 25.00	(DCM) (DCM)	5 10	DISTINCE (PT) 25.00	(DCR) 1.184
5 ND 1	DISTACE (PT) 25.00 50.00	0.537 0.654	\$ NO 1 2	25.00 50.00	0.905 0.982	\$ 10 	25.00 50.00	(DCN)
\$ 10 1 2	25.00 50.00 75.00	(DCM) 0.537	\$ 10	015724CE (PT) 25.00	0.805 0.982 0.606 0.435	\$ 10 	25.00 50.00 75.00 100.00	(DCR) 1.184 1.443 0.891 0.639
S NO	25.00 50.00 75.00 100.00 125.00	0.537 0.654 0.404 0.290 0.318	3 10 1 2 3 4 5	75.00 50.00 75.00 100.00 125.00	0.805 0.982 0.606 0.435 0.477	\$ 10 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	1.184 1.443 0.891 0.639 0.702
S NO	25.00 50.00 75.00 100.00 125.00 150.00	0.537 0.654 0.404 0.290 0.318 0.353	3 HD 1 2 3	75.00 50.00 75.00 100.00	0.805 0.982 0.606 0.435	1 2 3 4 5	25.00 50.00 75.00 100.00 125.00 150.00 175.00	1.184 1.443 0.891 0.639 0.702 0.779 0.831
S NO 1 2 3 4 5 6 7 8	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00	0.537 0.654 0.404 0.290 0.318 0.353 0.377 0.395	3 10 1 2 3 4 5 6 7	01STANCE (PT) 25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00	0.005 0.005 0.982 0.606 0.435 0.477 0.530 0.565 0.593	\$ 100 	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00	02728 (DC30) 1.164 1.443 0.891 0.639 0.702 0.779 0.831 0.872
S NO 1 2 3 4 5 6 7 8 9	25.00 59.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00	0.537 0.654 0.404 0.290 0.318 0.353 0.377 0.195	3 10 1 2 3 4 5 6 7	25.00 50.00 73.00 100.00 125.00 150.00 175.00 200.00 225.00	0.805 0.982 0.606 0.435 0.477 0.530 0.545	1 2 3 4 5	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	1.194 1.443 0.891 0.702 0.779 0.831 0.872 0.876 0.876
S HO 12 3 4 5 6 6 7 8 9 10 11	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00	0.5731 0.537 0.654 0.404 0.290 0.318 0.353 0.377 0.395 0.402 0.991 0.373	1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 250.00 275.00	0.805 0.902 0.606 0.435 0.477 0.530 0.565 0.593 0.603	1 1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 250.00 275.00	1.194 1.443 0.891 0.639 0.702 0.779 0.831 0.872 0.886 0.861 0.823
S NO 12 2 3 4 4 5 6 7 8 9 10 11 12 12	25.00 59.00 75.00 109.00 125.00 159.00 175.00 209.00 225.00 259.00 275.00 300.00	0.537 0.654 0.464 0.464 0.333 0.318 0.353 0.377 0.395 0.402 0.391 0.373 0.353	1 2 3 4 5 6 7 7 8 9 10	25.00 50.00 75.00 100.00 150.00 150.00 200.00 250.00 275.00 300.00	0.803 0.903 0.982 0.604 0.435 0.477 0.530 0.545 0.593 0.603 0.560 0.560 0.560	\$ NO 11 2 3 3 4 4 5 6 7 7 8 9 10 11 11 11 11 11 11 11 11 11 11 11 11	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 3125.00	(DCF) (DCF) 1.104 1.443 0.891 0.639 0.702 0.779 0.831 0.872 0.864 0.661 0.623 0.775 0.645
S 10 1 2 3 4 5 6 7 8 9 10 11 12 13 14	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 100.00 125.00 100.00 125.00	0.537 0.537 0.634 0.634 0.290 0.318 0.377 0.375 0.377 0.395 0.902 0.391 0.373 0.351	1 2 3 4 5 6 7 8 9 10 11 12 13	0157JACZ (PT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 225.00 225.00 300.00 335.00	(DCD) 0.805 0.905 0.902 0.606 0.435 0.477 0.530 0.545 0.593 0.603 0.560 0.527 0.439 0.454	\$ 100 	25.00 50.00 75.00 100.00 123.00 155.00 200.00 225.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00	(DCF) 1.104 1.443 0.639 0.702 0.779 0.831 0.872 0.806 0.061 0.623 0.775 0.645 0.666
S 10 12 3 4 5 6 7 8 9 10 11 12 13 14 15	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 125.00 200.00 225.00 225.00 235.00 325.00 325.00 325.00 325.00	0.537 0.537 0.634 0.404 0.290 0.318 0.353 0.377 0.395 0.402 0.391 0.373 0.373 0.391	1 2 3 4 5 6 7 7 8 9 10 11 12 13 14	0157JACE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 250.00 275.00 300.00 325.00 300.00 375.00	0.803 0.903 0.982 0.604 0.435 0.477 0.530 0.545 0.593 0.603 0.560 0.560 0.560	\$ NO 11 2 3 3 4 4 5 6 7 7 8 9 10 11 11 11 11 11 11 11 11 11 11 11 11	25.00 50.00 75.00 100.00 125.00 150.00 175.00 275.00 275.00 275.00 275.00 300.00 300.00 300.00 400.00	(DCF) (DCF) 1.104 1.443 0.891 0.639 0.702 0.779 0.831 0.872 0.866 0.061 0.823 0.775 0.645 0.668
S NO 1 2 3 4 4 5 6 6 7 8 9 10 11 12 13 14 15 16 17	DISTANCE (FT)  25.00 59.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00 375.00 375.00 400.00 405.00	0.537 0.537 0.654 0.654 0.250 0.377 0.375 0.377 0.375 0.402 0.391 0.373 0.373 0.353 0.371 0.353 0.373 0.353	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	0157JACZ (PT) 25.00 50.00 100.00 125.00 175.00 200.00 225.00 225.00 275.00 300.00 325.00 315.00 315.00 400.00 405.00	(DCD) 0.805 0.982 0.606 0.435 0.477 0.530 0.545 0.593 0.603 0.584 0.540 0.527 0.439 0.454 0.512 0.603 0.644	\$ 100 1 22 2 3 4 5 5 6 7 7 8 9 9 9 10 111 112 113 114 115 116 117	25.00 50.00 75.00 100.00 123.00 155.00 205.00 225.00 275.00 305.00 375.00 405.00 425.00	(DCF) 1.104 1.443 0.891 0.639 0.702 0.779 0.831 0.872 0.866 0.061 0.623 0.775 0.645 0.668 0.753 0.668 0.753
S NO 1 2 3 4 4 5 5 6 7 8 9 10 11 12 13 14 15 16 17 18	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00 325.00 375.00 400.00 425.00 425.00	0.537 0.537 0.634 0.634 0.290 0.318 0.353 0.377 0.395 0.402 0.391 0.373 0.351 0.362 0.303 0.341 0.402 0.402	1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18	0157JACE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00 375.00 300.00 375.00 400.00 425.00 425.00	0.805 0.805 0.982 0.606 0.435 0.477 0.530 0.545 0.593 0.603 0.546 0.560 0.527 0.439 0.454 0.512	3 10 1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 17 18	25.00 50.00 75.00 100.00 125.00 150.00 175.00 275.00 275.00 275.00 275.00 300.00 300.00 300.00 400.00	(DCF) (DCF) 1.104 1.443 0.639 0.702 0.779 0.831 0.872 0.866 0.061 0.623 0.775 0.645 0.668 0.753 1.006 0.753 0.951 1.007 0.991
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	25.00 59.00 75.00 100.00 125.00 175.00 200.00 225.00 225.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 325.00 3	0.537 0.537 0.654 0.404 0.250 0.318 0.377 0.355 0.402 0.391 0.373 0.373 0.351 0.377 0.353 0.377 0.353 0.402 0.303 0.441 0.449 0.410	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	0157JACZ (PT) 25.00 50.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 325.00 335.00 335.00 350.00 450.00 450.00 475.00 500.00	0.805 0.805 0.982 0.606 0.435 0.477 0.530 0.565 0.593 0.603 0.564 0.560 0.527 0.439 0.454 0.512 0.603 0.646 0.692	1 2 3 4 5 6 7 8 9 9 10 11 12 13 14 15 16 17 18 19 20 20 20 20 20 20 20 20 20 20 20 20 20	25.00 50.00 75.00 100.00 123.00 155.00 200.00 225.00 275.00 300.00 350.00 350.00 350.00 405.00 450.00 450.00	(DCF) 1.104 1.443 0.891 0.639 0.702 0.779 0.831 0.872 0.866 0.861 0.823 0.775 0.668 0.753 0.668 0.753 0.668 0.753 0.668 0.753 0.668
S NO 122 134 55 67 8 99 100 112 114 115 116 117 118 119 220 21	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00 175.00 400.00 475.00 400.00 475.00 500.00 525.00	0.537 0.537 0.634 0.404 0.290 0.318 0.377 0.375 0.402 0.391 0.373 0.371 0.351 0.402 0.402 0.403 0.401 0.402 0.401 0.401 0.401	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 20 21	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 325.00 400.00 425.00 400.00 425.00 400.00 425.00 400.00 425.00	(DICH) 0.805 0.982 0.605 0.413 0.477 0.530 0.565 0.593 0.603 0.560 0.527 0.439 0.454 0.512 0.603 0.603 0.604 0.615 0.615 0.558	1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18	25.00 50.00 75.00 100.00 125.00 150.00 125.00 275.00 275.00 275.00 300.00 325.00 400.00 450.00 475.00	(DCF) (DCF) 1.104 1.443 0.639 0.702 0.779 0.831 0.872 0.866 0.061 0.823 0.775 0.645 0.668 0.733 0.091 1.017 0.991 0.904
S NO 1 2 3 4 5 6 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	25.00 59.00 75.00 100.00 125.00 175.00 200.00 275.00 300.00 275.00 300.00 325.00 400.00 475.00 400.00 475.00 500.00 550.00 550.00 550.00 555.00 555.00 575.00	0.577 0.537 0.654 0.404 0.250 0.318 0.377 0.355 0.402 0.391 0.373 0.373 0.362 0.301 0.402 0.401 0.402 0.401 0.402 0.401 0.402 0.401 0.402	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	0157JACZ (PT) 25.09 50.00 100.00 125.00 175.00 200.00 225.00 325.00 325.00 325.00 325.00 325.00 400.00 425.00 475.00 500.00 500.00 525.00 550.00 575.00	0.805 0.805 0.982 0.606 0.435 0.477 0.530 0.565 0.593 0.603 0.564 0.560 0.527 0.439 0.454 0.612 0.603 0.646 0.672 0.615 0.558	\$ 100 1 2 2 3 3 4 4 5 5 6 6 7 7 8 9 9 100 111 122 123 124 125 125 125 125 125 125 125 125 125 125	25.00 50.00 75.00 100.00 123.00 150.00 125.00 200.00 225.00 225.00 235.00 300.00 400.00 450.00 450.00 550.00 550.00 550.00 550.00 550.00	(DCFD) (DCFD) 1.104 1.443 0.891 0.639 0.702 0.779 0.831 0.872 0.866 0.661 0.823 0.775 0.665 0.668 0.753 0.668 0.951 1.017 0.904 0.821 0.904 0.821 0.907
S NO 122 3 4 4 5 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	DISTANCE (FT)  25.00 59.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00 175.00 400.00 475.00 459.00 475.00 500.00 500.00 550.00 575.00 600.00	0.537 0.537 0.537 0.634 0.404 0.290 0.313 0.377 0.353 0.377 0.353 0.377 0.351 0.373 0.361 0.402 0.431 0.449 0.410 0.472 0.372 0.365 0.373	1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 20 21 22 23 24 24 25 26 27 27 28 28 29 20 20 20 20 20 20 20 20 20 20 20 20 20	0157JACE (PT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 225.00 225.00 300.00 375.00 400.00 425.00 425.00 425.00 425.00 500.00 500.00 500.00 500.00 500.00	0.805 0.905 0.902 0.602 0.435 0.477 0.330 0.545 0.593 0.603 0.546 0.527 0.439 0.454 0.512 0.603 0.646 0.692 0.674 0.615 0.558 0.547	1 2 3 4 5 6 7 7 10 11 11 12 13 14 15 16 17 17 18 19 20 21 22 22 22 23 24 24 25 26 26 27 27 28 28 28 28 28 28 28 28 28 28 28 28 28	25.00 50.00 75.00 100.00 125.00 125.00 250.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.0	(DCF) (DCF) 1.104 1.443 0.639 0.702 0.779 0.831 0.872 0.866 0.061 0.623 0.775 0.645 0.659 1.017 0.991 0.991 0.904 0.807 0.804
S NO 12 23 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26	DISTANCE (FT)  25.00 50.00 100.00 125.00 125.00 125.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00	0.537 0.537 0.654 0.464 0.290 0.318 0.353 0.377 0.395 0.402 0.391 0.391 0.402 0.303 0.441 0.402 0.431 0.449 0.410 0.472 0.365 0.365 0.366	1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 25 26 27 27 28 29 29 20 20 20 20 20 20 20 20 20 20 20 20 20	0157JACE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 275.00 300.00 325.00 400.00 455.00 400.00 475.00 500.00 575.00 600.00 600.00 650.00	(DICH) (DICH) 0.803 0.982 0.606 0.435 0.477 0.530 0.565 0.593 0.603 0.586 0.560 0.527 0.419 0.615 0.615 0.569 0.547 0.615 0.549 0.549 0.549 0.549	5 10 1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 27 28 28 28 28 28 28 28 28 28 28 28 28 28	25.00 50.00 75.00 100.00 125.00 125.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.0	(DCFT) (DCFT) 1.104 1.443 0.639 0.702 0.779 0.831 0.872 0.866 0.061 0.823 0.775 0.645 0.753 0.668 0.753 1.017 0.991 0.991 0.904 0.807 0.804 0.807
S NO 122 3 4 5 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 27	DISTANCE (FT)  25.00 59.00 75.00 100.00 125.00 175.00 200.00 225.00 325.00 375.00 400.00 475.00 450.00 475.00 650.00 655.00 675.00	0.577 0.537 0.537 0.654 0.404 0.290 0.318 0.377 0.395 0.402 0.303 0.341 0.462 0.431 0.469 0.419 0.419 0.419 0.372 0.365 0.377 0.377	1 2 3 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27	0157JACE (PT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 225.00 305.00 375.00 400.00 425.00 450.00 450.00 550.00 575.00 600.00 650.00 675.00	0.805 0.805 0.982 0.606 0.435 0.477 0.330 0.545 0.593 0.603 0.560 0.527 0.439 0.454 0.512 0.603 0.646 0.672 0.674 0.615 0.545 0.547 0.545	1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 19 20 21 22 21 22 21 22 22 23 24 24 25 26 27 27 28 28 28 28 28 28 28 28 28 28 28 28 28	25.00 50.00 75.00 100.00 125.00 135.00 250.00 250.00 250.00 250.00 250.00 400.00 475.00 400.00 475.00 500.00 500.00 500.00 500.00 500.00 600.00 600.00 600.00 600.00	(DCFD) 1.104 1.443 0.639 0.702 0.779 0.831 0.872 0.886 0.061 0.823 0.775 0.645 0.753 0.066 0.753 0.086 0.753 0.086 0.753 0.086 0.753 0.086 0.753 0.086 0.753 0.086 0.753 0.086 0.753 0.086 0.753 0.086 0.753 0.086 0.753 0.086
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ij	225.00	1.039	,	225.00	1.435	,	225.00	1.884
10	250.00	1.010	10	250.00	1.395	10	:50.00	1.431
:1	275.00	0.965	11	275.00	1.333	11	275.00	1.749
12	300.00	0.909	12	300.00	1.255	12	300.00	1.447
13	325.00	0.756	13	325.00	1.045	13	325.00 350.00	1.419
14	350.00	0.783	14	350.00		14 15	375.00	1.600
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16 17	400.00 425.00	1.039	16 17	425.00	1.539	17	425.00	2.020
18	450.00	1.114 1.192	18	450.00	1.647	18	450.00	2.161
19	475.00	1.162	19	475.00	1.604	19	475.00	2.106
20	500.00	1.060	20	500.00	1.463	20	500.00	1.921
21	525.00	0.963	21	525.00	1.329	21	525.00	1.745
22	550.00	0.943	22	550.00	1.302	22	550.00	1.709
ະນ	575.00	0.946	23	575.00	1.307	23	575.00 600.00	1.715 1.751
24	600.00	0.966	24	600.00	1.334	24	625.00	1.766
25	625.00	0.974	25	625.00	1.345	25 26	650.00	1.782
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28 29	725.00	0.916	29	725.00	1.265	29	725.00	:.560
36	750.00	0.798	30	750.00	1.102	30	750.00	1.417
31	775.00	0.635	31	775.00	<b>3.877</b>	31	775.00	1.151
32	800.00	0.701	32	800.00	0.968	33	800.90	1.270
33	125.00	0.517	33	125.00	0.715	33 34	825.00 150.00	0.641
34	<b>850.00</b>	0.354	34	850.00	0.4 <b>88</b> 0.319	35	875.00	0.416
35	875.00	0.231	35	875.00 900.00	0.301	36	900.00	0.396
36	900.00	0.218	36 37	125.00	0.290	37	925.00	0.381
37 38	925.00 950.00	0.210 0.139	37	750.00	0.275	30	950.00	8.362
39	975.00	0.187	<b>39</b>	975.00	0.258	39	975.00	0.338
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\$ NO 122345	25.00 50.00 75.00 100.00 125.00	1.678 2.045 1.262 0.906 0.994	\$ ND 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	2.237 2.727 1.682 1.208 1.326	1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	2.876 3.506 2.163 1.553 1.704
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\$ ND 12 2 3 4 5 6 7 8 9 10	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	1.678 2.045 1.678 2.045 1.762 0.906 0.994 1.104 1.178 1.235	\$ NO	25.00 50.00 75.00 100.00 125.00 175.00 200.00	2.237 2.237 2.727 1.682 1.206 1.326 1.472 1.571 1.647 1.674	1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 250.00 275.00	2.876 3.506 2.163 1.555 1.554 1.892 2.019 2.117 2.153 2.092 1.992
10 12 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00	11.678 2.045 1.262 0.906 0.994 1.104 1.178 1.235 1.256 1.220	\$ HD 1 2 3 3 4 5 6 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 255.00 200.00	2.237 2.237 2.727 1.682 1.206 1.326 1.472 1.571 1.647 1.627 1.555 1.464	1 2 3 4 5 6 7 8 9 10	01STNCS (FT) 25.00 50.00 75.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00	2.876 2.876 2.163 1.506 2.163 1.553 1.704 1.892 2.117 2.153 2.019 2.117 2.153 2.092 1.882
\$ ND 1 2 3 4 5 6 7 8 9 10 11 12 13	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 200.00 275.00 200.00 275.00	1.678 2.045 1.762 0.906 0.994 1.104 1.170 1.235 1.256 1.220 1.164 1.090 0.914	\$ NO 12 2 3 3 4 4 5 6 6 7 7 8 9 10 111 112 113	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 325.00	2.237 2.237 2.227 1.662 1.206 1.326 1.472 1.571 1.647 1.627 1.555 1.464 1.219	1 2 3 4 5 6 7 8 9 10 11 12 13	01STNC2 (FT) 25.00 50.00 75.00 100.00 125.00 150.00 225.00 205.00 275.00 300.00 325.00	2.876 2.876 2.506 2.163 1.553 1.704 1.892 2.019 2.117 2.153 2.092 1.992 1.567
\$ ND	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 250.00 275.00 300.00 125.00 150.00	1.678 2.045 1.262 0.906 0.994 1.178 1.235 1.236 1.220 1.166 1.090 0.914	\$ ND 1 2 2 3 3 4 5 5 6 7 7 8 9 10 11 12 12 13 14	DISTANCE (PT) 25.00 50.00 100.00 125.00 175.00 200.00 225.00 250.00 275.00 300.00 350.00	2.237 2.237 2.277 1.682 1.206 1.326 1.472 1.571 1.647 1.674 1.627 1.555 1.464 1.219	1 2 3 4 5 6 7 8 9 10 11 12 13	01STNC3 (PT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00 275.00 300.00 350.00	2.876 3.506 2.163 1.553 1.704 1.892 2.019 2.117 2.153 2.092 1.992 1.882 1.567 1.6421
\$ ND	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 235.00 300.00 135.00 135.00 135.00	1.678 2.045 1.205 1.205 0.906 0.994 1.104 1.215 1.226 1.226 1.220 0.914 0.914 0.914	\$ ND 1 2 3 3 4 4 5 6 6 7 7 8 9 10 11 12 13 14 15 15	DISTANCE (FT) 25.00 50.00 100.00 125.00 150.00 200.00 225.00 250.00 250.00 300.00 350.00 375.00	2.237 2.237 2.727 1.682 1.206 1.326 1.472 1.571 1.647 1.674 1.527 1.555 1.464 1.219 1.261	1 2 3 4 5 6 7 7 8 9 10 11 11 12 13 14	01STNC2 (FT) 25.00 50.00 75.00 100.00 125.00 150.00 225.00 205.00 275.00 300.00 325.00	2.876 2.876 2.506 2.163 1.553 1.704 1.892 2.019 2.117 2.153 2.092 1.992 1.567
\$ NO 12 2 3 4 5 6 7 8 9 10 111 122 113 114 115 116	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 190.00 225.00 225.00 225.00 225.00 300.00 325.00 305.00 305.00	1.678 2.045 1.262 0.906 0.994 1.104 1.178 1.235 1.256 1.200 1.166 1.0914 0.914 0.946 1.256	\$ PRO 1 2 3 3 4 4 5 6 6 7 7 8 9 9 10 11 12 13 14 15 16 16 16 16 16 16 16 16 16 16 16 16 16	DISTANCE (PT) 25.00 50.00 75.00 100.00 125.00 200.00 225.00 225.00 225.00 225.00 235.00 250.00 250.00 250.00 250.00	2.237 2.237 2.727 1.662 1.208 1.326 1.472 1.571 1.647 1.627 1.555 1.464 1.219 1.261 1.219	1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15	DISTNCS (FT) 25.00 50.00 75.00 100.00 125.00 100.00 225.00 200.00 225.00 300.00 375.00 390.00 390.00 375.00	2.876 3.506 2.163 1.553 1.704 1.892 2.019 2.117 2.153 2.092 1.992 1.582 1.542 1.421 1.828 2.153 2.309
\$ NO 11 22 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00 375.00 400.00 425.00	1.678 2.045 1.262 0.306 0.306 0.306 1.178 1.215 1.256 1.220 1.166 1.030 0.316 1.067 1.266 1.067	\$ ND 1 2 3 3 4 5 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 17	DISTANCE (PT) 25.00 50.00 100.00 125.00 175.00 200.00 225.00 225.00 275.00 300.00 400.00 400.00 425.00	(DCTR) (DCTR) 2.237 2.727 1.662 1.206 1.326 1.472 1.571 1.647 1.647 1.627 1.555 1.464 1.219 1.261 1.422 1.674	1 2 3 4 5 6 7 7 8 9 10 11 11 12 13 14	01.STMC3: (PT7 25.00 50.00 75.00 100.00 125.00 125.00 205.00 225.00 225.00 225.00 325.00 325.00 325.00 325.00 3400.00 400.00	2.876 1.506 2.163 1.553 1.704 1.872 2.117 2.153 2.092 1.547 1.682 1.547 1.621 1.828 2.153 2.153 2.470
\$ NO 11 22 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 205.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00	1.678 2.045 1.205 1.205 0.906 0.994 1.104 1.215 1.226 1.220 1.166 1.090 0.914 0.946 1.067 1.256 1.267	\$ ND 1 2 3 3 4 5 5 6 6 7 7 8 9 10 11 12 12 13 14 15 16 17 18	25.00 50.00 100.00 125.00 150.00 250.00 250.00 275.00 250.00 275.00 300.00 350.00 375.00 400.00 450.00	2.237 2.237 2.727 1.662 1.208 1.326 1.472 1.571 1.647 1.627 1.555 1.464 1.219 1.261 1.219	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 300.00 275.00 300.00 375.00 375.00 400.00 425.00 400.00 475.00	2.876 3.506 2.163 1.506 2.163 1.704 1.892 2.117 2.153 2.092 1.982 1.567 1.621 1.828 2.153 2.309 2.470
8 PD 12 23 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 125.00 225.00 225.00 225.00 235.00 305.00 375.00 400.00 425.00 450.00 473.00	1.678 2.045 1.262 0.306 0.306 0.306 1.178 1.215 1.256 1.220 1.166 1.030 0.316 1.067 1.266 1.067	\$ ND 1 2 3 3 4 5 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 17	DISTANCE (PT) 25.00 50.00 100.00 125.00 175.00 200.00 225.00 225.00 275.00 300.00 400.00 400.00 425.00	2.237 2.237 2.227 1.682 1.208 1.326 1.472 1.571 1.647 1.627 1.555 1.464 1.219 1.261 1.422 1.674 1.796 1.921 1.796	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	01.STMC3 (PT7 23.90 59.00 100.00 125.00 159.00 175.00 200.00 275.00 300.00 275.00 300.00 400.00 423.00 450.00 450.00 450.00	2.876 3.506 2.163 1.553 1.704 1.892 2.019 2.117 2.153 2.092 1.999 1.882 1.567 1.621 1.828 2.153 2.309 2.470 2.406 2.195
\$ NO 11 22 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 205.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00	1.678 2.045 1.252 0.906 0.994 1.104 1.215 1.225 1.220 1.166 1.098 0.914 0.946 1.067 1.256 1.347 1.441 1.404 1.281	\$ ND 12 2 3 3 4 4 5 5 6 6 7 7 8 9 110 112 112 113 114 115 116 117 118 119 200 221	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 200.00 215.00 300.00 215.00 400.00 450.00 450.00 450.00 500.00 525.00	2.237 2.227 2.727 1.682 1.206 1.326 1.472 1.571 1.647 1.674 1.627 1.555 1.464 1.219 1.201 1.422 1.674 1.796 1.921 1.872 1.971	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	01.STMC3 (PT7) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 300.00 275.00 300.00 375.00 400.00 425.00 450.00 475.00 500.00 500.00 500.00 500.00 500.00	2.876 3.506 2.163 1.553 1.704 1.892 2.117 2.153 2.092 1.999 1.882 1.567 1.621 1.828 2.133 2.309 2.470 2.406 2.195 1.994
\$ NO	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 235.00 235.00 475.00 475.00 500.00 525.00 550.00 550.00	02781 (DCS) 1.678 2.045 1.762 0.906 0.994 1.104 1.215 1.226 1.220 0.914 0.914 0.914 0.914 1.067 1.256 1.347 1.256 1.347 1.256 1.347 1.404 1.281 1.404	\$ PED 1 2 2 3 3 4 4 5 5 6 6 7 7 9 10 11 12 13 14 15 16 17 18 19 20 21 22 22 22 22 22 22 22 22 22 22 22 22	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 125.00 200.00 225.00 275.00 275.00 300.00 375.00 400.00 450.00 475.00 500.00 550.00	2.237 2.237 2.227 1.692 1.208 1.326 1.472 1.571 1.647 1.627 1.555 1.464 1.219 1.261 1.422 1.674 1.796 1.921 1.872 1.872	1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	01.STINC3 (PT) 25.00 50.00 75.00 100.00 125.00 100.00 225.00 225.00 275.00 300.00 375.00 375.00 400.00 425.00 400.00 425.00 500.00 500.00 500.00 500.00 500.00	2.876 3.506 2.163 1.553 1.704 1.872 2.117 2.153 2.072 1.982 1.567 1.682 2.153 2.309 2.406 2.153 2.406 2.195 1.994
\$ NO 12 2 3 3 4 4 5 5 6 7 7 8 9 9 10 111 122 13 14 15 16 17 18 19 20 21 22 23	25.00 50.00 50.00 100.00 125.00 150.00 175.00 200.00 225.00 275.00 300.00 325.00 475.00 400.00 475.00 500.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00 5	1.678 2.045 1.262 0.906 0.994 1.104 1.178 1.235 1.256 1.200 1.166 1.090 0.914 0.946 1.047 1.256 1.163 1.441 1.461 1.461 1.461 1.461	S ND 1 2 2 3 3 4 4 5 5 6 6 7 7 8 9 9 9 10 11 12 12 13 14 15 16 16 17 18 9 19 20 22 22 22 22 22 22 22 22 22 22 22 22	DISTANCE (PT) 25.00 50.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 225.00 235.00 300.00 400.00 475.00 450.00 475.00 500.00 550.00 575.00	22-237 2.237 2.227 1.662 1.208 1.326 1.472 1.571 1.647 1.627 1.555 1.464 1.219 1.261 1.422 1.796 1.921 1.921 1.921 1.921 1.921 1.921 1.921 1.921	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	01.STNC3 (PT7 25.00 50.00 100.00 125.00 150.00 175.00 200.00 275.00 300.00 275.00 300.00 400.00 425.00 475.00 500.00 550.00 550.00 575.00	2.876 3.506 2.163 1.553 1.704 1.892 2.019 2.117 2.153 2.092 1.567 1.621 1.828 2.153 2.309 2.470 2.406 2.195 1.994 1.954
\$ MO	DISTANCE (FT)  25.00 50.00 100.00 125.00 175.00 200.00 225.00 250.00 275.00 300.00 175.00 400.00 475.00 450.00 475.00 500.00 575.00 600.00	1.678 2.045 1.262 0.906 0.994 1.178 1.235 1.256 1.220 1.166 1.067 1.067 1.266 1.067 1.266 1.167 1.404 1.281 1.404 1.281 1.163 1.163	\$ ND	DISTANCE (PT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 300.00 275.00 300.00 400.00 450.00 450.00 450.00 550.00 550.00 550.00 550.00	2.237 2.237 2.727 1.682 1.206 1.326 1.472 1.571 1.647 1.674 1.427 1.555 1.464 1.219 1.201 1.422 1.674 1.796 1.921 1.872 1.971 1.872 1.575 1.570 1.571	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	01.STMC3 (PT7) 25.00 50.00 100.00 125.00 150.00 175.00 200.00 275.00 300.00 375.00 400.00 450.00 475.00 450.00 450.00 500.00 575.00 500.00 575.00 500.00	2.876 3.506 2.163 1.553 1.704 1.872 2.117 2.153 2.072 1.982 1.567 1.682 2.153 2.309 2.406 2.153 2.406 2.195 1.994
1 2 3 4 4 5 6 6 7 7 7 8 9 9 10 11 12 13 14 15 16 17 18 19 20 21 12 22 23 24 25 5	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00	02781 (DCS) 1.678 2.045 1.262 0.906 0.994 1.104 1.278 1.235 1.256 1.220 1.166 1.0914 0.914 0.914 0.914 1.281 1.163 1.164 1.163 1.164 1.163 1.163 1.164 1.163	\$ ND 12233445566777181122133224225	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00 175.00 400.00 475.00 400.00 525.00 650.00 675.00 675.00	2.237 2.237 2.727 1.682 1.206 1.326 1.472 1.571 1.647 1.674 1.674 1.674 1.219 1.301 1.422 1.674 1.725 1.726 1.921 1.921 1.921 1.921 1.921 1.921 1.921 1.921 1.921 1.921 1.921 1.921 1.921 1.921 1.921 1.921 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1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925 1.925	1 2 3 4 5 6 7 7 8 9 10 11 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 28 28 28 28 28 28 28 28 28 28 28 28	01.STMC3 (FT7) 25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 300.00 275.00 375.00 375.00 400.00 425.00 450.00 475.00 505.00 525.00 575.00 575.00 575.00 575.00 575.00	2.876 3.506 2.163 1.553 1.704 1.892 2.019 2.117 2.153 2.092 1.567 1.621 1.828 2.153 2.309 2.470 2.406 2.195 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 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2.019 2.117 2.153 2.092 1.567 1.828 2.153 2.309 2.470 2.406 2.195 1.994 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 1.954 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1.954 1.954 1.954

****	R SETTING	- 11 1	4 TIMER	AVERACE
S	DISTANCE	DEPTH	SETTING	DEPTH (IN)
NO	(FT)	(DICH)		
		1000	100	0.242
1	25.00	2.660	75	0.323
ż	50.00	4.462	60	0.403
j	75.00	2.753	50	0.484
i	100.00	1.976	42	0.576
Š	125.00	2.169	34	0.712
6	150.00	2.408	29	0.834
7	175.00	2.570	24	1.008
i	200.00	2.694	21	1.152
•	225.00	2.740	18	1.344
10	250.00	2.663	16	1.512
ii	275.00	2.544	14	1.728
12	300.00	2.395	ii	2.199
13	325.00	1.994	••	2000
14	350.00	2.063		
15	375.00	2.327		
16	400.00	2.740		
17	425.00	2.930		
18	450.00	3.144		
19	475.00	3.063		
20	500.00	2.794		
21	525.00	2.538		
22	550.00	2.487		
23	575.00	2.495		
24	600.00	2.546		
25	625.00	2.569		
26	650.00	2.592		
27	675.00	2.577		
28	700.00	2.524		
29	725.00	2.415		
30	750.00	2.105		
31	775.00	1.674		
32	800.00	1.847		
33	825.00	1.364		
34	850.00	0.932		
35	875.00	0.609		
36	900.00	0.576		
37	925.00	0.554		
38	950.00	0.526		
39	975.00	0.492		•
40	1000.00	0.449		
	•			

END GUN OFF WITH PURP N

TIME	R SETTING	a:00 a	*1167	SETTING	. 40 1	TIME	R SETTING	• 42 <b>1</b>
s	DISTANCE	DEPTH	s	DISTANCE	DEPTH	S	DISTANCE	CEPTH
.00	(22)	(DCM)	NC	(FT)	(1)(2)()	70	1871	( DICH)
:	25.00	2.418		25.00	0.697		25.00	0.996
i	50.00	3.507	ż	50.00	0.846	2	50.00	1.206
3	75.00	0.313	3	75.00	0.521	3	75.00	0.744
4	100.00	0.223	4	100.00	0.371	4 5	100.00 125.00	0.530 0.575
<u> </u>	125.00 150.00	C.243 0.271	5	125.00 150.00	0.4C5 0.452	,	150.00	0.646
,	175.00	0.290	7	175.00	0.483	7	175.00	0.690
8	200.00	0.306		200.00	0.510	•	200.00	0.728
9	225.00	0.308	9	225.00	0.514	,	225.00 250.00	0.734 0.714
10	250 <b>.00</b> 275 <b>.00</b>	0.300 0.291	10 11	250.00 275.00	0.500 0.4 <b>8</b> 5	10 11	275.00	0.692
11	300.00	0.272	12	300.00	. 0.454	12	300.00	0.649
ii	325.00	0.230	13	325.00	0.383	13	325.00	0.548
14	350.00	0.238	14	350.00	0.396	14	350.00	0.566 0.635
15	375.00	0.267	15	375.00	0.444 0.524	15 16	375.00 400.00	0.748
16 17	400.00 425.00	0.314 0.337	16 17	400.00 425.00	0.562	17	425.00	0.803
18	450.00	0.361	18	450.00	0.602	18	450.00	0.860
19	475.00	0.353	19	475.00	0.588	19	475.00	0.839 0.769
20	500.00	0.323	20	500.00	0.53 <b>8</b> 0.487	20 21	500.00 525.00	0.696
22 21	525.00 550.00	0.292 0.296	21 22	525.00 550.00	0.477	22	550.00	0.682
ž	575.00	0.288	23	575.00	0.479	23	575.00	0.685
24	600.00	0.294	24	600.00	0.490	24	600.00	0.700 0.707
25	625.00	J.297	25	625.00	0.495	25 26	625.00 650.00	0.707
26 27	650.00 675.00	0.302 4.300	26 27	650.00 675.00	0.503 0.500	27	675.00	0.715
28	700.00	0.292	28	700.00	0.487	28	700.00	0.696
29	725.00	0.275	29	725.00	0.459	29	725.00	0.655
30	750.00	0.239	30	750.00	0.398	30	750.00	0.569 0.452
31	775.00	0.190	37	775.00	0.316 0.235	31 32	775.00 800.00	0.335
32 33	800.00 825.00	0.141 0.087	32 33	800.00 825.00	0.144	ົລ	825.00	0.206
34	850.00	0.038	34	850.00	0.064	34	850.00	0.091
-		. 76 4	67.VE		- 60 9	THE	STTING	- 34 1
	R SETTING DISTANCE			SETTING DISTANCE	• 50 <b>1</b>	THE S	DISTANCE	CEPTM
TIME S NO	R SETTING DISTANCE (FT)	• 75 % DEPEN (DICN)	TIME S NO	R SETTING DISTANCE (FT)				
\$ 10	DISTANCE (FT)	(DICH)	S NO	DISTANCE (FT)	(DCH)	S NO	DISTANCE (FT)	(DICH)
NO -1	DISTANCE (FT) 25.00	(DICH) 0.558	5 NO 1	DISTANCE (FT) 25.00	0.837	S NO 1	DISTANCE	CEPTM
\$ 10	DISTANCE (FT)	(DICH)	S NO	25.00 50.00 75.00	(DCH)	S HO 1 2 3	25.00 50.00 75.00	1.231 1.492 0.919
S NO 123	25.00 50.00 75.00 100.00	0.558 0.677 0.417 0.297	\$ NO 1 2 3 4	25.00 50.00 75.00 100.00	0.837 1.015 0.625 0.445	S NO 1 2 3	25.00 50.00 75.00 100.00	1.231 1.492 0.919 0.655
S NO 123345	25.00 50.00 75.00 100.00 125.00	0.558 0.677 0.417 0.297 0.324	\$ ND 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	0.837 1.015 0.625 0.445 0.486	S NO 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	1.231 1.492 0.919 0.655 0.715
S NO 1 2 3 4 5 6	25.00 50.00 75.00 100.00 125.00 150.00	0.558 (DICS) 0.558 0.677 0.417 0.297 0.324 0.362	1 2 3 4 5	25.00 50.00 75.00 100.00 125.00 150.00	0.837 1.015 0.625 0.445 0.486 0.542	S NO 1 2 3	25.00 50.00 75.00 100.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.853
S NO 123345	25.00 50.00 75.00 100.00 125.00	0.558 0.677 0.417 0.297 0.324	\$ ND 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	0.837 1.015 0.625 0.445 0.486	S NO 1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00	02751 (DE30) 1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900
S NO 1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00	0.558 0.677 0.417 0.297 0.324 0.362 0.387 0.408 0.411	1 2 2 4 5 6 7 8	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00	0.837 1.015 0.625 0.445 0.446 0.542 0.590 0.612 0.617	S HO 1 2 3 4 5 6 7 8	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900 0.907
\$ NO 1 2 3 4 5 6 7 8 9 10	DISTRICE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	0.558 0.677 0.417 0.297 0.324 0.362 0.387 0.408 0.411 0.400	1 2 2 4 5 6 7 8	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	0.837 1.015 0.625 0.445 0.446 0.542 0.590 0.612 0.617	S NO 1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900 0.907 0.882
\$ NO 1 2 3 4 5 6 7 8 9 10 11	DISTRICE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00	0.558 0.677 0.417 0.297 0.362 0.362 0.387 0.408 0.411 2.400 0.388	1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 275.00	0.837 1.015 0.625 0.445 0.542 0.590 0.612 0.617 0.600 0.582	S NO 1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 130.00 175.00 200.00 225.00 275.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900 0.907
\$ NO 1 2 3 4 5 6 7 8 9 10	DISTRICE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	0.558 0.677 0.417 0.297 0.324 0.362 0.387 0.408 0.411 0.400	1 2 2 4 5 6 7 8	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 3125.00	0.837 1.015 0.625 0.445 0.446 0.542 0.590 0.612 0.617	S NO 1 2 3 4 5 6 7 7 8 9 10 11 12 13	25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 250.00 275.00 300.00 325.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.803 0.907 0.882 0.805 0.801
S NO 12 3 4 5 6 7 8 9 10 11 11 11 11 11 11 11 11 11 11 11 11	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 205.00 225.00 275.00 300.00 325.00 350.00	0.558 0.677 0.417 0.297 0.324 0.362 0.387 0.408 0.411 2.400 0.388 0.363 0.307	1 1 2 2 4 5 6 7 8 9 10 11 12 13	25.00 50.00 75.00 100.00 125.00 150.00 175.00 205.00 225.00 250.00 275.00 300.00 325.00	0.837 1.015 0.625 0.445 0.542 0.540 0.612 0.617 0.600 0.582 0.545 0.466 0.476	S NO 1 2 3 4 5 6 7 8 9 10 11 12 13	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 275.00 300.00 325.00 325.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.907 0.882 0.801 0.677 0.700
S NO 12 3 4 5 6 7 8 9 10 11 11 11 11 11 11 11 11 11 11 11 11	DISTRICE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 225.00 235.00 335.00 375.00	0.558 0.677 0.417 0.297 0.362 0.362 0.387 0.408 0.411 2.400 0.388 0.363 0.363 0.363 0.363	1 2 2 3 4 5 6 7 8 9 10 11 12 13 14 15	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 275.00 300.00 350.00 375.00	0.837 1.015 0.625 0.445 0.542 0.540 0.612 0.617 0.600 0.582 0.545 0.460 0.533	S NO 12 2 3 3 4 4 5 6 7 7 8 9 9 10 11 12 13 14 15	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 275.00 300.00 315.00 375.00	(DICH) 1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784
S NO 12 2 3 4 5 6 7 8 9 10 11 12 13 11 4 15 16	DISTRICE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 205.00 225.00 225.00 300.00 325.00 375.00 400.00	0.558 0.677 0.417 0.297 0.362 0.362 0.362 0.363 0.408 0.411 2.400 0.388 0.363 0.307 0.307	1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 250.00 250.00 300.00 355.00 375.00 400.00	0.837 1.015 0.625 0.445 0.542 0.590 0.612 0.617 0.600 0.582 0.545 0.460 0.476 0.573 0.628	S NO 12 2 3 3 4 4 5 5 6 6 7 8 9 10 11 112 113 114 115 116	25.00 50.00 75.00 100.00 125.00 150.00 205.00 250.00 250.00 250.00 350.00 375.00 400.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.907 0.882 0.801 0.677 0.700
S NO 12 3 4 5 6 7 8 9 10 11 11 11 11 11 11 11 11 11 11 11 11	DISTRICE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 225.00 235.00 335.00 375.00	0.558 0.677 0.417 0.297 0.362 0.362 0.387 0.408 0.411 2.400 0.388 0.363 0.363 0.363 0.363	1 2 2 3 4 5 6 7 8 9 10 11 12 13 14 15	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 275.00 300.00 350.00 375.00	0.837 1.015 0.625 0.445 0.542 0.540 0.612 0.617 0.600 0.582 0.545 0.460 0.533	S NO 1 2 3 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 275.00 300.00 350.00 375.00 400.00 425.00 425.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.803 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.924 0.992 1.063
S NO 12 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	DISTRICE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 275.00 300.00 375.00 400.00 400.00 475.00	0.558 0.677 0.417 0.297 0.362 0.387 0.408 0.411 0.400 0.388 0.363 0.363 0.363 0.419 0.419 0.450 0.450 0.470	1 2 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	25.00 50.00 75.00 100.00 125.00 150.00 205.00 225.00 225.00 225.00 300.00 350.00 375.00 400.00 405.00 475.00	0.837 1.015 0.625 0.445 0.542 0.540 0.612 0.617 0.600 0.582 0.545 0.460 0.533 0.628 0.675 0.723	S NO 12 2 3 3 4 4 5 6 7 7 8 9 9 10 11 12 13 14 15 16 17 18 19 19	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 250.00 275.00 300.00 350.00 400.00 450.00 475.00	(DICH) 1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.924 0.992 1.063 1.037
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 250.00 350.00 350.00 400.00 425.00 450.00 475.00 500.00	0.558 0.677 0.417 0.297 0.362 0.362 0.362 0.363 0.408 0.411 0.400 0.363 0.363 0.363 0.363 0.363 0.363 0.363 0.363 0.363 0.363 0.363 0.364 0.364 0.364 0.364 0.364 0.365 0.367 0.356 0.419 0.450 0.469	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 350.00 375.00 400.00 425.00 475.00 500.00	0.837 1.015 0.435 0.445 0.542 0.582 0.617 0.600 0.542 0.545 0.460 0.476 0.533 0.628 0.675 0.723 0.725	S NO 12 2 3 3 4 4 5 6 7 7 8 9 9 10 11 12 13 14 15 16 17 18 19 20	25.00 50.00 75.00 125.00 125.00 125.00 125.00 200.00 225.00 225.00 225.00 300.00 325.00 350.00 350.00 400.00 425.00 475.00 500.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.803 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.992 1.063 1.037 0.950
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	25.00 50.00 75.00 100.00 125.00 150.00 175.00 205.00 225.00 225.00 225.00 235.00 350.00 350.00 405.00 455.00 455.00 505.00	0.558 0.677 0.417 0.297 0.324 0.362 0.387 0.408 0.411 0.400 0.388 0.307 0.354 0.307 0.354 0.470 0.482 0.470 0.482 0.470 0.481	1 2 2 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 250.00 350.00 350.00 350.00 400.00 425.00 450.00 450.00 450.00 500.00 500.00 500.00	0.837 1.015 0.625 0.486 0.542 0.580 0.617 0.600 0.512 0.617 0.600 0.582 0.545 0.460 0.476 0.533 0.675 0.723 0.723	S NO 1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 20 21	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 250.00 275.00 300.00 350.00 400.00 450.00 475.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.924 0.992 1.063 1.037 0.950 0.859
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 250.00 350.00 350.00 400.00 425.00 450.00 475.00 500.00	0.558 0.677 0.417 0.297 0.362 0.362 0.362 0.363 0.408 0.411 0.400 0.363 0.363 0.363 0.363 0.363 0.363 0.363 0.363 0.363 0.363 0.363 0.364 0.364 0.364 0.364 0.364 0.365 0.367 0.356 0.419 0.450 0.469	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 350.00 375.00 400.00 425.00 475.00 500.00	0.837 1.015 0.625 0.425 0.446 0.542 0.590 0.617 0.600 0.582 0.545 0.476 0.533 0.628 0.675 0.723 0.705 0.646 0.573 0.755	S NO 12 23 3 4 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 275.00 300.00 375.00 400.00 425.00 405.00 475.00 500.00 500.00 575.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.803 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.924 0.992 1.063 1.037 0.950 0.859
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 225.00 235.00 350.00 350.00 425.00 450.00 475.00 450.00 475.00 500.00 555.00 555.00 575.00	0.558 0.677 0.417 0.227 0.324 0.362 0.362 0.363 0.408 0.411 0.400 0.363 0.363 - 0.307 0.317 0.356 0.419 0.450 0.482 0.450 0.482 0.482 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.483 0.48	1 2 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 250.00 250.00 255.00 350.00 350.00 455.00 450.00 475.00 550.00 555.00 550.00 575.00 600.00	0.837 1.015 0.485 0.445 0.542 0.582 0.617 0.600 0.612 0.617 0.600 0.582 0.545 0.476 0.533 0.628 0.675 0.723 0.723 0.723 0.723 0.723 0.723 0.723 0.723 0.723 0.723 0.723	S NO ———————————————————————————————————	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 250.00 275.00 350.00 375.00 400.00 425.00 425.00 450.00 475.00 500.00 575.00 575.00 600.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.803 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.992 1.063 1.037 0.950 0.859 0.846
S NO 1 2 3 4 5 6 6 7 8 9 10 111 112 113 114 115 116 117 118 119 220 21 22 23 114 25	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 225.00 225.00 235.00 325.00 325.00 405.00 455.00 455.00 555.00 550.00 555.00 600.00 625.00	0.558 0.677 0.417 0.297 0.324 0.362 0.387 0.408 0.411 0.400 0.388 0.307 0.317 0.356 0.419 0.450 0.482 0.470 0.482 0.470 0.481 0.390 0.383 0.390 0.383	S NO 1 2 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 250.00 350.00 350.00 350.00 400.00 425.00 450.00 450.00 550.00 550.00 550.00 600.00 625.00	0.837 1.015 0.625 0.486 0.542 0.560 0.617 0.600 0.582 0.545 0.460 0.476 0.533 0.623 0.675 0.723 0.723 0.755 0.584 0.573 0.575 0.588	S NO ———————————————————————————————————	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 250.00 350.00 350.00 405.00 450.00 450.00 450.00 505.00 550.00 550.00 550.00 550.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.992 1.063 1.037 0.959 0.859
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 14 15 16	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 205.00 275.00 275.00 305.00 375.00 405.00 475.00 500.00 525.00 575.00 600.00 625.00 625.00 625.00	0.558 0.677 0.417 0.227 0.324 0.362 0.387 0.400 0.411 0.400 0.388 0.317 0.354 0.307 0.317 0.354 0.470 0.482 0.470 0.482 0.470 0.383 0.392 0.383	S NO 1 2 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 1575.00 205.00 225.00 225.00 235.00 350.00 375.00 405.00 475.00 500.00 550.00 575.00 600.00 625.00 650.00	0.837 1.015 0.625 0.486 0.542 0.580 0.617 0.600 0.582 0.545 0.460 0.723 0.705 0.646 0.573 0.705 0.646 0.573 0.705 0.646 0.573 0.705	S NO 11 22 33 44 5 6 7 7 8 9 10 11 112 113 114 115 116 117 118 119 220 221 221 222 223 224 225 226	25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 275.00 305.00 375.00 405.00 475.00 450.00 475.00 505.00 575.00 600.00 625.00 625.00 625.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.803 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.992 1.063 1.037 0.950 0.859 0.846
S NO 1 2 3 4 5 6 6 7 8 9 10 112 123 14 15 16 17 18 19 20 21 22 23 14 25 16 17 18 17 18 19 20 16 17 18 19 19 20 16 17 18 19 19 20 16 17 18 19 19 20 16 17 18 19 19 20 16 17 18 19 19 20 16 17 18 19 19 20 16 16 17 18 19 19 20 16 16 17 18 19 19 20 16 17 18 19 19 20 16 16 17 18 19 19 20 16 16 16 16 16 16 16 16 16 16 16 16 16	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 225.00 225.00 235.00 325.00 325.00 405.00 455.00 455.00 555.00 550.00 555.00 600.00 625.00	0.558 0.677 0.417 0.297 0.324 0.362 0.387 0.408 0.411 0.400 0.388 0.307 0.317 0.356 0.419 0.450 0.482 0.470 0.482 0.470 0.481 0.390 0.383 0.390 0.383	S NO 1 2 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 250.00 350.00 350.00 350.00 400.00 425.00 450.00 450.00 550.00 550.00 550.00 600.00 625.00	0.837 1.015 0.637 1.015 0.645 0.446 0.542 0.582 0.617 0.600 0.582 0.675 0.466 0.476 0.533 0.628 0.675 0.723 0.705 0.584 0.573 0.573 0.588 0.594 0.594 0.594 0.594	S NO ———————————————————————————————————	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 130.00 125.00 250.00 250.00 250.00 350.00 350.00 450.00 450.00 450.00 450.00 550.00 550.00 550.00 650.00 650.00 675.00 675.00	02731 (DC30) 1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.992 1.063 1.037 0.950 0.859 0.846 0.864 0.864 0.864
S NO 12 3 4 5 6 7 8 9 10 112 13 14 15 6 17 18 19 20 21 22 23 14 25 16 27 13 19	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 225.00 325.00 325.00 350.00 405.00 455.00 455.00 550.00 550.00 555.00 655.00 655.00 675.00 725.00	0.558 0.677 0.417 0.297 0.324 0.362 0.387 0.408 0.411 0.400 0.388 0.307 0.317 0.356 0.419 0.450 0.482 0.470 0.482 0.470 0.383 0.390 0.383 0.390 0.392 0.392 0.396 0.402 0.402 0.403 0.396	1 2 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 20 20 21 22 22 23 24 24 25 26 26 27 28 28 28 28 28 28 28 28 28 28 28 28 28	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 225.00 235.00 350.00 355.00 400.00 425.00 450.00 450.00 650.00 655.00 655.00 675.00 675.00 705.00 725.00	0.837 1.015 0.625 0.486 0.542 0.580 0.617 0.600 0.582 0.545 0.460 0.476 0.533 0.628 0.675 0.723 0.705 0.546 0.594 0.573 0.575 0.588 0.594 0.594 0.594	S NO 11 22 33 44 5 66 77 8 9 100 111 112 113 114 115 116 117 118 119 220 21 22 213 224 25 226 27 28 29 29	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 235.00 300.00 325.00 400.00 425.00 450.00 450.00 500.00 500.00 600.00 600.00 650.00 675.00 775.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.992 1.063 1.037 0.950 0.859 0.842 0.859 0.846 0.873 0.888 0.883 0.883
S NO 1234 5 6 7 8 9 10 112 113 114 115 116 117 118 119 22 122 124 125 127 129 120 120 120 120 120 120 120 120 120 120	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 225.00 235.00 375.00 400.00 475.00 475.00 500.00 525.00 650.00 675.00 675.00 750.00	0.558 0.677 0.417 0.227 0.324 0.362 0.387 0.408 0.411 0.400 0.388 0.317 0.354 0.307 0.317 0.356 0.419 0.450 0.482 0.470 0.482 0.470 0.383 0.390 0.382 0.392 0.392 0.392 0.392 0.392	1 2 2 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 27 28 29 20 21 21 22 23 24 24 25 26 27 28 28 29 29 20 20 20 20 20 20 20 20 20 20 20 20 20	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 1575.00 205.00 225.00 225.00 235.00 350.00 375.00 405.00 475.00 500.00 525.00 650.00 675.00 675.00 750.00 750.00	0.837 1.015 0.625 0.486 0.542 0.580 0.617 0.600 0.582 0.545 0.460 0.575 0.460 0.575 0.723 0.705 0.646 0.573 0.575 0.584 0.573 0.575 0.584 0.573 0.575 0.584 0.573 0.575	S NO 12 23 34 45 66 77 8 9 10 11 112 13 114 115 116 117 118 119 20 21 22 23 24 25 26 27 28 29 30 30	25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 225.00 275.00 325.00 325.00 325.00 400.00 425.00 450.00 475.00 505.00 575.00 600.00 625.00 625.00 625.00 675.00 750.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.924 0.924 0.950 0.859 0.842 0.859 0.842 0.863 1.037 0.863 1.037 0.863
S NO 1234 5 6 7 8 9 10 112 113 114 115 116 117 118 119 22 122 124 125 127 129 120 120 120 120 120 120 120 120 120 120	DISTRICE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 300.00 325.00 375.00 400.00 475.00 400.00 475.00 500.00 575.00 600.00 650.00 650.00 675.00 700.00 750.00	0.558 0.677 0.417 0.297 0.382 0.387 0.408 0.401 0.400 0.383 0.307 0.317 0.356 0.419 0.459 0.459 0.482 0.470 0.431 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392 0.383 0.392	1 2 2 4 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 30 31 31 31 31 31 31 31 31 31 31 31 31 31	25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 225.00 235.00 300.00 375.00 400.00 425.00 450.00 475.00 500.00 575.00 600.00 650.00 675.00 700.00 775.00	0.837 1.015 0.625 0.445 0.580 0.625 0.446 0.542 0.580 0.617 0.600 0.582 0.646 0.525 0.466 0.583 0.628 0.675 0.723 0.705 0.646 0.594 0.594 0.594 0.594 0.594 0.594 0.594	S NO 12 23 34 45 66 77 8 9 10 11 12 13 14 15 166 17 7 18 19 20 21 22 23 24 25 26 27 28 29 30 31	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 235.00 300.00 325.00 400.00 425.00 450.00 450.00 500.00 500.00 600.00 600.00 650.00 675.00 775.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.992 1.063 1.037 0.950 0.859 0.842 0.859 0.846 0.873 0.888 0.883 0.883
S NO 12 3 4 5 6 7 8 9 10 112 13 14 15 6 17 18 19 20 21 22 23 14 25 16 27 13 19	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 225.00 235.00 375.00 400.00 475.00 475.00 500.00 525.00 650.00 675.00 675.00 750.00	0.558 0.677 0.417 0.227 0.324 0.362 0.387 0.408 0.411 0.400 0.388 0.317 0.354 0.307 0.317 0.356 0.419 0.450 0.482 0.470 0.482 0.470 0.383 0.390 0.382 0.392 0.392 0.392 0.392 0.392	1 2 2 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 27 28 29 20 21 21 22 23 24 24 25 26 27 28 28 29 29 20 20 20 20 20 20 20 20 20 20 20 20 20	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 1575.00 205.00 225.00 225.00 235.00 350.00 375.00 405.00 475.00 500.00 525.00 650.00 675.00 675.00 750.00 750.00	0.837 1.015 0.625 0.486 0.542 0.580 0.617 0.600 0.582 0.545 0.460 0.575 0.460 0.575 0.723 0.705 0.646 0.573 0.575 0.584 0.573 0.575 0.584 0.573 0.575 0.584 0.573 0.575	S NO 12 23 34 45 66 77 8 9 10 11 112 13 114 115 116 117 118 119 20 21 22 23 24 25 26 27 28 29 30 30	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 275.00 300.00 375.00 400.00 425.00 425.00 450.00 475.00 500.00 575.00 600.00 675.00 700.00 775.00	1.231 1.492 0.919 0.655 0.715 0.798. 0.853 0.900 0.907 0.882 0.855 0.801 0.677 0.700 0.784 0.924 0.924 0.925 1.063 1.037 0.950 0.842 0.846 0.846 0.846 0.864 0.863 0.883 0.883

7116	R SETTING	• 29 1	7196	R SETTING	• 21 \$		שודדנו א	• 16 1
s	CISTANCE	CEPTH	3	DISTANCE	HITCH	S NO	DISTANCE.	) HTGSC (HCH1)
.00	(FT)	INON	NO	(FT)	(1)(0)()			121-011
	25.00	1.443		25.00	:.992	1	25.00	2.615
:	50.00	1.750	:	50.00	2.416	2	50.00	3.171
3	75.00	1.078	ž	75.00	1.488	3	75.00	1.954
4	:00.00	C.768	4	100.00	060	4	125.00	1.392
•	:25.00	0.838	5	125.00	1.157	į	150.00	1.695
•	150.00	0.935	6	150.00	1.291 1.381	•	1.5.00	1.812
:	175.00 200.00	:.000 :.055	í	175.00 200.00	1.457	•	200.00	1.912
3	225.00	1.063	ij	225.00	1.468	•	:25.00	1.927
10	250.00	1.034	10	250.00	1.427	10	250.00	1.873
11	275.00	1.003	11	275.00	1.385	11	275.00 300.00	1.818
12	300.00	0.939	12	300.00	1.297 1.095	12 13	325.00	1.438
13	325.00	0.793	13	325.00 350.00	1.133	14	350.00	1.487
14 15	350.00 375.00	0.820 0.919	14 15	375.00	1.270	15	375.00	1.667
16	400.00	1.083	16	400.00	1.496	16	400.00	1.963
17	425.00	1.163	17	425.00	1.606	17	425.00	2.108 2.258
18	450.00	1.246	18	450.00	1.720	18	450.00 475.00	2.203
19	475.00	1.216	19	475.00 500.00	1.679 1.538	19 20	500.00	2.019
20 21	500.00 525.00	1-114 1.007	20 21	525.00	1.391	21	525.00	1.826
22	550.00	0.987	22	550.00	1.363	22	550.00	1.789
23	575.00	0.991	23	575.00	1.369	23	575.00	1.797 1.837
24	600.00	1.013	24	600.00	1.399	24 25	600.00 625.00	1.855
25	625.00	1.024	25	625.00	1.414 1.437	26	650.00	1.886
26 27	650.00 675.00	1.041	26 27	650.00 675.00	1.430	27	675.00	1.876
21	700.00	1.008	:	700.00	1.392	28	700.00	1.826
29	725.00	0.949	29	725.00	1.311	23	725.00	1.721
30	750.00	0.824	30	750.00	1.138	30 31	750.00 775.00	1.493 1.185
31	775.00	0.654	31	775.00	0.903 0.671	32	800.00	0.880
32	800.00	0.486 0.299	32 33	800.00 825.00	0.413	33	825.00	0.542
33 34	825.00 850.00	0.132	34	850.00	0.183	34	850.00	0.240
••		******						
						-114		- 14 9
	STTDG			R SETTING			DISTANCE	- 14 % DEPTH
S	DISTANCE	DEPTH	S	DISTANCE	DEPTH	TDG S NO	R SETTING DISTRICE (FT)	
					(DCH)	\$ 110	OISTANCE (FT)	(DCH)
\$ 10	DISTANCE (PT) 25.00	(DICH) 1.743	S NO 1	OISTANCE (PT) 25.00	(DICH) 2.324	\$ 10	OISTANCE (FT) 25.00	(DICH) 2.988
NO 1 2	DISTANCE (PT) 25.00 50.00	1.743 2.114	5 NO 1 2	25.00 50.00	(DICH) 2.324 2.819	\$ 10 1 2	25.00 50.00	(DCH)
\$ NO 1 2	25.00 50.00 75.00	1.743 2.114 1.302	\$ ND 1 2 3	25.00 50.00 75.00	2.324 2.819 1.737	\$ 10	OISTANCE (FT) 25.00	2.988 3.624 2.233 1.591
1 2 3	25.00 50.00 75.00 100.00	1.743 2.114 1.302 0.928	5 NO 1 2 3	25.00 50.00 75.00 100.00	(DICH) 2.324 2.819	1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	2.988 3.624 2.233 1.591 1.736
S 10 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	1.743 2.114 1.302 0.928 1.013	\$ ND 1 2 3	25.00 50.00 75.00	2.324 2.819 1.737 1.237 1.350 1.507	1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	2.968 3.624 2.233 1.591 1.736 1.937
1 2 3	25.00 50.00 75.00 100.00 125.00 150.00 175.00	DEPTH (DICH) 1.743 2.114 1.302 0.928 1.013 1.130 1.208	S NO 1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00 175.00	2.324 2.819 1.737 1.237 1.350 1.507 1.611	1 2 3 4 5 6	25.00 50.00 75.00 100.00 125.00 150.00 175.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071
\$ NO	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00	1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275	1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00	2.324 2.819 1.737 1.237 1.350 1.507 1.611 1.700	\$ NO	25.00 50.00 75.00 100.00 125.00 175.00 200.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185
1 2 3 4 5 6 7 8	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00	1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285	5 NO 1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00	2.324 2.819 1.737 1.237 1.350 1.507 1.611 1.700 1.713	\$ HO 1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00 175.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071
1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	DEPTH (DICH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249	S NO 1 2 3 4 5 6 7 7 8 9 10	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	2.324 2.819 1.737 1.237 1.350 1.507 1.611 1.700	\$ NO	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077
\$ NO 1 2 3 4 5 6 7 7 8 9 10 11	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 275.00	DEPTH (DICH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212	5 NO 1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 250.00 275.00 300.00	2.324 2.819 1.737 1.237 1.507 1.611 1.700 1.713 1.665 1.616 1.514	\$ NO 1 2 3 3 4 4 5 6 6 7 7 8 9 100 111 112	25.00 50.00 75.00 100.00 125.00 150.00 275.00 225.00 250.00 275.00 300.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946
1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	DEPTH (DIGH)  1.743 2-114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959	S NO 1 2 3 3 4 5 6 6 7 7 8 9 10 11 12 13 13	25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 250.00 275.00 300.00 325.00	2.324 2.819 1.737 1.237 1.350 1.507 1.611 1.700 1.713 1.665 1.514 1.278	\$ NO 12 13 13 13 13 13 13 13 13 13 13 13 13 13	25.00 50.00 75.00 100.00 125.00 125.00 225.00 225.00 235.00 235.00 235.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946
5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 275.00 300.00 325.00	DEPTH (DICH) 1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991	S NO 1 2 3 3 4 5 6 7 7 8 9 10 11 12 13 13 14	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 275.00 300.00 325.00	2.324 2.819 1.737 1.237 1.350 1.507 1.611 1.700 1.713 1.665 1.616 1.278 1.322	S NO 1 2 3 4 5 6 7 7 8 9 10 11 12 13	25.00 50.00 75.00 100.00 175.00 200.00 275.00 275.00 275.00 305.00 355.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	25.00 50.00 75.00 100.00 125.00 125.00 200.00 225.00 225.00 225.00 250.00 275.00 300.00 350.00	DEPTH (DICH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111	S NO 1 2 3 3 4 4 5 6 7 7 8 9 9 10 11 12 13 14 15 15	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 250.00 275.00 300.00 350.00	2.324 2.819 1.737 1.237 1.350 1.507 1.611 1.700 1.713 1.665 1.514 1.278 1.322 1.481	\$ NO 12 13 13 13 13 13 13 13 13 13 13 13 13 13	25.00 50.00 75.00 100.00 125.00 125.00 225.00 225.00 235.00 235.00 235.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.995
5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 125.00 250.00 225.00 225.00 235.00 330.00 335.00 375.00 375.00	DEPTH (DIGH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309	S NO 1 2 3 3 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16	25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 250.00 275.00 300.00 300.00 300.00 300.00	(DCF) (DCF) 2.324 2.819 1.737 1.237 1.350 1.507 1.611 1.700 1.713 1.665 1.616 1.514 1.278 1.322 1.481 1.745	S NO 1 2 3 4 5 6 7 8 9 9 10 11 12 13 14 15	25.00 50.00 75.00 100.00 125.00 125.00 225.00 225.00 225.00 235.00 305.00 315.00 315.00 315.00 315.00 315.00 315.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.905 2.244 2.409
5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 350.00 350.00 375.00 400.00 425.00	DEPTH (DIGH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405	S NO 1 2 3 3 4 4 5 6 7 7 8 9 9 10 11 12 13 14 15 15	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 235.00 305.00 375.00 400.00 425.00 425.00	2.324 2.819 1.737 1.237 1.350 1.507 1.611 1.700 1.713 1.665 1.616 1.278 1.322 1.481 1.745 1.874 2.007	S NO 1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18	25.00 50.00 75.00 100.00 175.00 200.00 275.00 275.00 275.00 305.00 305.00 3150.00 405.00 405.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.905 2.244 2.409 2.580
5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 125.00 250.00 225.00 225.00 235.00 330.00 335.00 375.00 375.00	DEPTH (DICH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.505 1.469	S NO 1 2 3 3 4 4 5 6 7 7 8 9 9 9 10 11 12 13 14 15 16 17 18 19	25.00 50.00 75.00 100.00 125.00 150.00 205.00 225.00 225.00 255.00 300.00 375.00 400.00 425.00 400.00 475.00	2.324 2.819 1.737 1.350 1.507 1.611 1.700 1.713 1.645 1.616 1.514 1.278 1.322 1.481 1.745 1.874 2.007 1.959	\$ NO	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 235.00 255.00 275.00 300.00 315.00 400.00 425.00 475.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.905 2.244 2.409 2.580 2.518
S NO 1 2 3 4 4 5 6 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 125.00 250.00 225.00 225.00 235.00 350.00 350.00 375.00 400.00 425.00 450.00 475.00 500.00	DEPTH (DICH)  1.743 2-114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.505 1.469 1.346	S NO 1 2 3 3 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20	25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 250.00 250.00 300.00 300.00 300.00 400.00 475.00 475.00 500.00	(DCF) (DCF) 2.324 2.819 1.737 1.237 1.507 1.611 1.700 1.713 1.665 1.616 1.514 1.278 1.322 1.481 1.745 1.874 2.007 1.959 1.795	\$ NO 1 2 3 3 4 4 5 6 6 7 7 8 9 10 112 12 13 14 15 16 17 18 19 20	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 235.00 235.00 235.00 245.00 405.00 405.00 405.00 405.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.905 2.244 2.409 2.580 2.518
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 235.00 350.00 375.00 400.00 450.00 450.00 450.00 450.00 450.00 500.00 525.00	DEPTH (DIGH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.505 1.469 1.346	S NO 1 2 3 3 4 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 225.00 250.00 300.00 300.00 350.00 400.00 425.00 450.00 450.00 500.00 500.00	(DCF) (DCF) 2.324 2.819 1.737 1.237 1.350 1.507 1.611 1.700 1.713 1.665 1.514 1.278 1.322 1.481 1.745 1.874 2.007 1.959 1.959 1.795 1.623	\$ NO 12 2 3 3 4 4 5 6 6 7 7 8 9 10 11 12 13 114 115 116 117 118 119 20 21	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 235.00 255.00 275.00 300.00 315.00 400.00 425.00 475.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.905 2.244 2.409 2.580 2.518 2.307 2.087
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 225.00 275.00 300.00 325.00 375.00 400.00 425.00 475.00 500.00 550.00	DEPTH (DICH) 1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.469 1.346 1.217 1.193	S NO 1 2 3 3 4 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 250.00 250.00 300.00 300.00 300.00 400.00 475.00 475.00 500.00	(DCF) (DCF) 2.324 2.819 1.737 1.237 1.507 1.611 1.700 1.713 1.665 1.616 1.514 1.278 1.322 1.481 1.745 1.874 2.007 1.959 1.795	\$ NO 1 2 3 3 4 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 235.00 305.00 315.00 405.00 475.00 500.00 525.00 500.00 555.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.649 1.905 2.244 2.409 2.580 2.518 2.307 2.087 2.087
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 235.00 350.00 375.00 400.00 450.00 450.00 450.00 450.00 450.00 500.00 525.00	DEPTH (DIGH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.505 1.469 1.346	S NO 1 2 3 3 4 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	25.00 50.00 75.00 125.00 150.00 175.00 200.00 225.00 250.00 250.00 350.00 350.00 450.00 450.00 450.00 550.00 550.00 550.00	(DCF) (DCF) 2.324 2.819 1.737 1.350 1.507 1.611 1.700 1.713 1.665 1.514 1.278 1.322 1.481 1.481 1.475 1.874 2.007 1.959 1.590 1.590 1.590 1.597 1.623	\$ NO	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 235.00 325.00 450.00 450.00 450.00 550.00 550.00 550.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.905 2.244 2.409 2.580 2.518 2.307 2.087 2.045 2.097
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 235.00 350.00 375.00 400.00 425.00 450.00 475.00 500.00 555.00 555.00 555.00 600.00 6025.00	DEPTH (DIGH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.505 1.469 1.3146 1.217 1.198 1.198 1.224 1.237	S NO 1 2 3 3 4 4 5 6 6 7 7 8 9 10 11 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 225.00 250.00 300.00 300.00 300.00 400.00 425.00 475.00 500.00 500.00 500.00 500.00 500.00 600.00 600.00	(DCF) (DCF) 2.324 2.819 1.737 1.350 1.507 1.611 1.700 1.713 1.665 1.514 1.278 1.322 1.481 1.278 1.322 1.481 1.745 1.874 2.007 1.959 1.795 1.623 1.590 1.597 1.633 1.649	\$ NO 12 2 3 3 4 4 5 5 6 6 7 7 8 9 10 11 12 13 114 115 116 117 118 119 220 22 23 24 25	25.00 50.00 75.00 100.00 125.00 125.00 225.00 225.00 225.00 225.00 300.00 325.00 450.00 450.00 450.00 550.00 550.00 550.00 550.00 550.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.905 2.244 2.409 2.580 2.518 2.307 2.087 2.045 2.054 2.099 2.120
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 235.00 235.00 375.00 400.00 425.00 475.00 500.00 525.00 575.00 600.00 625.00 650.00	DEPTH (DICH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.505 1.469 1.346 1.217 1.193 1.198 1.224 1.237 1.257	S NO 1 2 3 3 4 4 5 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 225.00 300.00 375.00 400.00 475.00 475.00 500.00 575.00 600.00 625.00 625.00 650.00	(DCF) (DCF) 2.324 2.819 1.737 1.350 1.507 1.611 1.700 1.713 1.645 1.514 1.278 1.322 1.481 1.745 1.674 2.007 1.959 1.795 1.623 1.590 1.597 1.633 1.649 1.676	\$ NO	25.00 50.00 75.00 100.00 175.00 175.00 250.00 275.00 300.00 275.00 350.00 350.00 475.00 475.00 500.00 555.00 575.00 605.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.905 2.244 2.409 2.580 2.518 2.307 2.087 2.045 2.097
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 6 27	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 125.00 250.00 225.00 225.00 235.00 350.00 375.00 400.00 425.00 475.00 500.00 525.00 600.00 625.00 650.00 675.00	DEPTH (DIGH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.505 1.469 1.217 1.193 1.198 1.224 1.237 1.257 1.251	S NO 1 2 3 3 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27	25.00 50.00 75.00 125.00 125.00 125.00 200.00 225.00 250.00 275.00 300.00 300.00 425.00 400.00 425.00 400.00 500.00 500.00 500.00 500.00 500.00 600.00 600.00 650.00 675.00	2.324 2.819 1.737 1.350 1.507 1.611 1.700 1.713 1.665 1.616 1.514 1.278 1.322 1.481 1.745 1.874 2.007 1.959 1.795 1.623 1.590 1.597 1.623 1.649 1.649 1.648	\$ NO 12 2 3 3 4 4 5 5 6 6 7 7 8 9 10 11 12 13 114 115 116 117 118 119 220 22 23 24 25	25.00 50.00 75.00 100.00 125.00 125.00 225.00 225.00 225.00 225.00 300.00 325.00 450.00 450.00 450.00 550.00 550.00 550.00 550.00 550.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.995 2.244 2.409 2.580 2.518 2.007 2.045 2.054 2.099 2.120 2.120 2.120 2.120
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 205.00 255.00 255.00 350.00 375.00 350.00 475.00 450.00 475.00 500.00 525.00 600.00 625.00 650.00 675.00	DEPTH (DIGH) 1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.505 1.469 1.346 1.217 1.193 1.198 1.224 1.237 1.257 1.251 1.218	S NO 1 2 3 3 4 4 5 6 6 7 8 9 100 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 225.00 300.00 375.00 400.00 475.00 475.00 500.00 575.00 600.00 625.00 625.00 650.00	(DCF) (DCF) 2.324 2.819 1.737 1.350 1.507 1.611 1.700 1.713 1.645 1.514 1.278 1.322 1.481 1.745 1.674 2.007 1.959 1.795 1.623 1.590 1.597 1.633 1.649 1.676	\$ NO 11 2 3 3 4 4 5 6 6 7 7 8 9 10 11 122 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29	25.00 50.00 73.00 100.00 125.00 125.00 225.00 225.00 225.00 225.00 225.00 225.00 250.00 250.00 250.00 250.00 250.00 450.00 450.00 450.00 450.00 650.00 650.00 675.00 675.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.905 2.244 2.409 2.580 2.518 2.307 2.087 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.054 2.055 2.054 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056 2.056
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 125.00 250.00 225.00 225.00 235.00 330.00 375.00 400.00 425.00 475.00 500.00 525.00 600.00 675.00 600.00 675.00 705.00	DEPTH (DICH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.505 1.469 1.346 1.217 1.198 1.224 1.237 1.257 1.251 1.218 1.147 0.996	S NO 1 2 3 3 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27	25.00 50.00 75.00 125.00 125.00 125.00 125.00 205.00 225.00 225.00 225.00 300.00 325.00 375.00 375.00 400.00 425.00 400.00 475.00 500.00 555.00 600.00 655.00 650.00 675.00 700.00 725.00	(DCF) (DCF) 2.324 2.819 1.737 1.237 1.350 1.507 1.611 1.700 1.713 1.665 1.616 1.514 1.278 1.322 1.481 1.745 1.874 2.007 1.959 1.795 1.623 1.590 1.590 1.597 1.633 1.649 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648 1.648	\$ NO 1 2 3 3 4 4 5 6 6 7 7 8 9 9 100 111 122 133 144 155 16 177 18 8 19 20 21 22 22 24 25 26 27 28 29 30	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 235.00 305.00 315.00 315.00 400.00 425.00 475.00 500.00 550.00 550.00 650.00 675.00 700.00 700.00	2.988 3.624 2.293 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.905 2.244 2.409 2.518 2.307 2.087 2.087 2.084 2.409 2.518 2.307 2.084 2.099 2.155 2.144 2.097
1 2 3 4 5 6 7 8 9 10 112 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 20 21	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 125.00 250.00 275.00 250.00 275.00 350.00 350.00 475.00 400.00 425.00 475.00 500.00 575.00 600.00 675.00 675.00 705.00	DEPTH (DICH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.505 1.469 1.217 1.193 1.198 1.224 1.237 1.257 1.257 1.251 1.218 1.147 0.996 0.790	S NO 1 2 3 3 4 5 6 6 7 7 8 9 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	25.00 50.00 75.00 125.00 125.00 125.00 125.00 225.00 225.00 225.00 225.00 300.00 300.00 425.00 400.00 475.00 500.00 575.00 600.00 625.00 650.00 675.00 700.00 725.00	(DCF) (DCF) 2.324 2.819 1.737 1.237 1.350 1.507 1.611 1.700 1.713 1.665 1.514 1.278 1.322 1.481 1.745 1.874 2.007 1.795 1.623 1.590 1.590 1.597 1.623 1.649 1.649 1.676 1.648 1.623 1.529 1.529 1.529 1.529 1.529 1.529 1.529	\$ NO 12 23 3 4 4 5 6 6 7 7 8 9 9 10 112 113 114 115 116 117 118 119 120 21 223 224 225 226 227 228 229 30 30 30 30 30 30 30 30 30 30 30 30 30	25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 225.00 235.00 350.00 405.00 425.00 450.00 450.00 650.00 655.00 700.00 725.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.905 2.244 2.409 2.580 2.518 2.307 2.087 2.087 2.054 2.099 2.120 2.155 2.144 2.087 1.966 1.707 1.355
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 24 25 26 27 28 29 10 11 32	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 250.00 275.00 300.00 225.00 250.00 375.00 300.00 325.00 400.00 425.00 450.00 450.00 650.00 650.00 650.00 675.00 700.00 725.00 700.00	DEPTH (DICH) 1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.505 1.469 1.346 1.217 1.193 1.198 1.224 1.237 1.257 1.251 1.218 1.147 0.996 0.790 0.587	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 31 31 42 31 32 32 32 32 32 32 32 32 32 32 32 32 32	25.00 50.00 75.00 100.00 125.00 150.00 205.00 225.00 225.00 225.00 300.00 300.00 315.00 350.00 450.00 450.00 450.00 650.00 650.00 650.00 675.00 750.00 750.00 750.00 750.00	(DCF) (DCF) 2.324 2.819 1.737 1.350 1.507 1.611 1.700 1.713 1.665 1.616 1.514 1.278 1.322 1.481 1.278 1.322 1.481 1.775 1.674 2.007 1.959 1.623 1.590 1.597 1.633 1.649 1.676 1.668 1.623 1.529 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327 1.327	\$ NO 11 2 3 3 4 4 5 6 6 7 7 8 9 100 111 112 113 114 115 116 117 118 119 200 21 22 22 22 22 24 25 26 7 7 8 29 100 11 32	25.00 50.00 75.00 150.00 175.00 150.00 175.00 225.00 225.00 225.00 235.00 325.00 325.00 450.00 475.00 450.00 525.00 525.00 525.00 525.00 525.00 525.00 525.00 525.00 525.00 525.00 525.00 525.00 525.00 625.00 625.00 625.00 625.00 625.00	2.988 3.624 2.293 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.905 2.244 2.409 2.518 2.307 2.087 2.087 2.084 2.409 2.518 2.307 2.084 2.099 2.155 2.144 2.097
1 2 3 4 5 6 7 8 9 10 112 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 20 21	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 125.00 250.00 275.00 250.00 275.00 350.00 350.00 475.00 400.00 425.00 475.00 500.00 575.00 600.00 675.00 675.00 705.00	DEPTH (DICH)  1.743 2.114 1.302 0.928 1.013 1.130 1.208 1.275 1.285 1.249 1.212 1.135 0.959 0.991 1.111 1.309 1.405 1.505 1.469 1.217 1.193 1.198 1.224 1.237 1.257 1.257 1.251 1.218 1.147 0.996 0.790	S NO 1 2 3 3 4 5 6 6 7 7 8 9 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	25.00 50.00 75.00 125.00 125.00 125.00 125.00 225.00 225.00 225.00 225.00 300.00 300.00 425.00 400.00 475.00 500.00 575.00 600.00 625.00 650.00 675.00 700.00 725.00	(DCF) (DCF) 2.324 2.819 1.737 1.237 1.350 1.507 1.611 1.700 1.713 1.665 1.514 1.278 1.322 1.481 1.745 1.874 2.007 1.795 1.623 1.590 1.590 1.597 1.623 1.649 1.649 1.676 1.648 1.623 1.529 1.529 1.529 1.529 1.529 1.529 1.529	\$ NO 12 23 3 4 4 5 6 6 7 7 8 9 9 10 112 113 114 115 116 117 118 119 120 21 223 224 225 226 227 228 229 30 30 30 30 30 30 30 30 30 30 30 30 30	25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 225.00 235.00 350.00 405.00 425.00 450.00 450.00 650.00 655.00 700.00 725.00	2.988 3.624 2.233 1.591 1.736 1.937 2.071 2.185 2.202 2.141 2.077 1.946 1.643 1.699 1.995 2.244 2.409 2.580 2.518 2.007 2.045 2.054 2.099 2.120 2.120 2.120 2.120 2.135 2.077 2.087 2.087 2.087 2.087 2.087 2.087 2.087 2.087

TIME	R SETTING	- 11 %		
S	DISTANCE	CEPTH	I TIHER	AVENACE
10	(FT)	(INOI)	SETTING	DEPTH ( DN)
-				
1	25.00	3.803	100	0.279
2	50.00	4.613	75	0.372
3	75.00	2.842	60	0.465
4	100.00	2.024	50	0.558
5	125.00	2.209	42	0.664
6	150.00	2.465	34	0.821
7	175.00	2.636	29	0.962
	200.00	2.781	24	1.162
9	225.00	2.803	21	1.329
10	250.00	2.725	18	1.550
11	275.00	2.644	16	1.744
12	300.00	2.477	14	1.993
13	325.00	2.091	11	2.536
14	350.00	2.162		
15	375.00	2.424		
16	400.00	2.856		
17	425.00	3.066		
18	450.00	3.284		
19	475.00	3.205		
20	500.00	2.937		
21	525.00	2.656		
22	550.00	2.602		
23	575.00	2.614		
24	600.00	2.672		
25	625.00	2.699		
26	650.00	2.743		
27	675.00	2.729		
28	700.00	2.657		
29	725.00	2.503		
30	750.00	2.172		
31	775.00	1.724		
32	800.00	1.280		
33	825.00	0.788		
34	850.00	0.349		

END CUN OFF WITH PURP V

TIME	R SETTING	•100 %	7:107	R SETTING	• 60 N	TIME	STTING	• 42 <b>1</b>
Ş	CISTANCE	DEPTH	S	CISTANCE	DEPTH	\$	CISTANCE	DEPTH (INCH)
:C	(17)	(INCH)	;€	(52)	(1800)	:0	·[ <del>**</del> ]	
:	25.00	0.528		25.00	3.880	1	25.00	1.258
;	50.00	2.623	į	50.00	:.038	:	50.00	1.483
;	75.00	0.385	3	.3.00	0.641	3	75.00 100.00	0.916 0.625
4	100.00	2.263	•	100.00	0.43 <b>8</b> 0.514	4 5	125.00	0.734
6	125.00 150.00	0.3C <b>8</b> 0.342	5	150.00	0.570	í	150.00	0.814
÷	175.00	0.350	÷	175.00	0.583	7	175.00	0.833
	200.00	0.358		200.00	0.596	•	200.00	0.852 0.845
9	23.00	0.355	9	225.00	0.591	9 10	225.00 250.00	0.866
10 11	250.00 275.00	0.3 <del>64</del> 0.353	10 11	250.00 275.00	0.606 0.5 <b>88</b>	11	275.00	0.840
12	300.00	0.325	12	300.00	0.341	12	300.00	0.773
13	325.00	0.299	13	325.00	0.499	13	325.00	0.713 0.745
14	350.00	0.313	14	350.00	0.521	14 15	350.00 375.00	0.833
15 16	375.00 400.00	0.350 0.385	15 16	375.00 400.00	0.583 0.642	16	400.00	0.917
17	425.00	0.414	17	425.00	0.690	17	425.00	0.985
18	450.00	0.444	18	450.00	0.739	18	450.00	1.056
19	475.00	0.433	19	475.00	0.722	19 20	475.00 500.00	0.945
20	500.00	0.397	20	500.00 525.00	0.661 0.599	21	525.00	0.856
2) 22	525.00 550.00	0.359 0.352	21 22	550.00	0.586	22	550.00	0.838
23	575.00	0.354	23	575.00	0.589	23	575.00	0.842
24	600.00	0.362	24	600.00	0.603	24	600.00	0.861 0.870
25	625.00	0.365	25	625.00	0.609	25 26	625.00 650.00	0.891
26 27	650.00 675.00	0.374 0.372	26 27	650.00 675.00	0.624 0.620	27	675.00	0.885
28	700.00	0.358	**	700.00	0.597	28	700.00	0.852
29	725.00	0.331	29	725.00	0.551	29	725.00	0.787
30	750.00	0.284	30	750.00	0.473	30	750.00 775.00	0.676 0.534
31	775.00	0.224	31	775.00	0.374 0.281	31 32	\$00.00	0.402
32 33	800.00 825.00	0.169 0.105	32 33	800.00 825.00	0.175	<b>5</b> 3	825.00	0.250
34	850.00	0.065	34	850.00	0.106	34	850.00	0.155
					- 60 5	91167	CTTDE	
	DITTE R			DUTTEE R			DISTANCE	CEPTH
TIME S NO	R 5217 DG + D15724CZ (FT)	• 75 % DEPTH (DICH)	TDE S NO	DISTANCE (FT)	• 50 % DEPTH (DICH)	TIME S NO		
NO	DISTANCE (FT)	(DICH)	\$ 10	DISTANCE (FT)	(DICH)	S NO	DISTANCE (FT)	(DCH)
NO 1	DISTANCE (FT) 25.00	(DICH) 0.704	S 10	DISTANCE (PT) 25.00	(DICH) 1.056,	NO 1	DISTANCE (PT) 25.00	CEPTH
NO 1	DISTANCE (PT) 25.00 50.00	0.704 0.830	5 10 1 2	25.00 50.00	DEPTH (DICH) 1.056, 1.245	S NO	25.00 50.00 75.00	(DCH) (DCH) 1.553 1.832 1.132
5 NO 1 2 3	DISTANCE (FT) 25.00	(DICH) 0.704	S 10	DISTANCE (PT) 25.00	DEPTH (DICH) 1.056, 1.245 0.770 0.525	\$ NO 1 2 3	25.00 50.00 75.00 100.00	1.553 1.832 1.132 0.773
S NO 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	0.704 0.830 0.513 0.350 0.411	5 10 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	1.056, 1.245 0.770 0.525 0.617	\$ NO 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	1.553 1.832 1.132 0.773 0.907
S NO 1 2 3 4 5 6	25.00 50.00 75.00 100.00 125.00 150.00	0.704 0.830 0.513 0.350 0.411 9.456	S HO 1 2 3 4 5 6	25.00 50.00 75.00 100.00 125.00 150.00	1.056, 1.245 0.770 0.525 0.617 0.684	1 2 3 4 5	25.00 50.00 75.00 100.00 125.00 150.00	1.553 1.832 1.132 0.773
S NO 1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00 175.00	0.704 0.830 0.513 0.513 0.350 0.411 0.456 0.446	5 10 1 2 3 4 5 6 7	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 175.00	1.056, 1.245 0.770 0.525 0.617 0.684 0.699	\$ NO 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052
1 2 3 4 5 6 7 8	25.00 50.00 75.00 100.00 125.00 175.00 200.00	0.704 0.830 0.513 0.350 0.411 9.456 0.477	3 1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00	1.056, 1.245 0.770 0.525 0.617 0.684	1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00 150.00 200.00 225.00	(DCH) 1.553 1.832 1.132 0.773 0.907 1.002 1.029 1.052 1.043
S NO 1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00 175.00	0.704 0.830 0.513 0.513 0.350 0.411 0.456 0.446	5 10 1 2 3 4 5 6 7	DISTANCE (PT) 25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00	1.056, 1.245 0.770 0.525 0.617 0.684 0.699 0.715 0.727	1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	(DCS) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070
S ND 1 2 3 4 5 6 7 8 9 10 11	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00	0.704 0.830 0.513 0.350 0.411 0.456 0.466 0.477 0.473 0.485 0.471	S 100 1 2 3 3 4 4 5 6 7 8 9 9 10 11	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 250.00 275.00	1.056, 1.245 0.770 0.525 0.617 0.684 0.699 0.715 0.727 0.706	3 1 2 3 4 5 6 7 8 9 10	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 275.00 225.00 275.00	(DCS) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070 1.038
S ND 1 2 3 4 5 6 7 8 9 10 11 12	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00	0.704 0.830 0.513 0.350 0.456 0.466 0.477 0.473 0.485 0.485	S NO 12 2 3 4 4 5 6 6 7 8 9 9 10 11 12	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00	1.056, 1.245 0.770 0.525 0.617 0.684 0.699 0.715 0.710 0.727 0.706 0.649	1 2 3 4 5 6 7 8 9 10 11	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00	(DCS) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 235.00 300.00 3125.00	0.704 0.830 0.513 0.350 0.411 0.456 0.466 0.477 0.473 0.485 0.471 0.433 0.399	S NO 11 2 3 4 4 5 6 6 7 8 9 100 111 122 13	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 250.00 255.00 255.00 255.00 305.00	1.056, 1.245 0.770 0.525 0.617 0.684 0.699 0.715 0.710 0.727 0.706 0.649 0.599	3 1 2 3 4 5 6 7 8 9 10	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 275.00 225.00 275.00	(DCF) (DCF) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070 1.038 0.955 0.881
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 205.00 225.00 225.00 235.00 305.00 3150.00	0.704 0.830 0.513 0.550 0.411 0.456 0.466 0.477 0.473 0.485 0.471 0.433 0.399 0.417	S 140 1 2 3 4 5 6 7 7 8 9 10 11 12 13 14	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00	1.056, 1.245 0.770 0.525 0.617 0.684 0.699 0.715 0.710 0.727 0.706 0.649 0.599 0.649	1 2 3 4 5 6 7 8 9 10 11 12 12 13	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 225.00 275.00 300.00 175.00 3150.00 175.00	(DCF) (DCF) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070 1.038 0.955 0.861 0.920
S NO 12 2 3 4 5 6 6 7 8 9 10 11 12 13 13 14 15 16	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 250.00 250.00 250.00 300.00 325.00 300.00 375.00 400.00	0.704 0.830 0.513 0.350 0.411 0.456 0.466 0.477 0.473 0.485 0.471 0.433 0.399 0.417 0.467	S NO 11 2 3 4 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 250.00 250.00 250.00 325.00 300.00 315.00 400.00	1.056, 1.245 0.770 0.525 0.617 0.684 0.699 0.715 0.710 0.727 0.706 0.649 0.599 0.626	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DISTANCE (PT) 25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 275.00 300.00 325.00 350.00 375.00 400.00	(DCH) (DCH) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070 1.038 0.955 0.861 0.920 1.030
S NO 12 2 3 4 5 6 6 7 8 9 10 11 12 13 14 15 16 17	25.00 59.00 75.00 100.00 125.00 159.00 175.00 225.00 225.00 259.00 275.00 300.00 300.00 375.00 400.00 425.00	0.704 0.830 0.513 0.350 0.411 0.456 0.466 0.477 0.473 0.485 0.471 0.483 0.399 0.417 0.467 0.552	S NO 11 2 3 4 5 6 6 7 8 9 10 11 12 13 14 15 16 17	DISTANCE (FT)  23.00 50.00 75.00 100.00 123.00 150.00 175.00 205.00 275.00 250.00 275.00 250.00 275.00 250.00 275.00 250.00 275.00 250.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00	1.056, 1.245 0.770 0.525 0.617 0.684 0.699 0.715 0.710 0.727 0.706 0.649 0.599 0.626 0.700 0.771	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DISTANCE (PT) 25.00 50.00 75.00 100.00 125.00 150.00 275.00 250.00 275.00 300.00 350.00 350.00 375.00 400.00 425.00	(DCF) (DCF) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070 1.038 0.955 0.861 0.920 1.030 1.133 1.217
S NO 1 2 3 4 4 5 6 6 7 8 9 100 111 122 133 144 156 167 17 18	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 235.00 330.00 375.00 400.00 425.00 450.00	0.704 0.830 0.513 0.350 0.411 0.456 0.466 0.477 0.473 0.485 0.471 0.483 0.399 0.417 0.467 0.514 0.552 0.591	S 140 1 2 3 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 205.00 275.00 205.00 275.00 305.00 375.00 405.00 425.00 425.00	1.056, 1.245 0.770 0.525 0.617 0.684 0.699 0.715 0.710 0.727 0.706 0.649 0.599 0.626 0.700 0.771 0.828 0.887	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	DISTANCE (PT) 25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 275.00 300.00 325.00 350.00 375.00 400.00	(DCH) (DCH) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070 1.038 0.955 0.861 0.920 1.030
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 205.00 225.00 225.00 235.00 300.00 375.00 400.00 475.00	0.704 0.830 0.513 0.350 0.411 0.456 0.446 0.477 0.473 0.485 0.471 0.433 0.399 0.417 0.467 0.514 0.552 0.577	S NO 11 2 3 3 4 4 5 6 7 7 8 9 9 10 11 12 13 14 15 16 17 18 19	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 205.00 225.00 225.00 235.00 300.00 315.00 400.00 450.00 475.00	1.056, 1.245 0.770 0.525 0.617 0.684 0.699 0.715 0.710 0.727 0.706 0.649 0.599 0.626 0.700 0.771	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 235.00 300.00 315.00 315.00 400.00 425.00 475.00 475.00 500.00	(DCF) (DCF) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070 1.038 0.920 1.038 0.920 1.030 1.133 1.217 1.305 1.274 1.167
S NO 1 2 3 4 4 5 6 6 7 8 9 100 111 122 133 144 156 167 17 18	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 235.00 330.00 375.00 400.00 425.00 450.00	0.704 0.830 0.513 0.350 0.411 0.456 0.466 0.477 0.473 0.485 0.471 0.483 0.399 0.417 0.467 0.514 0.552 0.591	S 140 1 2 3 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18	DISTANCE (FT)  23.00 50.00 75.00 100.00 123.00 150.00 175.00 205.00 275.00 255.00 275.00 250.00 375.00 405.00 475.00 405.00 475.00 500.00 505.00	1.056, 1.245 0.770 0.525 0.617 0.684 0.699 0.715 0.710 0.727 0.706 0.649 0.399 0.626 0.700 0.771 0.887 0.887	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 225.00 225.00 235.00 300.00 325.00 350.00 400.00 425.00 455.00 455.00 500.00 505.00	(DCF) (DCF) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070 1.038 0.955 0.861 0.920 1.030 1.133 1.217 1.305 1.274 1.167
\$ NO 11 2 3 3 4 4 5 6 6 7 7 8 9 10 111 12 13 14 15 16 17 18 19 20 21 22 12 22	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 225.00 235.00 3150.00 375.00 405.00 475.00 450.00 550.00	0.704 0.830 0.513 0.350 0.411 0.456 0.466 0.477 0.473 0.485 0.471 0.467 0.514 0.552 0.591 0.577 0.529 0.479	S 140 1 2 3 3 4 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 205.00 275.00 275.00 305.00 375.00 405.00 475.00 405.00 475.00 505.00 525.00	1.056, 1.245, 0.770, 0.525, 0.617, 0.684, 0.699, 0.715, 0.710, 0.727, 0.706, 0.649, 0.599, 0.626, 0.700, 0.771, 0.887, 0.887, 0.887, 0.8866, 0.794, 0.719, 0.704	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 275.00 300.00 375.00 400.00 475.00 4050.00 475.00 500.00 525.00 550.00	(DCF) (DCF) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070 1.038 0.920 1.030 1.133 1.217 1.395 1.274 1.167 1.057 1.057
\$ NO 11 2 3 3 4 4 5 6 6 77 8 8 9 9 10 111 122 13 14 15 16 6 17 18 19 20 21 22 23 3	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 235.00 300.00 175.00 400.00 475.00 450.00 475.00 500.00 550.00 575.00	0.704 0.830 0.513 0.350 0.411 0.456 0.446 0.477 0.473 0.485 0.471 0.433 0.399 0.417 0.467 0.514 0.552 0.577 0.529 0.479 0.479	S 100 1 2 3 3 4 5 6 7 7 8 9 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 225.00 225.00 225.00 275.00 300.00 175.00 400.00 475.00 500.00 550.00 550.00 575.00	0.527H (DICH) 1.056, 1.245 0.770 0.525 0.617 0.684 0.699 0.715 0.710 0.727 0.706 0.649 0.599 0.526 0.700 0.771 0.887 0.887 0.794 0.799	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 225.00 225.00 235.00 300.00 325.00 350.00 400.00 425.00 455.00 455.00 500.00 505.00	(DCF) (DCF) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070 1.038 0.955 0.861 0.920 1.030 1.133 1.217 1.305 1.274 1.167
\$ NO 11 22 3 4 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 22 1 22 23 24	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00	0.704 0.830 0.513 0.350 0.411 0.456 0.466 0.477 0.473 0.485 0.471 0.467 0.514 0.552 0.591 0.577 0.529 0.479	S NO 11 2 3 3 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 19 20 21 22 23 24	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 205.00 275.00 275.00 305.00 375.00 405.00 475.00 405.00 475.00 505.00 525.00	1.056, 1.245, 0.770, 0.525, 0.617, 0.684, 0.699, 0.715, 0.710, 0.727, 0.706, 0.649, 0.599, 0.626, 0.700, 0.771, 0.887, 0.887, 0.887, 0.8866, 0.794, 0.719, 0.704	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 125.00 250.00 275.00 300.00 375.00 375.00 405.00 475.00 475.00 500.00 550.00 575.00 550.00 575.00 600.00 625.00	(DCF) (DCF) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070 1.038 0.955 0.861 0.920 1.030 1.133 1.217 1.305 1.274 1.167 1.057 1.057
\$ NO 11 2 3 3 4 4 5 6 6 7 7 8 9 100 111 122 13 134 155 166 17 18 19 200 21 22 23 3 24 25	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 225.00 235.00 305.00 315.00 475.00 405.00 475.00 505.00 575.00 600.00 625.00 625.00 625.00 625.00	0.704 0.830 0.513 0.350 0.411 0.456 0.466 0.477 0.473 0.485 0.471 0.433 0.399 0.417 0.514 0.552 0.591 0.591 0.577 0.529 0.472 0.482 0.489	S 140 1 2 3 3 4 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 25 26	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 205.00 275.00 305.00 375.00 405.00 475.00 475.00 505.00 575.00 600.00 625.00 625.00 625.00	1.056, 1.245, 0.770, 0.525, 0.617, 0.684, 0.699, 0.715, 0.710, 0.727, 0.706, 0.649, 0.599, 0.626, 0.700, 0.771, 0.828, 0.887, 0.887, 0.8866, 0.794, 0.794, 0.794, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.707, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0.704, 0	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 27 28 28 29 29 20 20 21 21 22 22 23 24 24 25 26 26 27 27 27 27 27 27 27 27 27 27 27 27 27	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 250.00 275.00 300.00 275.00 300.00 275.00 350.00 375.00 4050.00 475.00 500.00 575.00 600.00 650.00 650.00	(DCF) (DCF) 1.553 1.832 1.132 0.773 0.907 1.006 1.029 1.052 1.043 1.070 1.038 0.920 1.030 1.133 1.217 1.305 1.274 1.167 1.057 1.040 1.063 1.075 1.040
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2 ON	CISTANCE	(INCH)	\$ 100	(FT)	(INCH)		m	(DOI)
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:	50.00	2.147	2	50.00 75.00	2.965 1.833		75.00	2.405
3	75.00 100.00	1.327 0.90 <del>6</del>	3	100.00	1.251		00.00	1.642
•	125.00	1.063	š	125.00	1.468		25.00	1.927
i	:50.00	1.179	í	150.00	1.628		50.00	2.137
7	175.00	1.206	7	175.00	1.665		75.00 00.00	2.186 2.235
	200.00	1.233		200.00 225.00	1.703 1.689		zs.00	2.217
,	225.00	1.223 1.254	9 10	250.00	1.732		50.00	2.273
10 11	250.00 275.00	1.234	11	275.00	1.680		75.00	2.206
12	300.00	1.119	12	300.00	1.545		00.00	2.026
13	325.00	1.032	13	325.00	1.426		25.00 50.00	1.871
14	350.00	1.079	14	350.00	1.490 1.667		75.00	2.188
15	375.00	1.207	15 16	375.00 400.00	1.835		œ.œ	2.408
16 17	400.00 425.00	1.329 1.427	17	425.00	1.971		25.00	2.586
18	450.00	1.529	18	450.00	2.112		50.00	2.772
19	475.00	1.493	19	475.00	2.062		75.00	2.707 2.480
20	500.00	1.368	20	500.00	1.890		00.00 25.00	2.246
21	525.00	1.239	21 22	525.00 550.00	1.711 1.676		50.00	2.199
23 23	550.00 575.00	1.213 1.219	น ม	575.00	1.684		75.00	2.210
23	600.00	1.247	24	600.00	1.722	• • • •	00.00	2.260
25	625.00	1.260	25	625.00	1.740		25.00	2.284
26	650.00	1.291	26	650.00	1.782		50.00 75.00	2.339 2.324
27	675.00	1.282	27	675.00 700.00	1.771 1.705	• • •	0.00	2.238
28 29	700.00 725.00	1.235 1.140	28 29	725.00	1.574		25.00	2.066
30	750.00	0.979	30	750.00	1.352		50.00	1.775
31	775.00	0.773	31	775.00	1.068		75.00	1.402
32	800.00	0.582	32	800.00	0.804	-	00.00 25.00	1.055 0.455
33	825.00	0.362	33	825.00 850.00	0.4 <del>99</del> 0.30 <del>9</del>		50.00	0.406
34	850.00	0.224	34	130.00	0.505			
TIME	R SETTING	- 24 1	TIME	SETTING			***	
S	DISTANCE	DEPTH	\$	DISTANCE	DEPTH	1 TIMER		NCZ R(DO
						TIMER SETTING		NCZ H(DI)
S NO	DISTANCE (PT)	(DICH)	\$	DISTANCE	(DICH) 2.934	2277DG	0.3	H(DQ)
\$ NO. 1	DISTANCE (PT) 25.00 50.00	(DCH) 2.201 2.595	\$ NO 1 2	25.00 50.00	(DICH) 2.934 3.460	100 75	0.3 0.4	H(DQ) 43 57
\$ NO. 1 2	25.00 50.00 75.00	DE2TH (DE2H) 2.201 2.595 1.603	\$ NO 1 2 3	25.00 50.00 75.00	(DICH) (DICH) 2.934 3.460 2.138	100 75 60	0.3	H(D0) 43 57 72
S NO.	25.00 50.00 75.00 100.00	2.201 2.595 1.603 1.094	\$ ND 1 2 3 4	25.00 50.00 75.00 100.00	(DICH) 2.934 3.460	100 75	0.3 0.4 0.5 0.6 0.8	H(DQ) 43 57 72 06 17
S NO. 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	DE2TH (DE2H) 2.201 2.595 1.603	\$ NO 1 2 3	25.00 50.00 75.00	2.934 3.460 2.138 1.459 1.713 1.899	100 75 60 50 42	0.3 0.4 0.5 0.6 0.8	H(30) 
S NO.	25.00 50.00 75.00 100.00	2.201 2.595 1.603 1.094 1.285	\$ ND 1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00 175.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943	100 75 60 50 42 34 29	0.3 0.4 0.5 0.6 0.8 1.0	H(30) 
S NO. 1 2 3 4 5 6 7 8	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00	2.201 2.595 1.603 1.094 1.285 1.425 1.457 1.490	1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.987	100 75 60 50 42 34 29 24	0.3 0.4 0.5 0.6 0.8 1.0 1.1	H(DQ) 43 57 72 86 117 09 83 29
\$ NO. 1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00	2.201 2.595 1.603 1.094 1.285 1.425 1.457 1.470	\$ NO 1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00	2.934 3.460 2.138 1.459 1.713 1.899 1.991 1.997 1.971	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1	H(D0) 43 57 72 96 117 09 83 29
\$ NO. 1 2 3 4 5 6 7 8 9 10	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	2.201 2.595 1.603 1.094 1.285 1.425 1.425 1.457 1.490 1.470 1.515	\$ NO 1 2 3 4 5 6 6 7 8 9 10	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.987	100 75 60 50 42 34 29 24	0.3 0.4 0.5 0.6 0.8 1.0 1.1	H(200) 43 57 77 96 17 99 93 93 93 95
\$ NO. 1 2 3 4 5 6 7 8 9 10 11	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 275.00	2.201 2.595 1.603 1.094 1.285 1.425 1.457 1.490 1.478 1.515 1.470	\$ NO 1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00	(DCM) (DCM) 2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.960	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
\$ NO. 1 2 3 4 5 6 7 8 9 10	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00	2.201 2.595 1.603 1.094 1.285 1.425 1.425 1.457 1.490 1.470 1.515	\$ NO 1 2 3 3 4 4 5 6 6 7 8 9 10 11 11	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00	(DCSI) 2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.960	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 5 6 7 8 9 10 11 12 13 14	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 275.00 275.00 325.00 325.00	2.201 2.595 1.603 1.094 1.285 1.425 1.425 1.457 1.490 1.478 1.515 1.470 1.352 1.247	5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00 325.00 330.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.803 1.663 1.738	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 275.00 275.00 275.00 300.00 375.00	2.201 2.595 1.603 1.094 1.285 1.425 1.457 1.490 1.478 1.515 1.470 1.352 1.247 1.304	5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 275.00 275.00 300.00 375.00	(DCSI) 2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.803 1.663 1.738 1.945	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO 1 2 3 3 4 5 6 7 8 9 10 11 12 13 14 15 16	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 275.00 250.00 275.00 300.00 325.00 350.00 375.00	2.201 2.595 1.603 1.094 1.285 1.425 1.457 1.490 1.470 1.515 1.470 1.352 1.247 1.304 1.459 1.605	5 NO 1 2 3 3 4 5 6 7 8 9 10 11 12 13 14 15 16	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 275.00 300.00 325.00 300.00 325.00 350.00 375.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.803 1.663 1.738	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 275.00 275.00 275.00 300.00 375.00	2.201 2.595 1.603 1.094 1.285 1.425 1.457 1.490 1.478 1.515 1.470 1.352 1.247 1.304	5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 250.00 275.00 250.00 375.00 400.00 425.00 425.00 425.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.963 1.738 1.945 2.141 2.299 2.464	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16 17	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 275.00 275.00 300.00 325.00 375.00 400.00 425.00 450.00 475.00	2.201 2.595 1.603 1.094 1.285 1.425 1.425 1.457 1.490 1.478 1.515 1.470 1.352 1.247 1.304 1.459 1.605 1.724	5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 275.00 300.00 375.00 400.00 400.00 475.00	(DCSI) 2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.863 1.738 1.945 2.141 2.299 2.464 2.406	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 275.00 250.00 275.00 300.00 350.00 375.00 400.00 425.00 400.00 475.00 500.00	2.201 2.595 1.603 1.094 1.285 1.425 1.457 1.490 1.478 1.515 1.470 1.352 1.247 1.304 1.459 1.605 1.724 1.804 1.804	5 NO 1 2 3 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 275.00 300.00 375.00 400.00 425.00 400.00 475.00 500.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.967 1.960 1.960 1.803 1.603 1.738 1.945 2.141 2.299 2.464 2.406 2.205	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 250.00 275.00 350.00 355.00 355.00 455.00 455.00 455.00 505.00	2.201 2.595 1.603 1.094 1.285 1.425 1.457 1.470 1.515 1.470 1.352 1.247 1.304 1.459 1.605 1.724 1.848 1.804 1.654	5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 125.00 225.00 225.00 225.00 225.00 225.00 400.00 425.00 425.00 450.00 475.00 500.00 525.00	(DCSI) 2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.863 1.738 1.945 2.141 2.299 2.464 2.406	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 275.00 275.00 375.00 375.00 405.00 475.00 500.00 525.00 500.00 525.00 500.00 500.00 500.00	2.201 2.595 1.603 1.094 1.285 1.425 1.457 1.490 1.478 1.515 1.470 1.352 1.247 1.304 1.459 1.605 1.724 1.804 1.804	5 NO 1 2 3 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00 375.00 400.00 475.00 500.00 550.00 575.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.803 1.663 1.738 1.945 2.141 2.299 2.464 2.406 2.205 1.996 1.995	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 250.00 275.00 350.00 355.00 355.00 455.00 455.00 455.00 505.00	2.201 2.595 1.603 1.094 1.285 1.425 1.457 1.490 1.515 1.470 1.352 1.247 1.304 1.459 1.605 1.724 1.804 1.654 1.497 1.466 1.477	5 NO 1 2 3 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 225.00 235.00 375.00 400.00 425.00 450.00 575.00 575.00 575.00 600.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.971 2.020 1.960 1.803 1.663 1.738 1.945 2.141 2.299 2.464 2.406 2.205 1.996 1.995 1.996	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 159.00 275.00 225.00 275.00 325.00 325.00 325.00 350.00 400.00 425.00 450.00 475.00 500.00 555.00 555.00 555.00 600.00	2.201 2.595 1.603 1.094 1.285 1.425 1.457 1.470 1.515 1.470 1.515 1.470 1.304 1.459 1.605 1.724 1.848 1.804 1.654 1.497 1.466 1.477 1.466 1.474 1.507	5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00	2.934 3.460 2.138 1.459 1.713 1.999 1.943 1.997 2.020 1.960 1.803 1.663 1.738 1.945 2.141 2.299 2.464 2.406 2.205 1.995 1.995 1.995 1.995 2.1099 2.030	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 275.00 305.00 375.00 405.00 475.00 505.00 575.00 600.00 625.00 625.00 625.00	2.201 2.595 1.603 1.094 1.285 1.425 1.425 1.457 1.490 1.478 1.515 1.470 1.352 1.247 1.304 1.459 1.605 1.724 1.848 1.804 1.654 1.654 1.654 1.654 1.657 1.507 1.523 1.560	5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 20 21 22 22 23 24 24 25 26 26 27 28 28 28 28 28 28 28 28 28 28 28 28 28	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 250.00 275.00 250.00 275.00 350.00 375.00 400.00 425.00 475.00 500.00 575.00 600.00 625.00 625.00 650.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.971 2.020 1.960 1.903 1.663 1.738 1.945 2.141 2.299 2.464 2.406 2.205 1.996 1.995 1.996 1.995 1.996 2.030 2.079	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 225.00 275.00 325.00 375.00 400.00 425.00 475.00 500.00 525.00 550.00 575.00 600.00 650.00 650.00	2.201 2.595 1.603 1.094 1.285 1.425 1.425 1.457 1.490 1.478 1.515 1.470 1.352 1.247 1.304 1.459 1.605 1.724 1.848 1.804 1.654 1.804 1.654 1.804 1.654 1.804 1.654 1.806 1.5507 1.523 1.560 1.549	5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 250.00 275.00 300.00 375.00 400.00 425.00 475.00 500.00 575.00 600.00 650.00 650.00 675.00	2.934 3.460 2.138 1.459 1.713 1.999 1.943 1.997 2.020 1.960 1.803 1.663 1.738 1.945 2.141 2.299 2.464 2.406 2.205 1.995 1.995 1.995 1.995 2.1099 2.030	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 275.00 305.00 375.00 405.00 475.00 505.00 575.00 600.00 625.00 625.00 625.00	2.201 2.595 1.603 1.094 1.285 1.425 1.425 1.457 1.490 1.478 1.515 1.470 1.352 1.247 1.304 1.459 1.605 1.724 1.848 1.804 1.654 1.654 1.654 1.654 1.657 1.507 1.523 1.560	5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 20 21 22 22 23 24 24 25 26 26 27 28 28 28 28 28 28 28 28 28 28 28 28 28	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 125.00 205.00 225.00 225.00 235.00 300.00 325.00 350.00 400.00 425.00 450.00 450.00 650.00 650.00 675.00 675.00 700.00 775.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.803 1.663 1.738 1.945 2.141 2.299 2.464 2.406 2.205 1.996 1.955 1.965 2.009 2.030 2.079 2.066 1.999 1.816	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	DISTANCE (PT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 275.00 275.00 375.00 400.00 475.00 475.00 500.00 525.00 575.00 600.00 675.00 675.00 675.00 775.00	2.201 2.595 1.603 1.094 1.285 1.425 1.425 1.457 1.490 1.478 1.515 1.470 1.352 1.247 1.304 1.459 1.605 1.724 1.848 1.804 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.655 1.724 1.806 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654 1.654	5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 27 28 29 30	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 250.00 275.00 250.00 275.00 350.00 375.00 400.00 425.00 475.00 500.00 575.00 600.00 625.00 675.00 675.00 7750.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.983 1.738 1.945 2.141 2.299 2.464 2.406 2.205 1.996 1.955 1.996 1.955 2.009 2.030 2.079 2.066 1.999	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 275.00 375.00 375.00 400.00 425.00 475.00 500.00 525.00 550.00 575.00 600.00 650.00 675.00 700.00 775.00	2.201 2.595 1.603 1.094 1.285 1.425 1.425 1.425 1.470 1.315 1.470 1.315 1.470 1.315 1.470 1.352 1.247 1.304 1.459 1.605 1.724 1.848 1.804 1.654 1.804 1.654 1.807 1.507 1.507 1.507 1.523 1.560 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549	5 NO 1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 250.00 275.00 300.00 375.00 400.00 475.00 500.00 575.00 600.00 675.00 705.00 775.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.983 1.663 1.738 1.945 2.141 2.299 2.464 2.406 2.205 1.996 1.995 1.995 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 4 5 6 7 8 9 10 112 123 124 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	DISTANCE (FT7)  25.00 50.00 75.00 100.00 125.00 125.00 275.00 275.00 275.00 275.00 350.00 375.00 450.00 450.00 450.00 655.00 650.00 675.00 675.00 775.00 775.00 785.00	2.201 2.595 1.603 1.094 1.285 1.425 1.457 1.470 1.478 1.515 1.470 1.352 1.247 1.304 1.459 1.605 1.724 1.848 1.804 1.654 1.497 1.466 1.477 1.466 1.477 1.523 1.507 1.523 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549	5 NO 1 2 3 3 4 4 5 6 7 8 9 10 11 12 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 300.00 275.00 350.00 475.00 450.00 450.00 450.00 650.00 650.00 675.00 675.00 775.00 775.00 775.00 775.00	(DCS) (DCS) 2.934 3.460 2.138 1.459 1.713 1.899 1.971 2.020 1.960 1.803 1.663 1.738 1.945 2.141 2.299 2.464 2.406 2.205 1.996 1.955 1.955 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.079 2.030 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.040 2.	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95
S NO. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 275.00 375.00 375.00 400.00 425.00 475.00 500.00 525.00 550.00 575.00 600.00 650.00 675.00 700.00 775.00	2.201 2.595 1.603 1.094 1.285 1.425 1.425 1.425 1.470 1.315 1.470 1.315 1.470 1.315 1.470 1.352 1.247 1.304 1.459 1.605 1.724 1.848 1.804 1.654 1.804 1.654 1.807 1.507 1.507 1.507 1.523 1.560 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549 1.549	5 NO 1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	DISTANCE (FT)  25.00 50.00 75.00 100.00 125.00 150.00 175.00 250.00 275.00 300.00 375.00 400.00 475.00 500.00 575.00 600.00 675.00 705.00 775.00	2.934 3.460 2.138 1.459 1.713 1.899 1.943 1.997 1.971 2.020 1.960 1.983 1.663 1.738 1.945 2.141 2.299 2.464 2.406 2.205 1.996 1.995 1.995 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009 2.009	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.8 1.0 1.1 1.4	H(200) 43 57 77 96 17 99 93 93 93 95

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	SETTING .			DISTANCE	DEPTH	5	DISTANCE.	DEPTH
S NC	CISTANCE (FT)	DEDPTH (DNCH)	\$ 180	1871	(INOI)	.00		(INCH)
						-		
•	25.00	0.463	:	25.00	0.771	3	25.00	1.101
3	50.00	0.550	2	\$0.00	0.916	į	\$0.00 ?\$.00	1.309
	75.00	<b>3.341</b>	:	75.00	C.568	2		0.569
4	100.00	0.239	4	100.00	0.399 0.460	Š		0.657
•	125.00	0.276	•	:25.00	0.510	í		0.729
<b>6</b> 7	150.00	0.306	6 7	150.00 175.00	0.514	ž		0.734
2	175.00 200.00	0.30 <b>8</b> 0.326	í	200.00	0.544			0.777
•	225.00	0.326	•	225.00	0.543	,	225.00	0.776
10	250.00	0.317	10	250.00	0.529	10	250.00	0.756
11	275.00	0.316	11	275.00	0.527	11	275.00	0.753
12	300.00	0.293	12	300.00	0.488	12		0.697
13	325.00	0.262	13	325.00	0.436	13		0.623 0.622
14	350.00	0.261	14	350.00	0.435	14 15		0.715
15	375.00	0.300	15	375.00	0.500 0.570	16	400.00	0.814
16	400.00	0.342	16	400.00 425.00	0.612	17		0.874
17 18	425.00 450.00	0.367 0.393	17 18	450.00	0.656	18		0.936
19	475.00	0.393	19	475.00	0.640	19		0.914
20	500.00	0.352	20	500.00	0.586	20		0.838
21	525.00	0.318	21	525.00	0.531	21		0.758
22	550.00	0.312	22	550.00	0.520	22		0.742
23	575.00	0.313	23	575.00	0.522	23		0.74 <b>6</b> 0.7 <b>6</b> 2
:4	600.00	0.320	24	600.00	0.534	24		0.770
25	625.00	0.324	25	625.00	0.539	25 26		0.789
26	650.00	0.331	26	650.00	0.552 0.548	27		0.784
27	675.00	0.329	27	675.00 700.00	0.528	28		0.754
28 29	700.00 725.00	0.317 0. <b>29</b> 3	28 29	725.00	0.488	29		0.697
30	750.00	0.251	30	750.00	0.419	30	750.00	0.599
ñ	775.00	0.199	31	775.00	0.331	31	775.00	0.473
32	800.00	0.150	32	800.00	0.249	32		0.356
33	825.00	0.093	ນ	825.00	0.155	33		0.221
34	850.00	0.057	34	850.00	0.096	34	850.00	0.137
				-	- 60 6	71M	ER SETTING	• 34 %
	R SETTING			DITTING			ER SETTING DISTANCE	• 34 % DEPTH
S	DISTANCE	CEPTH	5	DISTANCE	DEPTH	TIM S NO	DISTANCE	• 34 % OEPTH (INCH)
						S NO	DISTANCE (FT)	OEPTH (DICH)
S	DISTANCE	CEPTH	5	DISTANCE	(DCS) 0.925	\$ NO 1	DISTANCE (PT) 25.00	(1)(2)() (1)(2)() 1.360
5 NO 	25.00 50.00	0.617 0.733	5 10 1 2	25.00 50.00	0.925 1.099	5 NO 1 2	25.00 50.00	1.360 1.617
S NO 1 2	25.00 50.00 75.00	0.617 0.733 0.454	5 10 1 2 3	25.00 50.00 75.00	0.925 1.099 0.682	\$ NO 1 2 3	25.00 50.00 75.00	1.360 1.617 1.002
\$ NO 1 2 3	25.00 50.00 75.00 100.00	0.617 0.733 0.454 0.319	1 2 3	25.00 50.00 75.00 100.00	0.925 1.099 0.682 0.478	5 HO 1 2 3	25.00 50.00 75.00 100.00	1.360 1.617 1.002 0.703
S NO	25.00 50.00 75.00 100.00 125.00	0.617 0.617 0.733 0.454 0.319 0.368	5 NO 1 2 3 4 5	75.00 75.00 75.00 75.00 100.00 125.00	0.925 1.099 0.682 0.478 0.552	S NO 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00	1.360 1.617 1.002
5 NO 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00 150.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408	1 2 3 4 5	75.00 50.00 75.00 100.00 125.00 150.00	0.925 1.099 0.682 0.478 0.552 0.613	5 HO 1 2 3	25.00 50.00 75.00 100.00 125.00 150.00	1.360 1.617 1.002 0.703 0.812
5 NO 1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00 175.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408	1 2 3 4 5 6	0157ACE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 175.00	0.925 1.099 0.682 0.478 0.552	S NO 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00 175.00 200.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960
5 NO 1 2 3 4 5	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00	0.617 0.733 0.454 0.319 0.368 0.408 0.401 0.435	1 2 3 4 5	75.00 50.00 75.00 100.00 125.00 150.00	0.925 1.099 0.682 0.478 0.552 0.613 0.617	5 NO 1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958
\$ NO   1   2   3   4   5   6   7   8	25.00 50.00 75.00 100.00 125.00 150.00 175.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408	1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 125.00 150.00 175.00 205.00 225.00 250.00	0.925 1.099 0.682 0.478 0.552 0.613 0.617 0.653 0.652 0.635	S NO 1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 250.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958 0.933
\$ NO   1 2 3 4 5 6 7 8 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.435 0.434	5 NO 1 2 3 3 4 5 6 7 8 9	0157NCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 250.00 275.00	0.925 1.099 0.682 0.478 0.552 0.613 0.617 0.653 0.635 0.635	5 NO 1 2 3 4 5 6 7 8 9 10	25.00 50.00 75.00 100.00 125.00 175.00 200.00 250.00 275.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958 0.933
\$ NO	25.00 50.00 75.00 100.00 150.00 150.00 200.00 225.00 250.00 275.00 300.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.435 0.434 0.422 0.422	5 HO	25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 275.00 300.00	0.925 1.099 0.682 0.478 0.553 0.617 0.653 0.653 0.652 0.632	S NO 11 12 3 3 4 4 5 6 6 7 7 8 9 10 11 11 12	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 200.00 250.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958 0.933 0.930 0.861
\$ NO	25.00 50.00 75.00 100.00 150.00 175.00 200.00 225.00 275.00 300.00 325.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.435 0.434 0.422 0.423 0.423	5 HO 1 2 3 4 5 6 7 8 9 10 11 12 12	25.00 50.00 75.00 100.00 125.00 150.00 175.00 205.00 225.00 250.00 275.00 300.00 325.00	0.925 1.099 0.682 0.613 0.617 0.653 0.653 0.635 0.635 0.632 0.536	S NO 1 2 3 3 4 4 5 6 7 7 8 9 10 11 12 13 13	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 275.00 300.00 325.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958 0.933 0.930 0.861 0.770
S NO 12 2 3 4 5 6 6 7 8 9 10 11 12 12 13 14	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 325.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.435 0.435 0.422 0.422 0.390 0.348	5 NO 1 2 3 4 5 6 7 8 9 10 11 12 13	0157NCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 300.00 325.00	0.925 1.099 0.682 0.478 0.552 0.613 0.617 0.653 0.635 0.632 0.586 0.524 0.524	S NO 11 2 3 3 4 4 5 6 7 7 8 9 10 11 12 13 13 14	25.00 50.00 75.00 100.00 125.00 175.00 205.00 275.00 250.00 275.00 305.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958 0.933 0.930 0.861 0.770
S NO 1 2 3 4 4 5 6 6 7 8 9 10 11 12 11 12 11 14 15	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 375.00	0.617 0.617 0.733 0.454 0.319 0.368 0.401 0.411 0.435 0.422 0.390 0.422 0.390 0.349	5 NO 1 2 3 4 5 6 7 8 9 9 10 11 12 13 14 15	25.00 55.00 75.00 100.00 125.00 175.00 200.00 275.00 300.00 350.00 375.00	0.925 1.099 0.682 0.478 0.552 0.613 0.617 0.653 0.632 0.632 0.534 0.524 0.524 0.522	5 NO 1 2 3 4 4 5 6 7 8 9 9 10 11 12 13 14 14 15	25.00 50.00 75.00 100.00 125.00 175.00 205.00 275.00 250.00 275.00 305.00	(INCH)  1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958 0.933 0.930 0.861 0.770 0.768 0.883 1.005
S NO 12 2 3 4 5 6 6 7 8 9 10 11 12 13 114 115 116	25.00 50.00 75.00 100.00 125.00 150.00 200.00 250.00 250.00 250.00 375.00 300.00 375.00 400.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.435 0.434 0.422 0.390 0.349 0.348 0.400 0.456	5 HO	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 250.00 275.00 300.00 375.00 375.00 400.00	0.925 1.099 0.682 0.478 0.552 0.613 0.617 0.653 0.635 0.632 0.506 0.524 0.522 0.600	S NO 11 2 3 3 4 4 5 6 7 7 8 9 10 11 12 13 13 14	25.00 50.00 75.00 100.00 125.00 200.00 250.00 250.00 275.00 300.00 350.00 375.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.958 0.933 0.930 0.861 0.770 0.768 0.883 1.005
S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	25.00 59.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 325.00 150.00 375.00 400.00 425.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.435 0.423 0.422 0.390 0.349 0.348 0.400 0.456 0.489	S NO 1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17	25.00 50.00 75.00 100.00 125.00 159.00 275.00 225.00 225.00 259.00 275.00 305.00 375.00 406.00 425.00	0.925 1.099 0.682 0.478 0.552 0.613 0.617 0.653 0.632 0.632 0.534 0.524 0.524 0.522	5 NO 1 2 3 4 4 5 6 7 7 8 9 10 11 12 13 14 15 15 16 16 17 18 18 18 18 18 18 18 18 18 18 18 18 18	25.00 50.00 75.00 100.00 125.00 175.00 205.00 275.00 305.00 375.00 400.00 450.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.958 0.933 0.930 0.861 0.770 0.768 0.883 1.005 1.080
S NO 1 2 3 4 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18	25.00 50.00 75.00 100.00 125.00 150.00 275.00 225.00 225.00 250.00 275.00 305.00 375.00 400.00 425.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.435 0.422 0.390 0.348 0.400 0.489 0.524	5 HO	25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 250.00 275.00 300.00 375.00 375.00 400.00	0.925 1.099 0.682 0.478 0.552 0.613 0.617 0.653 0.635 0.632 0.584 0.524 0.522 0.600 0.684 0.734 0.737 0.768	5 NO 1 2 3 4 4 5 6 7 8 9 9 10 11 12 13 14 15 16 17 18 19 19 19 19 19 19 19 19 19 19 19 19 19	25.00 50.00 75.00 100.00 125.00 125.00 205.00 225.00 275.00 300.00 375.00 400.00 425.00 475.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958 0.933 0.930 0.861 0.770 0.768 0.883 1.005 1.080
S NO 12 23 44 56 67 8 9 10 11 12 13 144 15 16 17 18 19 20	25.00 59.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 325.00 150.00 375.00 400.00 425.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.435 0.423 0.422 0.390 0.349 0.348 0.400 0.456 0.489	S NO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	25.00 75.00 100.00 125.00 150.00 175.00 200.00 275.00 300.00 375.00 300.00 400.00 425.00 450.00 450.00	0.925 1.099 0.682 0.478 0.552 0.613 0.617 0.653 0.635 0.632 0.632 0.506 0.524 0.522 0.600 0.604 0.734 0.737	S NO 11 2 3 3 4 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20	25.00 50.00 75.00 100.00 125.00 175.00 200.00 250.00 250.00 250.00 300.00 375.00 400.00 425.00 450.00	(INCH)  1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.958 0.933 0.930 0.861 0.770 0.768 0.883 1.005 1.080 1.157 1.129 1.035
S NO 1 2 3 4 4 5 6 7 8 9 10 11 12 12 12 12 12 12 12 12 12 12 12 12	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 275.00 300.00 375.00 400.00 400.00 475.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.423 0.422 0.390 0.349 0.348 0.400 0.456 0.489 0.524 0.512 0.459	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	25.00 55.00 75.00 100.00 125.00 159.00 175.00 225.00 225.00 225.00 235.00 325.00 325.00 405.00 459.00 459.00 459.00 459.00 459.00 500.00 500.00 500.00	0.925 1.099 0.682 0.613 0.617 0.653 0.635 0.635 0.635 0.632 0.524 0.522 0.600 0.684 0.734 0.787 0.768 0.768	5 NO 1 2 3 3 4 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 300.00 400.00 425.00 450.00 475.00 500.00 500.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958 0.933 0.961 0.770 0.768 0.883 1.005 1.005 1.127 1.129
S NO 1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 2	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 225.00 235.00 375.00 305.00 405.00 475.00 475.00 500.00 525.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.435 0.422 0.390 0.348 0.400 0.489 0.524 0.512 0.469	5 NO 1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 20 21 22 21 22 22 22 23 24 24 25 26 26 27 27 28 28 28 28 28 28 28 28 28 28 28 28 28	0157NCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00 305.00 375.00 405.00 475.00 505.00 555.00	0.925 1.099 0.682 0.613 0.617 0.653 0.653 0.635 0.632 0.586 0.524 0.522 0.600 0.684 0.734 0.787 0.787	S NO  1 2 3 3 4 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 21 22	25.00 50.00 75.00 100.00 125.00 175.00 200.00 275.00 250.00 275.00 305.00 405.00 475.00 405.00 475.00 505.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.958 0.933 0.930 0.861 0.770 0.768 0.883 1.005 1.080 1.157 1.129 1.035 0.936
S NO 1233456677891001112112113114115116017912021223	25.00 50.00 75.00 100.00 125.00 150.00 175.00 205.00 225.00 225.00 275.00 300.00 375.00 400.00 475.00 400.00 475.00 500.00 550.00 550.00	0.517 0.517 0.517 0.733 0.454 0.319 0.368 0.401 0.435 0.434 0.423 0.422 0.390 0.148 0.400 0.456 0.400 0.456 0.449 0.524 0.512 0.449	5 NO 1 2 3 3 4 5 6 7 7 8 9 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 23 24 24 25 26 27 27 28 28 28 28 28 28 28 28 28 28 28 28 28	0157NCE (FT) 25.00 50.00 75.00 100.00 175.00 200.00 225.00 225.00 275.00 300.00 375.00 400.00 475.00 500.00 500.00 575.00	0.925 1.099 0.682 0.478 0.552 0.613 0.617 0.653 0.635 0.632 0.586 0.524 0.522 0.600 0.684 0.734 0.734 0.768 0.704	S NO 11 2 3 3 4 4 5 6 7 7 8 9 9 10 11 12 13 14 15 16 17 18 19 20 21 22 22 22 22 22	25.00 50.00 75.00 100.00 125.00 125.00 205.00 275.00 300.00 275.00 305.00 375.00 400.00 425.00 475.00 500.00 550.00 550.00 575.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958 0.933 0.961 0.770 0.768 0.883 1.005 1.005 1.127 1.129
S NO 12334567789102112313415516617922021222324	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 275.00 300.00 375.00 400.00 450.00 450.00 450.00 550.00 575.00 600.00	0.617 0.617 0.733 0.454 0.319 0.368 0.401 0.435 0.422 0.390 0.422 0.390 0.422 0.390 0.456 0.489 0.524 0.512 0.469 0.624 0.624	5 NO 1 2 3 3 4 5 6 7 8 9 9 10 11 12 13 14 15 16 17 18 19 20 21 22 21 22 21 22 21 22 22 23 24 24 25 26 27 27 28 28 28 28 28 28 28 28 28 28 28 28 28	25.00 75.00 100.00 125.00 175.00 200.00 275.00 275.00 300.00 375.00 400.00 425.00 425.00 425.00 425.00 500.00 575.00 500.00	0.925 1.099 0.682 0.478 0.552 0.613 0.617 0.653 0.632 0.536 0.524 0.522 0.600 0.684 0.734 0.734 0.737 0.637	S NO	25.00 50.00 75.00 100.00 125.00 175.00 200.00 275.00 250.00 275.00 305.00 405.00 475.00 405.00 475.00 505.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958 0.933 0.930 0.861 0.770 0.768 0.883 1.005 1.080 1.157 1.129 1.035 0.936 0.931
S NO 12334567789102112313415516617922021222324	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00 300.00 325.00 400.00 450.00 450.00 450.00 500.00 550.00 550.00 550.00 550.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.423 0.423 0.422 0.390 0.349 0.349 0.366 0.400 0.456 0.489 0.524 0.512 0.424 0.416 0.418	S NO 1 2 2 3 3 4 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	25.00 55.00 75.00 125.00 125.00 125.00 125.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00	0.925 1.099 0.682 0.617 0.652 0.613 0.617 0.653 0.635 0.635 0.635 0.632 0.524 0.522 0.600 0.684 0.787 0.768 0.704 0.637	S NO 11 2 3 3 4 4 5 6 7 7 8 9 9 10 11 12 13 14 15 16 17 18 19 20 21 22 22 22 22 22	25.00 50.00 75.00 100.00 175.00 200.00 175.00 200.00 275.00 300.00 375.00 400.00 425.00 425.00 500.00 500.00 500.00 500.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958 0.933 0.930 0.861 0.770 0.768 0.883 1.005 1.080 1.157 1.129 1.035 0.936 0.936 0.937 0.921 0.942 0.952
1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 5 5 6 6 7 8 8 9 10 10 10 10 10 10 10 10 10 10 10 10 10	25.00 50.00 75.00 150.00 175.00 150.00 175.00 225.00 225.00 225.00 235.00 325.00 325.00 400.00 475.00 450.00 475.00 500.00 575.00 600.00 625.00 625.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.423 0.422 0.390 0.348 0.400 0.456 0.499 0.524 0.512 0.422 0.422 0.400 0.456	5 NO 1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 28 28 28 28 28 28 28 28 28 28 28 28	0157NCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 225.00 225.00 225.00 235.00 375.00 400.00 475.00 475.00 505.00 575.00 605.00 675.00 675.00	0.925 1.099 0.682 0.613 0.617 0.653 0.653 0.635 0.632 0.524 0.522 0.600 0.684 0.734 0.787 0.786 0.704 0.637 0.624	S NO 1 2 2 3 3 4 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	25.00 50.00 75.00 100.00 125.00 150.00 225.00 225.00 250.00 375.00 400.00 475.00 475.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00 500.00	1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.960 0.958 0.933 0.930 0.861 0.770 0.768 0.883 1.005 1.080 1.157 1.129 1.035 0.936 0.937 0.952
S NO 1233 445 667 8 9 10 11 123 134 155 166 177 18 19 20 21 223 24 256 27	25.00 50.00 75.00 100.00 125.00 150.00 175.00 225.00 225.00 225.00 235.00 375.00 400.00 425.00 475.00 500.00 575.00 600.00 650.00 675.00	0.617 0.617 0.733 0.454 0.319 0.368 0.408 0.411 0.435 0.422 0.390 0.148 0.400 0.456 0.490 0.524 0.512 0.469 0.469 0.418 0.427 0.416 0.418	5 NO 1 1 2 3 3 4 4 5 6 6 7 7 8 9 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27	25.00 55.00 75.00 125.00 125.00 125.00 125.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00	0.925 1.099 0.682 0.617 0.652 0.613 0.617 0.653 0.635 0.635 0.635 0.632 0.524 0.522 0.600 0.684 0.787 0.768 0.704 0.637	S NO  1 2 3 3 4 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 26	25.00 50.00 75.00 100.00 125.00 150.00 250.00 250.00 250.00 250.00 250.00 350.00 450.00 450.00 450.00 550.00 550.00 575.00 575.00 675.00	(INCH)  1.360 1.617 1.002 0.703 0.812 0.901 0.907 0.958 0.933 0.930 0.861 0.770 0.768 0.883 1.005 1.080 1.157 1.129 1.291 1.935 0.936 0.917 0.952 0.974 0.968
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	:00.00	:.::3	8 200.0C	554	4 200.00 3 225.00	
	::5.00	1.124	) 235.00 .: 350.00	1.336	:3 750.00	1.903 1.976 1.830 1.637 1.633
::	:75.00	1.090	10 250.00 11 175.00 11 100.00 13 325.00	1.511 1.506 1.395	275.00	1.976
13	300.00 325.00	:.010	300.00	1.395	11 275.60 12 200.60 13 225.60	1.830
13	325.08	0.90)	:3 325.00	1.247	ມ ນຽ.00	1.637
:4 :5	350.00	0.901	14 350.00 15 375.00	1.364	14 350.60 :5 175.60	1.676 1.676 2.117 2.274 2.496 2.399 2.199
16	400.00	1.179	16 400.00		:6 400.00	2.137
16 :7	425.00	:.266	16 400.00 : 425.00 18 450.00	1.748	17 (25.00	2.294
10	450.00	1.356	18 450.00	1.873	18 459.00	2,430
19	475.00 NO. 60	1.334	19 475.00 20 500.00	1.475	20 500.00	2.199
31 30	323.00	1.096	21 525.00	1.316	25 373.00 26 000.00 17 425.00 18 459.00 29 500.00 21 525.00 22 550.00 23 575.00	1.900
:3	350.00	1.075	22 550.00	1.455	27 550.69	1.969
23	575.00	1.000	23 575.00	1.492	24 600.00	2.601
74 25	350.00 375.00 400.00 425.00 450.00 475.00 500.00 525.00 550.00 575.00 600.00 625.00	1.010 0.901 0.901 1.035 1.179 1.264 1.236 1.213 1.090 1.075 1.000	100.00 13 135.00 14 150.00 15 175.00 16 400.00 17 475.00 18 450.00 19 475.00 20 500.00 21 525.00 22 575.00 23 575.00 24 600.00 25 575.00	1.325	3 (3.00	2.622
26	650.80 673.00	1.142	26 650.00 27 675.00	1.370	26 650.00	2.673
26 27	675.00	1.135	26 650.00 27 675.00	1.567	27 675.00	2.67
7	700.00	1.116 1.142 1.135 1.093 1.609 6.867 0.663	<b>39 700.00</b>	1.429 1.429 1.748 1.873 1.873 1.675 1.516 1.465 1.492 1.525 1.541 1.570 1.567 1.567 1.394 1.197 8.394	78 770.89	1.989 1.949 1.956 2.601 2.622 2.677 1.900 1.629 1.572
.7	725.00	1.007 0.867	29 725.00 30 750.60 31 775.00	1.197	750.00	1.572
ñ	775.00	0.665	31 , 775.00	0.346	33 775.80	1.34
31 32 23 34	900.00 825.00	9.516 0.320 0.120	32 800.00 33 825.00 34 850.00	0.712	20 500.00 21 525.00 22 554.00 23 575.00 24 600.00 25 625.00 26 625.00 27 675.00 29 725.00 29 725.00 31 705.00 31 705.00 31 255.00	1.243 0.934 0.560 0.259
23	825.00 850.00	0.320	33 825.00 34 850.00	6.442 6.273	1) 125.00	4.250
,•	120.00	V. 1,50				
TIME	SETTUG	- 24 1	THE STITE	. 18.4	THER SETTING	34 4
TIME	DISTNO	- 24 % (2277) (2000)	TUES STITUE ( \$ DISTMES HD IFT)	18 % (1277) (1212)	S DISTINGS S DISTINGS NO NETI	(DCM)
TIME NO	OISTANCE (FT)	(DC))	S DISTACE 10 (FT)	18 t (DOI)	\$ 015774CS 10 1/71	1909
100	OISTANCE (FT)	(DC))		2.570	\$ 0157HG 6 \$ 0157HG 8 10 1771	3.304 3.527
100	OISTANCE (FT)	(DC))		2.570 3.654 1.893	1 25.00 2 50.00 10 UTI 1 25.00 2 50.00 3 73.00	1.304 1.327 1.434
10	OISTANCE (FT)	(DC))		2.570 3.654 1.893 1.339	1 25.00 2 50.00 3 77.00 4 100.00	1.304 1.304 1.304 1.304 1.306 1.300
10 × 0	OISTANCE (FT)	(DC))		2.570 1.694 1.693 1.694 1.693 1.399	11 25.00 2 90.00 3 77.00 4 100.00 5 125.00	1.304 1.304 1.404 1.404 1.400 1.400 1.400
THE S 10	OISTANCE (FT)	(DC))		2.570 3.654 1.893 1.129 1.534 1.702	TURCH SETTING OF STATE OF STAT	3.394 3.1394 3.137 2.434 1.780 1.977 2.186 2.382
.9	25.00 25.00 26.00 75.00 100.00 125.00 175.00	(DC))		2.570 3.694 1.693 1.329 1.534 1.702 1.703	THER SETTING (STRING) S DISTINGS 10 UTT 1 25.00 2 50.00 3 73.00 4 100.00 5 125.00 6 139.00 7 175.00 8 200.00	1.304 1.327 2.436 1.577 2.436 1.577 2.100 2.302 2.302 2.303
59 eser es	25.00 25.00 26.00 75.00 100.00 125.00 175.00	(DC))		2.570 1.694 1.893 1.329 1.534 1.762 1.773 1.783	THE SETTING OF STREET OF S	1.304 1.327 2.434 1.772 2.434 1.772 2.100 2.302 2.302 2.303 2.303
5 10	25.00 25.00 26.00 75.00 100.00 125.00 175.00	(DC))		2.570 1.694 1.893 1.329 1.534 1.762 1.773 1.783	THE SETTING S S DISTINGS S DISTINGS S DISTINGS S 100 LP71	1.304 1.304 1.304 1.377 2.414 1.378 1.378 2.180 2.180 2.331 2.331 2.337 2.337
5 NO	25.00 25.00 26.00 75.00 100.00 125.00 175.00	(DC))		2.570 1.694 1.893 1.329 1.534 1.762 1.773 1.783	THER SETTING 6 S DISTINGE 100 UTTI 1 25.60 2 59.60 3 77.60 4 100.60 5 125.60 6 150.60 7 175.60 8 200.60 9 225.60 10 256.60 11 275.60	1.304 1.304 1.306 1.306 1.306 1.306 1.307 2.306 2.306 2.307 2.307 2.307 2.307
5 NO   :223	25.00 25.00 26.00 75.00 100.00 125.00 175.00	(DC))		2.570 1.694 1.893 1.329 1.534 1.762 1.773 1.783	THER SETTING (STRING) S DISTINGS 10 UTT) 1 23.60 2 50.60 3 73.60 4 100.60 5 125.60 6 139.60 7 175.60 8 200.60 9 225.60 10 236.60 11 775.60 12 206.60 13 125.60	1.304 1.327 2.434 1.327 2.434 1.377 2.309 2.309 2.309 2.309 2.309 2.309 2.309 2.309 2.309
5 NO	25.00 25.00 26.00 75.00 100.00 125.00 175.00	(DC))		2.570 1.694 1.893 1.329 1.534 1.762 1.773 1.783	THER SETTING IS THE S	1.200 1.200 1.200 1.200 1.200 1.300 1.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.300 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000 2.000
5 NO	25.00 25.00 26.00 75.00 100.00 125.00 175.00	(DC))		2.570 1.694 1.893 1.329 1.534 1.762 1.763 1.763	THER SETTING (STRING) S DISTINGS 10 UTT) 1 25.00 2 7.00 4 100.00 5 125.00 6 130.00 7 175.00 6 200.00 10 256.00 11 275.00 12 300.00 13 135.00 14 356.00 15 175.00 16 600.00	1300 1300 1300 1.301 1.302 1.302 1.302 1.302 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.303 1.3
5 NO	25.00 25.00 26.00 75.00 100.00 125.00 175.00	(DC))	1 73.00 2 50.00 3 73.00 4 100.00 5 125.00 6 159.00 7 173.00 8 700.00 9 225.00 10 226.00 11 775.00 12 300.00 13 175.00 14 159.00 15 175.00	2.570 1.694 1.893 1.329 1.534 1.762 1.763 1.763	100 SETTING S 5 DISTINGS 100 UTTI 1 25.60 2 59.60 3 77.89 4 100.80 5 125.60 6 159.80 7 175.60 8 200.60 9 225.60 11 275.60 12 206.60 13 125.60 14 154.60 15 175.60 16 425.60 17 425.60	1300 1300 1300 1.301 1.300 1.300 1.300 1.300 1.300 1.300 1.300 1.300 1.300 1.300 1.400 1.400 1.400 1.400 1.400 1.400 1.400 1.400
5 NO	25.00 25.00 26.00 75.00 100.00 125.00 175.00	(DC))	1 73.00 2 50.00 3 73.00 4 100.00 5 125.00 6 159.00 7 173.00 8 700.00 9 225.00 10 226.00 11 775.00 12 300.00 13 175.00 14 159.00 15 175.00	2.570 3.054 1.093 1.329 1.329 1.722 1.713 1.813 1.816 1.753 1.627 1.625 1.631 1.647 1.659 2.029 2.115	THER SETTING (STRINGS) S DISTINGS 10 UTT) 1	1200 (1200) 1200) 1200 1200 1200 1200 1200 120
5 NO : 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	25.00 25.00 26.00 75.00 100.00 125.00 175.00	(DC))	1 73.00 2 50.00 3 73.00 4 100.00 5 125.00 6 159.00 7 173.00 8 700.00 9 225.00 10 226.00 11 775.00 12 300.00 13 175.00 14 159.00 15 175.00	2.570 3.694 1.994 1.399 1.534 1.703 1.703 1.703 1.704 1.009 1.451 1.609 1.609 2.009 2.109 2.109	THER SETTING (STINGS) S DISTINGS S DISTINGS 10 UPT) 1	1200 (1900) 1.304 1.307 1.404 1.507 2.309 2.301 2.301 2.307 2.300 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600 1.600
5 NO	25.00 25.00 26.00 75.00 100.00 125.00 175.00	(DC))	1 73.00 2 90.00 3 73.00 4 100.00 5 125.00 6 159.00 7 175.00 8 700.00 9 225.00 10 236.00 11 375.00 12 300.00 13 375.00 14 400.00 15 45.00 16 400.00 17 425.00 18 450.00 19 475.00	1.570 1.091 1.299 1.330 1.730 1.731 1.810 1.761 1.651 1.667 1.699 2.099 2.115 2.115	THER SETTING (STINGS) SO USTINGS 10 USTINGS 12.00 13.00 14.00 15.00 15.00 16.00 17.13.00 16.00 17.13.00 16.00 17.13.00 16.00 17.13.00 16.00 17.13.00 16.00 17.13.00 18.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.0	1300 1300 1300 1300 1300 1300 1300 1300
5 NO	25.00 25.00 26.00 75.00 100.00 125.00 175.00	(DC))	1 73.00 2 90.00 3 73.00 4 100.00 5 125.00 6 159.00 7 175.00 8 700.00 9 225.00 10 236.00 11 375.00 12 300.00 13 375.00 14 400.00 15 45.00 16 400.00 17 425.00 18 450.00 19 475.00	1.570 1.091 1.299 1.330 1.730 1.731 1.810 1.761 1.651 1.667 1.699 2.099 2.115 2.115	THER SETTING (STINGS) SO UTT) 1 25.60 2 59.60 3 73.60 4 100.60 5 125.60 6 139.60 17 175.60 18 225.60 11 275.60 12 296.60 13 135.60 14 296.60 15 17 425.60 16 600.60 17 425.60 18 646.60 19 675.60 20 500.60 21 255.60	1.007 1.007 1.004 1.004 1.004 1.005 1.007 1.007 1.009 1.007 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.009 1.
5 NO	DISTANCE (F7)  25.00 10.00 10.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.	1.950 1.251 1.420 1.420 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150	1 73.00 2 90.00 3 73.00 4 100.00 5 125.00 6 159.00 7 175.00 8 700.00 9 225.00 10 236.00 11 375.00 12 300.00 13 375.00 14 400.00 15 45.00 16 400.00 17 425.00 18 450.00 19 475.00	2.570 1.094 1.994 1.399 1.399 1.702 1.703 1.810 1.713 1.810 1.713 1.617 1.617 1.617 1.619 2.109 2.113 1.704 1.704 1.704	THER SETTING (STINGS) SO USTINGS 10 USTINGS 12 59.60 2 59.60 2 59.60 3 77.60 4 100.60 5 125.60 6 136.60 7 175.60 12 206.60 13 125.60 14 256.60 15 256.60 16 405.60 17 425.60 18 475.60 19 475.60 20 500.60 21 525.60 22 536.60 23 575.60 24 546.60 25 575.60	1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000
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5 10 12 13 14 5 6 7 8 9 10 11 12 11 14 15 16 17 18 19 22 23 23 25 25 25 25 25 25 25 25 25 25 25 25 25	DISTANCE (F7)  25.00 10.00 10.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.	1.950 1.251 1.420 1.420 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150 1.150	1 73.00 2 90.00 3 73.00 4 100.00 5 125.00 6 159.00 7 175.00 8 700.00 9 225.00 10 236.00 11 375.00 12 300.00 13 375.00 14 400.00 15 45.00 16 400.00 17 425.00 18 450.00 19 475.00	2.570 1.094 1.994 1.399 1.399 1.702 1.703 1.810 1.713 1.810 1.713 1.617 1.617 1.617 1.619 2.109 2.113 1.704 1.704 1.704	100 SETTING STATES STAT	1.007 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.
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TUER STING	MONZ 0070100
100	0.304
-3	0.405
44	0.304
50	0.400
43	0.723
34	0.894
29	1.048
24	264
21	1.447
18	1.606
:6	:.877
:4	2.170

### END SUN OFF WITH MODIFIED DEELSN

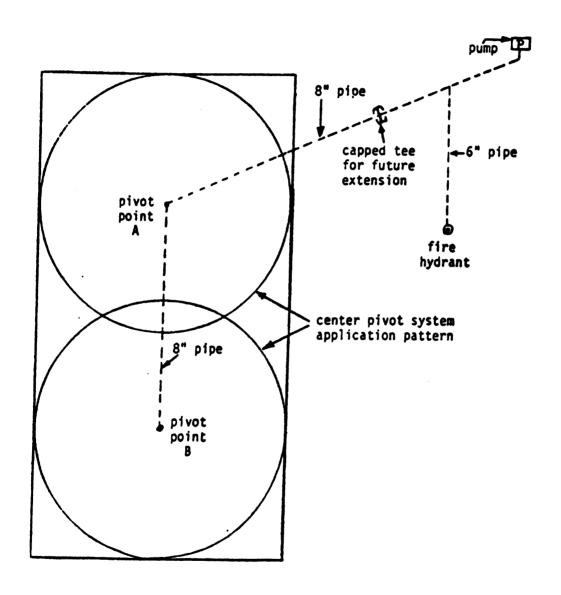
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£:J	22H 144							
TIME	R SETTING	-100 %	1:48	H SETTING	. 60 %		R SETTING	• 42
S	SISTANCE	DEPTH	5	::STANCE	DEPTH	\$	CISTANCE	DEPTH ( NCH )
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• • •	••••••	•••••	•••	•••••			25.00	3.982
•	: 5.25	2.413	1	35.53	C.400		50.00	1.217
2	50.00	0.511	•	50.00	0.852	j	75.00	0.801
3	75.00	3.336	3	75.00 100.00	0.427		:00.00	0.610
•	:00.00	2.256	4 5	:25.00	0.491	š	:25.00	0.702
5	125.00	3.295	•	150.00	0.553	í	150.00	0.790
6	:50.00	3.332	,	175.00	0.593	7	175.00	0.847
	175.00	0.356 0.387		200.00	0.645	•	200.00	0.921
;	200.00 225.00	0.391	Ţ,	224.00	0.652	•	225.00	0.932
10	250.00	0.383	10	250.00	0.637	10	250.00	0.911
:1	275.00	0.357	11	275.00	0.594	41	275.00	0.849
12	300.00	0.338	12	300.00	0.563	12	300.00	0.804
:5	325.00	0.205	13	325.00	0.474	13	325.00	0.677
14	350.00	0.284	14	350.00	0.473	14	350.00	0.676
15	375.00	0.135	15	375.181	0.559	15	375.00	0.798
16	400.00	0.301	16	400.00	0.635	16	400.00	0.907
17	425.00	0.411	17	425.00	0.606	17	425.00	0.300
18	450.00	0.437	10	450.00	0.728	19	450.00	1.010
19	475.00	0.427	19	475.00	0.712	19	475.00	0.961
20	500.00	0.404	20	\$00.00	0.673	20	500.00	0.869
21	525.00	0.365	21	525.00	0.600	21	\$2\$.00 \$50.00	0.803
33	550.00	2.337	22	550.00	0.562	22	575.00	0.863
23	575.00	0.363	53	575.00	0.604	23 24	600.00	0.856
24	600.00	2.360	24	600.00	0.509	25	625.00	0.811
25	625.00	0.341	25	625.00	0.568 0.570	26	650.00	0.814
26	650.00	0.342	26	650.00	0.618	27	675.00	0.882
: 7	675.00 .	0.371	27	675.00 700.00	0.623	28	700.00	0.891
28	700.00	0.374	20 29	725.00	0.595	29	725.00	0.849
39	725.00 750.00	0.357 0.307	30	750.00	0.311	30	750.00	0.730
30 31	775.00	0.249	31	775.00	0.414	31	775.00	0.592
32	900.00	0.177	32	.00.00	0.295	32	800.00	0.621
"	825.00	0.084	ີ້	825.00	0.141	33	025.00	0.201
34	<b>?50.00</b>		34		0.062	34	850.00	0.089
				950.00	V			
	730.00	0.037						
	A SETTING			R SETTING	- 50 +	TIME	R SETTING	• 34 <b>•</b>
		a 75 4 DEPTH	TINE S	R SETTING DISTANCE	- SO & DEPTH	TIME	R SETTING DISTANCE	DEPTH
TIME	A SITTING	. 75 4	TIME S NO	R SETTING DISTANCE (FT)	• 50 t DEPTH (INCH)	TIME S NO	R SETTING DISTANCE (FT)	• 34 4 DEPTH (INCH)
TIME S	R SETTING DISTANCE (FT)	o 75 6 DEPTH (INCH)	TIME S NO	R SETTING DISTANCE (FT)	SO T DEPTH (INCH)	TIME S NO	R SETTING DISTANCE (FT)	DEPTH (INCH)
TIME S NO	R SETTING DISTANCE (FT) 25.00	- 75 % DEPTH (INCH)	TIME S MO	R SETTING DISTANCE (FT) 25.00	. SO T DEPTH (INCH)	TIME S MO	R SETTING DISTANCE (FT) 25.00	(INCM)
TIME S MO	R SETTING DISTANCE (FT) 25.00 50.00	- 75 % DEPTH (INCH) 	1 1 ME	R SETTING DISTANCE (FT) 25.00 50.00	- 50 % DEPTH (IMCH) 0.825 1.022	TIME S MO	R SETTING DISTANCE (FT) 25.00 50.00	DEPTH (INCH)
TIME S MO	R SETTING DISTANCE (FT) 25.00 50.00 75.00	- 75 Q DEPTH (INCH)  0.550 0.461 0.449	TIME \$ NO	R SETTING DISTANCE (FT) 25.00 50.00 75.00	- 50 t DEPTH (IMCH) 	TIME S NO 1 2	R SETTING DISTANCE (FT) 25.00 50.00 75.00	DEPTH (INCH) 1.213 1.503
TIME S MO	R SETTING DISTANCE (FT) 	- 75 % DEPTH (INCH) 0.550 0.661 0.449 0.342	71ME 8 NO 17 2 3 4	R SETTING DISTANCE (FT) 25.00 50.00 75.00 100.00	- 50 t DEPTH (INCH) 	TIME S NO	R SETTING DISTANCE (FT) 25.00 50.00	1.213 1.503 0.990
TIME S MO 	25.00 50.00 75.00 25.00 25.00	- 75 Q DEPTH (IMCM) 0.550 0.601 0.449 0.342 0.393	TIME S MO  1' 2 3 4 5	R SETTING DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00	- 50 t DEPTM (INCH) 0.825 1.022 0.673 0.513	TIME S NO 1 2	R SETTING DISTANCE (FT) 25.00 50.00 75.00 :00.00	1.213 1.213 1.503 0.990 0.754 0.867
TIME S MO 	R SETTING DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00	75 9 DEPTH (INCH)  0.550 0.461 0.342 0.342 0.393	TIME 8 MO  1' 2 3 4 5	R SETTING DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00	- 50 t DEPTH (INCH) 	TIME S NO	R SETTING DISTANCE (FT) 	1.213 1.503 0.990 0.754 0.867 0.976
TIME 8 NO 	R SETTING DISTANCE (FT) 	- 75 9 DEPTH (INCH) 	TIME S MO 1: 2 3 4 5 6 6 7	R SETTING DISTANCE (FT) 	- 50 t DEPTM (INCH) 0.825 1.022 0.673 0.513	TIME S MO	R SETTING DISTANCE (FT) 25.00 50.00 75.00 :00.00 :25.00 175.00 200.00	1.213 1.503 0.990 0.754 0.867 1.046
TIME S NO	R SETTING DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00	- 75 9 DEPTH (INCH) 	TIME S MO	R SETTING DISTANCE (FT) 2\$.00 50.00 100.00 12\$.00 150.00 17\$.00 200.00	DEPTM (IMCN) 0.825 1.022 0.673 0.513 0.590 0.664 0.712	TIME S MO  1 2 3 4 5	R SETTING DISTANCE (FT) 25.00 50.00 75.00 :00.00 :25.00 :150.00 :25.00 200.00 225.00	1.213 1.503 0.990 0.754 0.867 0.976 1.046
TIME S NO	R SETTING DISTANCE (FT) 	- 75 0 DEPTH (INCH) 	TIME S HO  1' 2 3 4 5 6 7	R SETTING DISTANCE (FT) 	- 50 t DEPTH (INCH) 	TIME S MO	R SETTING DISTANCE (FT) 	1.213 1.503 0.990 0.754 0.867 0.976 1.046 1.138 1.151
TIME 8 MO  1 2 3 4 5 6 7	R SETTING DISTANCE (FT) 	75 9 DEPTH (INCH) 0.550 0.661 0.449 0.342 0.393 0.442 2.474 0.516 3.522 2.510	TIME S MO	R SETTING DISTANCE (FT) 	- 50 % DEPTH (IMCM)	TIME S MO  1 2 3 4 5 6 7	R SETTING DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 275.00	1.213 1.503 0.990 0.754 0.867 0.976 1.046 1.138 1.151 1.125
TIME S NO	R SETTING DISTANCE (FT) 	- 75 0 DEPTH (INCH) 	TIME S NO	R SETTING DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 225.00 250.00 275.00	- SO % DEPTH (INCH) 0.825 1.022 0.673 0.513 0.590 0.664 0.712 0.774 0.783 0.765 0.713	TIME S MO  1 2 3 4 5 6 7 8 9 10	R SETTING DISTANCE (FT) 25.00 50.00 75.00 150.00 175.00 200.00 225.00 250.00 275.00	1.213 1.503 0.990 0.754 0.867 0.976 1.046 1.138 1.151 1.125
TIME S NO	R SETTING DISTANCE (FT) 	- 75 9 DEPTH (INCH) 0.550 0.661 0.449 0.342 0.393 0.462 0.474 0.516 0.552 0.510 0.476 0.451 0.379	TIME S HO 1' 2 3 4 5 6 7 0 1: 1: 1:2 1:3	R SETTING 01STANCE (FT)	- SO 9 DEPTH (INCH)  0.825 1.022 0.673 0.513 0.590 0.664 0.712 0.774 0.774 0.765 0.713 0.676 0.389	TIME S MO  1 2 3 4 5 6 7 8 9 10 11 12	R SETTING DISTANCE (FT) 	1.213 1.503 0.990 0.754 0.867 1.046 1.138 1.151 1.125 1.049
TIME 8 NO 	R SETTING DISTANCE (FT) 	- 75 0 DEPTH (INCH) 	TIME S MO 1: 22 3 4 5 6 7 0 1: 12 13	R SETTING DISTANCE (FT) 	- 50 t DEPTH (1MCH) 0.825 1.022 0.673 0.513 0.590 0.664 0.712 0.774 0.778 0.778 0.778 0.778 0.765 0.713	TIME S MO  1 2 3 4 5 6 7 8 9 10 11 12 12	R SETTING DISTANCE (FT) 	1.213 1.503 0.990 0.754 0.867 0.976 1.066 1.138 1.151 1.125 1.049 0.994
TIME S MO	R SETTING DISTANCE (FT)  25.00 100.00 125.00 150.00 175.00 200.00 275.00 250.00 275.00 200.00 275.00	- 75 9 DEPTH (INCH) 0.550 0.661 0.449 0.342 0.393 0.462 0.474 0.516 0.552 0.510 0.476 0.451 0.379	TIME S S MO	R SETTING DISTANCE (FT) 25.00 50.00 15.00 100.00 125.00 150.00 200.00 225.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00	- SO % DEPTH (INCH) 0.825 1.022 0.673 0.513 0.590 0.664 0.712 0.774 0.783 0.765 0.765 0.566 0.560	TIME S MO  1 2 3 4 5 6 7 8 9 10 11 12 13 14	R SETTING DISTANCE (FT) 25.00 50.00 75.00 150.00 175.00 200.00 225.00 275.00 350.00 350.00 375.00	1.213 1.503 0.990 0.754 0.867 0.976 1.046 1.138 1.155 1.049 0.994 0.937
TIME 8 MO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 15 16	R SETTING DISTANCE (FT) 	- 75 0 DEPTM (INCH) 0.550 0.461 0.449 0.342 0.393 0.442 0.474 0.516 0.522 0.510 0.475 0.451 0.379 0.379 0.379	TIME S MO 1' 2 3 4 5 6 7 8 9 :0: 11 12 13 14 15	R SETTING 01STANCE (FT) 25.00 50.00 75.00 100.00 125.00 135.00 135.00 205.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00	DEPTH (INCH)	TIME S MO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	R SETTING (FT) 25.00 50.00 75.00 :00.00 :25.00 :75.00 :25.00 225.00 225.00 235.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00	1.213 1.503 0.990 0.754 0.877 1.046 1.138 1.125 1.049 0.994 0.997
TIME 8 MO 1 2 3 4 5 6 7 8 9 10 11 12 12 13 14 15 16 17	R SETTING DISTANCE (FT) 25.00 50.00 75.00 100.00 :75.00 200.00 275.00 200.00 275.00 300.00 375.00 375.00 375.00 375.00 375.00	- 75 9 DEPTM (INCH) 0.550 0.661 0.449 0.342 0.393 0.462 0.474 0.516 0.522 0.510 0.475 0.451 0.379 0.379 0.379 0.447 0.569	TIME S MO 1 2 3 4 5 6 7 0 1: 12 13 14 15 16	R SETTING DISTANCE (FT)	- SO T DEPTH (INCH)	TIME S MO 	R SETTING (FT) 25.00 50.00 75.00 :00.00 150.00 175.00 200.00 250.00 250.00 275.00 300.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00 350.00	1.213 1.503 0.990 0.754 0.867 0.976 1.066 1.138 1.151 1.125 1.049 0.994 0.937 0.835 0.806
TIME S MO 1 2 3 4 5 6 7 8 9 10 11 12 12 13 14 15 16 17 17 18 18 18 18 18 18 18 18 18 18 18 18 18	R SETTING DISTANCE (FT) 	- 75 9 DEPTH (INCH) 0.550 0.681 0.449 0.342 0.393 0.442 3.516 3.522 3.516 0.451 0.379 0.379 0.379 0.347 3.500 0.447	TIME S NO	R SETTING DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 125.00 200.00 225.00 235.00 235.00 235.00 235.00 235.00 235.00 400.00 425.00 425.00	- SO % DEPTH (INCH)	TIME S MO  1 2 3 4 5 6 7 8 9 10 11 12 12 13 14 15 16 17	R SETTING DISTANCE (FT)  25.00 50.00 75.00 150.00 150.00 125.00 250.00 275.00 300.00 275.00 300.00 375.00 400.00 425.00 425.00 425.00	1.213 1.503 0.990 0.754 0.877 1.046 1.138 1.125 1.049 0.994 0.997
TIME 8 MO 	R SETTING DISTANCE (FT) 250.00 100.00 125.00 125.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00	- 75 9 DEPTH (INCH) 0.550 0.461 0.449 0.342 0.393 0.442 0.474 0.516 0.522 0.510 0.476 0.451 0.379 0.370 0.447 0.500 0.549 0.582	TIME S NO	R SETTING DISTANCE (FT)	DEPTH (INCH)	TIME S MO 1 2 3 4 5 6 7 8 9 10 11: 12: 13: 16: 15: 16: 17: 18: 19: 19: 19: 19: 19: 19: 19: 19: 19: 19	R SETTING (FT) 25.00 50.00 75.00 :00.00 :25.00 :25.00 :25.00 20.00 225.00 235.00 235.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 255.00 2	1.213 1.503 0.990 0.754 0.867 0.976 1.066 1.138 1.151 1.125 1.049 0.994 0.937 0.835 0.836 1.120 1.210
TIME S MO  1 2 3 4 5 6 7 8 9 10 11 12 11 12 11 14 15 16 17 19 19 19 19 19 19 19 19 19 19 19 19 19	R SETTING DISTANCE (FT) 25.00 100.00 125.00 130.00 275.00 200.00 275.00 250.00 275.00 350.00 375.00 350.00 375.00 450.00 475.00	- 75 9 DEPTM (INCH) 0.550 0.681 0.449 0.342 0.393 0.462 0.474 0.516 0.522 0.510 0.476 0.451 0.379 0.379 0.379 0.379 0.379 0.589 0.589 0.589	TIME S NO 1' 2 3 4 5 6 7 0 1: 12 13 14 15 16 17 10	R SETTING DISTANCE (FT)	- SO 9     DEPTH (INCH) 0.825 1.022 0.673 0.513 0.590 0.664 0.712 0.774 0.765 0.713 0.676 0.765 0.713 0.676 0.969 0.560 0.677 0.762 0.973 0.855 0.807	TIME S MO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	R SETTING DISTANCE (FT)  25.00 50.00 75.00 150.00 150.00 125.00 250.00 275.00 300.00 275.00 300.00 375.00 400.00 425.00 425.00 425.00	1.213 1.503 0.990 0.754 0.867 0.976 1.066 1.138 1.151 1.129 0.994 0.837 0.835 0.986 1.120 1.220 1.230
TIME S NO	R SETTING DISTANCE (FT)	- 75 % DEPTH (INCH)	TIME S MO	R SETTING DISTANCE (FT)  25.00 50.00 15.00 125.00 125.00 125.00 200.00 225.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 255.00 255.00 255.00	- SO % DEPTH (IMCM)	TIME S MO 1 2 3 4 5 6 7 8 9 10 11: 12: 13: 16: 15: 16: 17: 18: 19: 19: 19: 19: 19: 19: 19: 19: 19: 19	R SETTING (FT) 25.00 50.00 75.00 :00.00 :00.00 :25.00 :25.00 250.00 275.00 300.00 300.00 350.00 375.00 360.00 475.00 475.00 475.00 475.00 475.00 475.00	1.213 1.503 0.990 0.754 0.087 1.046 1.138 1.151 1.125 1.049 0.037 0.035 0.994 0.037 0.120 1.210 1.210
TIME NO	R SETTING DISTANCE (FT) 250.00 150.00 125.00 150.00 275.00 200.00 275.00 250.00 275.00 350.00 475.00 450.00 475.00 500.00 525.00	- 75 9 DEPTH (INCH) 0.550 0.461 0.449 0.342 0.393 0.442 3.516 3.522 3.510 0.476 0.451 0.379 0.379 0.379 0.379 0.3647 0.582 0.590 0.582 0.590 0.582 0.590 0.5882 0.590 0.5882 0.590 0.5882 0.590 0.5882	TIME S MO 17	R SETTING DISTANCE (FT)  25.00 30.00 75.00 100.00 125.00 150.00 225.00 235.00 235.00 235.00 235.00 400.00 425.00 400.00 475.00 500.00 500.00 500.00	DEPTH (INCH)	TIME S MO 1 2 3 4 5 6 7 8 9 10 11: 12 13 14 15 16 17 18 19 20 21	R SETTING (FT)  25.00 75.00 75.00 100.00 175.00 125.00 175.00 205.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00 215.00	1.213 1.503 0.990 0.754 0.867 1.046 1.138 1.155 1.049 0.994 0.937 0.835 0.906 1.120 1.210 1.210 1.210
TIME 5 MO	R SETTING DISTANCE (FT) 25.00 100.00 125.00 100.00 275.00 200.00 275.00 250.00 275.00 350.00 375.00 350.00 375.00 450.00 475.00 500.00 575.00	- 75 9 DEPTM (INCH) 0.550 0.461 0.449 0.342 0.349 0.462 0.474 0.516 0.522 0.510 0.476 0.451 0.379 0.379 0.379 0.379 0.549 0.582 0.570 0.538 0.467 0.483	TIME S MO 1' 2 3 4 5 6 7 8 9 :0: 11 12 13 14 15 16 17 18 20 21 22 23	R SETTING (FT)  25.00 35.00 15.00 15.00 15.00 175.00 200.00 225.00 275.00 175.00 175.00 400.00 425.00 450.00 475.00 450.00 575.00	- SO % DEPTH (IMCM)	TIME S MO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	R SETTING DISTANCE (FT)	1.213 1.503 0.990 0.754 0.867 0.976 1.066 1.138 1.151 1.125 1.049 0.994 0.935 0.986 1.120 1.210 1.210 1.210
TIME NO	R SETTING DISTANCE (FT)	- 75 % DEPTH (INCH) 0.550 0.681 0.449 0.342 0.393 0.442 3.516 3.522 3.510 0.476 0.451 0.379 0.379 0.475 0.467 0.582 2.570 0.582 0.582 0.580 0.480 0.480	TIME S MO	R SETTING DISTANCE (FT)  25.00 50.00 15.00 125.00 125.00 125.00 200.00 225.00 235.00 235.00 275.00 300.00 275.00 400.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00 425.00	- SO 9 DEPTH (INCH) 0.825 1.022 0.673 0.513 0.590 0.664 0.712 0.774 0.703 0.765 0.713 0.676 0.569 0.560 0.676 0.569 0.560 0.675 0.725	TIME S MO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	R SETTING DISTANCE (FT)	1.213 1.503 0.990 0.754 0.867 0.976 1.046 1.138 1.151 1.129 1.049 0.994 0.937 0.996 1.120 1.284 1.287 1.074 0.992 1.074
TIME NO	R SETTING DISTANCE (FT) 25.00 100.00 125.00 150.00 125.00 250.00 275.00 275.00 300.00 375.00 400.00 475.00 475.00 500.00 575.00 500.00 575.00 600.00 625.00	- 75 9 DEPTH (INCH) 0.550 0.681 0.449 0.342 0.393 0.442 3.516 3.522 3.510 0.476 0.451 0.379 0.379 0.379 0.379 0.379 0.382 2.570 0.538 0.487 0.483 0.487 0.456	TIME S MO 17	R SETTING (FT)  25.00 35.00 15.00 15.00 15.00 175.00 200.00 225.00 275.00 175.00 175.00 400.00 425.00 450.00 475.00 450.00 575.00	- SO % DEPTH (IMCM)	TIME S MO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26	R SETTING (FT)  25.00 50.00 75.00 :00.00 :25.00 :150.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00 :25.00	1.213 1.503 0.990 0.754 0.867 1.046 1.138 1.151 1.125 1.049 0.937 0.935 0.935 0.936 1.120 1.210 1.210 1.210 1.257 1.074
TIME NO	R SETTING DISTANCE (FT) 250.00 100.00 150.00 150.00 275.00 200.00 275.00 250.00 275.00 350.00 375.00 450.00 475.00 500.00 575.00 500.00 575.00 600.00 650.00	- 75 9 DEPTM (INCH) 0.550 0.461 0.449 0.342 0.393 0.442 3.474 3.516 3.522 3.510 0.476 0.451 0.379 0.379 0.379 0.447 0.500 0.549 0.582 2.570 0.538 0.467 0.450 0.463	TIME S MO	R SETTING DISTANCE (FT)  25.00 30.00 75.00 100.00 125.00 150.00 225.00 235.00 235.00 235.00 235.00 400.00 425.00 400.00 475.00 500.00 525.00 550.00 550.00 550.00 550.00 550.00 550.00 550.00	- SO % DEPTH (IMCM)	TIME S MO 1 2 3 4 5 6 7 8 9 10 11: 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27	R SETTING DISTANCE (FT)	1.213 1.503 0.990 0.754 0.867 0.976 1.066 1.138 1.151 1.125 1.049 0.994 0.993 0.995 0.906 1.204 1.210 1.204 1.257 1.107 1.074 0.993 1.074 0.993
TIME S NO	R SETTING DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 125.00 275.00 200.00 275.00 300.00 375.00 400.00 475.00 450.00 475.00 500.00 575.00 600.00 675.00	- 75 9 DEPTH (INCH) 0.550 0.681 0.449 0.342 0.393 0.442 3.516 3.522 3.510 0.476 0.451 0.379 0.379 0.379 0.379 0.379 0.382 2.570 0.538 0.487 0.483 0.487 0.456	TIME S MO 1' 2 3 4 5 6 7 0 0 1: 12 13 14 15 16 17 18 20 21 22 23 24 75 26	R SETTING 01STANCE (FT)	- SO % DEPTH (IMCM) 0.825 1.022 0.673 0.513 0.590 0.664 0.712 0.774 0.783 0.765 0.713 0.676 0.560 0.676 0.560 0.670 0.762 0.823 0.873 0.875 0.873 0.875 0.725 0.725 0.725	TIME S MO 1 2 3 4 5 6 7 8 9 10 11: 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	R SETTING DISTANCE (FT)	1.213 1.503 0.990 0.754 0.875 1.046 1.138 1.151 1.125 1.049 0.837 0.835 0.986 1.120 1.210 1.227 1.107 1.074 0.932 1.066 1.002 1.005 1.005
TIME MO 12 2 3 4 6 5 6 7 8 9 10 11 12 12 13 14 15 16 6 17 20 12 22 22 22 26 25 26 27 29	R SETTING DISTANCE (FT) 250.00 100.00 150.00 150.00 275.00 200.00 275.00 250.00 275.00 350.00 375.00 450.00 475.00 500.00 575.00 500.00 575.00 600.00 650.00	- 75 % DEPTH (INCH)	TIME S MO	R SETTING (FT)  25.00 35.00 15.00 15.00 15.00 15.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00	- SO % DEPTH (IMCM)	TIME S MO 1 2 3 4 5 6 7 8 9 10 112 123 14 15 15 16 17 18 19 20 21 22 23 24 25 26 27 28	R SETTING (FT)  25.00 75.00 75.00 150.00 175.00 205.00 235.00 235.00 235.00 300.00 325.00 375.00 400.00 425.00 450.00 675.00 500.00 575.00 600.00 675.00 600.00 675.00 675.00 675.00	1.213 1.503 0.990 0.754 0.867 1.046 1.138 1.1525 1.049 0.994 0.937 0.995 1.204 1.229 1.210 1.229 1.210 1.229 1.210 1.220 1.210 1.200 1.200 1.000
TIME S NO	R SETTING DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 275.00 275.00 375.00 400.00 475.00 475.00 575.00 575.00 575.00 575.00 575.00 575.00	* 75 % DEPTH (INCH)	TIME  S  MO  1 2 3 4 5 6 7 0 9 ::0:12 13 14 15 16 17 10 19 20 21 22 23 24 25 26 27 28	R SETTING (FT)  25.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00	- SO 9     DEPTH (INCH) 0.825 1.022 0.673 0.513 0.590 0.664 0.712 0.703 0.765 0.713 0.676 0.763 0.765 0.713 0.676 0.569 0.560 0.677 0.752 0.823 0.873 0.855 0.807 0.725 0.719 0.5681 0.741 0.748 0.748	TIME S MO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	R SETTING (FT)	1.213 1.503 0.990 0.754 0.867 0.976 1.046 1.138 1.151 1.049 0.994 0.994 1.120 1.210 1.220 1.210 1.210 1.210 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201 1.201
TIME NO	R SETTING DISTANCE (FT) 250.00 75.00 100.00 125.00 125.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00	75 9 DEPTM (INCH) 0.550 0.461 0.449 0.342 0.393 0.462 0.474 0.516 0.522 0.510 0.475 0.451 0.379 0.379 0.379 0.379 0.462 0.549 0.589 0.589 0.589 0.487 0.480 0.480 0.480 0.484 0.496 0.494 0.499 0.497	TIME S MO 1 2 3 3 4 4 5 6 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	R SETTING DISTANCE (FT)  25.00 50.00 15.00 100.00 125.00 150.00 200.00 225.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00	DEPTH (INCH)	TIME  S  MO  1 2 3 4 5 6 7 8 9 10 11 12 12 13 14 15 16 17 18 19 20 12 12 22 23 24 25 26 27 28 29 30 31	R SETTING DISTANCE (FT)	1.213 1.503 0.990 0.754 0.867 1.138 1.1513 1.1513 1.1513 1.125 1.049 0.994 0.994 0.994 0.994 1.1210 1.284 1.257 1.074 0.992 1.005 1.000 1.1000 1.000 1.000
TIME NO	R SETTING DISTANCE (FT) 25.00 100.00 125.00 100.00 125.00 275.00 200.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00	75 9 DEPTH (INCH) 0.550 0.461 0.449 0.342 0.393 0.442 3.516 3.522 3.510 0.476 0.451 0.379 0.378 0.467 0.549 0.582 3.570 0.538 0.467 0.450 0.483 0.479 0.456 3.494 0.499 1.476 3.409 2.331 3.2256	TIME S MO 17	R SETTING  01STANCE (FT)  25.00  30.00  15.00  150.00  150.00  150.00  250.00  250.00  250.00  250.00  350.00  350.00  350.00  350.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00  550.00	DEPTH (INCH)	TIME  S  MO  1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	R SETTING (FT)	1.213 1.503 0.990 0.754 0.976 1.046 1.138 1.151 1.125 1.049 0.937 0.994 0.937 0.996 1.120 1.210 1.210 1.210 1.210 1.204 1.257 1.107 1.005 1.000 1.000 1.000
TIME MO 12 23 6 6 7 8 9 10 11 12 13 14 15 16 6 17 20 21 22 22 25 26 27 29 31 1	R SETTING DISTANCE (FT)  25.00 100.00 125.00 150.00 125.00 200.00 275.00 275.00 275.00 275.00 400.00 475.00 575.00 575.00 575.00 575.00 575.00 575.00 575.00	* 75 % DEPTH (INCH)	TIME S MO 1 2 3 3 4 4 5 6 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	R SETTING DISTANCE (FT)  25.00 50.00 15.00 100.00 125.00 150.00 200.00 225.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00 235.00	DEPTH (INCH)	TIME  S  MO  1 2 3 4 5 6 7 8 9 10 11 12 12 13 14 15 16 17 18 19 20 12 12 22 23 24 25 26 27 28 29 30 31	R SETTING DISTANCE (FT)	1.213 1.503 0.990 0.754 0.867 1.138 1.1513 1.1513 1.1513 1.125 1.049 0.994 0.994 0.994 0.994 1.1210 1.284 1.257 1.074 0.992 1.005 1.000 1.1000 1.000 1.000

TIME	DRITTER R	. 29 1		R SETTING	• :: •		SETTING	HTTBC
•		CEPTH	:		CEPTH	; ;	(FT)	(INCH)
ж	FT:	(INCH)	NC.		I INCH I			
•••	•••••	•••••	•••	•••••	•••••	•	25.00	2.570
•	: 4.20	1.422	:	25.00	1.964			3.194
:	42.33	762	:	50.06	3.433	;	75.07	2.103
3	~5.30	:.:60	3	`\$.00 ::0.00	602		130.00	1.602
	:00.00	2.864		::0.00	:.220		135.0C 150.00	1.842
ŧ	::5.30	1.016	•	:25.00	: .404		150.00	2.074
•	:50.00	1.144	6	150.00	:.500	Ţ	175.00	2.224
•	: 75.00	1.227			1.694	í		2.418
•	200.00	1.334	•	200.00	1.843		225.00	2.446
9	225.00	1.349	•	225.00	1.863		250.00	2.390
:0	:50.00	1.319	10	250.00	: . 621	10	250.00 275.00	2.229
1:	: `5.00	1.230	1:	275.00	1.678	11	275.00	2.112
12	300.00	1.165	12	300.00	1.609		300.00 32 <b>5.00</b>	1.770
13	325.00	0.901	13	325.00	1.355			1.774
14	350.00	0.979	14	350.00	1.353		350.00	2.095
15	375.00	1.156	15	375.00	1.586		375.00	2.301
16	400.00	1.313	16	400.00	1.814		400.00	2.572
17	425.00	1.419	17	425.00	1.959		425.00	2.729
1.0	450.00	1.506	10	450.00	2.079	10		2.671
19	475.00	1.474	19	475.00			475.00	2.523
30	500.00	1.392	30	500.00	1.922		500.00	
21	\$25.00	1.259	21	\$25.IRI	1.739		\$25.00	2.202
22	550.00	1.163	33	550.00	1.607		\$50.00	2.109
::	575.00	1.250	23	575.00	1.727		575.00	2:266 2:240
24	600.00	1.240	24	600.00	:.712		600.00	
25	625.00	1.174	:5	625.00	1.622		625.00	2.128
26	450.00	1.179		650.00	1.628		650.00	2.136 2.316
:7	675.00	1.278	27	6/5.00	1.765	•	675.00	
20	700.00	290	29	700.00	1.781	20	700.00	2.336
	725.00	. 1.230	29	725.00	1.699	29	725.00	2.230
30	750.00	1.050	30	750.00	1.461	30		1.917
31	775.00	0.457	31	775.00	1.184		775.00	1.553
33	.00.00	0.610	32	100.00	0.042	33	100.00	1.105
33	825.00	0.291	33	025.00	0.402	33	825.00	0.526
34	450.00	0.128	34	850.00	0.177	34	150.00	V.233
• • •								
TIME	R SETTING	. 24 %	TIME	R SETTING	. 18 9			2266
	DHITTES R	• 24 t DEPTH	TIME		DEPTH	. TIMER		RAGE
\$	SISTANCE	DEPTH		R SETTING DISTANCE (FT)	• 18 6 DEPTH (INCH)	SETTING	DEPT	M(IM)
S NO	DISTANCE (FT)		\$	DISTANCE	DEPTH (INCH)	SETTING	DEPT	M(IM)
S NO	OISTANCE (FT)	DEPTH (INCK)	\$ 110	DISTANCE (FT)	DEPTH (INCH) 2.292.	100	DEPT	H(IM) 35
S NO	DISTANCE (FT) 25.00	DEPTH (INCH) 1.719	\$ 100	DISTANCE (FT) 25.00	(INCM) (INCM) 2.292. 2.839	100 75	0.3 0.4	H(IM) 35 46
\$ NO 1 2	DISTANCE (FT) 25.00 50.00	DEPTH (INCH) 1.719 2.129	\$ 10  1 2	DISTANCE (FT) 25.00	2.292. 2.839 1.869	SETTING 100 75 60	0.3 0.4 0.5	N(IN) 35 46 50
\$ NO 1 2	25.00 50.00 25.00	DEPTH (INCH) 1.719 2.129 1.402	\$ NO  1 2	25.00 50.00	DEPTH (INCH) 2.292. 2.839 1.869 1.424	100 75 60 50	0.3 0.4 0.5	N(IN) 35 46 50
\$ NO 1 2 3	25.00 50.00 75.00 100.00	DEPTH (INCH) 1.719 2.129 1.402 1.068	\$ NO  1 2	25.00 50.00 75.00	DEPTH (INCH) 2.292. 2.839 1.869 1.424 1.638	100 75 60 50 42	DEPT: 0.3 0.4 0.5 0.6	N(IN) 35 46 50 69 97
\$ NO 1 2 3 4 5	25.00 50.00 75.00 100.00 25.00	DEPTH (INCK) 1.719 2.129 1.402 1.068 1.228	\$ NO  1 2 3	25.00 50.00 75.00	DEPTH (INCH) 2.292. 2.839 1.869 1.424 1.638	100 75 60 50 42	DEPT: 0.3 0.4 0.5 0.6 0.7	N(IM) 35 46 50 69 97
\$ NO 1 2 3 4 5	25.00 50.00 75.00 100.00 25.00	DEPTH (INCH) 1.719 2.129 1.402 1.068 1.228 1.382	\$ 10 2 3 4 5	25.00 50.00 75.00 100.00 125.00	DEPTH (IMCH) 2.292. 2.839 1.869 1.424 1.638 1.833	100 75 60 50 42 34	DEPT: 0.3 0.4 0.5 0.6 0.7 0.9	N(IM) 35 46 50 69 97 04
\$ NO 1 2 3 4 5 6 7	25.00 50.00 75.00 100.00 25.00 150.00 175.00	DEPTH (INCH) 1.719 2.129 1.402 1.068 1.228 1.382 1.403	\$ 100 1 2 3 4 5 6	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 170.00 200.00	DEPTH (INCH) 2.292. 2.839 1.869 1.424 1.638	100 75 60 50 42 34 29	DEPT: 0.3 0.4 0.5 0.6 0.7 0.9	N(IM) 35 46 50 69 97 04 54
\$ NO 1 2 3 4 5 6 7	21STANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00	DEPTM (IMCN) 1.719 2.129 1.402 1.058 1.228 1.382 1.483	\$ 100 1 2 3 4 5 6	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 170.00 200.00	DEPTH (IMCH) 2.292. 2.839 1.869 1.424 1.638 1.833	100 75 60 50 42 34 29 24	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(1M)  35 46 50 69 97 04 54
\$ NO 1 2 3 4 5 6 7	DISTANCE (FT1 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00	DEPTH (INCH) 1.719 2.129 1.402 1.068 1.228 1.382 1.483 1.612	\$ 100 1 2 3 4 5 6	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 170.00 200.00	2.292 . 2.339 1.869 1.424 1.638 1.803 1.977 2.150	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
\$ NO	DISTANCE (FT1 	DEPTH (INCH) 1.719 2.129 1.402 1.068 1.228 1.382 1.483 1.612 1.630 1.593	\$ 100 	DISTANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 170.00 200.00	DEPTH (INCN) 2-292. 2-339 1-869 1-424 1-638 1-877 2-150 2-174 2-125 1-881	100 75 60 50 42 34 29 24	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
\$ NO	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 25.00 25.00	DEPTH (IMCH) 1.719 2.129 1.402 1.068 1.228 1.382 1.483 1.612 1.630 1.593	\$ NO	015TANCE (FT) 25.00 50.00 75.00 100.00 125.00 175.00 200.00 225.00 250.00	DEPTH (INCH) 2.292 2.839 1.869 1.424 1.638 1.977 2.150 2.174 2.125	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
S NO 1 2 3 4 5 6 7 0 9	25.00 50.00 75.00 100.00 125.00 150.00 175.00 200.00 25.00 250.00 250.00	DEPTM (IMCN) 1.719 2.129 1.402 1.068 1.228 1.382 1.403 1.612 1.630 1.593 1.408	\$ NO 1 2 3 4 5 6 7 7 8 9 10 21 12 12	25.00 50.00 100.00 125.00 100.00 125.00 200.00 225.00 225.00 275.00	DEPTH (IMCH) 2.292 2.839 1.469 1.424 1.538 1.977 2.150 2.174 2.125 1.981 1.977	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
\$ NO	DISTANCE (FT1	DEPTH (IMCH) 1.719 2.129 1.402 1.068 1.228 1.382 1.483 1.612 1.630 1.593	\$ NO	25.00 50.00 75.00 150.00 150.00 150.00 125.00 200.00 225.00 250.00 275.00 100.00	DEPTH (INCN) 2-292. 2-339 1-869 1-424 1-638 1-877 2-150 2-174 2-125 1-981 1-977 1-581 1-577	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
\$ NO	25.00 50.00 75.00 100.00 125.00 125.00 125.00 25.00 25.00 125.00 125.00 125.00 125.00	DEPTH (IMCN) 1.719 2.129 1.402 1.068 1.228 1.483 1.612 1.630 1.593 1.486 1.408 1.408	\$ NO	25.00 50.00 75.00 100.00 125.00 150.00 275.00 275.00 275.00 275.00	DEPTH (IMCH) 2.292 2.839 1.469 1.424 1.538 1.977 2.150 2.174 2.125 1.981 1.977	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
\$ NO	DISTANCE (FT1	DEPTM (IMCN) 1.719 2.129 1.402 1.068 1.228 1.382 1.403 1.612 1.630 1.593 1.406 1.408 1.106 1.106	\$ 100 11 12 13 13	25.00 50.00 100.00 125.00 100.00 125.00 200.00 225.00 275.00 100.00 275.00 100.00	DEPTH (INCN) 2.292 2.393 1.469 1.424 1.538 1.977 2.150 2.174 2.125 1.981 1.977 1.581 1.577 1.581	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
S NO 12 2 3 4 5 6 7 8 9 10 11 11 11 11 11 11 11 11 11 11 11 11	DISTANCE (FT1	DEPTH (INCH) 1.719 2.129 1.402 1.068 1.228 1.382 1.483 1.612 1.630 1.593 1.466 1.408 1.166 1.183 1.397	\$ NO	015TANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00	DEPTH (INCN) 2-292. 2-839 1-869 1-424 1-638 1-877 2-150 2-174 2-125 1-981 1-977 1-577 1-562 2-116	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
S NO 12 2 3 4 5 6 7 9 10 ::::::::::::::::::::::::::::::::::	25.00 50.00 75.00 100.00 125.00 25.00 25.00 25.00 25.00 25.00 350.00 375.00 375.00 375.00	DEPTM (IMCN) 1.719 2.129 1.402 1.068 1.228 1.483 1.612 1.630 1.593 1.486 1.408 1.108 1.108 1.108 1.108 1.108 1.108	\$ 100 11 12 13 14 15 16 16	015TANCE (FT) 25.00 50.00 75.00 100.00 125.00 150.00 200.00 225.00 250.00 250.00 250.00 250.00 250.00 250.00 250.00	DEPTH (INCN) 2-292. 2-339 1-869 1-628 1-638 1-877 2-150 2-174 2-125 1-881 1-977 1-581 1-577 1-562 2-116 2-286 2-286	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
S NO	25.00 50.00 75.00 100.00 125.00 125.00 125.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00 25.00	DEPTH (IMCN) 1.719 2.129 1.402 1.068 1.228 1.403 1.612 1.630 1.593 1.486 1.408 1.186 1.183 1.397 1.397	\$ MO	25.00 50.00 75.00 100.00 125.00 175.00 200.00 275.00 275.00 100.00 275.00 100.00 275.00 400.00 425.00	DEPTH (INCN) 2-292. 2-839 1-869 1-424 1-638 1-877 2-150 2-174 2-125 1-981 1-977 1-577 1-562 2-116	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
S NO 1 2 3 4 4 5 6 7 8 9 10 11 11 11 11 11 11 11 11 11 11 11 11	DISTANCE (FT1	DEPTM (IMCN) 1.719 2.129 1.402 1.068 1.228 1.382 1.612 1.630 1.593 1.466 1.408 1.103 1.397 1.587 1.714	S NO	25.00 50.00 100.00 125.00 100.00 125.00 200.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00 225.00	DEPTH (IMCN) 2-292. 2-839 1-869 1-424 1-638 1-897 2-150 2-174 2-125 1-981 1-977 1-581 1-577 1-662 2-116 2-286 2-426 2-375 2-242	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
S NO	25.00 50.00 100.00 125.00 150.00 150.00 250.00 250.00 250.00 350.00 350.00 375.00 400.00 450.00 475.00	DEPTM (IMCN) 1.719 2.129 1.402 1.068 1.228 1.483 1.612 1.630 1.593 1.486 1.408 1.108 1.108 1.108 1.108 1.109 1.701 1.701	\$ NO	25.00 50.00 75.00 100.00 125.00 175.00 200.00 275.00 275.00 275.00 275.00 400.00 475.00 475.00 475.00	DEPTH (INCN) 2-292. 2-339 1-869 1-424 1-638 1-897 2-150 2-174 2-125 1-881 1-977 1-581 1-577 1-581 2-246 2-246 2-275 2-246 2-275 2-286	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
S NO 1 2 3 4 5 6 6 7 9 10 11 12 13 14 15 16 17 18 19 20 11	DISTANCE (FT1	DEPTM (IMCN) 1.719 2.129 1.402 1.068 1.228 1.382 1.612 1.630 1.593 1.466 1.408 1.103 1.397 1.587 1.714	S NO	25.00 50.00 100.00 125.00 150.00 200.00 225.00 225.00 225.00 225.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00	DEPTH (INCN) 2-292. 2-339 1-869 1-424 1-638 1-803 1-877 2-150 2-174 2-125 1-981 1-877 1-581 2-377 1-582 2-375 2-242 2-375 2-242 2-375 2-242 2-375	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
S NO	25.00 50.00 75.00 100.00 125.00 125.00 125.00 250.00 250.00 250.00 375.00 400.00 475.00 475.00	DEPTH (IMCN) 1.719 2.129 1.402 1.068 1.228 1.403 1.612 1.630 1.593 1.486 1.408 1.106 1.106 1.103 1.397 1.397 1.397 1.701 1.701	S NO	25.00 50.00 75.00 100.00 125.00 175.00 200.00 275.00 275.00 275.00 275.00 400.00 475.00 475.00 475.00	DEPTH (IMCN) 2.292. 2.839 1.869 1.424 1.638 1.977 2.150 2.174 2.125 1.981 1.977 1.581 1.577 1.581 2.226 2.426 2.426 2.426 2.426 2.426 2.426 2.426 2.426 2.426 2.426 2.4275 2.422 2.422 2.422 2.422 2.422 2.423	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
S NO	318TANCE (FT1) 28.00 50.00 100.00 125.00 150.00 125.00 225.00 225.00 320.00 225.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00 320.00	DEPTM (IMCN) 1.719 2.129 1.402 1.068 1.228 1.382 1.403 1.612 1.630 1.593 1.406 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105 1.105	\$ NO	25.00 50.00 100.00 125.00 150.00 200.00 225.00 225.00 225.00 225.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00 275.00	DEPTH (INCN) 2-292. 2-339 1-424 1-638 1-843 1-877 2-150 2-174 2-125 1-981 1-977 1-962 2-116 2-286 2-426 2-375 2-222 2-1014 1-908	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
S NO	25.00 50.00 100.00 125.00 150.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00 125.00	DEPTM (IMCN) 1.719 2.129 1.402 1.068 1.228 1.483 1.612 1.630 1.593 1.486 1.408 1.185 1.397 1.397 1.597 1.714 1.019 1.701 1.682 1.521 1.406 1.511	S NO	01STANCE (FT)  25.00 50.00 75.00 100.00 125.00 200.00 275.00 300.00 275.00 350.00 275.00 400.00 475.00 475.00 500.00 575.00	DEPTH (INCN) 2-292. 2-339 1-869 1-424 1-638 1-877 2-150 2-174 2-125 1-881 1-977 1-581 1-577 1-581 2-216 2-216 2-226 2-375 2-324 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-32	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
S NO	DISTANCE (FT1	DEPTM (IMCN) 1.719 2.129 1.402 1.402 1.403 1.512 1.612 1.630 1.593 1.486 1.408 1.106 1.105 1.397 1.397 1.397 1.701 1.405 1.406 1.511 1.622 1.521 1.406 1.511	S NO	25.00 50.00 100.00 125.00 100.00 125.00 200.00 225.00 275.00 100.00 275.00 100.00 475.00 450.00 475.00 450.00 475.00 475.00 475.00 475.00	DEPTH (INCN) 2-292. 2-339 1-424 1-638 1-843 1-877 2-150 2-174 2-125 1-981 1-977 1-962 2-116 2-286 2-426 2-375 2-222 2-1014 1-908	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
S NO	DISTANCE (FT1	DEPTM (IMCN) 1.719 2.129 1.402 1.068 1.228 1.382 1.612 1.630 1.593 1.486 1.408 1.105 1.397 1.587 1.714 1.019 1.701 1.682 1.521 1.606 1.511 1.406	S NO	25.00 50.00 75.00 100.00 125.00 135.00 250.00 275.00 100.00 275.00 100.00 275.00 400.00 475.00 450.00 475.00 500.00 475.00 500.00 600.00 625.00	DEPTH (INCN) 2-292. 2-339 1-869 1-424 1-638 1-877 2-150 2-174 2-125 1-881 1-977 1-581 1-577 1-581 2-216 2-216 2-226 2-375 2-324 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-328 2-32	100 75 60 50 42 34 29 24 21	0.3 0.4 0.5 0.6 0.7 0.9 1.1	N(IN) 35 46 50 69 97 04 54 95
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#### APPENDIX G

IRRIGATION SYSTEM PLAN LAYOUT OF MR. JERRY BEMEANT'S FARM



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