

Designing a Viable Irrigation System for the National Mall

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The National Mall is nestled between the US Capital and the Washington Monument in the nation's capital. This large open area of lawn and old oaks is commonly referred to as America's front lawn. Over the past several years the mall has suffered from dead turf, lack of turf, weeds and bare spots and does not look very good. It is also extremely compacted and retains water on the surface. Due to these issues, over the next few years the eight lawn panels of the mall will be going under construction to perform a major renovation to the turf areas. As part of the renovation, a new irrigation system will be installed.

The National Mall is unique in many ways and because of its uniqueness it provides many challenges to having a long term operational irrigation system. Although the mall has been irrigated in the past, the previous systems have suffered from the activities on the mall and rarely were the systems completely operational. So let's first look at a few of the obstacles to conventional irrigation that are somewhat unique to the National Mall

- 25 million visitors a year
- 3,300 permitted events per year; an unknown number of unpermitted events including baseball, softball, soccer and football
- weight, including tanks and landing and taking off of Harrier jets
- lack of sunlight for long periods of time from tents, stages and the Solar Decathlon
- vehicle traffic
- historic precedents that limit what can be done to the mall
- 1st amendment right to gather
- availability of potable water sources

All of these activities provide compaction, lots of it. The soil settles and sprinkler heads become high, low or crooked. Sprinkler heads are easily damaged by all these activities. But the most damaging aspect is tent stakes; tent stakes up to 48 inches in length that go through PVC pipe like it is not even there.

So based on the above, what are the design parameters:

1. Minimize the amount of equipment in the turf; sprinklers, valve boxes, etc.\
2. Minimize damage from tent stakes
3. Minimize potable water use
4. Provide a maximum water window of 3 days per week, 5 hours per day.
5. Do not impact the historic aspects of the mall, including the visual aspects
6. Install a central control system and weather station, however the closest place for both is over a mile away
7. Have a long lasting viable system that requires as little maintenance as possible

Some of these were easier than you might think others much more difficult.

1. Large golf rotors were used to minimize sprinklers. Luckily the lawn panels are exactly 180 feet wide the whole length of the mall. A 90 foot x 90 foot spacing pretty much covered it. So there were 3 rows of sprinklers. Two rows were preferred but it just was not possible. Valve-in-head sprinklers were used to

eliminate zone valves and their associated boxes. . Almost all valve boxes for isolation and air release are piped in and out of the walkways. To minimize wiring and wire splices a two wire system was used. Less wire and less splices will hopefully have less maintenance issues.

2. The pipe depth of cover is 60 inches to minimize stake damage. Additionally, pipe is HDPE as it has a much thicker wall at the sizes needed and without fittings. A “no stake” area of 5 feet around the sprinklers is established along each side of the mall and down the middle.
3. In order to minimize potable water use, storm water is being collected from the mall sidewalks and lawn areas. Storm water collected is stored in four 250,000 gallon cisterns buried under the mall sidewalks and is expected to provide approximately 1/3 of the annual irrigation demand. Because the water is collected and stored it also needs to be pumped. Because it is storm water it needs to be filtered and the District of Columbia regulations also require that it be disinfected. So before entering the irrigation system the water needs to be pumped, filtered and disinfected.
4. The water window dictated, quickly defined a water requirement of 1,400 gpm.
5. The historic requirement meant no controllers on the mall and no buildings. The pumping plant with its required accessories is buried in a large underground vault that houses all of the controls and logic as well as the electrical supplies for the cistern transfer pumps, drainage pumps (the mall has little elevation change) and the irrigation system.
6. The central control system had to be located off site of the mall as it cannot be in an underground pit and a weather station was not visually appealing. These are both located at the closest mall maintenance yard, about a mile away by line of site. Not usually a big issue as radio can cover that distance easily. However, no antennas are allowed as they are not part of the historic look of the mall. As you can imagine, all mall projects need to be approved by a number of entities and antennas would not be tolerated. So the system was set up with internet communication. Pump monitoring which is extensive and communication with the central controller is accomplished with dedicated ISP addresses for the pump station and the central control system interface which is the only piece of irrigation control equipment in the vault. The internet connection provides a direct link to the central computer 24/7 and from any other internet capable smart device. The weather station however communicates via radio as it is down by the maintenance yard where visual aesthetics are not an issue.
7. Maintenance is hopefully minimized by using less equipment, minimal wire and wire splices, keeping the equipment all in one place (valve-in-head), installing all wire in conduit, grounding the system more than required by the manufacturer, burying the pipe where it is mostly away from harm and getting buy in from the maintenance staff throughout the design process.

The project which started construction in September 2011 in addition to the irrigation system also replaces the soil, adds drainage, adds curbing and replaces the turf. When completed the Mall should have a more viable turf system that can better handle most of the activities being undertaken on the mall and a viable irrigation system is essential to having that occur.

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