

Irrigation System, Sprinkler

(for controlling dust emissions from CAFOs)

Oklahoma Conservation Practice Job Sheet 442

USDA Natural Resources Conservation Service (NRCS)

May, 2006

Name of Feedyard _____



SCOPE

The work shall consist of designing; furnishing and installing a sprinkler system for air quality improvements, specifically dust control of pen areas occupied by livestock except for feed aprons. This work shall include the system design, necessary equipment and labor required to install the sprinkler distribution system including the pumping plant and the automatic irrigation control system. It also includes leveling roadways and generally restoring site to pre-construction contours. It does **NOT** include the water storage tank or any irrigation pipeline from remote water sources (wells) to the water storage tank.

PUBLIC AND PRIVATE UTILITIES

Utilities are defined to be overhead and underground power or communication lines, and pipelines. The contractor should conduct their own search and discovery for utilities in order to lessen or avoid potential damages. The CALL OKIE one call system is to be used. The owner/operator shall complete OK-ENG-45, UTILITIES INVENTORY prior to any ground disturbance and return it to a USDA-NRCS representative.

PERMITS

All required federal, state and local permits shall be secured by the CAFO owner or their contractor prior to start of construction. The contractor shall perform all work according to local standards and codes.

MATERIALS

Plastic Pipe. All plastic pipe, joints and fitting materials shall conform to the latest version of USDA-NRCS Conservation Practice Standard, 430-DD - Irrigation Water Conveyance – High-Pressure, Underground Plastic Pipeline, marked NRCS, Oklahoma. All above ground plastic pipe shall be protected from UV deterioration by painting or other acceptable methods.

Steel Pipe. All steel pipe, joints and fitting materials shall conform to the latest version of USDA-NRCS Conservation Practice Standard, 430-FF - Irrigation Water Conveyance – Steel Pipeline, marked NRCS, Oklahoma.

Pipe fittings. All fittings shall meet or exceed the same strength requirements as those of the pipe and shall be made of material that is recommended by the manufacturer for use with the pipe. Such fittings and joints shall be capable of withstanding a working pressure equal to or greater than that for the pipe. All buried fittings shall be made of plastic or ductile iron.

Thrust Blocks. All concrete used in thrust blocks shall have a minimum twenty-eight (28) day compressive strength of four thousand (4,000) pounds per square inch. Joint restraints shall be used where appropriate.

Conductors. All conductors shall meet applicable National Electric Code (NEC) standards. Wire for the communication paths, shall be minimum 14 ga. double jacketed type wire, consisting of tin-coated type UF insulated (4/64" PVC), soft drawn, annealed solid copper conductors. The second outer jacket shall be a solid color, high density, and polyethylene insulation. Jacket colors and conductor sizes shall be as shown on the drawings and/or as directed.

For underground installation, wire will be of the direct burial solid tinned copper wire of the conductor size 14 ga. or larger as required by ASTM B-33, PVC insulated conforming to UL 493 and UL 83 pressure extruded high density, ultraviolet resistant polyethylene, meeting ICEA S-61-402 and NEMMA WC-5.

All electrical splices shall be done using a water tight wire connector; no taping of wire splices is allowed.

PIPE INSTALLATION

Minimum Depth of Cover. The depth of the trench shall be as required to allow for the pipe bedding and to place the top of the pipe at a minimum depth of 36 inches below natural ground excluding the manure pack in the pen areas.

Trench Construction. Trenches for PVC pipe shall be excavated to sufficient depth and width to permit proper handling and installation of the pipe and fittings including wiring.

The trench bottom shall be uniform so that the pipe lies on the bottom without bridging. Clods, rocks, and uneven spots that can damage the pipe or cause non-uniform support shall be removed. If rocks, boulders, or any other material that can damage the pipe are encountered, the trench bottom shall be under-cut a minimum of 4 inches below final grade and filled with bedding material consisting of sand or compacted fine-grained soils.

Initial Backfill. Hand, mechanical, or water packing methods may be used. The initial backfill material shall be soil or sand that is free from rocks or stones larger than 2 inches in diameter. At the time of placement, the moisture content of the material shall be such that the required degree of compaction can be obtained with the backfill method to be used. The initial backfill material shall be placed so that the pipe

Provisions shall be made to insure safe working conditions where unstable soil, trench depth, or other conditions can be hazardous to personnel working in the trench.

Placement of Pipe. Care shall be taken to prevent permanent distortion and damage when handling the pipe during unusually warm or cold weather. The pipe shall be allowed to come within a few degrees of the temperature it will have after it is completely covered before placing the backfill, other than that needed for shading, or before connecting the pipe to other facilities. The pipe shall be uniformly and continuously supported over its entire length on firm stable material. Blocking or mounding shall not be used to bring the pipe to final grade.

For pipe with bell joints, bell holes shall be excavated in the bedding material, as needed, to allow for unobstructed assembly of the joint and to permit the body of the pipe to be in contact with the bedding material throughout its length.

Joints and Connections. All joints and connections shall be designed and constructed to withstand the design maximum working pressure for the pipeline without leakage and to leave the inside of the line free of any obstruction that may tend to reduce its capacity below design requirements. All fittings, such as couplings, reducers, bends, tees, and crosses, shall be installed according to the recommendations of the pipe manufacturer.

Thrust Blocks. Thrust blocks must be formed against a solid hand-excavated trench wall undamaged by mechanical equipment. They shall be constructed of concrete, and the space between the pipe and trench wall shall be filled to the height of the outside diameter of the pipe or as specified by the manufacturer.

Testing. The pipeline shall be tested for pressure strength, leakage, and proper functioning. The pipeline shall be tested to insure that it functions properly at design capacity. At or below design capacity there shall be no objectionable flow conditions. Objectionable flow conditions shall include water hammer, continuing unsteady delivery of water, and damage to the pipeline, or detrimental discharge from control valves. Any leaks shall be repaired and the system retested. will not be displaced, excessively deformed, or damaged.

If backfilling is done by hand or mechanical means, the initial fill shall be compacted firmly around and above the pipe as required to provide adequate lateral support to the pipe.

If the water packing method is used, the pipeline first shall be filled with water. The initial backfill before wetting shall be of sufficient depth to insure complete coverage of the pipe after consolidation. Water packing is accomplished by adding enough water to diked reaches of the trench to thoroughly saturate the initial backfill without excessive pooling. After the backfill is saturated, the pipeline shall remain full until after the final backfill is made. The wetted fill shall be allowed to dry until firm before beginning the final backfill.

Final Backfill. The final backfill material shall be free of large rocks, frozen clods, and other debris greater than 3 inches in diameter. The material shall be placed and spread in approximately uniform layers so that there will be no unfilled spaces in the backfill and the backfill will be two (2) inches above the surrounding natural ground to allow for settling. Rolling equipment shall not be used to consolidate the final backfill until the specified minimum depth of cover has been placed. All special backfilling requirements of the pipe manufacturer shall be met.

Surface Runoff Water. The Contractor shall at all times protect any open trench from the entrance of surface runoff water due to storms or irrigation water. In the event that water does enter a trench in an area where it would weaken the foundation, additional selected backfill will be installed and thoroughly compacted into the weakened foundation until it is fully stabilized to provide a suitable foundation for laying the pipe.

SPRINKLER RISER INSTALLATION

The riser assembly shall be constructed in a manner that provides protection from corrosive soils, freezing, equipment damage and livestock damage. Riser heights shall not be less than 6 ft., but shall be high enough to prevent any interference with the distribution pattern. Riser assemblies shall be constructed to include a thrust block for each riser. The soil around the thrust block must be undisturbed or compacted to approximately the same density as undisturbed soil to ensure a solid riser assembly installation. The soil directly around the riser assembly must be compacted, tamped, or water settled to ensure a solid riser installation. If steel pipe is used in the riser construction, a mastic coating or sleeve shall be installed between the concrete and steel pipe interface to prevent bonding and corrosion. Risers must be installed or supported in such a manner that the finished riser is level, plumb and stable at operating pressures.

UNDERGROUND WIRE INSTALLATION

All wiring will be laid out parallel path to allow alternate power source to sprinkler controls in the

event that a wire run is shorted. A minimum of one set of spare control wire runs will be furnished to all valve locations. The wire run will be placed in the corner of the excavated trench at least one (1) foot from all piping and no more than two (2) feet from its adjoining pipe. Wire shall never be installed through or behind a thrust block assembly. In areas where wire must cross the piping network it shall be installed below the pipe maintaining the 2 inch shading clearance only but must be beneath the trench grade.

No underground splicing will be allowed without placing the splice in a watertight junction. All splicing of the common wire will be accomplished at the riser. All wire junctions will be made in a suitable above ground junction box located at the ends of each lateral water line. Should the wire become accidentally nicked it will be repaired or replaced immediately.

Lightning suppression equipment shall be installed per manufacturer's recommendations to protect wiring grid.

ISOLATION VALVE INSTALLATION

Manual zone valves shall be incorporated into the system to facilitate isolation of laterals for repair and maintenance and still allow partial system operation.

AUTOMATIC CONTROL SYSTEM

Due to high application rates inherent with large sprinkler nozzle diameters (>0.5 inches), an automatic irrigation control system shall be utilized. The automatic irrigation control system shall be capable of changing individual sprinkler operation in one minute increments and have a minimum of 6 start times per day to provide for operation adjustments for varying climatic conditions.

The control system shall provide for the flow measurement units in U.S. gallons per minute. During actual operation of the system, the controller shall provide a visual indication of all areas being irrigated. The system shall provide complete system flow information.

An automatic rain shutdown shall be possible with the integration of a rain sensor. A "dry run" feature shall provide for testing of a program and making necessary adjustments before actually operating it in the field. The control system shall provide for daily and seasonal logs for record keeping and monitoring of system performance regarding water usage.

CONTROL VALVES

The automated control system shall utilize electro-hydraulic valves facilitating automatic system operation. The valves shall be of a size and quality

consistent with standard engineering practice. If chemicals will be injected through the sprinkler system, the valves shall be rated for chemical application. Control valves shall be installed as per the manufacturer's recommendations. This valve shall maintain a constant downstream pressure regardless of changing flow rate and/or varying inlet pressure.

SYSTEM PUMPING PLANT

The pumping plant shall have minimum capacity to apply the design application depth every three days or less. The system frequency of operation and application shall be capable of replacing maximum daily total soil evaporation. When determining capacity requirements, allowances shall be made for reasonable water losses during application. The pumping plant shall be capable of varying flow rates, from a minimum capacity of one (1) sprinkler nozzle to the required maximum capacity of the system. The automatic control system shall control operation of the pumping plant.

CHEMIGATION SAFETY

All applicable Federal, state and local laws and regulations in regards to backflow prevention shall be followed in the installation of the system.

GUARANTEE

The Contractor shall guarantee all equipment, materials and installation against any defective materials or workmanship, for a period of one year from the date of completion. If any equipment, materials or workmanship prove to be defective within one year, they shall be replaced or repaired by the contractor.

MEASUREMENT

The amount of the sprinkler irrigation system will be determined by measuring the total pen area of the CAFO covered by the sprinkler system to the nearest 0.1 acre. This area will include the working alleys. It does NOT include roads, feed roads or feed alleys, feed mill area, office, etc.

An onsite check of the installed sprinkler system including pumping plant will be performed by a USDA-NRCS engineer.

OTHER CONSTRUCTION DETAILS:

I acknowledge receipt of the construction job sheet JS 442-01 along with any attached construction details explaining the requirements for proper completion of my sprinkler system. The requirement for completion of an OK-ENG-45, UTILITIES INVENTORY has been reviewed with me and I agree to install my sprinkler system according to the construction specifications contained in the job sheet.

Feed yard Owner/Operator/Mgr

Date

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