How to Make a Watermark™ Sensor

This publication shows how to construct and install a Watermark™ Sensor manufactured by Irrometer for irrigation water management.

MATERIALS:

- PVC pipe ½ inch (Schedule 20, 315 psi thin wall)
- Moisture sensors, 200SS
- Blue PVC cement (for wet conditions)
- PVC cleaner and primer (optional)
- Electrical tape (black tape, or color tape for depths, blue, red, green, black) or poly pipe tape.
- ½ inch PVC cap.
- Rubber Washer (American Packing and Gasket (APG 13880rf125a0050v, can be purchased at Fastenal)
- Saw or PVC cutter to cut the pipe, and to make indentions for the wires.
- Sharpie Marker

*Figure 1. 1/2 Inch SCH 20, 315 PSI, PVC pipe and a Watermark 200 SS Sensor*
1. Cut ½” PVC approximately four inches over desired depth of sensor. For example for a 6” sensor, cut the pipe 10”. The sensor is 2.5” long, do this will leave 6” above the ground after installation.

<table>
<thead>
<tr>
<th>Sensor Install Depth</th>
<th>Minimum Recommended PVC pipe length</th>
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<tr>
<td>6”</td>
<td>10.5”</td>
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<tr>
<td>12”</td>
<td>15.5”</td>
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<tr>
<td>18”</td>
<td>21.5”</td>
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<tr>
<td>30”</td>
<td>34”</td>
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2. Cut a 1 inch notch or drill a hole at the top of the pipe so that the wire can be brought out and the cap put on firmly. Ensure the slot or hole if far enough down the pipe so that it is not pinched when the cap is used to drive the sensor into the ground.
3. Drill a small 1/8” hole about a ¼” from the end of the pipe. This is a drain hole.

4. Run the wires through the pipe from the moisture sensor.
5. Apply PVC primer and glue to the sensor and pipe. The slot on the sensor and hole must align so that water can drain. Hold firmly until it dries and wipe off excess glue so the surface is smooth. Do not allow excess glue to build up around the seam.

6. Mark PVC pipe with a permanent marker for the sensor install depth. Place depth of sensor on cap. Do not glue the cap.
7. Place rubber washer on PVC pipe to ensure sensor is installed to correct depth.

8. Route wire, place end cap on sensor and tape wire and cap to seal.

1. For manual read sensors, put the excess wire in the pipe by looping it inside before routing the wire out of the PVC. Leave 2-4” of wire outside for the leads, just enough to connect a manual reader, less is better.

2. For sensors that are to be used with telemetry units and require a long lead, route the wire and wrap the excess wire around the completed sensor.
Condition sensors. Sensors must experience two wetting and drying cycles, preferably overnight soaking and drying during the day. They should completely dry to 199 cb and read less than 10 cb after being soaked. Store sensors wet before they are installed and dry in the off-season. It is preferable to soak sensors in the irrigation water that will be applied to the field or fresh rainwater, but tap water can be used.
Sok sensors overnight before installation. Check with manual reader, they must read less than 10 cb when wet.

Use Slide hammer to install in the row or between plants. For twin row systems, install between the twin rows. Always install sensor in the top of the bed. Turn slide hamper over and gently tap sensor so that it is solid in the bottom of the hole. Sensor will need at least 2 days to acclimate to the soil moisture. Install sensors at least 3 plants apart from each other in the row, preferably in order of depth. Sensors should be installed early in the season when plants are small so that the installation does not damage roots. Plants with roots that are damaged by sensor installations may not use water the same as undamaged plants.
12. Push rubber washer into place so that it contacts the soil. Remove soil from slide hammer probe and place on top of washer and gently pack down. Use enough soil so that washer is no longer visible.

13. Place flags in field at sensor location and at end of row so they can be located after the growing season and before harvest. The deeper sensors are easier to extract if the soil is moist than dry.