SECTION 13XXX
DISPERSAL PUMP STATION
(4x8 DiPS)

PART 1: GENERAL

1.01 SCOPE OF WORK

A. Under this section of the specifications, the contractor shall furnish and install a shop-fabricated Dispersal Pump Station (DiPS). The 4x8 DiPS shall have the capacity to disperse from 75,000 up to 300,000 gallons in approximately 16 hours of dosing operation per day with a 3 x 4 filter bank installed. All work is to be in accordance with the plans and specifications.

1.01 QUALITY ASSURANCE

A. A Registered Engineer shall certify the design, specify the materials and define a testing procedure for verifying the operational status of the DiPS once installed. The shop-fabricated DiPS shall initially be tested and certified for functionality prior to shipment.

B. The supplier of the DiPS shall furnish a warranty of fourteen (14) months on all Materials and Workmanship from the date of shipment.

1.02 SUBMITTALS

A. The contractor shall submit to the Engineer for approval ___ copies of shop drawings for the fabricated DiPS. All shop drawings submitted shall bear the contractor's stamp of approval.

PART 2: OPERATION

2.01 ELECTRICAL WIRING INTERFACE FOR OPERATION

A. The Dispersal Pump Station shall require a minimum number of interface points with the electrical wiring and shall utilize one junction box to house all termination points. Power to the Pump Station shall be sized properly and protected by a circuit breaker (load center) or fused disconnect switch. The site contractor shall protect the incoming circuit from lightning and surges.

B. A terminal shall be installed for each listed conductor:

- Two conductors (terminal handles minimum #12 AWG) for supply of 120 Volt AC (Vac) power from the incoming power source to operate the control panel.
- One ground conductor (terminal handles minimum #12 AWG) from the incoming power source.
- Three conductors (terminal handles minimum #6 AWG) for supply of 240 Vac three-phase-power from the incoming power source to operate the dosing pump motors.

- Ten conductors (terminal handles minimum #16 AWG) for interfacing with the five floats in the holding tank.
- Forty-eight conductors (terminal handles minimum #12 AWG) for carrying the individual 24 Vac "open block solenoid" signal to up to forty-eight dosing-blocks (zones on a one-for-one relationship table of block to zone) or two-wire system.
- Six conductors (terminal handles minimum #12 AWG) for carrying the 24 Vac common return signal from up to forty-eight dosing-block valve solenoids.
- Five conductors (terminal handles minimum #20 AWG) for interfacing with an Autodialer.
- Two conductors (terminal handles minimum #12 AWG) for supplying power signal to an alarm light.
- Two conductors (terminal handles minimum #12 AWG) for supplying power signal to an alarm horn.

C. The terminals for dosing-block solenoid valve control shall be compatible with two-wire communications packages to control the solenoid valves.

D. The control panel shall be operated on a single 120 Vac power circuit which shall energize all other control voltages (24 Vac & 24 Vdc).

E. The pump motors, individually or simultaneously, shall be operated by power supplied over a single 240 Vac power circuit.

F. All solenoid valves in the pump station and in the dosing-blocks shall be operated by 24 Vac signals, which shall be supplied from the control panel, unless a two-wire system is used to repeat control signals to the dosing-block solenoid valve.

G. All digital status inputs shall be detected using 24 Vdc.

2.02 PIPING INTERFACE FOR OPERATION

A. The Dispersal Pump Station shall require a minimum of interface points with the piping systems. All piping to the Pump Station shall attach at one end of the Station.

B. The Pump Station shall have a 4" female connector for interfacing with the following piping:
- Suction pipe from the holding tank.
- Main discharge pipe for dosing and flushing zones
- Return pipe for field flushing zones.
- Wastewater pipe for wastewater created during filter back flushes and zone field flushing.

2.03 PROGRAMMABLE LOGIC CONTROLLER (PLC)

A. The Dispersal Pump Station shall utilize an Allen Bradley PLC or equivalent reliable PLC, which is in use nationally in multiple industries.

B. The PLC shall automatically control the following output activities:
- Alternating dosing pumps.
- Back-flushing a maximum of four filter groups.
- Dosing a maximum of forty-eight zones/blocks.

- Field-flushing all zones individually.
- Activating a facility alarm light.
- Activating a facility alarm horn.
- Activating a maximum of four alarm circuits on an Autodialer.

C. The PLC shall receive the following inputs:
- Flow pulses from a flow meter, installed in the Pump Station, which measures flow to the zones.
- High pressure from an adjustable differential pressure gage/switch, installed in the Pump Station, measuring the differential pressure across the filters.
- Reset alarms from an HOA switch in the panel.
- Pump running for each dosing pump.
- Float level condition from five floats installed in the holding tank.
- Silence horn from a "touch input" on the Operator Interface Console (OIC).
- Reset alarms from a "touch input" on the OIC.
- Software HOA inputs for zones and pumps from a "touch input" on the OIC.
- Setpoint value inputs from a "touch input" on the OIC.

D. The PLC shall have programmed logic to isolate failures in floats, pumps, and zone solenoids and shall continue to operate automatically around such failures. The alarm logic shall include:
- Low level in the Wetwell
- High level in the Wetwell
- Float "fail to operate" properly
- Pump fail to produce flow
- A zone valve "fail to open"
- A flow failure blocking bit from a "touch input" on the OIC
- Reset alarms from a "touch input" on the OIC
- Reset alarms by manual operation of system
- Alarm light "flashing" is varied by "type" of alarm
- Alarm output to signal the Autodialer to call-out an alarm

E. The PLC and its Applications Software Program shall be specifically designed for communicating data by Internet phone modem, spread spectrum or Ethernet radio and leased-line modem and shall be designed for remote interface with a SCADA system.

2.04 FLOAT CONTROL SYSTEM OPERATION

A. The Pump Station shall employ a five-float system of level control for the holding tank. All floats shall be "normally-open", "closed-upon-rising".
- Low-level alarm float (bottom float).
- Zone-dosing-off float (next lowest).
- Zone-dosing-enabled float (middle float).
- High-duty-enable float (second highest).
- High-level alarm float (top float).

B. The PLC shall utilize two-out-of-three failure logic to detect failure-to-close on the lowest three floats and failure-to-open on the three highest floats.
C. The floats shall be utilized to display on the Operator Interface Console the approximate liquid level in the holding tank.
D. The low-level alarm float, when open, shall trigger an Autodialer alarm and will stop Dosing Pumps from running in "software" HAND mode or in AUTO mode when a filter back-flush has been initiated.
E. The zone-dosing-off float shall stop pumps from dosing zones.
F. The zone-dosing-enabled float shall latch "on" the zone dosing logic.
G. The high-duty-enable float shall increase dosing frequency by 50% on the 4x8 DiPS by reducing rest times of the zones.
H. The high-level float, when closed, shall initiate the high-level alarm and Autodialer call-out.
I. The inputs from the individual floats shall be routed through an HOA switch so that various levels in the holding tank can be simulated for testing purposes or failures can be temporarily overridden.
J. In the event of a float failure, the failed float shall be detected and isolated by the operating logic and the remaining floats shall assume the tasks of the failed float.

2.05 DOSING PUMP OPERATION

A. The Pump Station shall employ two Dosing Pumps.
B. The Dosing Pumps shall be adequately sized to dose the expected daily volume of liquid in a sixteen-hour period.
C. The Dosing Pumps shall be alternated by the PLC when dosing has stopped.
D. Each Dosing Pump shall be protected by an individual motor circuit breaker and controlled by an IEC-rated motor starter.
E. Each Dosing Pump starter shall detect electrical problems and shall have a "normally-closed" contact to break the starter circuit.
F. Each Dosing Pump starter shall have a "normally-open" auxiliary contact to indicate when the starter contacts are "pulled-in."
G. The PLC shall detect and send an alarm to the Autodialer when a Dosing Pump has:
    - Failed to run.
    - Failed to produce flow.
H. The PLC shall automatically remove the failed pump from service and utilize only the one remaining pump.
I. If in small pump mode of operation, the PLC shall:
    - Run one Dosing Pump to dose one zone.
    - Run one Dosing Pump during back flush of filters.
    - Run two Dosing Pumps to field-flush a zone.
    - Delay field flushing until a disabled pump is returned to service.
    - Stop pumping if the selected zone is in rest mode.
    - Block PLC operation of a Dosing Pump if no zone is open.
J. If in large pump mode of operation, the PLC shall:
    - Run one Dosing Pump to dose two zones.

- Run one Dosing Pump during back flush of filters.
- Run one Dosing Pump to field-flush a zone.
- Continue pumping to one zone if the other zone is in rest mode.
- Skip a zone if the zone is disabled or has failed.
- Block PLC operation of a Dosing Pump if no zone is open.

K. The PLC shall automatically calculate and store the elapsed run times for each pump in minutes and hours.

L. Each Dosing Pump shall have its own "software" HOA in the PLC and its own "hardware" HOA on the signal output from the PLC to the starter.

M. The operator shall be able to force, by use of the HAND setting on the "hardware" HOA, a Dosing Pump to run disregarding all non-electrical operating conditions.

2.06 FILTER OPERATION

A. The Pump Station shall utilize three or four dual-filters in a bank based on the required daily volume of reuse water to be dosed.

B. The filters shall be of the 3-D NETAFIM ring disc filter design. Ring disc shall have a minimum of level filtration equal to 120 micron.

C. The filters shall be modular so that an individual module may be removed from service without affecting any other filter. The method of flushing shall require flow through the other filter module. Each filter module shall be equipped with isolation valves before and after the filter unit, which allows other filters to provide uninterrupted flow to the zones. In multiple filter systems, the Dosing Pumps shall continue to dose zones during flush of the filter system.

D. The filters shall be flushed, rings scoured, using a timed flow of high-pressure filtered water. High-pressure water shall move reverse to the normal direction of flow. Such forced reverse flow shall open up the disks. The water shall pass through the spray nozzles along the filter spine creating a turbulent scouring to remove debris trapped between the rings and material stuck to the rings.

E. Filter flushes shall be initiated by:
- Manual signal from the OIC.
- Differential pressure signal from the filter modules.
- Exceeding a specified accumulated run time of zone dosing since the last filter flush.

F. The PLC shall automatically initiate filter flush after receiving an initiating signal. The PLC shall initiate the flush of each filter module in sequence by energizing one solenoid valve. The operator shall be able to vary the duration of the filter flush time (in seconds) and the time between flushes (in minutes) through the OIC.

G. The high differential pressure signal to the PLC from the filter modules shall be routed through an HOA switch to allow the signal to be disabled or tested.

H. The filter flush signal from the PLC to each filter module shall be routed through an HOA switch to allow the signal to be disabled or to allow manual flush of individual filter modules.

2.07 ZONE OPERATIONS

A. The Pump Station shall utilize from two to Forty-eight dosing zones/blocks based on the required daily volume of reuse water to be dosed and the size of the receiving field.
B. Each zone shall be fed through a valve controlled by an output from the PLC. The zone valves shall be controlled by a 24 Vac signal. The "open zone valve" output signal from the PLC to each zone's valve solenoid shall be routed through an HOA switch to allow the signal to be disabled or the zone valve to be manually opened.
C. Software HOA switches shall be created for zones in the PLC logic. The operator shall be able to operate the zone "software" HOA switch through the OIC. The operator shall be able to take a zone out of service or operate the zone in HAND through the PLC.
D. Each zone shall have a rest-time timer and a dosing-time timer in the PLC. Each zone shall have a gallons-per-dosing-run accumulator in the PLC. Each zone shall have an elapsed dosing time meter and a totalizer for gallons dosed in the PLC.
E. The operator shall be able to enter into the PLC through the OIC set point values for the zone rest and run times and gallons per run. The operator shall be able to read the elapsed dosing time meters and the totalizer meters for gallons dosed on the OIC.
F. The PLC shall operate the zones as follows:
    - Alternate the zones/blocks in sequence.
    - Skip zones/blocks that are not in service or that have failed.
    - Test the flow to each zone to determine if a valve has failed to open.
    - Send an alarm to the Autodialer in the event of a zone failure.
    - Dose zones when the float system has enabled operation.
    - Stop dosing when the PLC selects a zone that has not completed its rest period. If in large pump mode, stop dosing if either zone is still resting.
    - Dose zones based on their specified dosing time (Time Mode) or on their specified gallons per dose (Volume Mode).
G. The PLC shall receive a digital pulse from a flow meter measuring the flow to the zones. The PLC shall calculate the flows from the pulses and shall allocate the flows to the correct registers. The PLC shall have an internal switch, which shall activate a timer, which will simulate flow pulses. The PLC shall have an internal switch, which shall disable all flow failure alarms. The operator shall be able to activate the timer pulse or disable the flow alarms through the OIC.
H. The flow meter pulse input signal to the PLC shall be routed through an HOA switch to allow the signal to be disabled or the flow pulse to be manually simulated.
I. The PLC shall be able to automatically flush the zones on a periodic basis or based on an initiating signal from the OIC. The PLC shall operate a field flush valve to allow high-velocity flows to run through individual zones and back to the wastewater processing system.

J. The open signal from the PLC to the zone field flush valve solenoid shall be routed through an HOA switch to allow the signal to be disabled or the field flush to be manually operated.
K. The PLC will treat the zone field flush in the same alternating manner as the zone dosing operation.
L. Zone dosing flow accumulators shall accumulate flows during field flushing periods based on half the flow going to actual dosing and half going to flushing.
M. The PLC shall automatically adjust the crediting of flows based on the number of zones being dosed in automatic mode and in hand mode.
N. A relationship table shall be provided in the PLC and displayed on the OIC to allow groups of dosing blocks to be set as individual zones.

2.08 OPERATOR INTERFACE CONSOLE (OIC) AND SCADA

A. The Dispersal Pump Station shall have a color, touch-screen, Operator Interface Console (OIC) EZP-S8C-FS supplied by EZAutomation.net or equivalent.
B. The operator shall be able to input the following configurations and initiate the following actions into the PLC through the OIC:
- Number of dosing zones/blocks installed at the site (2 to 48).
- Number of filter modules in the pump station (3 or 4).
- Length of flush time in seconds for flush of each filter (4 to 20).
- Maximum dosing time in minutes between each flush of the filter modules (25-300).
- Number of days between each field flush (7 to 30).
- Flow timer simulation activation.
- Flow alarms disabled.
- Manual initiation of filter back flush.
- Manual initiation of zone field flush.
- HOA settings for pumps and zones
- Time and gallon set points for each zone

C. The OIC shall automatically adjust its screens to display the correct number of zones and filters once configuration data has been inputted.
D. The OIC shall display the following details:
- Float and zone operation status.
- Holding tank level.
- Float failure alarms.
- Dosing pump run status.
- Dosing pump "software" HOA switches.
- Dosing pump failure alarms.
- Dosing pump elapsed run time meters.
- Each zone's operating status.
- Each zone's "software" HOA switches.
- Each zone's failure alarm.
- Each zone's specified length of run time.

- Each zone's specified length of rest time after dosing.
- Each zone's specified volume to be dosed each run.
- Current length of time each zone has rested.
- Each zone's accumulated dosed gallons meter.
- Time from last filter back flush.
- Operational status of each filter.
- Time from last field flush.

E. The PLC shall be programmed to operate with a Supervisory Control and Data Acquisition System (SCADA). The PLC/SCADA interface shall be capable of performing remotely over a radio system the same functions as the PLC/ OIC interface.

PART 3: MATERIALS

3.01 DISPERSAL PUMP STATION

A. Designed with the following characteristics:

- Two Pumps: Self-Priming centrifugal pump, three phase 230v, 7.5 HP for 3 filter modules, 10 HP for 4 filter modules shall be a Quick Prime model as manufactured by Myers or an approved equal.
- Check Valves: Brass swing check valve model 530 Bronze as manufactured by Matco-Norca or an approved equal.
- Filters Modules (three or four): Spin Klin Fully Automatic Advanced Air Assist Filter with Air-Sparging as manufactured by JNM Technologies or an approved equal.
- Flow Meter: Globe Hydrometer flanged combo flow meter/pressure sustaining valve as supplied by JNM Technologies or an approved equal.
- Field Flush Valve: 3" nylon model # 61ET323PBI3 as manufactured by NETAFIM USA or an approved equal.
- Control Panel: Drip Irrigation Control Panel model # DiCP-07-448, AB, OIC as manufactured by TEI Controls or an approved equal.
- Pipe: Scheduled 80 PVC type # 8008-030AB as manufactured by George Fisher or an approved equal.
- Clear Pipe: Field flush line may be schedule 40 type # 4000H030 as manufactured by Harvel or an approved equal.
- Fittings: All 90°, T's, Couplings, shall be schedule 80 PVC as manufactured by Spears or an approved equal.
- Skid: Shall be a 4'x 8' section. The top plate shall be 3/16" steel. The side frame shall be 4'' channel. The support steel under plate steel shall be 1''x 1'' square tube. The pipe & filter supports shall be 2''x 2'' angle iron. All metal and welds shall be cleaned prior to being hot dip galvanized.
- Differential Pressure Switch: Diaphragm-actuated switch with built–in electrical switch model # A20DP-15 as manufactured by FW Murphy or an approved equal.
- Electrical Conduit and Connectors: Shall be schedule 40 PVC.

PART 4: INSTALLATION

A. DiPS may be located in a building as shown on sheet ____ of ____.
B. Field piping shall be brought under the slab or through the outer-sleeved wall. Field piping shall not be incased in concrete. Final connections shall be made with the proper PVC Schedule 80 fittings. Teflon tape shall be used on all threaded fittings.
C. Terminate the incoming electrical feeder to the terminals in the J-box located on the DiPS directly below the Control Panel. Refer to the plans for the correct voltage and phase of feeder.
D. Terminate float switch wiring to the terminals in the J-box as shown per the electrical plans.
E. Terminate all zones wiring to the terminals in the J-box as shown per the electrical plans.
F. All filters, pumps, flow meters, field flush valves, and switches shall be wired and tested before delivery.

PART 5: MANUFACTURER

Furnish a complete 4x8 Dispersal Pump Station, as described in this section as manufactured by SURFLO Soil Absorption Systems, PO Box 200122 Austin, Texas 78720 (512 259-1993) or an approved equal.

PART 6: PAYMENT

Measurement and payment shall be made for the unit onsite. Provide proof of payment prior to the unit being commissioned.

END OF SECTION 13XXX