



deeproot REVOLUTION LLC

Prime Distributor for Deep Root Irrigation



Manufacturer's Specifications & Procedures for Installation of the Deep Root Irrigation System

Highest Priority Considerations when Installing DRI

1. "Woodpecker" style pressure compensating emitters must be attached only on the side or the bottom of the irrigation hose.
2. As the DRI unit is attached to the emitter, the first wrap of the 1/4 inch tubing should always go: **from the emitter and then under the irrigation hose first**, before wrapping up around the irrigation hose and being inserted down into the ground. Emitters must be installed parallel to the soil surface (facing sideways) or facing downward so as not to allow an air bubble to enter the 1/4 -inch tubing.
3. Irrigation tubing, pressure compensating emitters, and DRI units must be checked for successful flow before burial and installation. Water must be on and running through the emitter during time of installation. This confirms to the installer that the emitter is not clogged and it is working. Once the DRI unit is connected to the emitter, the unit should be allowed a few minutes to demonstrate that it emits water before the DRI unit is inserted in the ground. Everything must be working correctly before DRI goes into the ground.
4. **Venting:** Auto flush valves, or comparable venting, must be placed at the end of each irrigation line and at any apex of rises in hose line. Couplers used to connect the valve to the drip line must be the twist-lock type, not compression. Venting must be installed at the same time the DRI units are installed. If vents were not originally installed, the lines must be retrofitted with them for optimal performance.
5. DRI soaker hose portion must be buried three inches below soil surface. Vine crops will have the DRI unit inserted diagonally, down and away, at the base of the vine, to offset the bulb of saturation from the main root mass. For trees, the DRI units are inserted vertically.
6. The soil above the DRI soaker hose must be tamped down to prevent easy escape of water when the water being delivered begins to pressurize.
7. DRI unit must be in close enough proximity to the root ball to provide soil moisture to the root ball.
8. When a new planting occurs on a slope, the initial DRI unit should be installed uphill from the plant.
9. When storing DRI units, avoid prolonged exposure to sunlight.
10. There must be a subsurface monitoring system in place to monitor soil moisture (Climate Minder or something similar).



11. The DRI units must be isolated from existing drips and spray. In other words, avoid installing DRI units on irrigation lines where open drip or fanjets are being used. These open emitters will steal the pressure you hope to build within the DRI units. This will cause your DRI unit to have less than optimal performance.
12. A Deep Root Revolution representative must be present at all installations, to train field crews how to properly install and "dial in" DRI.

What to watch for: Once the irrigation has begun, within about 15 minutes you can expect to see a 4 to 6-inch wet spot. This means you are putting the water into the ground at a flow rate slightly faster than the ground can absorb. This is important! If the initial wet spot does not occur, you are probably using too slow of a flow rate. After several hours of irrigating you will suddenly see the 6-inch wet spot grow to about 30 inches in diameter. As a matter of fact, all the wet spots, from each DRI unit, will grow suddenly at the same time. This means your ground has reached capacity. Make a note of how long you were irrigating before this overflow occurred and then turn your water off. The next time you irrigate, be ready to turn off the water at approximately the same time. Use a portable soil moisture probe to measure the soil moisture content and the width of your moisture pattern in the ground. You can enlarge the "bulb" of saturation by pulsing with shorter more frequent irrigation events. You can also maintain a smaller bulb of saturation by waiting until you notice a decrease in the soil moisture content before adding more water.

Overview

The hole in which the DRI unit is installed is created by a tool made from 3/4" hardened steel. It has a handle on top and a foot peg at 22 inches up from the bottom. Ideally, the installer will make the hole about 22 inches deep, which is deeper than necessary in order to accommodate dirt that falls back in (and also to break through the hardpan, which is usually around 14 to 16 inches). Automated installation tools are in development.

All four DRI unit sizes will install so that 3 inches of the 1/4-inch tubing is buried. Total burial for the DRI-12 will then be 15 inches from ground surface to bottom of unit. The DRI-3 will total 6 inches of burial, the DRI-6 will total 9 inches of burial, and the DRI-18 will total 22 inches of burial. **Burying the first 3 inches of the 1/4-inch tubing** is important to ensure that the soaker hose part of the unit is not exposed to air and sun. When installed correctly, the DRI unit can last the life of your vine or tree.

*Tool specifications and technical drawing can be found at the end of these instructions.



Comprehensive Installation Instructions

When to install DRI

- The best time of year to install DRI is during the rainy season when the ground is soft. In these conditions, a unit can be installed in 30 to 60 seconds. If installation takes place in drier weather, simply irrigate the location well, 24 hours prior to DRI installation.
- If units are installed just prior to or during the rainy season, we require you to fill the system with water to eliminate the chance of DRI units becoming buoyant in wet soil, and lifting to the surface because air is trapped in them. Once you have filled the system with water and completed an irrigation cycle on a vented irrigation line, the unit will be anchored for good and lifting will never again be a problem.

What size DRI to install

- Vineyards use **1 DRI-12** unit per vine installed at a 45-degree angle, down and away from the base of the vine to offset the bulb of saturation from the main root mass. Tree saplings also take one DRI-12 unit installed 12 inches from the plant base for the first season of growth.
- Mature orchards take **2 DRI-12** units per tree, one on each side, in line with the row, approximately halfway between trunk and dripline of canopy, ideally targeting the spot where original surface watering occurred. Feeder roots will be established in that location, but such placement is not absolutely necessary if not possible. **In some cases, it may be necessary on mature orchards to run surface irrigation as supplemental watering to DRI for the first season until capillary roots are established at the DRI site.** Typically, DRI is installed vertically for trees.
- Larger trees, such as mature walnuts, take **4 DRI-12** units per tree, requiring **two irrigation lines**, one on each side of the tree, with emitters spaced in a rectangle around the tree. Mature trees might need supplemental surface irrigation for the first season while the roots transition to DRI.
- Blueberries, blackberries, and other smaller perennials take **1 DRI-6 per plant**. The DRI-6 also can be used as an alternative to the DRI-12 when vineyard or orchard ground is very rocky or the soil is shallow on a stone bed. Some growers prefer to use the DRI-6 on their starts and saplings in more porous soil types (sand and loam) in order to promote downward root growth, while ensuring that enough water remains closer to the surface to aid the small developing roots.
- The **DRI-3** is primarily for use in potted plants.
- The **DRI-18** is used for large heritage trees—such as maples, redwoods, pines, etc.—that are drought stressed and need some help with water and nutrient delivery.



Pre and Post Install Tips

- If hard-wall irrigation hose is being used, as is the case in many orchards, it is best to allow the water to run while connecting the DRI's ¼-inch tubing to the emitter. Water flowing from the emitter during installation will ensure that the system is performing properly and there is no clogging.
- Before placing DRI units into the ground, water must be flowing into them and they must be weeping to ensure there are no obstructions or air bubbles in the line or emitters. **The first wrap of the ¼ inch tubing should always proceed from the emitter and then be wrapped under the irrigation hose.** Wrapping or coiling the tubing around the hose allows it to absorb movement from the hose without disconnecting.
- Once the unit is buried, it is important to **compact the soil well around the ¼-inch tubing.** This helps to **optimize subsurface pressurization.**

Requirements for hillside installations

- In vineyards, always install the DRI unit on the **uphill side** of the vine for optimal water delivery to the root zone.
- For orchards, always install **one DRI unit on the uphill side and the other just below the trunk if the hill is steep.** If the hill is **not too steep**, then install the unit on the lower side at the **typical recommended location**, about halfway between trunk and drip line of the tree.
- On hillside vineyards and orchards, back-flow **check valves** are required for every 20 feet of rise to ensure that gravity does not create a vacuum, literally pulling water out of the root zone.
- A **vent at the top of the hill and at the termination of the drip line** is required in order to relieve the line of air.
- For both long runs and hillsides, **pressure compensating emitters are required.**

The dial in process

- This is the process in which our customer service Technician assists you, the Grower, in the proper implementation of DRI for optimal performance. This includes isolation from other methods of irrigation, using the correct rate of flow per soil type, and making sure the right irrigation and dissipation cycles are being used to prevent under- or over-watering.



Isolation

- In order to really demonstrate DRI's performance, it's **imperative that DRI is able to operate on an isolated irrigation block**. Because DRI's irrigation cycles are radically different from those of surface watering methods, it is important that the grower has control over when the water is turned on and off.
- Isolation will make it easy to ascertain the desired irrigation and dissipation cycles in any given soil type. Please refer to our documented "cut away procedures" in order to better understand how long cycles ought to be in each soil type.
- Also, isolating DRI from other surface irrigation methods will allow DRI to perform optimally. When DRI units are installed to share a row or a block with open emitters—drip or fan jet—DRI performance will be compromised. **WHEN DRI IS ISOLATED, IT PERFORMS OPTIMALLY BY CREATING PRESSURE THAT PUSHES THE WATER Laterally THROUGH THE GROUND.**

Rate of flow

- Rate of flow is dictated by the emitter to which the DRI is connected. When using DRI, the rule of thumb for emitters used in varying soil types is:
 - ½ to 1 gallon per hour in clay soil.
 - 1 to 2 gallons per hour in loam.
 - 2 to 6 gallons per hour in sand or porous soil.
- **Recommended Flow Rate:** Because soil types vary from site to site, or sometimes even within irrigation blocks, some Growers want to use emitters that accommodate those differences. For example, if a vein of heavy clay is running through an otherwise loamy block, the Grower would slow the rate of flow in that vein of clay by using a slower rate emitter. The loamy area may use a 1 or 2 gallon per hour emitter while the clay vein may use a ½ to 1 gallon per hour emitter to optimize performance. The obvious objective is to **slow down the rate of flow in denser soils and increase the rate of flow in more porous soils to optimize efficiency**.
- Examples of soil-emitter combinations that really do not work well are ½ gallon per hour emitters in sand, and 4 gallons per hour emitters in clay. The ½ gallon per hour rate is too slow for sand, and the 4 gallons per hour rate is too fast for the clay soil to absorb efficiently.
- **Standardized Flow Rate:** Some Growers, for ease of operation, want to use the same emitter rate of flow regardless of soil type. In this case **we recommend a standardized rate of flow of 2 gallons per hour emitters for orchards, and 1 gallon per hour emitters for vineyards**. The duration of irrigation cycles can be adjusted to control the amount of water delivered over a given period of time.



Irrigation cycles

- Take note of the time you turn the water on to begin irrigation. Depending on the soil type, you will see a 4- to 6-inch wet spot within about 15 minutes. Some heavier clay soils may show 12 to 24-inch surface wet patterns. This **wet spot tells you that DRI is working**.
- Depending on soil type, that wet spot will expand after several hours of irrigating: clay in 4 to 6 hours, loam in 6 or 7 hours, and sand in about 8 or 9 hours. Note and document the amount of time it took for the wet spot in your soil to expand. The expanding wet spot means you have **completed subsurface saturation and now the water has nowhere to go but up**. In short, you have completed your irrigation cycle.

Dissipation cycles

- A dissipation cycle is the **amount of time recommended between irrigation cycles**. Knowing and **adhering to dissipation time will prevent over-watering**. Because of DRI's targeted delivery, saturation is complete using half—or less than half—of the water normally used, and in a considerably shorter amount of time.
- Important to note that cycles for saplings and starts will be different than for mature vines and trees.

Installation Imperatives

- **It is absolutely vital that ALL installation procedures be followed.**
- **A Deep Root Revolution representative must be present at all installations and there must be a subsurface monitoring system in place to monitor soil moisture.**

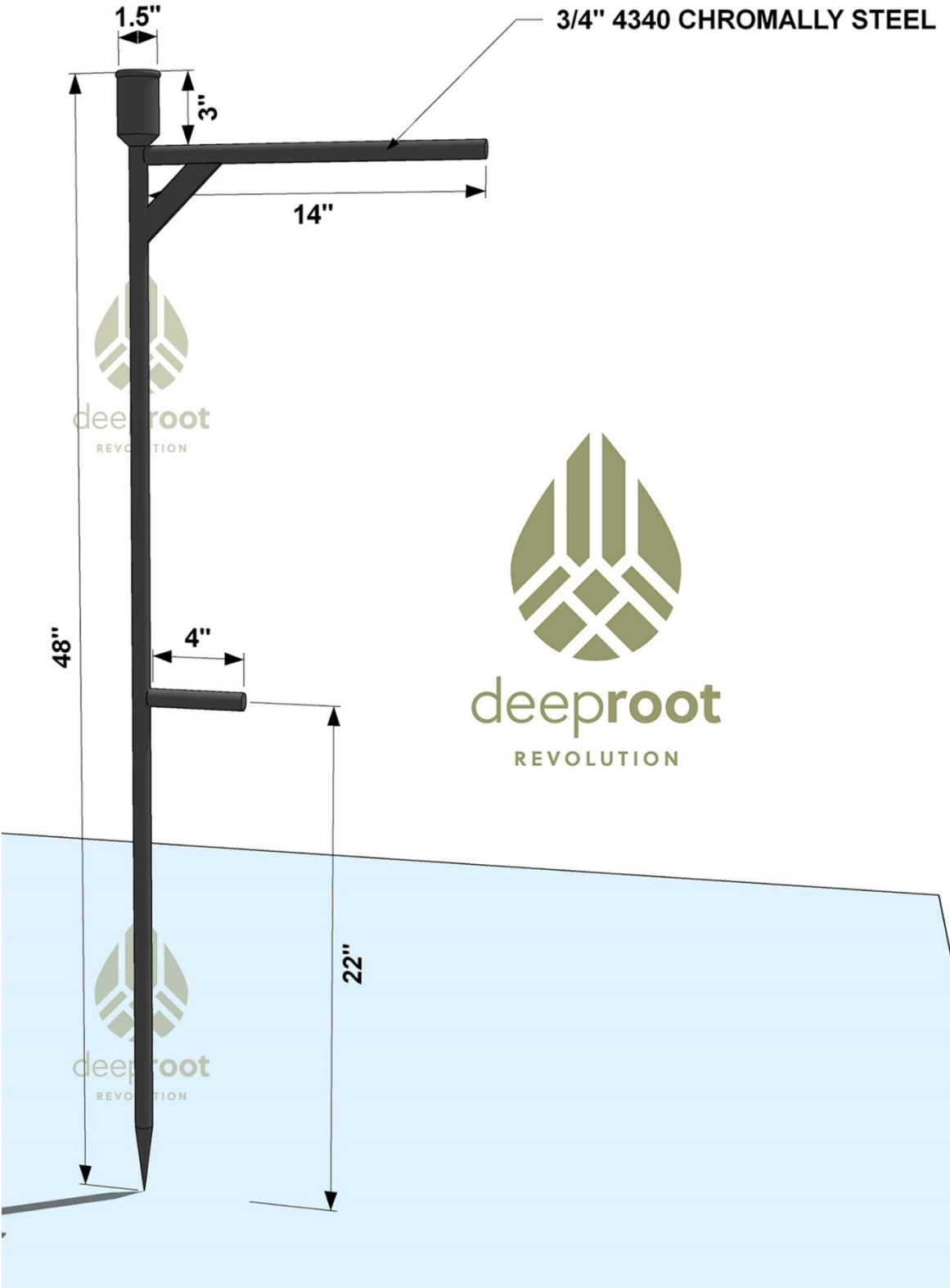
One Last Important Perspective to Keep in Mind

Subsurface monitoring as a component of control must be a part of any DRI installation. Saturation levels must be observed at 1, 2, and 3 feet underground.

Otherwise, overwatering or underwatering can happen. Many monitoring systems are available, such as GroGuru, ClimateMinder, Sentek, and Observant. DRI is a simple device that allows growers to direct water into the root zone of their plants. All growers using DRI accept full responsibility for how much or how little water they use. The object is to grow healthy trees. It is the grower's responsibility to determine how best to achieve those results.



Deep Root Irrigation Install Tool Specs and schematic





deeproot

REVOLUTION LLC

For additional information or to place an order:

707-963-8788

sales@deeprootrevolution.com

www.deeprootrevolution.com



Manufactured in Angwin, CA
U.S. Pat. No. 8,381,437 and Other Patents Pending

