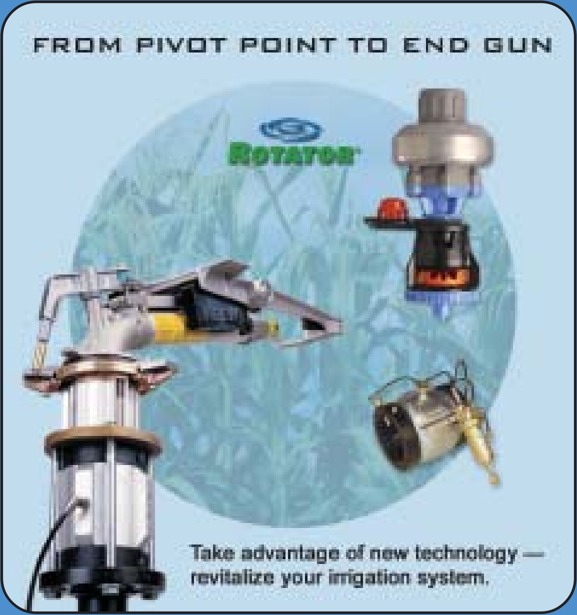
Handy Pocket Guide

NELSON

SAVE WATER, SAVE ENERGY and do a better job of irrigating.

sprinkler technology

water application solutions for CENTER PIVOT IRRIGATION



WATER APPLICATION SOLUTIONS FOR CENTER PIVOTS

Today, the value of center pivots has increased even further as the tools available in the form of computer controls and sprinkler technology have reached a new plateau. Center pivot applications have also expanded into the realm of applying not only water but also nutrients and chemicals to the crop via fertigation and chemigation.

Advances in sprinkler technology for mechanized irrigation have answered many of the previous challenges. Today a grower can apply water and chemicals with precision uniformity and high irrigation efficiency. The improvements in irrigation efficiency, uniformity, and the control of runoff illustrate major technological advancements.

UPGRADE YOUR SPRINKLER PACKAGE TODAY!

10 REASONS TO RETROFIT / RENOZZLE YOUR PIVOT

1. To add pressure regulators to compensate for pressure fluctuations and stabilize flowrate.
2. To replace old technology for better irrigation efficiency.
3. To improve irrigation uniformity.
4. To operate at lower pressure and save energy.
5. To improve crop yield and get a higher return per acre.
6. To adjust gallonage to match soil and crop requirements.
7. To replace worn out sprinklers and nozzles.
8. To minimize operating costs.
9. To take advantage of local power utility cost-sharing programs.
10. To reduce runoff and solve wheel-tracking problems.

WHY THE NEW 3000 SERIES PIVOT SPRINKLER WAS DEVELOPED

The vast differences in crops, soils, farming practices and climatic conditions worldwide, coupled with regional differences in the availability of water and energy resources requires a diverse array of center pivot sprinkler performance. The Nelson 3000 Series is an advanced design sprinkler line developed to simplify the variety of sprinkler choices into one basic group of center pivot products.

MAXIMIZE IRRIGATION EFFICIENCY

Irrigation efficiency involves the ability to minimize water losses. Such factors as loss of water from wind drift and evaporation from the soil surface and plant affect the level of efficiency. Meanwhile, another factor of irrigation efficiency is simply getting water into the soil, and controlling runoff. For mechanized irrigation, the biggest single advancement towards increasing irrigation efficiency has been mounting the sprinkler down out of the wind on drop tubes. Enabling the success of drop tubes are products that spread the water out over a wide area, even when mounted below the truss rods of a center pivot. These rotating and spinning devices operating at low pressure have dual benefits – increased soak time and low application rates. A more complete throw pattern can give twice the soak time of fixed sprayheads.

R

The **R3000 Rotator®** features the greatest throw distance available on drop tubes. The wide water pattern from rotating streams equates to lower average application rates, longer soak time and reduced runoff. More overlap from adjacent sprinklers improves uniformity.

S

The **S3000 Spinner** utilizes a free-spinning action to produce a gentle, rain-like water pattern. Designed for more sensitive crops and soils, low instantaneous application rates and reduced droplet kinetic energy help maintain proper soil structure.

N

The **N3000 Nutator®** combines a spinning action with a continuously offset plate axis for a highly uniform pattern even in the wind. Larger, wind-penetrating droplets and low trajectory angles reduce wind exposure for maximum application efficiency.

D

The **D3000 Sprayhead** is a fixed spray designed with future needs in mind. As irrigation requirements change throughout the season, the D3000 features a flip-over cap to change spray patterns. The D3000 is easily convertible to LEPA or other 3000 Series sprinklers.

A

The **A3000 Accelerator** maximizes performance of in-canopy water application. Designed as a hybrid of Rotator and Spinner technology, the Accelerator increases rotation speed through the nozzle range.

T

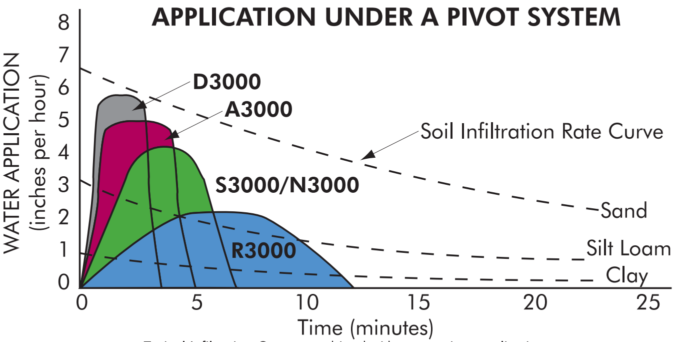
Developed for the land application of wastewater, the **T3000 Trashbuster** features an open-architecture body design to pass debris more easily. Available with the 3000 FC, a plug-resistant, flow compensating sprinkler package can simplify maintenance.

	OPERATING RANGE	APPLICATION RATE	MOUNTING	THROW DIAMETER
 R3000	15-50 PSI (1-3.4 BAR)	LOW	Up Top or On Drops	50-74' (15.2-22.6M)
 S3000	10-20 PSI (.7-1.4 BAR)	LOW - MEDIUM	On Drops	42-54' (12.8-16.5M)
 N3000	10-15 PSI (.7-1 BAR)	LOW - MEDIUM	On Drops (flex hose)	44-52' (13.4-15.9M)
 D3000	6-40 PSI (.41-2.8 BAR)	HIGH	Up Top or On Drops	16-40' (4.9-12.2M)
 A3000	6-15 PSI (.41-1 BAR)	MEDIUM	On Drops	30-46' (9.1-14.0M)
 T3000	Depends on sprinkler selection	LOW - HIGH	Up Top or On Drops Do not use 3000FC with hose drops.	Depends on sprinkler selection

WHY IS SPRINKLER THROW DISTANCE IMPORTANT?

Without sprinkler performance that can apply water at an application rate that more closely matches the infiltration rate of the soil, the efficiency gained with drops and money saved with low pressure, is soon lost to runoff. The rate at which a center pivot applies water increases with the higher flow demands required at the outer portion of a center pivot. By increasing the wetted throw distance of the sprinkler, the rate at which water is applied can be reduced to match the soil's infiltration rate.

Look at a typical infiltration curve below with superimposed application rates for center pivot sprinklers. It is obvious that the Rotator, which provides the widest throw distance on drop tubes, comes the closest to matching infiltration rates of the soil. The best condition for infiltration is to keep the soil surface open and apply water using a wide application width.



Typical Infiltration Curves combined with center pivot application rate (end of 1/4 mile (402m) system at 8 GPM/acre (4.5 m^3/hr/ha) and travel speed 5 fpm (1.4m/min)

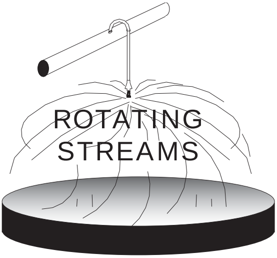
APPLICATION RATE DEFINITIONS.

There are two types of application rates used: Average and Instantaneous. Some understanding of the difference between these two is helpful in nozzle and sprinkler selection.

Average application rate (AAR) is the rate of water application over the wetted area. It is an average value assuming uniformity within the wetted area. Pivot average application rates increase with the higher flow demands required at the outer portion of a center pivot. Comparably, in analyzing different sprinkler options, superior throw distance yields lower average application rates.

Instantaneous application rate (IAR) is also an important element of sprinkler performance especially for silt type soils that are prone to compaction. Instantaneous application rate (IAR) is the peak intensity of water application at a point. IAR and droplet kinetic energy are important variables in maintaining good soil intake rate throughout the season. Pivot sprinklers that produce high instantaneous application rates with high velocity, large droplets are detrimental to some soil types causing surface damage by sealing off the soil pore space at the surface. The rate of instantaneous application for a fixed stream type sprinkler can be more than ten times the average if measured at the instant the stream hits the soil. The problem comes when some surface damage occurs, sealing off the soil pore space at the surface. The best condition for infiltration is to keep the soil surface open, and apply water using a wide application width.

Fixed streams produce high instantaneous application rates on a small percent of area.



Even distribution throughout full coverage area produces low instantaneous application rates.

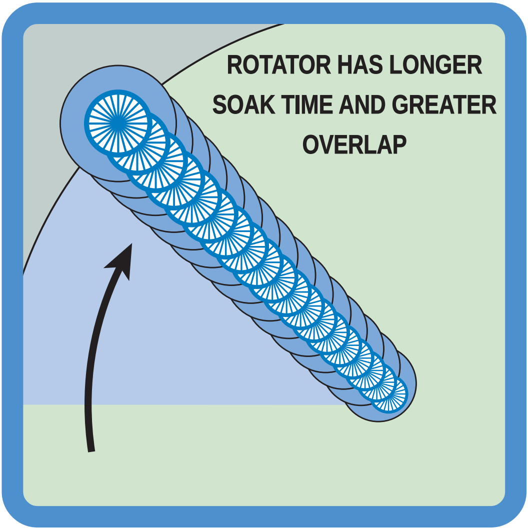
CONTROLLING RUNOFF

WHY BE CONCERNED WITH RUNOFF?

Runoff is one of the most environmentally sensitive issues involved in irrigation. Runoff can result in unwanted water and fertilizers being carried into streams and rivers. Additionally, soil erosion is not only a pollution issue, but results in lost fertilizer and lower overall crop growth. Increased runoff means lower application efficiency which increases operating costs.

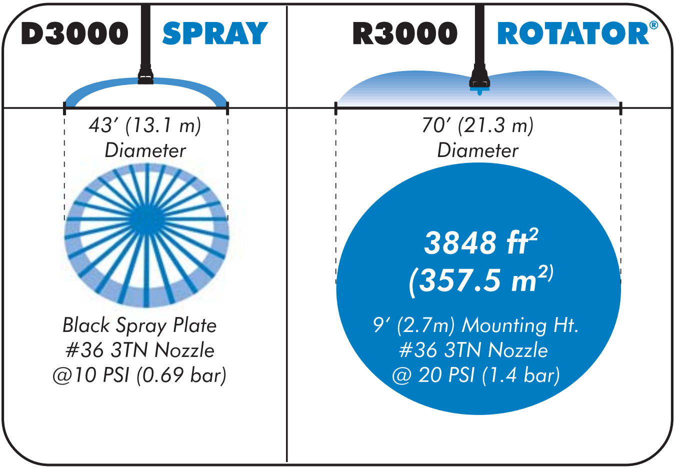
SELECT THE WIDEST WETTED PATTERN.

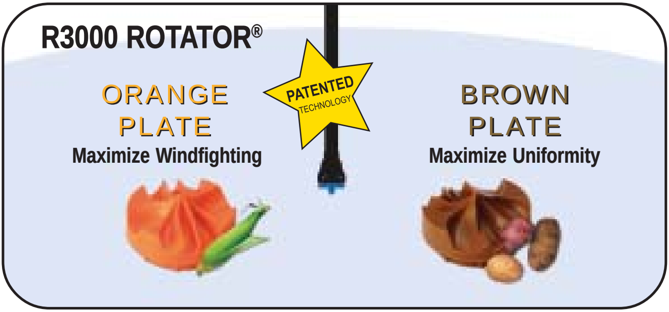
A wide wetted pattern provides longer soak time for water intake, while providing a lower average application rate. The R3000 Rotator has the furthest throw distance of any 3000 Series sprinklers.



NEW ADVANCED ROTATOR® TECHNOLOGY

New advances in the design of Rotator plate technology now provides lower operating pressures and even greater throw distance. Built-in uniformity is made possible by multi-trajectory stream geometry that fills in the water pattern and provides greater overlap.



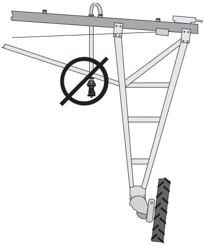


USE FINE WATER DROPLETS ON FINE PARTICLE SOIL TYPES.

Droplet kinetic energy is an important part of keeping the soil surface open and to maintaining a good soil intake rate throughout the season. Silty clay loam soils benefit from a very fine droplet, maintaining the soil structure integrity. Fine water droplets can be achieved by using a higher pressure and selecting plates with increased diffusion properties. Field reports have shown that gentle, rain-like droplets are good for preventing soil sealing problems in certain conditions.

SELECT PROPER SPRINKLER MOUNTING HEIGHTS.

Generally, higher mounting heights benefit uniformity. Higher mounting gives the pattern more distance to maximize the throw of the streams and provide greater sprinkler overlap. However, interference with system structure must be carefully avoided. If sprinklers are placed "in-canopy", spacings need to be reduced to compensate for smaller wetted diameters.



USE RESERVOIR SURFACE BASINS.

Reservoir tillage basins can be used to provide surface storage and minimize runoff. The proper basin and dike shape will have to be determined by experimentation with the soil and slope involved.

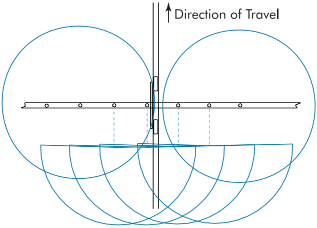
DUAL NOZZLE CLIP — REDUCE AVERAGE APPLICATION RATES DURING GERMINATION. Innovations like the 3TN Dual Nozzle Clip allow irrigators to reduce Average Application Rates during germination or the early stages of a crop's growth curve. The 3TN Dual Nozzle Clip holds a secondary nozzle, allowing quick and accurate changes of system flow rate. Lowering average application rates reduces ponding of water and potential erosion, while maintaining the integrity of the soil structure with less intense water droplets. NOTE: Not designed for usage in-canopy.

DRY WHEEL TRACK SOLUTIONS - MINIMIZE TRACK RUTTING.

Another variable that affects overall field uniformity is the center pivot's ability to maintain a uniform travel speed. This can be affected by excessive slippage of the tires due to water in wheel tracks. Wet areas and steep slopes can cause the system to slow down in these areas, thereby increasing the application depth in relation to other parts of the field. Sprinkler technology advances in the form of part circle sprinklers, combined with the use of boombacks can solve this problem and reduce chances of drive units getting stuck by directing the water pattern behind the direction of travel.

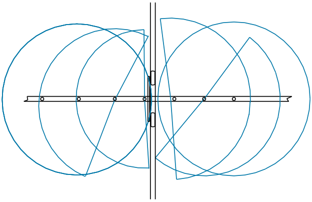
Part-Circle Sprinklers can be installed in a variety of configurations

BOOMBACKS



Installations on boombacks minimize the compromise in uniformity that occurs when part-circle devices are utilized.

STRAIGHT DROPS

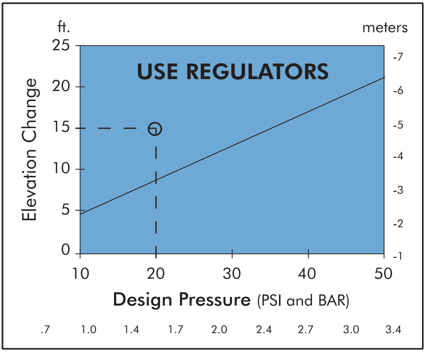


Installations on straight drops require careful adjustment of the orientation.

WHY ARE PRESSURE REGULATORS IMPORTANT?

The function of a pressure regulator in center pivot sprinkler design is to fix a varying inlet pressure to a set outlet pressure regardless of changes in the system pressure due to hydraulic conditions, elevation changes, pumping scenario, etc. The benefits are numerous:

1. Uniform depth of water application.
2. Controlled sprinkler performance(droplet size and throw distance).
3. Flexibility in system operation.



Example: A 15 ft. (4.6m) elevation change at 20 PSI (1.4 BAR) design pressure shows that pressure regulators should be used.

IMPORTANT: Allow approximately 5 PSI (.35 BAR) extra pressure in order for the regulator to function properly. For example, the minimum design pressure for a 20 PSI (1.4 BAR) pressure regulator is 25 PSI (1.7 BAR). IMPORTANT: If your system is designed with Nelson sprinklers, use Nelson Pressure Regulators. Individual manufacturers' pressure regulator performance varies. Interchanging could result in inaccurate nozzle selection.

HOW MUCH ELEVATION CHANGE IS ACCEPTABLE?
LESS THAN 10% FLOW VARIATION IS A GOOD RULE OF THUMB.

The graph above is based on the elevation limit which will cause a flow variation of ten percent or more. If the elevation change from the lowest point is above the line then a flow variation of more than 10 percent will occur. Notice the lower design pressure allows less elevation change before pressure regulators are recommended. NOTE: Even if elevation changes do not require pressure regulators, you should consider them for their other advantages.

WIDE FLOW RANGE

The Nelson Universal Pressure Regulator has a flow up to 12 GPM (2.7 M^3/H) at 15 PSI (1.0 BAR) and above.

PATENTED DAMPENING SYSTEM

A patented o-ring dampening system handles severe pressure surges to withstand water hammer.

EXTENDED PERFORMANCE & PRECISION ACCURACY

Precision components coupled with an internally lubricated o-ring minimize frictional drag and hysteresis.

PLUG RESISTANT DESIGN

A new single-strut seat (patent pending) minimizes hair-pinning, debris hang-up and plugging.

1 lb. Weight for Flexible Drops

CHEMICALLY RESISTANT MATERIALS

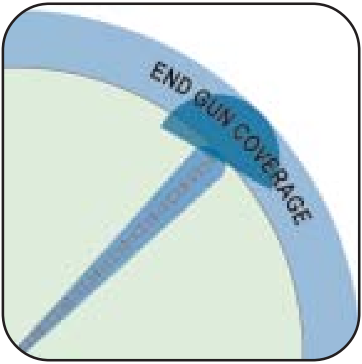
UNIVERSAL 3000 SERIES CONNECTION

Integral adapter connects directly into all Nelson 3000 Series Sprinklers.

EFFECTIVE END GUN SOLUTIONS FOR EXTRA ACREAGE.

A Big Gun® sprinkler (operating through a complete rotation) on a quarter-section pivot can effectively irrigate up to 20 additional acres (8.1 ha). Considering the cost-effectiveness of putting this additional land into production, an end gun alternative shouldn't be overlooked. Even if high-pressure is not available to the end of a system, lower pressure options are available.

THE ORIGINAL BIG GUN®

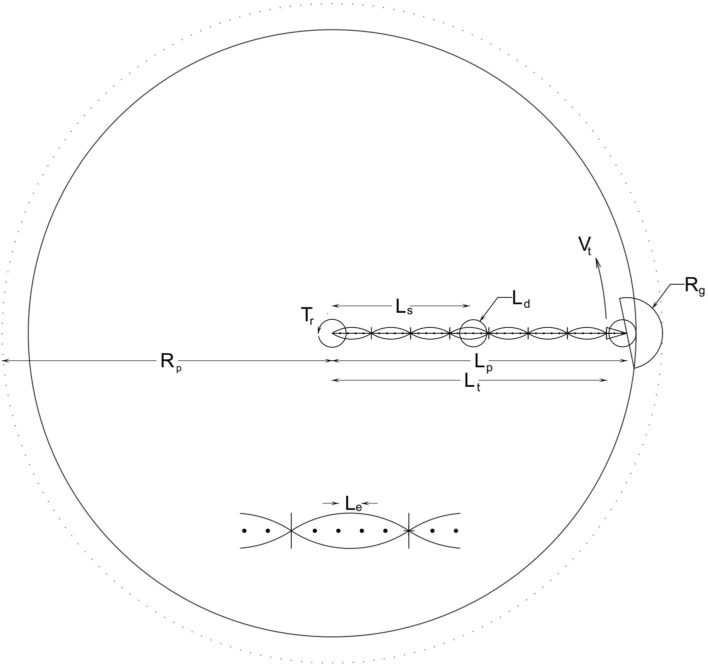


END GUN PRODUCT COMPARISONS*

SPRINKLER	PSI RANGE	FLOW RANGE	RADIUS
BIG GUN = ~ 20 ACRES* (8.1 ha)	25-80 PSI (1.7-5.5 bar)	40-160 GPM (9-36 m^3/h)	100 FT. (30.5 m)
P85A= 8-15 ACRES* (3.2-6.1 ha)	20-60 PSI (1.4-4.1 bar)	20-125 GPM (4.5-28 m^3/h)	45-75 FT. (13.7-22.9 m)
Part-Circle PC3000= 3-6 ACRES* (1.2-2.4 ha)	10-30 PSI (0.7-2.1 bar)	< 20 GPM (< 4.5 m^3/h)	10-35 FT. (3.0-10.7m)

* Assumes end gun is on all the time for a quarter-mile (402m) center pivot.

PIVOT DIAGRAM FOR CALCULATIONS (PAGES 16-19)



LEGEND	U.S. UNITS	METRIC UNITS
A = area	acres	hectares (ha)
Q_p = pivot flow	gpm	m^3/hr
Q_e = sprinkler flow	gpm	liters/min (lpm)
Q_s = required system flow	gpm/acre	m^3/hr/ha
D = applied depth of water	inches	mm
L_p = length of pivot	feet	meters (m)
L_t = distance to last tower	feet	meters (m)
L_e = sprinkler spacing	feet	meters (m)
L_s = distance to sprinkler "x"	feet	meters (m)
L_d = sprinkler diameter	feet	meters (m)
R_p = effective pivot radius	feet	meters (m)
R_g = end gun radius	feet	meters (m)
T_r = time for one revolution	hours	hours
V_t = last tower speed	feet / minute	meters / minute
E_a = irrigation application efficiency	decimal	decimal
E_p = pump efficiency	decimal	decimal
H = pump head	feet	meters (m)
P = power	hp	kw

U.S. Units Calculation:	U.S. Units Equation:	FOR EXAMPLE:
AREA IRRIGATED BY CENTER PIVOT. (Assumes end gun on all the time.)	$A = \frac{3.14 \times (L_p + R_g)^2}{43{,}560}$ A = area (acres) L_p = pivot length (ft.) R_g = end gun radius (ft.)	Find the acreage irrigated by a 1000 ft. pivot with an end gun radius of 130 ft. $A = \frac{3.14 \times (1000 + 130)^2}{43{,}560}$ **A = 92 acres**
HOURS PER PIVOT REVOLUTION @ 100% TIMER.	$T_r = \frac{0.105 \times L_t}{V_t}$ T_r = hours per revolution (hr.) L_t = distance to last tower (ft.) V_t = last tower speed (ft./min.)	Find the amount of time needed for the pivot above to complete a revolution at the maximum tower speed of 10 ft./min (100% timer).The machine includes a 40 feet overhang. $L_t = 1000 - 40 = 960$ ft. $T_r = \frac{0.105 \times 960}{10}$ **T_r = 10.08 hrs per revolution**
DEPTH OF WATER APPLIED BY A CENTER PIVOT.	$D = \frac{30.64 \times Q_p \times T_r}{(L_p + R_g)^2}$ D = depth of water applied (in.) Q_p = pivot flowrate (gpm) T_r = hours per revolution (hrs.) L_p = pivot length (ft.) R_g = end gun radius (ft.)	Determine the depth of water applied by the above pivot. Flowrate is 700 gpm. Last tower speed is 2.5 ft./min (25% timer). $T_r = \frac{0.105 \times 960}{2.5} =$ 40.32 hrs/rev. $D = \frac{30.64 \times 700 \times 40.32}{(1000 + 130)^2}$ **D = 0.68 inches**
REQUIRED FLOW FOR A GIVEN PIVOT SPRINKLER.	$Q_e = \frac{2 \times L_s \times Q_p \times L_e}{(L_p + R_g)^2}$ Q_e = sprinkler flowrate (gpm) L_s = distance to sprinkler (ft.) Q_p = pivot flowrate (gpm) L_e = sprinkler spacing (ft.) L_p = length of pivot (ft.) R_g = end gun radius (ft.)	Determine the flowrate required by a sprinkler located 750 ft. from the pivot, if the sprinkler spacing is 17 ft. Pivot flowrate is 700 gpm. $Q_e = \frac{2 \times 750 \times 700 \times 17}{(1{,}000 + 130)^2}$ $Q_e = \frac{17{,}850{,}000}{1{,}276{,}900}$ **Q_e = 14.0 gpm**

AVERAGE APPLICATION RATE	$I_a = \dfrac{2 \times 96.3 \times L_s \times Q_p}{(L_p + R_g)^2 \times L_d}$ I_a = average application rate (in./hr.) L_s = distance to sprinkler (ft.) Q_p = pivot flowrate (gpm) L_p = pivot length (ft.) R_g = end gun radius (ft.) L_d = sprinkler throw diameter (ft.)	Compute the average application rate at the location of 750 ft. from the pivot point. System flow is 700 gpm on 92 acres. Sprinkler coverage is 60 ft. diameter. $I_a = \dfrac{2 \times 96.3 \times 750 \times 700}{(1000 + 130)^2 \times 60}$ **I_a = 1.3 inches per hour**
REQUIRED SYSTEM FLOW	$Q_s = \dfrac{ET_p \times 453}{T_p \times E_a}$ Q_s = system flowrate (gpm/acre) ET_p = peak evapo-transpiration (in./day) T_p = hours pumping per day E_a = water application efficiency (decimal)	Determine the required system flow if the peak crop water requirement is .30 in/day, water application efficiency is 90% and the system can be operated 18 hours per day. $Q_s = \dfrac{.30 \times 453}{18 \times .90}$ **Q_s = 8.4 gpm/acre**
POWER REQUIRED	$P = \dfrac{Q_p \times H}{3960 \times E_p}$ P = power (hp) Q_p = pivot flowrate (gpm) H = head the pump must produce (ft.) E_p = pump efficiency (decimal)	Determine the power required to pump 700 gpm against a head of 200 ft. if pump efficiency is 75% $P = \dfrac{700 \times 200}{3960 \times .75}$ **P = 47.1 hp**
NOZZLE OR NON-REGULATED SYSTEM FLOWRATE WITH CHANGING PRESSURE.	$Q_1 / Q_2 = \sqrt{P_1} / \sqrt{P_2}$ $Q_1 = Q_2 \times \sqrt{P_1} / \sqrt{P_2}$ Q_1 = flow to determine (gpm) Q_2 = known flow (gpm) P_1 = pressure (psi) for Q_1 P_2 = pressure (psi) for Q_2	Determine the flowrate of a #30 3TN nozzle at 15 psi, knowing the flow at 10 psi is 4.94 gpm. $Q_1 = 4.94 \times \sqrt{15} / \sqrt{10}$ **Q_1 = 6.05 gpm**

CONVERSIONS:

- 1 horsepower = .746 kilowatts
- 1 acre = 43,560 ft.^{2}
- 1 acre-inch = 27,154 gallons (U.S.)
- 1 ft. of head (water) = .433 PSI
- inches/day = gpm/acre x .053
- 1 U.S. gallon (water) = 8.336 pounds
- 1 mile = 5,280 feet

Metric Calculation:	Metric Equation:	For Example:
AREA IRRIGATED BY CENTER PIVOT. (Assumes end gun on all the time.)	$A = \frac{3.14 \times (L_p + R_g)^2}{10{,}000}$ A = area (ha) L_p = pivot length (m) R_g = end gun radius (m)	Find the area irrigated by a 400m pivot with an end gun radius of 40m. $A = \frac{3.14 \times (400 + 40)^2}{10{,}000}$ **A = 60.8 ha**
HOURS PER PIVOT REVOLUTION @ 100% TIMER.	$T_r = \frac{0.105 \times L_t}{V_t}$ T_r = hours per revolution (hr.) L_t = distance to last tower (m) V_t = last tower speed (m/min.)	Find the amount of time needed for the pivot above to complete a revolution at the maximum tower speed of 3m/min. (100% timer). The machine includes a 15m overhang. L_t = 400-15 = 385m $T_r = \frac{0.105 \times 385}{3}$ **T_r = 13.5 hours per revolution**
DEPTH OF WATER APPLIED BY A CENTER PIVOT.	$D = \frac{Q_p \times T_r \times 318.3}{(L_p + R_g)^2}$ D = depth of water applied (mm) Q_p = pivot flowrate (m^3/hr) T_r = hours per revolution (hrs.) L_p = pivot length (m) R_g = end gun radius (m)	Determine the depth of water applied by the above pivot. Flowrate is 240 m^3/hr. Last tower speed is 0.75 m/min (25% timer). $T_r = \frac{0.105 \times 385}{0.75}$ = 53.9 hrs/rev $D = \frac{240 \times 53.9 \times 318.3}{(400 + 40)^2}$ **D = 21.3 mm**
REQUIRED FLOW FOR A GIVEN PIVOT SPRINKLER.	$Q_e = \frac{2 \times L_s \times Q_p \times L_e}{(L_p + R_g)^2}$ Q_e = sprinkler flowrate (lpm) L_s = distance to sprinkler (m) Q_p = pivot flowrate (m^3/hr) L_e = sprinkler spacing (m) L_p = length of pivot (ft.) R_g = end gun radius (ft.)	Determine the flowrate required by a sprinkler located 250m from the pivot, if the sprinkler spacing is 5m. Pivot flowrate is 240 m^3/h. $Q_e = \frac{2 \times 16.7 \times 250 \times 240 \times 5}{(400 + 40)^2}$ $Q_e = \frac{10{,}020{,}000}{193{,}600}$ **Q_e = 51.8 lpm**

AVERAGE APPLICATION RATE	$I_a = \frac{2 \times 1000 \times L_s \times Q_p}{(L_p + R_g)^2 \times L_d}$ I_a = average application rate (mm/hr.) L_s = distance to sprinkler (m) Q_p = pivot flowrate (m^3/hr) L_p = length of pivot (m) R_g = end gun radius (m) L_d = sprinkler throw diameter (m)	Compute the average application rate at the location of 250m from the pivot point. System flow is 240 m^3/hr and sprinkler coverage is 18m diameter. $I_a = \frac{2 \times 1000 \times 250 \times 240}{(400 + 40)^2 \times 18}$ **I_a = 34.4 mm per hour**
REQUIRED SYSTEM FLOW	$Q_s = \frac{ET_p \times 10}{T_p \times E_a}$ Q_s = system flowrate (m^3/hr/ha) ET_p = peak evapo-transpiration (mm/day) T_p = hours pumping per day E_a = water application efficiency (decimal)	Determine required system flow if the peak crop water requirement is 8mm/day, water application efficiency is 90% and the system can be operated 18 hours per day. $Q_s = \frac{8 \times 10}{18 \times .90}$ **Q_s = 4.9 m^3/hr/ha**
POWER REQUIRED (kW)	$P = \frac{Q_p \times H \times 9.81}{3600 \times E_p}$ P = power (kW) Q_p = pivot flowrate (m^3/hr) H = head the pump must produce (m) E_p = pump efficiency (decimal)	Determine the power required to pump 240 m^3/hr against a head of 60 m. Pump efficiency is 75% $P = \frac{240 \times 60 \times 9.81}{3600 \times .75}$ **P = 52.3 kW**
NOZZLE OR NON-REGULATED SYSTEM FLOWRATE WITH CHANGING PRESSURE.	$Q_1 / Q_2 = \sqrt{P_1} / \sqrt{P_2}$ $Q_1 = Q_2 \times \sqrt{P_1} / \sqrt{P_2}$ Q_1 = flow to determine (lpm) Q_2 = known flow (lpm) P_1 = pressure (bar) for Q_1 P_2 = pressure (bar) for Q_2	Determine the flowrate of a #30 3TN nozzle at 1 bar, knowing the flow at 0.7 bar is 18.7 lpm. $Q_1 = 18.7 \times \sqrt{1} / \sqrt{0.7}$ **Q_1 = 22.35 lpm**

CONVERSIONS:

1 litre/sec = 3.6 m^3/hr
1 mm/hr = 10m^3/hr/ha
1 mm/day = 0.417 m^3/hr/ha (24 hour operation)
1 m^3/hr = 4.403 U.S. gpm

1 m = 1.42 psi
1 bar = 14.5 psi
1 bar = 10.2 m
1 bar = 100 kPa

WARRANTY AND DISCLAIMER

Nelson products are warranted for one year from the date of original sale to be free of defective material and workmanship when used within the working specifications for which the products were designed and under normal use and service. The manufacturer assumes no responsibility for installation, removal or unauthorized repair of defective parts and the manufacturer will not be liable for any crop or other consequential damages resulting from any defects or breach of warranty. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSES AND OF ALL OTHER OBLIGATIONS OR LIABILITIES OF MANUFACTURER. No agent, employee or representative of the manufacturer has authority to waive, alter or add to the provisions of this warranty nor to make any representations or warranty not contained herein.

NELSON

NELSON IRRIGATION CORPORATION
848 Airport Rd.
Walla Walla, WA 99362 U.S.A.
Tel: 509.525.7660
info@nelsonirrigation.com

NELSON AUSTRALIA

NELSON IRRIGATION CORPORATION OF AUSTRALIA PTY LTD
35 Sudbury Street, Darra QLD 4074
Tel: +61 7 3715 8555
info@nelsonirrigation.com.au

SAVE WATER, SAVE ENERGY AND DO A BETTER JOB OF IRRIGATING.

WWW.NELSONIRRIGATION.COM