



Granting of Variance on Water Use Permit for Landscape Irrigation for Century Village East

Why and How Our Irrigation System Saves Water

Why? Traditional irrigation controllers turn on at a pre-set time and duration regardless of whether or not the landscape needs water. Often the landscape is watered too long or too often which wastes water, money, causes run-off of chemicals, and damages plant health through disease or poor root development. Most traditional controllers are set once by the installation contractor, and never changed seasonally or to reflect the maturity of the landscape.

At CVEMM the irrigation system is controlled by a Baseline 6000 soil moisture and weather based computerized control system. CVEMM has been granted a 'days of the week' variance to their Consumptive Use permit by the South Florida Water Management district due to the use of this sophisticated system. Such a system is proven, when properly implemented and managed, to save water, reduce operational costs, and offers overall better irrigation management capabilities.

How? The Baseline 6000 control system has nine (9) RBU's, eighteen (18) soil moisture sensors (SMS) and one weather station reporting system and environmental information to it. Each RBU has two SMS connected which report a volumetric soil moisture while the weather station collects rainfall, temperature, solar radiation, humidity, wind speed and wind direction. All these environmental parameters are communicated to the Baseline 6000 monitoring computer on a continuous basis to develop irrigation schedules which vary according to the weather and soil moisture conditions. This process is outlined below.

Soil Moisture Sensor (SMS)

SMS controlled and scheduled zones operate using the following principles and concepts:

Each SMS is programmed for the soil type it is installed in. This soil type determines the soils 'field capacity' and 'permanent wilt' points in terms of volumetric soil moisture; both of which are learned empirically by the Baseline 6000 system.

- **Field Capacity (FC)** – is the volumetric soil moisture when all pore spaces are filled but no water leaves the soil profile due to gravity. (100% plant available water in the soil profile).



- **Permanent Wilting (PW)** – is the volumetric soil moisture when all plant available water is removed from the soil profile and plant death will occur. (0% plant available water in the soil profile).

Utilizing irrigation management principles of maximum allowable depletion (MAD), FC, PW and deficit irrigation (DI) the Baseline 6000 is programmed to turn on irrigation at a certain MAD and turn off at a certain percentage of (FC).

- **Maximum Allowable Depletion (MAD)** – this is the percentage of volumetric soil moisture content the irrigation manager allows to be depleted before another irrigation cycle is scheduled. In the sandy soil at CVEMM this is set at 60%.

- **Deficit Irrigation (DI)** – an irrigation management concept which determines what percent of (FC) a scheduled irrigation will refill the soil profile to. At CVEMM we allow the soil profile to refill to 80% of (FC) or 20% (DI).

Therefore, irrigation shuts off when the (FC) reaches 80% and turns on when the MAD reaches 60%. This management concept allows room in the soil profile to accept rainfall (only 80% of the capacity is ever filled by irrigation). It also allows a reasonable amount of time to pass between irrigation events. This insures the plant always has enough water for survival and growth but prevents irrigation from occurring when the soil profile (thus the plants) have sufficient water. In other words, irrigation is only allowed when the plants need it due to a lack of rainfall.

- **Weather Station** – Weather station controlled and scheduled zones operate using the following principles:

The weather station collects the environmental parameters listed above and supplies this to the Baseline 6000 computer. The computer, using this environmental data and the modified Penman-Montieth equation, calculates the Eto for the site. The Eto is then modified, zone by zone, to Etp. Etp is calculated every day by the monitoring computer and compared to the theoretical plant available water, in inches/foot of soil. Based on the soil type, a (FC) in inches/foot of soil is determined for every zone and this is the amount of soil moisture you start with when initially setting up a site. The daily Etp is subtracted from the previous days soil moisture level to determine the current days soil moisture level. This process continues each day until 60% MAD has been reached. Once 60% MAD is reached irrigation will be scheduled to refill the soil to 80% of (FC). Then the process repeats itself.

- **Eto** – The baseline line evapotranspiration for the site, unadjusted for the site specific plants.



- **Etp** – The adjusted baseline Eto which takes into account the plant species and site hydro-zones.
- **Evapotranspiration** – the amount of water in an irrigated area which is lost due to evaporation and transpiration. This is usually reported in inches per hour or inches per day.
- **Hydrozone** – a hydrozone, in this discussions context, is the environment in which the zone operates. Sun vs Shade, level vs sloped, windy vs calm, etc.

Future Irrigation

We do not expect to use more water than we do currently. It is important to allow the soil to dry out to an extent, as this stimulates root growth, which makes our plants more resistant to dry conditions down the road. This, in turn, will allow us to look at areas where we can adjust our soil moisture lower limits, as being able to irrigate any day will allow us to not have to worry about a situation where we the soil moisture reaches the lower limit and we have to wait several potentially hot and dry days before we can irrigate.

Our water usage will still be monitored by South Florida Water Management District and requires we adhere to both a monthly and annual water allocation, as they determine. The variance agreement also requires we provide access to the Baseline 6000 as well as submission of water usage reports on a regular basis. Substantial oversight and accountability is required in order to maintain the variance.

Summary

Using measured soil moisture and environmentally calculated plant/soil water loss, allows an irrigation manager to insure irrigation is applied only when the plants require it, not at set days and times (as we had been). Instead, when plants need water, water is scheduled by the Baseline 6000 control system and the control system only puts back (through irrigation) exactly how much needs to be replaced. This could mean watering daily for a short time or not at all during the week based on the soil moisture needs. This prevents over and under watering and allows rainfall and soil plant requirements to drive irrigation schedules. This process has been shown to routinely reduce overall water use by 28-40% or more.

Remember plants and irrigation systems do not save – knowledgeable and competent people save water. The keys to efficient watering are: knowing when to water, how much to apply, and how to apply it uniformly. So when you see the landscapes in Century Village East being irrigated, remember CVEMM is working to promote efficient water and cost management.

