SOP 23: Evaluation of design and operation of overhead sprinklers

Updated 9/20/10

Estimated completion time: field: 16 person hours, data analysis: 4 person hours

Materials and equipment needed:

1. Data sheet
2. Clipboard
3. Sharpie pen
4. Flags
5. Calibrated pressure gauge with Schrader valve adapter
6. Flow meter with adapters
7. GPS / measuring wheel (for measuring length of beds and submains)
8. Drill bits ranging from 5/64 " – 5/32" diameter
9. 8 Schrader valves on 3-inch diameter aluminum pipe inserts
10. 6 Schrader valves and bushing adapters
11. Tape measure (measure diameter of pipe, width of beds, etc)
12. 15 Schrader valves with bushings to adapt to pipe (number each Schrader valve for reference to location in field)
13. Teflon tape
14. Small adjustable open ended wrench (crescent)
15. Cordless drill, drill bit, tap
16. Hand held EC and pH meter
17. Pitot tube and adapter for pressure gauge (measure nozzle pressure)
18. Rain coat and rain pants.

Procedures:
Preparations before irrigating (recommend completing the day before irrigating)

A. Characterize soil and irrigation water:
   1. Determine soil type and texture from NRCS on line soil map or laboratory report.
   2. Determine source of irrigation water (surface, ground, recycled, blend)
   3. Determine water chemistry from water suitability analysis report

B. Describe crop and field dimensions (sketch map of field and irrigation system):
   1. Determine crop
   2. Determine number of plant rows per bed
   3. Determine plant row spacing
   4. Determine in row spacing of plants
   5. Determine bed spacing
   6. Measure longest and shortest row
   7. Determine width of field
   8. Determine area of field
   9. Estimate slope (percent change in elevation per 100 ft)

C. **Description of field and sprinkler system**
   1. Determine crop
   2. Measure longest and shortest row of field (irrigation block).
   3. Determine width of field (irrigation block)

4. Determine area of field (irrigation block)
5. Determine bed width (center to center)
6. Determine rows of plants per bed
7. Determine in row spacing of plants
8. Determine lateral pipe diameter
9. Determine lateral pipe spacing
10. Determine sprinkler head model and brand
11. Determine nozzle diameter
12. Determine riser height
13. Sprinkler head offset (feet)
14. Determine diameter of main line

D. Describe irrigation system design (sketch map of field and irrigation system):

1. Determine type of filter present
2. Determine where and if backflow prevention device is present
3. Determine where air/vacuum release is present
4. Determine if low pressure drain is present near well
5. Determine if low pressure drain is present near lowest point in drip system
6. Determine locations where pressure can be monitored by operator
7. Determine if pressure regulators are present at main/submain connections and if functional

E. Before starting irrigation system:
1. Install flow meter on main or submain, record the initial gallons, and determine area irrigated after flow meter
2. Install Schrader valves before and after filter if possible
3. Install Schrader valves at 3 locations on submain (near mainline connection , middle, and end of submain)
4. Install Schrader valves at 3 to 6 locations at end of sprinkler lateral
5. Determine where pressure measurements of nozzles will be taken
6. Map locations of all valves with a number reference for each valve.
7. Determine the distance of Schrader valves from reference point (main/submain connection, bed number, and distance from submain)

F. At start of irrigation:
1. Record start time of irrigation

G. During the irrigation (at least 20 minutes after pressurizing system):
1. Flow rate (gpm) on flow meter
2. Pressures at all locations with Schrader valves (note time and valve number)
3. Take nozzle pressure measurements
4. Count number of significant leaks per submain (significant water flow out pipe, furrow irrigating…)
5. Count number of leaks per length of lateral line (sprinkler pipe) on 5 to 10 laterals lines
6. Measure electrical conductivity and pH of irrigation water

H. After irrigation ends:
1. Record end time of irrigation
2. Record ending flow meter reading
3. Remove Schrader valves, flush valves, and flow meter, and reassemble drip system.

I. Reporting:
1. Enter data into “Irrigation evaluation sprinkler” spreadsheet

Comments:

1. Distribution uniformity can also be evaluated during the irrigation. Refer to SOP 15: “determining distribution uniformity of sprinkler systems)

Notes:

Grower _____ Date _____

Ranch _____ Block _____

crop and field dimensions

crop	
plant rows per bed	
between row spacing (feet)	
In row plant spacing (feet)	
bed width or spacing (feet)	
shortest bed length (feet)	
longest bed length (feet)	
field width (feet)	
field area (acres)	
slope of field (%)	

soil properties (from NRCS online soil map)

Texture	
% clay	
% sand	
% silt	
soil saturated paste SAR	
soil saturated paste EC (dS/m)	

water properties (from report unless specified differently)

field measured pH	
field measured EC (dS/m)	
pH	
EC (dS/m)	
SAR	
bicarbonate (meq/L)	
Iron (ppm)	
Manganese (ppm)	
Boron (ppm)	
Chloride (meq/L)	
Magnesium (meq/L)	
Calcium (meq/L)	
Sodium (meq/L)	

Water source (check all that apply)

well	☐
project water (blue pipeline)	☐
reservoir/pond	☐
potable district water	☐
other	☐

if other please specify _____

Grower _____ Date _____

Ranch _____ Block _____

Mainline description

diameter (inches) _____

length (feet) _____

material (PVC, aluminum, concrete, etc) _____

Submain (Pipe between main line and laterals) description

diameter (inches) _____

length (feet) _____

material (PVC, polyethylene, layflat, aluminum, other) _____

Pressure regulators at submains (check all that apply)

not present ☐

gate valve (not a regulator) ☐

not adjustable ☐

adjustable ☐

Adjustable regulating valve ☐

regulator diameter (inches) _____

Description of irrigation system

lateral spacing or hand move spacing (feet) _____

sprinkler spacing along lateral(feet) _____

lateral length (feet) _____

diameter of lateral (inches) _____

number of lateral lines on main line _____

number of irrigation sets _____

sub main line diameter (inches) _____

submain length (feet) _____

sprinkler pattern (eg. 270°) _____

Drain down at low end of block (check all that apply)

low pressure drain ☐

flush valves ☐

other _____

Pressure check (check all that apply)

not present ☐

number of locations ☐

before filter ☐

after filter ☐

submain ☐

other _____

Map:

Grower _____ Date _____

Ranch _____ Block _____

Flowmeter 1		Flowmeter 2	
Time	Reading (gal/acre-ft)	Time	Reading (gal/acre-ft)

Grower _____ Date _____

Ranch _____ Block _____

leaks on sprinkler system	number of leaks	description of leaks
# of leaks along submain 1		
# of leaks along submain 2		
# of leaks along submain 3		
# of leaks on lateral line 1		
# of leaks on lateral line 2		
# of leaks on lateral line 3		
# of leaks on lateral line 4		
# of leaks on lateral line 5		
# of leaks on lateral line 6		
# of leaks on lateral line 7		
# of leaks on lateral line 8		
# of leaks on lateral line 9		
# of leaks on lateral line 10		
% of furrows (locations) with signficant amounts of ponded		

Grower _____ Date _____

Ranch _____ Block _____

	Location/Area	manufacturer's nozzle diameter (inches/mm)	Actual nozzle diameter (inches/mm)
nozzle 1			
nozzle 2			
nozzle 3			
nozzle 4			
nozzle 5			
nozzle 6			
nozzle 7			
nozzle 8			
nozzle 9			
nozzle 10			
nozzle 11			
nozzle 12			
nozzle 13			
nozzle 14			
nozzle 15			
nozzle 16			
nozzle 17			
nozzle 18			
nozzle 19			
nozzle 20			
nozzle 21			
nozzle 22			
nozzle 23			
nozzle 24			
nozzle 25			

Grower _____ Date _____

Ranch _____ Block _____

Location	Description	Time 1	Pressure (psi)	Time 2	Pressure (psi)	Time 3	Pressure (psi)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
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25							
26							
27							
28							
29							
30							