652.0605 Low Pressure Center Pivot Design Criteria and Considerations

(a) General

The following criteria are the requirements for uniform and efficient application of irrigation water on low-pressure center pivot designs and conversions, in accordance with Nebraska Standard 442, Irrigation System, Sprinkler:

(b) Criteria

1. Pressure at the end of the system provides the optimum operating pressure for the last nozzle.
2. Pressure regulators
    a. Regulated working pressure at the nozzle shall be 30 psi, or less.
    b. Regulators are required for each nozzle. While it is possible to operate a system on a very level field without regulators, the risk of non-uniform application is too great and not worth the potential cost savings
    c. Pressures throughout the system shall be 5 psi greater than the regulated working pressure at any nozzle.
3. Nozzle spacing will not exceed 50 percent of the wetted diameter as given by the manufacturer's performance tables. (Note 5.b.ii below)
4. Height of nozzles will be uniform, considering topography, pipe sag and wheel ruts. Nozzles on inner 2 or 3 spans may be different from the rest of the system to achieve better uniformity of water application. (See 5.b.ii below)
5. Overall projected system runoff will average less than 1%
    a. Runoff calculations will be made using CPNOZZLE software or other approved method.
    i) Wetted diameter of nozzle will be as stated by the manufacturer's performance tables.
    ii) When the nozzle is expected to operate in the canopy the wetted diameter shall not exceed 12 feet.
    iii) The slope of the row should be used where row ridges cross the land slope and are high enough to limit water movement down slope.
    b. Considerations:
    i) Runoff lowers overall system efficiencies due to non-uniformity of application. Ponding or over application in any area of the field can lead to deep percolation, potentially contaminating ground water quality.
    ii) Special nozzles on portions of the system should be considered to reduce excessive runoff to acceptable averages.

6. Nozzles

   a. Nozzles 12-30 inches above the ground or within the crop canopy:

      i) Maximum nozzle spacing will be the equivalent of two row widths.

      ii) Two pound weights or larger will be installed above nozzles on flexible drops to minimize movement from crops or wind.

      iii) Considerations

         a) Planting crops concentrically with pivot will greatly improve uniformity.

         b) Tillage systems should be used that control runoff.

         c) Increase surface storage by deep ripping, basins or implanted reservoirs.

         d) Galvanized steel goose necks and flexible drops reduce potential for breaks.

   b. Nozzles positioned below the truss rods and above the crop canopy

      i) Nozzles will be positioned to clear the growing crop.

      ii) Nozzles will be installed such that nozzle water distribution pattern is not altered by the truss rods.

      iii) Considerations

         a) Tillage systems and conservation practices should be used that control runoff.

         b) Increase surface storage by deep ripping and/or basin tillage on row slopes less than 5 percent.

         c) Increase surface storage by implanted reservoirs on row slopes greater than 5 percent.

         d) Galvanized steel goose necks and flexible drops reduce potential for breaks.

   c. Nozzles on the pipe

      i) Nozzles can be place on the pipe when runoff would occur with nozzles at or below the trust rods or when the terrain or crop height is such that drop nozzles would be operating within the canopy over more than 20 percent of the area.

      Nozzles on the pipe may only be used where the terrain is such that drop nozzles would be operating in the canopy more than 20 percent of the time.

      ii) Low pressure, low angle impact nozzles (<8° trajectory), spray nozzles or rotators will be used. High angle nozzles are not acceptable.

      iii) Considerations:

         a) Increase surface storage by deep ripping and/or basin tillage on row slopes less than 5 percent.

         b) Increase surface storage by implanted reservoirs on row slopes greater than 5 percent.

7. End guns, with or without booster pumps, and flood valves should be discouraged.
   i) End gun operation is inefficient and non-uniform compared to the rest of the system.
   ii) The end gun, as it cycles on and off, adversely alters the operating pressures and capacity of the system.
   iii) Use an extension on the system, if not restricted by obstacles, to retain some of the irrigatable area.
8. The flow capacity of the well at the projected operating pressure of the proposed pivot shall be determined prior to design. The flow discharge characteristics can be computed with existing flow measurement devices, pump (well) test or computed from pump characteristic curves.
9 Documentation will also include a copy of the design sheet showing nozzle locations, flow rates, pipe pressures, nozzle pressure, type of nozzle and size of pressure regulators. This needs to be reviewed prior to installation to ensure the design will meet technical guide standards.