

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSTRUCTION SPECIFICATION**

*North Dakota*

**SPRINKLER SYSTEM  
(Code 442)**

**1. SCOPE**

The work shall consist of furnishing and installing sprinkler system(s) (linear move, center pivot, solid set, wheel line, or handline) including nozzles and all required appurtenances. It may also consist solely of retrofit of an existing system with an improved nozzle package and/or variable rate irrigation equipment. Any materials or construction details contained within the design drawings supersede those of this construction specification.

**2. LOCATION**

The sprinkler system(s) and appurtenances will be installed at the locations, and in the configurations, as shown on the drawings. Any deviations from the drawings requires approval from NRCS prior to installation.

**3. QUALITY CONTROL**

Quality Control of all materials and construction procedures is the responsibility of the producer and installer. NRCS will make periodic review(s) of the work for the benefit of the agency which will include the final construction inspection.

**4. ELECTRICAL WORK**

Extra care should be taken when working on our near electrical powered irrigation systems. Electric power shall be disconnected from all components of the irrigation system prior to any maintenance or installation of any sprinkler nozzle package. A wiring certificate must be filed with the ND State Electrical Board is required to be provided to the NRCS prior to certification for project that entails installation of a control panel. A copy of the ND Electrical Board Wiring Certificate shall be provided to NRCS when issued.

**5. INSTALLATION AND MATERIALS**

SPRINKLER SYSTEMS

Materials used in the installation of the sprinkler irrigation system shall be new and free from defects, unless the ND-ENG-442 form for refurbished sprinklers is completed and signed off on by both the supplier and NRCS Area Engineer prior to purchase of materials. Aluminum tubing shall have a minimum pressure rating of 150 psi, and all steel parts shall be galvanized. For aluminum wheel lines, handlines, or onground solid set laterals, a minimum wall thickness of .05 inches is required.

All joints and connections shall be made in accordance with the manufacturer's recommendations. All valves shall be equal to the size of pipe in which they are installed and of the material and type specified. All joints, connections, and valves shall be constructed to withstand the maximum design working pressure for the pipelines without damage or leakage.

NOZZLE PACKAGES (REPLACEMENT OR NEW)

NRCS will be provided a proposal for the nozzle package to review and approve prior to final purchase of the equipment by the producer.

For center pivot and linear move systems, the minimum Coefficient of Uniformity (CU) value of the nozzle package shall be 85% except with Variable Rate Irrigation is specified on the system, in which case the minimum CU shall be 90%. For center pivots, the CU is to be computed using the Heermann-Hein weighted area method and for linear moves the CU is to be computed utilizing equivalent unit areas (Christensen method). For center pivot and linear move systems with nozzles that operate in the canopy for 50% or more of the growing season, nozzle spacing shall not exceed every other crop row or 80-

inches maximum. Avoid placing nozzles at heights of high leaf concentration. All nozzle heights shall be uniform above the soil surface, for the majority of the field, when the system is operating.

For fixed solid set or wheel lines, nozzles will be of the specified size and type shown on the plans, and sprinkler spacing will be based on 50% of the manufacturer listed wetted diameter when operating at the design pressure. For wheel lines, sprinkler heads shall be self-leveling. Risers for solid set systems will be set based on the table below:

Sprinkler discharge (gallons/minute)	Riser height* (inches)
Less than 10	6
10-25	9
25-50	12
50-120	18
More than 120	36

\*Risers over 3 feet in height shall be anchored and stabilized.

Projects that entail replacement of nozzle packages require that, with the exception of weights, none of the existing sprinkler system remain below the existing furrow arms or goosenecks. The new nozzle package shall be comprised of all new components including the flexible drop hose, any rigid pipe used on the drop, pressure regulators (if specified), gate valves (if specified), nozzle bodies or bracket assemblies, sprinkler nozzles and/or spray pads.

**VARIABLE RATE IRRIGATION SYSTEM**

The sprinkler will be equipped with hydraulic or pneumatic actuated solenoid valves, panel, interface board, and GPS based programmable controller. The panel must be capable of operating multiple prescriptions, loaded and stored on the operating software. The valve controls must be capable of controlling no more than five nozzles at one time.

The application rate prescriptions will not be developed by NRCS. This should be done by any combination of the following: producer, crop consultant, or supplier. The producer will provide NRCS with the proposed prescriptions for the initial irrigation season, which should reflect the zones identified by NRCS on the drawings, prior to certification of the VRI system. The prescription can be developed based on additional information that NRCS did not use in the analysis to determine the minimum amount of hardware needed to operate the VRI system.

**6. SYSTEM MANAGEMENT**

Application rates shall be set such that runoff, translocation, and deep percolation are eliminated or additional measures such as furrow diking, in-furrow chiseling, conservation tillage, and/or residue management shall be applied.

**7. CHEMIGATION SAFETY**

All applicable federal, state, tribal, and local laws and regulations in regards to backflow prevention shall be followed in the installation of the system. All systems into which any type of chemical (except disinfecting agents) or other foreign substances will be injected shall be equipped with an in-line, automatic quick-closing check valve in accordance with ND Century Code, Chapter 4-35.1, Chemigation Regulation. NRCS requires identical protection on systems from surface water sources.

**8. OPERATIONAL TESTS**

After installation, the system shall be operated and checked to ensure that it functions properly at design capacity, that the distribution pattern and spacing requirements are met, and that the variation in pressure or discharge rate is within the allowable specified. The test shall consist of normal start-stop and running operations and all system components shall operate without difficulty. Leakage or defects caused by inadequate materials or workmanship shall be corrected immediately.

**9. ITEMS OF CONSTRUCTION DETAIL**

Items of work to be performed in accordance with this specification and construction details are:

a)