Irrigation Challenges and Opportunities Created by Modern Day Synthetic Turf Sports Field Surfaces

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ABSTRACT

Turf managers charged with maintaining natural turf on sports field complexes can work wonders given they are provided with adequate staff, equipment and budget. This is true even at high-use sports facilities. However, near constant field usage coupled with decreasing field maintenance budgets have made it almost impossible to maintain high quality natural turf for many turf managers. Modern day "infill" synthetic turf surfaces resolve many of the issues associated with high-use sports field facilities. While installing synthetic turf serves to resolve the playing surface quality issues, it presents new challenges for both the player and those charged with field maintenance. Most notable of these concerns is the need to reduce the high heat generated when these surfaces are exposed to sunlight. Synthetic turf was once considered a negative to the irrigation industry. Today, irrigation has become one solution towards resolving this high heat concern. The opportunity of irrigating synthetic turf presents new and unique challenges for the irrigation specifier, contractor and end user. Once understood, these challenges are easily overcome and will lead to ongoing irrigation opportunities for our industry.

KEYWORDS

Synthetic turf, artificial turf, sports field irrigation, irrigation challenges, irrigation opportunities, high heat, high temperatures, cooling turf.

INTRODUCTION

While it is clear that most everyone would prefer the aesthetic beauty and playability of a well maintained natural turf sports field, the reality is this is not always the most practical solution. This is particularly true at high-use sports field facilities where near constant play on the field coupled with decreasing field maintenance budgets have made it all but impossible to maintain quality turf. Given this dilemma, field & facility managers can be faced with the difficult choice of either keeping the natural turf, which might in fact be unsightly and unsafe for the players or, explore fund-raising activities towards converting the field to a synthetic turf surface.

Fortunately, modern-day synthetic turf surfaces have evolved to become an acceptable alternative for these high-use facilities. Current generation "infill" type fields resolve virtually all of the past concerns that were associated with synthetic surfaces. In fact, researchers have found that infill systems are softer, less abrasive, and generally exhibit better traction qualities than traditional Astroturf™ (McNitt, Petrunak, 2007). As a result, growth in new synthetic turf installations and the retro-fitting of existing sports fields to synthetic turf have skyrocketed in recent years throughout the US and around the world. Demand has grown to the point where there are now more than 6,000 multi-use synthetic turf sports fields installed in North American schools, colleges, parks and professional sports stadiums with consistent robust double-digit growth over the last several years (Synthetic Turf Council, 2011).

Of course, for the irrigation industry this trend has been disturbing to say the least. In fact most sales pitches received by sports turf managers in the early years from the synthetic turf industry included the end-user benefits of completely eliminating irrigation equipment and the costs of water. These presentations also included the elimination of nearly all field maintenance costs as well. However, these claims and selling tactics have in large part become a part of the past as a result of ongoing university and industry research yielding data to the contrary (McNitt, Petrunak, 2008).

While installing synthetic turf can resolve the aesthetic and playing surface quality issues on high use fields, it presents new challenges for both the player and those charged with field maintenance. Most notable of these concerns is the need to reduce the high heat generated when these surfaces are exposed to sunlight and in particular during summer's peak high temperature hours. One study noted that three things were apparent from these summer observations: 1) Natural turf surfaces are much cooler than non-irrigated synthetic surfaces; 2) non-irrigated synthetic surface temperatures can be as high as 177°F (80°C); and 3) surface temperature of synthetic fields can be reduced by 33 percent with proper use of irrigation cycling (Minner, 2004). Other research confirms this phenomenon with data revealing that field surface temperatures can reach as high as 199°F (93°C) with ambient temperatures of 99°F (37°C) (Brakeman, 2004).

This author personally experienced the concern as an assistant Pop Warner football coach. At 11 AM one Saturday southern California morning the ambient temperature was 95°F (35°C) and a temperature gun was used to measure the field surface temperature. We were amazed to hear that the field was at 160°F (71°C). By the time our kids hit the field at 2:00 PM they could barely keep their hands on the turf while in stance on the line. This of course dictated plenty of hydration, a lot of substitutions and raised concern about the safety of the team members in this environment.

Once considered a negative to the irrigation industry, irrigation has emerged as the most effective solution to date towards resolving this high heat concern on synthetic surfaces. Through research activities we can see that applications of water will dramatically reduce field temperatures. The graph in Fig 1 shows the average temperature of 8 different manufacturer's synthetic surface test plots measured on June 30th, 2004 after a single irrigation cycle (McNitt, Petrunak, 2008). While the effects of this single irrigation cycle do not last the entire day, it is clear the benefit of irrigation is one solution towards minimizing this concern. It should also be noted that it is this author's opinion the research shows there is a correlation between the ambient temperature and the effectiveness of a single irrigation cycle. At higher ambient temperatures the effectiveness of irrigation is diminished as indicated by a more rapid increase in surface temperatures after irrigation.

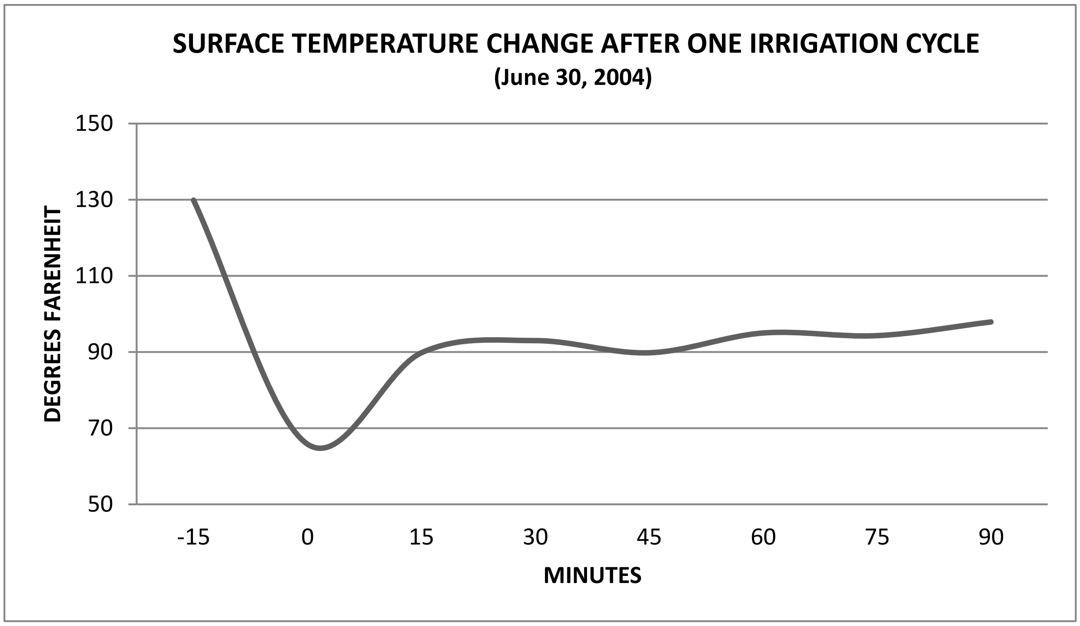

Fig. 1

Research continues at Pennsylvania State and other universities. Once believed to be a viable target towards reducing heat, it has become clear that changes to the infill material color and/or the color of the turf fibers themselves make very little difference in reducing the temperatures of synthetic surfaces (Serensits, 2011)

One area of research that appears to show promise is exploring the means to retain more water within the infill material. The intent here is to make the cooling effects of irrigation longer lasting. These experiments have shown that current day infill media are largely hydrophobic with a strong tendency towards shedding water instead of retaining it. This water then quickly disappears along with its cooling effects as it percolates through the field's extensive drainage network (McNitt, Petrunak, 2007).

PURPOSE

First and foremost, this is not a document whose purpose is to get in the middle of the active controversy between the natural turf and synthetic turf industries. Each have their benefits, each have their set of concerns and each are adamant about which is best. This document is not the forum for this discussion. This document is also specific to sports turf related synthetic turf irrigation systems. It does not tackle the emergence in recent years of infill type synthetic turf surfaces in the residential market. And, there is no intent towards justifying whether or not irrigation of synthetic turf is required other than to present informational research in the introduction above. The sole purpose of this document is, given the existence of synthetic turf projects, to convey the challenges and resulting opportunities associated with irrigating these surfaces.

One thing is clear, too often the approach to irrigating synthetic turf comes from a natural turf mindset. This is understandable given the long history of irrigating natural turf. However, this approach can create serious mistakes that will ultimately lead to a disappointed synthetic turf end-user customer.

SPECIFIER, CONTRACTOR and END-USER CONSIDERATIONS

As with any irrigation project, the irrigation specifier is the gatekeeper who is not only charged with providing a high quality site appropriate design but also with selecting equipment that protects the interests of both the contractor and end-user. The contractor is charged with providing a quality installation for the customer. At the same time, the contractor has a vested interest in making sure the installation goes as smooth and as easy as possible. The end-user customer wants it all to come together and be provided with a reliable & long-lasting system. If and when maintenance is required, the end-user expects that these repairs be simple and easy to make. In these ways, synthetic turf irrigation projects are no different than natural turf projects. However, with synthetic turf irrigation there are additional and perhaps extraordinary factors that must also be considered.

***Sprinklers* -** In the earlier years of synthetic turf irrigation, the most common product and configuration was a riser-mounted long barrel vertical impact Ag sprinkler. These so called big gun impacts were the only products that could achieve the long radius requirements needed for synthetic turf. While still used in systems today, the emergence of pop-up long-range sprinklers created a new market trend. Today, the most prevalent design is one that includes some type of pop-up product. In large part this is due to the aesthetic appeal of being able to hide the sprinklers when they are not in operation.

In the few short years since becoming an integral part of the new era synthetic surfaces, irrigation has evolved to encompass two basic segments. These include sprinklers with radius capabilities up to 125 feet and those with much higher radius capabilities up to 160 feet and beyond.

***Sprinkler Distribution Uniformity* -** Contrary to traditional natural turf irrigation, nozzle efficiency and distribution uniformity are not normally a prime factor when considering the irrigation system layout and design. This is due to several factors as will be explained. One contributing factor is that sprinklers are not typically placed within the playing surface on synthetic fields. The reasoning for this is certainly based in the fact that these sprinklers have relatively large exposed surface areas and there is a need to provide a safe playing surface for the athlete. But this is not the only reason. Another important factor is the forced sprinkler spacings dictated by the field’s subsurface composition.

For all intents and purposes, the synthetic surface should be considered a non-serviceable surface as it relates to irrigation. This is because the end-user can't simply cut into the "carpet" and dig-in to make irrigation repairs. There is much more to consider. Beneath the typical approximate 2½" pile of turf fibers and the 1¾" of layered sand and rubberized infill material there is a finely orchestrated system of gradient layers designed to provide optimum support and drainage for the field (Figs. 2 & 3).

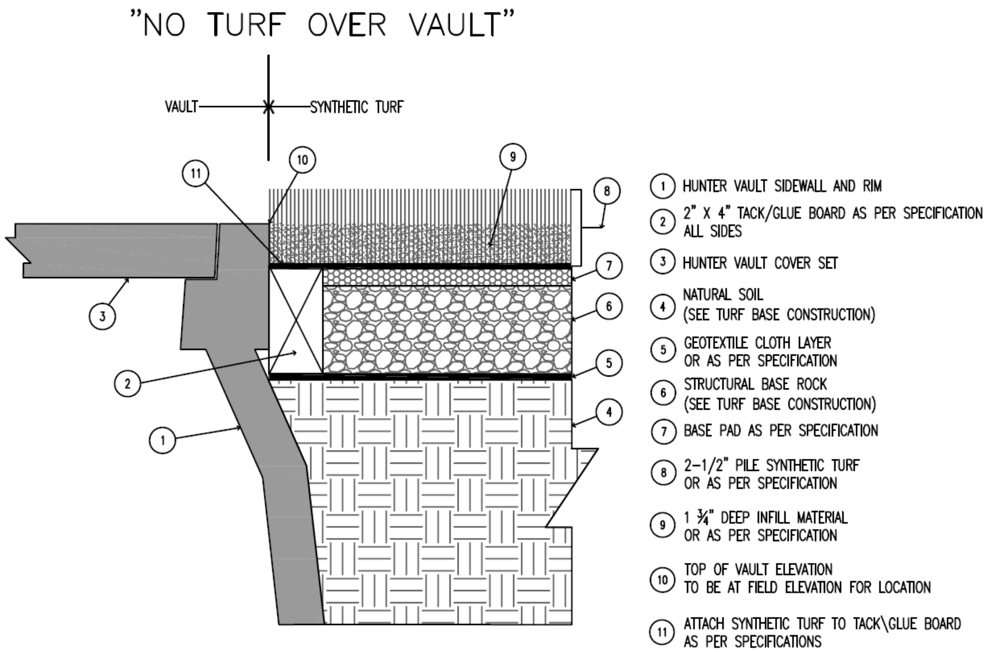

Fig. 2

Beneath the perforated carpet backing is also a perforated pad about 1" thick that not only provides drainage but also additional cushioning to protect the athlete. Beneath this pad layer is another layer or varying layers comprised of specific & specified aggregate sizes designed to provide a solid base for everything above while still allowing percolation for drainage. Further down still is a layer of geotextile cloth and/or a drainage system grid under the entire field. Some fields employ an asphalt type base with drainage provided by flowing the percolated water from the field's elevated crown along this surface to a peripheral field drainage system.

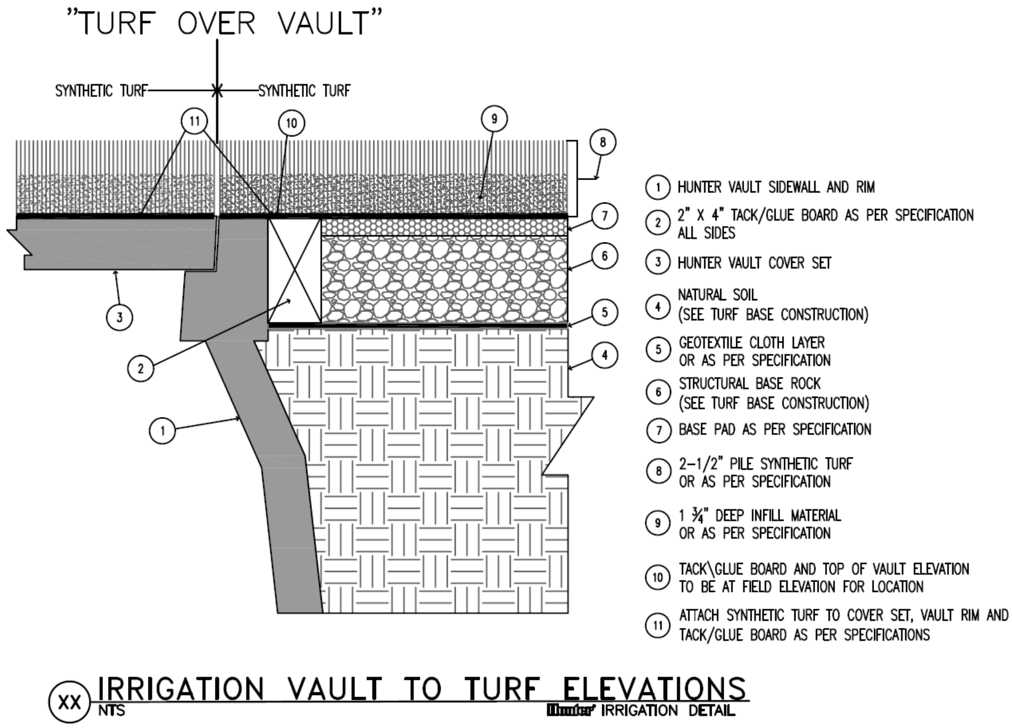

Fig. 3

Even if one assumes the excavation and subsequent backfilling after repairs can restore this gradient to its original intended profile, the next challenge is to restore the turf itself to a safe and playable surface. In order to do so, specialized equipment and techniques are required that provide appropriate hot gluing and/or stitching of the surface together.

So in consideration of the factors above, most all irrigation designs for synthetic sports turf place the sprinklers at or near the perimeter of the field. This not only keeps all irrigation plumbing away from the all-important game playing surface but also minimizes the amount of irrigation piping beneath the surface while simplifying access should repairs be required.

With sprinklers limited to the perimeter of the field, by default the challenge is not to optimize uniformity but to simply provide adequate coverage over the field in order to cool the turf. The reason is that most long range sprinklers do not have the capacity to reach all the way across the field to the one on the opposing side. Many times the sprinkler's radius only provides something that is incrementally greater than what is often called "tip to tip" coverage. This is due to the fact that there is usually more to the synthetic surface than just the primary playing field. There is usually also the peripheral sideline area to be considered as well.

As an example, an American football field with a running track around the perimeter has a distance of approximately 190 to 200 feet from the inside track edge across the field to the opposite inside track edge. For international football (soccer) the playing surface alone can reach up to 240 feet across on the largest fields with peripheral sideline & player areas beyond.

Another factor that diminishes the need for synthetic turf sprinklers to have traditional high levels of uniformity is the need to minimize or even eliminate the water close to the sprinkler. Creating the normal and sought after wedged-shaped profile requires water close to the sprinkler head. If equipped with a short-range nozzle directed close to the head, these high-flow/high-pressure sprinklers could easily blast away the infill material from the surface area adjacent to the sprinklers. The net result would be a visibly different looking and unsafe variation in the synthetic turf around the sprinklers.

***Wind* –** Nighttime and very early AM watering are the established norms for irrigating natural turf. Less evaporation, higher available water pressures and exposure to less radius & uniformity robbing wind are some of the key reasons for this practice. To the contrary, synthetic turf irrigation can and does happen at any time of the day. This includes the afternoon hours when many areas experience their highest winds of the day. Long radius sprinklers directed into the wind will experience substantial radius reductions. Of course, with sprinklers surrounding the field, some will realize the down-wind benefit of the wind pushing the radius longer. Regardless, the point is that wind should at least be placed in consideration with every synthetic turf irrigation design.

Another point to at least consider - - - given that synthetic turf irrigation can happen at any time of the day and during those times it can be windy and during those times there are usually people in close proximity, is the use of reclaimed water appropriate? I'm sure that many would say absolutely yes given the water has been treated sufficiently. However, there are also those that would at the very least question this practice.

***Operating Pressure and System Costs* –** The two categories of synthetic turf sprinklers each have different operating pressure requirements. The category of sprinkler with up to 125 feet radiuses require approximately 130 psi minimum at the pump station in order to maximize the radius potential and achieve the desired results at the sprinkler. Individual sprinkler flows in this category run from approximately 90 gpm up to 120 gpm. Of course, these higher pressures & flows require pump station sizing that will accommodate this demand. These relatively higher pump station and operating costs are in part offset by the lower cost of this category sprinkler. Typical list prices in this category run from a low of $300 up to $800 for individual block-type sprinklers.

The 160 feet plus category sprinkler has a much broader range of radius and operating pressures to choose from. As an example, on the lower end of the spectrum these sprinklers can fit the narrower field requirements with a 115 feet radius and 75 psi at the sprinkler with a flow of 108 gpm. At the opposite extreme these sprinklers can achieve 160 feet radius but the pressure jumps to again requiring a minimum 130 psi at the pump station and the flows at this level approach 300 gpm. A notable exception is the long-barrel vertical impact sprinkler where longer radiuses can be achieved at sub 100 psi pressures. Of course there is a price to be paid for this flexibility and capacity. To achieve the maximum performance on these larger sprinklers the pump station will need to be upsized considerably. The block type sprinklers in this category are also upsized in list price from a low of $1300 up to $3,000.

Flow Capacity and Runtime – Most customers with synthetic turf irrigation systems would prefer to minimize the total runtime required to cool the entire sports field. This is in part due to the time constraints that exist on game day. In severe temperature conditions the end-user may want to run an irrigation cycle between games and even during the halftime of a game. This can obviously place severe constraints on the system design.

Consider the following as an example scenario: Each field typically has 6, 8 or even 10 sprinklers. A gear-driven sprinkler might have a 4 minute or more full-circle speed of rotation (2 minutes for a ½ circle). The most cost-effective way to minimize the total runtime is running two sprinklers at one time. So if the user has 8 heads, runs two at a time, with ½ circle arc settings and applies a single pass per sprinkler this would require a minimum of 8 minutes of runtime. If two passes are desired then it will take 16 minutes. In many current installations either through calculation errors or construction cost constraints, the customer can only run one sprinkler at a time. This again results in a minimum of 16 minutes total runtime. With only 12 to 15 minutes in a typical halftime this can be problematic. It should be noted that some sprinklers like impact type sprinklers have a faster speed of rotation. However, the application rate per pass of faster rotating sprinklers will be less so more passes would be required.

Valve Configurations – Three different valve configurations are typically used when designing irrigation systems for synthetic turf sports fields. The three are remotely located valve Block type systems, Valve-In-Head type systems (VIH) and Valve-Adjacent-to-Head type systems (VAH).

Block systems are considered by some to be the most pragmatic approach to accommodating the need. This faction feels very strongly that highly pressurized mainlines should not exist beneath the unserviceable synthetic turf surface. Their concerns are strongly rooted in understanding the high costs and disruption associated with repairing irrigation system leaks under these surfaces (Fig. 4).

TYPICAL BLOCK SYSTEM INSTALLATION

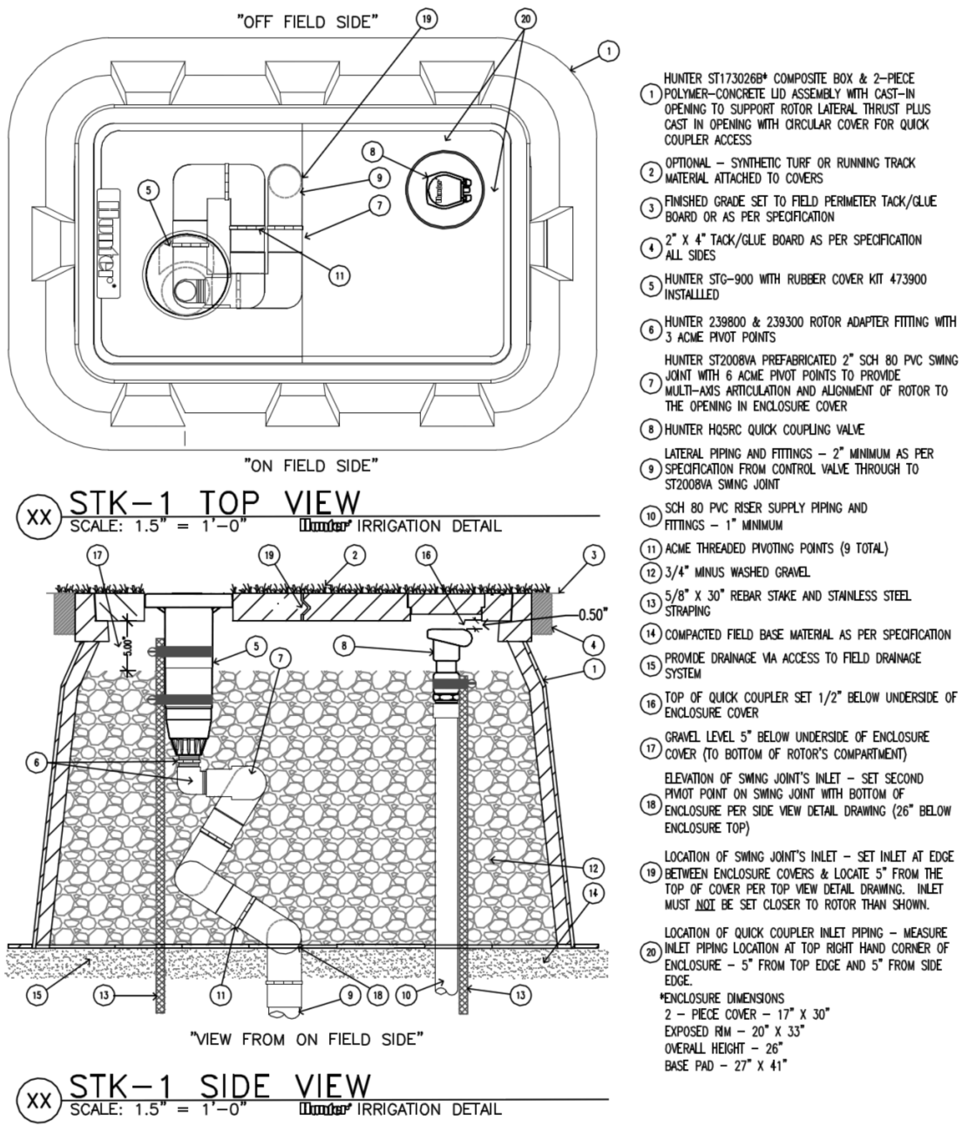

Fig. 4

Of course there can be shortcomings with this type of valving as well. Many times there is simply no suitable place for the valves and valve boxes adjacent to the field. If there is a good location then this location might be within or surrounded by hundreds of square feet of concrete or asphalt thus defeating in many ways the original intent. This approach might also require running multiple lateral piping sleeves under a running track to supply the sprinklers. The designer is also faced with the decision of where to place the pressurized quick coupler system. If under the synthetic surface then perhaps an isolation valve might be used to depressurize them when not in use. Or, quick couplers might be placed outside the perimeter of the field if logistically a possibility.

While in recent years the trend has been moving strongly towards pop-up type sprinklers in Block type synthetic irrigation systems, there is still a viable market and application for the riser-mounted sprinkler configurations. Some irrigation designers and customers prefer to place these high flow and high pressure sprinklers in an elevated position well above those that might be passing by while the system is in operation. These might be mounted against the front of the grandstands or perimeter fencing in a position that does not obstruct the grandstand view of the field. Or, they are sometimes even mounted on very tall polls as high as 20 feet tall. The riser mounted sprinkler option might also be the most appropriate and cost-effective solution for the retro-fitting of an existing synthetic turf field to irrigation. This allows all irrigation piping and gear to be installed without disrupting the existing synthetic turf surface.

VIH systems are popular and used extensively especially in the up to 125 feet category of sprinklers. This configuration offers a somewhat simple design and convenient installation for the contractor. They also offer top serviceability of the sprinkler's internal components without cutting into the synthetic surface.

The concerns with the VIH configuration are two-fold. First, they are most often used within the synthetic surface as detailed in the Block system discussion above so therefore all mainlines will exist there as well. Second, at these higher flows & pressures the valves within these VIH sprinklers are stretched well beyond their original design intent. These valves were designed for normal and acceptable pressure losses in the up to 60 gpm flow range. When attempting to push 90 to 120 gpm across these valves the pressure losses can easily exceed 25 to 65 psi (Fig. 4). The net result is a severe reduction of the pressure and flow to the sprinkler's nozzle with a commensurate reduction in the sprinkler's performance relative to the printed nozzle chart data. Also and as discussed later in this document, a directly buried VIH sprinkler's external components or its body case or the attached swing joint cannot be serviced without excavation of the synthetic surface.

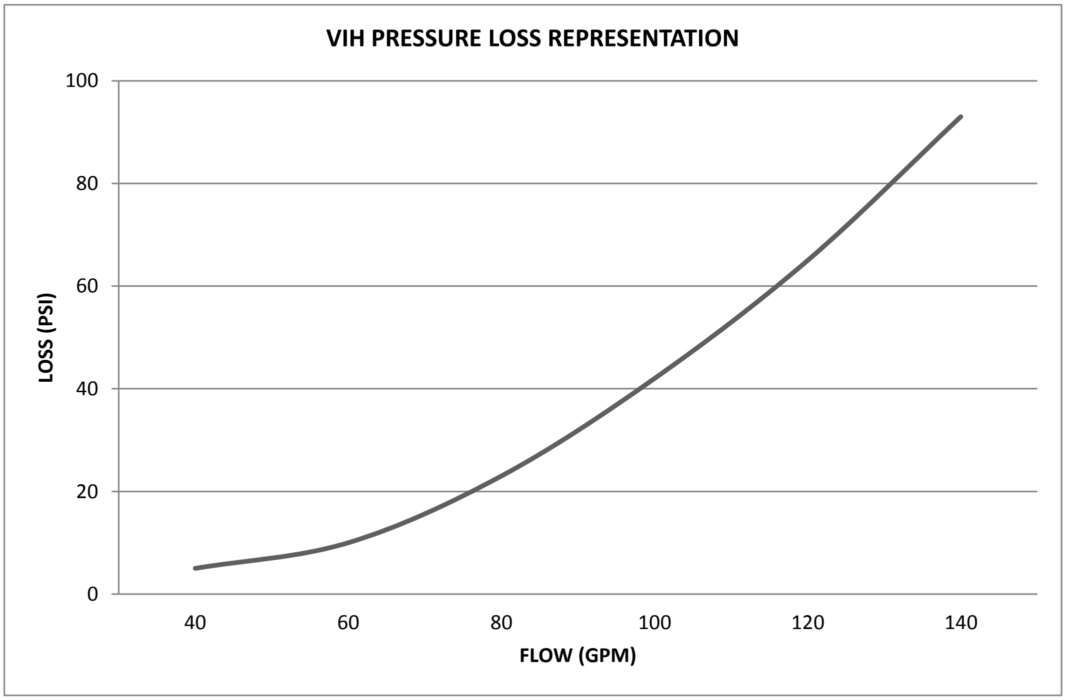

Fig. 4

<u>VAH</u> type valving is used in many larger radius category installations and is increasingly being used in the shorter radius category as well. This is because larger and more flow-appropriate valves can be coupled to the sprinklers with very low pressure losses realized as a result. The sprinklers and valves in this configuration are usually housed within a subsurface vault installed either within the peripheral of the synthetic surface or beyond the perimeter of the field. Ideally these vaults provide as much top access as possible to the irrigation components attached to the mainline.

Like VIH systems, the VAH systems installed within the synthetic surface will include high-pressure mainlines under the synthetic surface. Special installation care is also required to ensure the transition from the synthetic turf surface to vault is smooth (Figs. 2 & 3). VAH system vaults are typically larger in size especially when the vault provides access to not only the sprinkler & valve but also to the swing joint’s point of connection to the mainline or sub-main.

TYPICAL VAH SYSTEM INSTALLATION

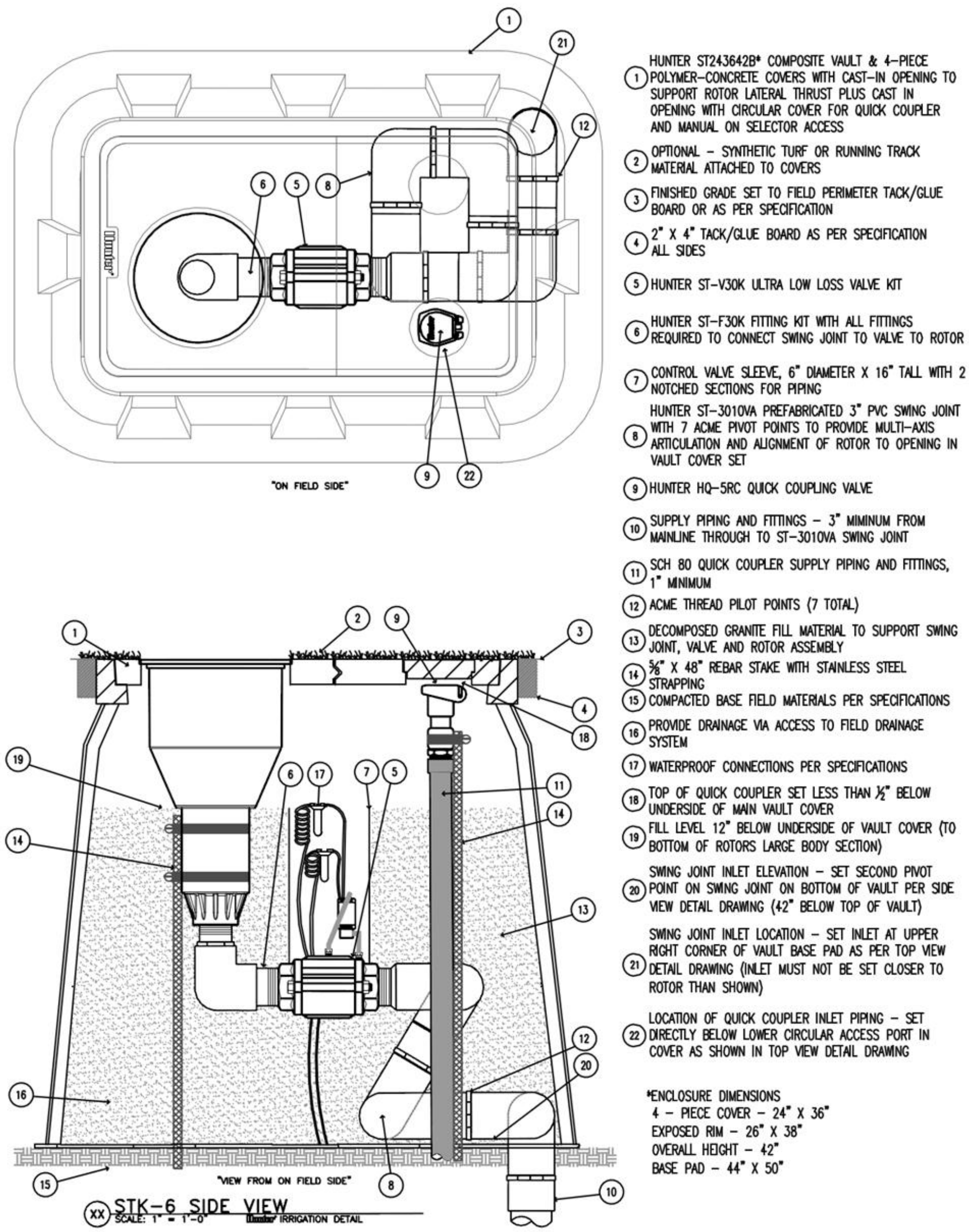

Fig. 5

Component Accessibility – For the end-user, one of the prime considerations is long-term serviceability of the irrigation system's components. This of course requires access to those components should repair or replacement be needed. Access to an exposed riser-mounted sprinkler is straight-forward to say the least. Ideally, access to pop-up type sprinklers should be easy as well.

Direct burial of a pop-up sprinkler is intuitive to those in our industry. As a result, some synthetic turf irrigation systems with pop-up sprinklers have been installed directly within the synthetic surface. These have been both block and VIH type sprinklers with either jar-top (threaded) or snap-ring/fastener access to the components within the sprinkler. The concern with this type of installation is the lack of total access. A jar-top sprinkler would require cutting into the synthetic surface even for the simplest of repairs. And of course, traditional VIH sprinklers with top serviceability of limited components and even newer generation models with total top serviceability of all components offer generous access. However, resealing of the body's threaded connection or replacement of a complete sprinkler, a sprinkler body or even the swing joint might be needed at some point in the life of the system. A sprinkler that is directly buried dictates excavation of the synthetic surface for these repairs.

The most common way to solve this dilemma is to place as many of the irrigation components as possible within subsurface vaults. This allows the service technician total access without excavation and disruption of the surface. Ideally these vaults are large enough to allow access to the sprinkler, the valve and also to the swing joint's point of connection to the main or sub-main. These vaults are usually covered with the synthetic turf carpet and the infill material is worked in at the same time as the rest of the field. This creates a seamless and safe transition over the installed vaults (Figs. 2 & 3).

If and when needed, the vault covers can be removed to service the components within. The clean transition can easily be restored once the covers are replaced using normal field maintenance grooming techniques and equipment. Unlike other enclosures that surround a field like those needed for electrical and public address needs, access to the irrigation vaults should be extremely rare. As a result there is no need for specialized barriers on the vault covers to prevent infill migration. Some end-users prefer to leave the synthetic turf off the covers altogether. The thought in these instances is to make them visible so a player running towards them can see them and take evasive action.

Sprinkler Support and Elevation to Grade – Whether riser-mounted or pop-up, these high-flow, high-pressure sprinklers create a tremendous amount of lateral thrust. Support for the riser-mounted sprinkler must come from robust free-standing metal risers and/or brackets attached to structures. For the pop-up within a vault, it is the vault's cover that must provide the lateral thrust support. Typical installations will have a properly sized hole created in the cover for the sprinkler to fit within.

With a swing joint mounted below the sprinkler, it is possible for the sprinkler to move up or down slightly over time. For this reason it is critical for the vault's cover to be adequately thick in order to maintain ongoing support if the sprinkler moves a little. Metal plate type covers will not work properly unless a support ring is created & welded to the underside. A more common option is a concrete or polymer-concrete cover which is usually two or three inches thick. The hole in a standard concrete cover can be created in the field with a properly sized circular hole saw. However, once the hole is created the standard concrete cover may be more prone to breakage due to the narrowed wall sections about the perimeter of the cover. On the other hand, polymer-concrete covers are much stronger & considerably more durable with the sprinkler hole section removed. The down side is the material is so strong and durable that cutting the hole is near impossible in the field. As a result, pre-casting polymer-concrete covers with the hole in the correct location is highly desirable.

Setting the sprinkler to proper grade and at the same time perfectly within the hole in the cover can be extremely challenging. This is due the fact that during this process the sprinkler is raised & lowered while attached to the swing joint in order to set the proper elevation to grade. The problem is that this movement also moves the sprinkler's relative position within the vault. So the installer is faced with two options.

One option is to set the elevation of the sprinkler first and then brace & lock it into position with rebar and stainless steel strapping. Once the sprinkler is in place the hole is cut into the cover to match the sprinkler's location. This option works well with the only downside being the time required to create the cover openings in the field and, the net result that every cover has a customize hole location. Replacement covers would require that this custom location to be recreated. A further complication might arise if the vault itself settles after installation.

The other option is to add up, down, forward, backward and side-to-side articulation to the swing joint. With a fully articulating swing joint the sprinkler can be placed perfectly within a pre-cast hole in the cover and all covers can have the hole in the same location. This configuration also makes it possible to easily adjust and correct the sprinkler's elevation to grade at any time in the future or, even replace the sprinkler with one that has a physically different body length.

***Drainage* –** Properly designed modern-day synthetic sports fields include a highly efficient drainage system. They have the ability to rapidly percolate rain or irrigation into the system in order to maintain optimum playability and to keep the infill material from being washed off the field. These systems will usually route the water to the perimeter edges of the field and into the looped main drainage line. Running tracks around fields are often design to drain to the inside edge of the track adjacent to the irrigation vaults. The designs of these drainage systems can be problematic for the irrigation vaults that surround the field. Some configurations can allow the water to enter the vault, either from above or below, and fill them up. With highly compacted soils surrounding the vault the water might remain and then stagnate. Consideration should be given as to whether this potential exposure exists. If so, the bottom of the irrigation vault needs to be connected to the drainage system such to provide draining of the vault.

***Control* Systems –** Many synthetic turf irrigation systems include some form of traditional irrigation controller and, these systems exist in both conventional and decoder control configurations. However, these controllers alone don't always satisfy the needs of the end-user that must manage the irrigation timing and cycling of these systems. This is because many times it is not the turf manager or irrigator that activates the sprinklers. Often it is someone on the coaching staff who is charged with cooling down the turf prior to practice or someone in the recreational league for a sport who is asked to take on this responsibility during Saturday games. The bottom line is these people typically have no knowledge of how to initiate a manual cycle on a controller. These people need a simple and easy means to activate the sprinklers. This is generally accomplished in three ways.

Manual Controller – sometimes the synthetic field is installed with a manual controller. This lockable pedestal or wall-mounted controller is installed off the field but close by. It is equipped with manual push buttons to activate & deactivate each valve. This approach while fairly simple requires that someone stay at the controller during all irrigation if players are on the field.

Remote Control – another option is to install a simple to use hand-held remote control for the system. This is convenient since the operator can be on the field while initiating and deactivating the sprinklers.

Manual Activation – some end-users prefer the simplicity of manually activating the sprinklers from the control valve's manual bleed feature.

The logistics of activating sprinklers while people are on the field are worth noting. Some facilities use the public address system to move people off the field in preparation for irrigations cycles. Some designs have even included a system of smaller sprinklers that activate as a warning prior to the activation of the larger sprinklers. Still others rely on simple verbal warnings and ushering of people & players away from the soon to be activated sprinklers. Regardless of how it is to be accomplished, consideration needs to be given to this important logistic. This consideration takes on particular importance with multi-field sports complexes where crowds are moving in and out at varying times as games on fields start and end.

Isolation Valves and Mainlines – Synthetic turf irrigation system designs vary considerably as it relates to mainline isolation valves. Some rely on a single shutoff valve located at the pump station. After all, they say, “it’s not as if we need to maintain irrigation in other areas during repairs - - - the turf isn’t going to die.” Other designs include 2 or 3 isolation valves around the looped perimeter mainline for “good measure.” Still others include 1 isolation valve at every vault for optimum isolation. All three seem to be plausible & appropriate solutions until you take a closer look.

An important factor to consider in synthetic turf irrigation systems using subsurface vaults to house the sprinklers is the mainline depth relative to the depth of the vault. Some vaults are as deep as 42” which means the sub-main enters the vault at a depth slightly below that. If the mainline depth is at 36” the contractor can be faced with a difficult situation during installation.

Typically the mainline is installed first and flushed with water. Sub-main access points to the vaults are then plugged with perhaps a PVC cap slipped onto the pipe stub until such time as the vaults get installed. Once vault installation begins it can be very difficult to plumb and make the solvent weld connections with an ongoing flow of water coming from the mainline. The solution to this potential problem is either placing the mainline lower than the vault’s plumbing or, installing an isolation valve at each vault.

Similarly, this situation can cause problems in the future for the end-user making repairs within the vault as well. With the mainline elevation higher than the vault’s plumbing the entire mainline will drain into the vault as soon as any pre-valve component is cut or removed. Again the solution is simple. Either ensure that the mainline’s elevation is below the vault’s plumbing or install an isolation valve at each vault.

Another important thing to consider is the mainline's physical location as it relates to the location of the vaults. The mainline should never be running directly beneath the vaults. This is because during sprinkler installation rebar staking is typically driven into the ground to facilitate banding & securing the sprinkler in place. With the mainline directly below the vault this could create an unfortunate mishap. Or, consider the end-user making repairs years down the road that has no knowledge of the mainline's location. An extra piece of rebar won't hurt - - - right?

Supplemental Water Use – Synthetic turf irrigation systems are most often used to cool the surface as discussed earlier. However, some users make use of the system to also wash down & clean the field. Infill dust and in particular bacteria removal are cited as reasons for this practice. This even though research has shown that Staphylococcus aureus, a common human bacterium, does not survive well in the higher heat and exposed U.V. conditions typically associated with synthetic turf (McNitt, 2008). Some have even suggested using injector systems to apply disinfectants across the field through the irrigation system.

A very common practice on synthetic fields, whether irrigated or not, is to have quick coupler valves positioned in at least two locations around the field. One reason is to have a potable water supply source for the team bench areas on the field. Another reason is to have a water supply source to take care of spills & associated problems that can happen anywhere on the field's surface. For this reason an emerging trend is to have multiple quick coupler valves around the field such that a 100 foot hose can reach anywhere on the surface.

Another reason for the quick couplers is to source the water for removal of water-soluble paint from the field. During special events these paints are often applied for various reasons. Lines are also painted on the synthetic surface for what are considered peripheral sports by the end-user entity. Many synthetic fields like high school football fields host multiple sporting events throughout the year. If every sport's lines and boundaries were included as part of the synthetic fibers in a field, both players and spectators could become confused during a game and - - - most agree that too many lines just doesn't look very attractive on a field.

For these reasons, many synthetic turf fields only include the lines in the turf fibers for the top 2 popular sports. The rest of the sports have the lines painted on the field only during the specific months of that sport's season. Once the season is over a water source is generally required to remove the paint.

A common mistake made during installation of the quick coupler valves is to place them too low in the vault. This is a problem because a removable cover within the vault's main cover is often used to access the quick coupler below. If the quick coupler valve is installed too low it will be impossible to attach the key to the quick coupler from above. All quick couplers need to be installed as close to the underside of the vault's cover as possible.

Installer Experience – This author is aware of synthetic turf irrigation projects that were fraught with problems. Multiple irrigation leaks and associated plumbing issues that didn't appear until well after the fields were completed and signed off. I saw one field where the whole corner of the field raised up seemingly a foot high with a bubble of water underneath the carpet. Issues like this under normal circumstances are troubling. However, add to this the complexity of the synthetic surface & sub-surface and it can be a recipe for disaster for the contractor and end-user.

Repairs to plumbing under these fields are very expensive for the contractor. In most situations the contractor is only allowed to make the actual plumbing repair yet they are responsible for paying the synthetic turf experts to restore the field to its original elevations and condition. The contactor might also be exposed to the loss-of-use costs that the end-user endures. For the proud end-user customer with their brand new synthetic field there is nothing worse than the embarrassment of problems right after spending a million dollars for the field.

The bottom line is that any contractor installing a synthetic turf irrigation system needs to be well trained, well versed and very experienced in installing large turf irrigation. No shortcuts can be taken and quality of installation is far more important that speed of installation.

CONCLUSION

Irrigating synthetic turf in order to cool the playing surface appears to be here to stay. In many ways, the irrigation systems for these synthetic fields are no different than those for natural turf irrigation. However, there are unique aspects and challenges associated with the synthetic system that must be taken into consideration during the design, installation and operational phases of these systems. Irrigating synthetic sports fields represents an ongoing and growing opportunity potential for the irrigation industry. Taking the time to fully understand the differences between natural turf and synthetic turf systems will turn this potential opportunity into a successful reality.

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