UltraBaseSystems Installation Manual

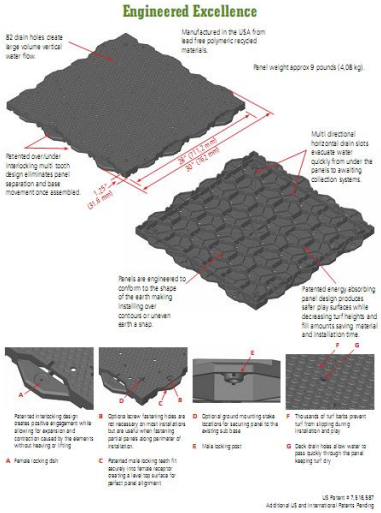
The following manual is intended as a guide to the installation of UltraBaseSystems• panels. For many of you familiar with the Tour Links panel system much of the technical and installation data will be very similar. The patented panel system that we have created for both Tour Links and UltraBaseSystems use many of the same installation methods and techniques. Slight differences will be evident due to the sheer size and applications of the UBS panel system but for the most part the techniques will be similar. We hope this manual will provide you with an easy step-by-step procedure process for installation as well as providing the technical and engineering details that will be important for you to convey to your customers.

Mission Statement

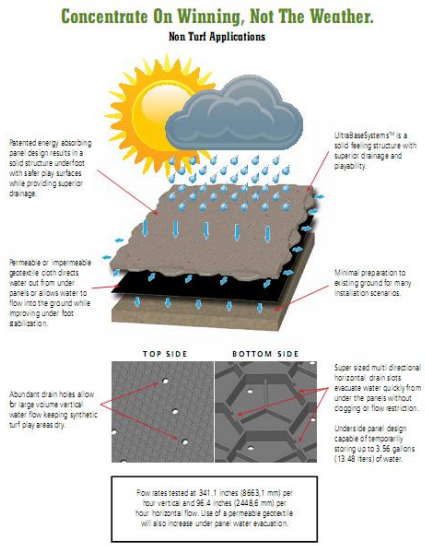
Our mission statement has remained unchanged for many years. The goal is simple, eliminate as much labor and time in the installation of synthetic turf systems while maintaining the utmost level of playability and safety. The patented interlocking UltraBaseSystems panel was designed with this goal in mind. Through extensive independent testing, engineering studies and field experience we are convinced more than ever that our interlocking panel system will forever change the way synthetic turf is installed in virtually any geographic, climatic or facility location. From rooftops to parking lots, natural grass retrofits or new construction, UltraBaseSystems will dramatically improve installation time; reduce turf pile height and infill quantity while maintaining a level of safety and versatility never before seen in the synthetic turf industry. With nearly 2,000,000 ft² (185.000 m^2) of Tour Links panels installed worldwide our record of panel base construction is strong and our level of commitment to excellence unsurpassed.

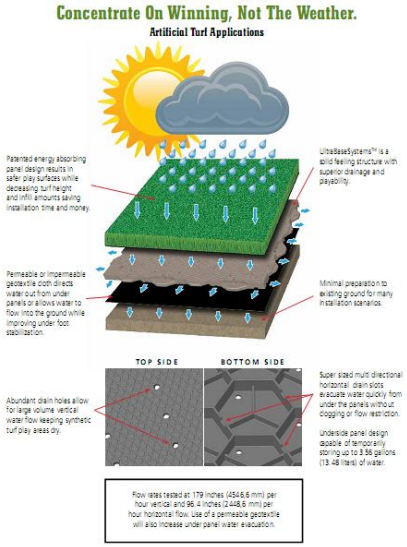
Overview of UltraBaseSystems

Before we begin to detail the installation process of installing an UltraBaseSystems project we believe it's important to have basic understanding of the panel system and its uses. Our base systems were designed as an alternative to rock and gravel base technology which has long been the installation methodology used in synthetic turf construction. We also wanted to provide an easy-to-use methodology for indoor, rooftop or temporary synthetic turf installation jobs. From dog kennels to athletic fields, putting greens to playgrounds our goal is to cover the globe one panel at a time.



The UBS base panels are manufactured using a sophisticated molding system which allows us to produce a precision part that is repeatable every time. This is important due to the fact panels are sent worldwide and must be of a consistent makeup for all customers, with the ability to create a base system that remains unchanged from job to job. The only variable is the site not the product. **(Fig 1)** Each panel is approximately 28" x 28" or a total of 5.44 ft² (0,55 m^2) of usable space. The panels are 1.25 inches (3,2 cm) tall and weigh approximately 9 lbs (4 kg) each. Each panel is designed to interlock with the surrounding panels utilizing the patented locking system without the need of any fasteners. Although fastening holes are present in each panel they are unnecessary to use in most all installations. It will be described when to use fasteners later in this





manual. **(Fig 2 & 3)** As evident by the test data that is available in our brochure and website, our panels drain at a incredible rate which ensures the continued playability of the synthetic turf systems even in the most extreme weather conditions. Both vertical water flow and horizontal water flow under the panels provides a system that quickly removes water from a playing field that is properly pitched and allows it to either dissipate into the ground or flow to the perimeter of the installation and be collected by an engineered storm water management system. Each UBS field panel has been designed with our patented turf barb system. **(Fig 4)** These 3000 turf barbs allow for underfoot stability of turf even when infill is not present, something the industry was in desperate need of. The turf barbs have allowed for the stability of turf system with little to no infill to act as ballast. This is extremely important for installations where no infill is required such as a temporary installation or rooftop project, where playability and safety must not be sacrificed. This advancement in turf stability will allow installations to occur more quickly than ever before. If an infill system is required, then the turf will hold even better and of course weight will never be an issue due to the enormous load capacity each panel possesses, over 1000 lbs/in^2 (70 kg/cm^2).

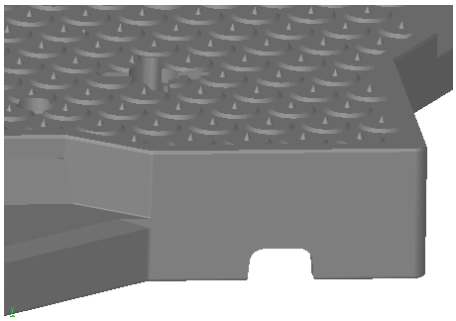


Fig 4

We are often asked what differentiates UltraBaseSystems from other pad systems on the market. Our answer is simple, we are in engineered STRUCTURE that is designed to replace the need for extensive excavation and rock or gravel base work while creating tremendous drainage capabilities and shock distribution; in essence an all-in-one system as never seen before. We are confident that you'll find that once UltraBaseSystems is used, be it on a rooftop or parking lot, mini pitch or full-size field you will agree that the game has forever been changed. We know more about panel base technology than any other company in the world, we should we invented it!

Perhaps on of the most important things to understand about UBS panels and their use with synthetic turf is the symbiotic relationship that is created between the turf and the panels. **The simple explanation is as follows: when the panels are installed on to the ground they will expand and contract as they heat and cool. The panels will expand about a 1/8 in (3 mm) during the heat of the day. If the panels are installed when they are cool and there are no gaps left between the panels, during the first heating cycle they will expand and ultimately cause the installation to grow outwards. This is why it's important to install the panels with a slight gap when they are cool to compensate for this future expansion. If this is not done properly warping of the area could occur do to the panels being forced to move outward, up against a fixed barrier such as a curb. The situation will not be as critical if there are no permanent borders surrounding the panels, but gapping cold panels is always necessary to keep everything flat.**

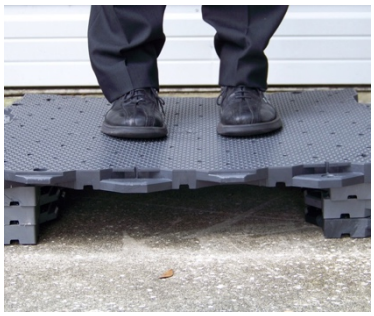
When the turf is installed on to the panels it also will expand and contract. The interesting part is that while the panels are expanding in the heat and pushing outward slightly they are being restrained by the rigidity of the turf but during the cooling process when the turf begins to contract as it cools this will pull the panels back in towards each other effectively regulating the installation size. This is why it is so important that we anchor the turf around the outer perimeter of the panels which will allow this constant tug-of-war to happen. The techniques we are describing in this manual will help keep the turf and panels working together as a unified structure. You may also notice that during installation when the panels are hot they may appear to have a slight crown in the center of the panel when they first heat up. Once the turf is installed over top of the panels it creates a scenario much like a convection oven which will heat the panel on all sides and will combat this slight lifting in the center. The turf allows the panels to heat up evenly, hence eliminating any distortion that may occur. We utilize many different types of materials for the manufacturing of our panels and some are more prone to slight warp when left uncovered. This is not a concern at all due to the fact that this is eliminated completely when covered with turf. We have however created panels made from blends of plastic that are not susceptible to any movement and these are panels that we are utilizing in situations such as the underlayment base for athletic court tiles or panels that are left to be completely exposed to the heat. Chemistry is a wonderful thing and our team at UBS is taking full advantage of all of the polymeric materials that are available to us in order to create the perfect panel for every situation.

Site Evaluation

As with all construction projects the first thing to be determined are the parameters that surround the installation. Is the installation indoors or outdoors, is there accessibility for equipment to get to the site, is load a factor, it is a temporary installation, will we be building on top of an existing field and doing a retrofit, or is it new construction, what is the nature of the existing soils in the area that is to be constructed, is there drainage capable of handling storm water runoff? All of these questions are ones that must be determined prior to selecting the proper panel, geotextile fabric and turf. You will find on our website an extensive geological and civil engineering study that examines the criteria as to how UltraBaseSystems should be used in a variety of geological and climatic regions. We recommend that you review this engineer report in an effort to determine the best scenario for your installation. A brief summary of the Geo engineering report produced by one of the country's top civil engineering firms confirms that UltraBaseSystems can be used in virtually any location, any climatic condition, or soil conditions throughout the world. Although certain soils such as those heavy in organics are more susceptible to conditions such as frost heave or settling due to the organic makeup of the soil, with proper removal of these type soils and replacement with a more stable soil or gravel the UBS panels will perform extremely well. You may ask yourself if it is necessary to remove these organics and replace with rock then why is the use of UBS a benefit? The answer is simply this, despite what type of soil or conditions you have there will be far less need for excavation and rock construction and a dramatic reduction in the labor needed to achieve the necessary stability to create a quality synthetic turf base. It is not our intention to insinuate that the total abandonment of rock and gravel is always in the best interest of the project, we just know through experience, engineering data, and common sense that the use of an engineered molded panel such as UltraBaseSystems will improve the overall playability and ease of installation of your next synthetic turf project.

Selecting the proper UBS panel

Once the evaluation of the site is completed the selection of the proper UltraBaseSystems panel and turf must be decided. One of the unique aspects of our panel system is the ability to change the polymeric configuration of the panels, in essence change the feel of each panel. **(Fig 5 & 6)**



This is achieved by molding a variety of polymers in an effort to stiffen or soften the panel according to the desired results. An example would be a different blend of UBS panels may be used on a concrete sub base that will be used as a playground area for children than ones used over compacted earth for a soccer pitch. In the first example if the customer chooses to use a non-filled turf system it will be our job to provide a panel blend that is more flexible and capable of achieving the ASTM test results required. The same could be true for an athletic field that is to be built indoors over an existing concrete floor but must perform as well for GMAX/FIFA testing as a field built on a compacted earth base. This is achieved by changing the polymeric blends used to mold our panels. By changing the blend of the panels we now give the engineers the ability to select a variety of turf pile heights as well as reducing or increasing the infill amounts to achieve the necessary test results. This engineering change will allow greater flexibility by engineers and customers. As you can see an entire world of opportunities is now available to you as the engineer or installer making UBS a logical choice to use in virtually any location without sacrificing playability, drainage, and most importantly safety.

Ground Preparation for a Natural Grass Retrofit

Creating an UltraBaseSystems field over top of an existing natural grass area is what we refer to as a retrofit. In essence the goal is to quickly remove the existing grass or top layer of organics and replace it with our geotextile fabric, panels and turf.

There are two methods to achieve these results. One is to simply kill the existing organics with an anti-foliate such as Roundup. Once the grass layer has been eradicated remove the debris down to the root base of the existing grass. It may be necessary to do grading in the area to remove high spots or add a fill material such is a limestone screen or decomposed granite to fill low areas. It is important to select a material that is easily compacted in order to create a firm base under the panels. Once the area has been graded it is always necessary to perform thorough compaction of the area. **(Fig 7)** A compaction rate of 95% of maximum density is the target we are looking for as dictated by the ASTM, the more solid the base the better the installation. It is not necessary for the base to be perfectly flat as the UBS panels will flow over existing terrain, pitches or undulations. This allows the installer to make the decision as to whether the area will be perfectly laser graded or not as in situations such as a putting green, pet run area or a simple school play yard where ground perfection is not necessary. This process is one that is used very often in the construction of putting greens with both the Tour Links panel systems and UBS. More often than not golfers do not want a perfectly flat putting green

Fig 7

Fig 8

and by adding contours which can be easily navigated by our panel system realistic breaks can be created with ease. More details about putting green ground preparation are available in the Tour Links installation manual.

The next method of ground preparation over an existing field pertains to the removal of all of the organics such as grass. Easy ways to achieve this is to simply sod cut the entire area to the desired depth and remove the sod leaving the exposed soils. **(Fig 8)** A typical depth of sod cutting is approximately 2 in (5 cm). Once the sod has been removed and earth exposed, it is now the decision of the construction engineer and installer to determine the level of grading required. A good earth moving crew with proper equipment can remove all of the sod in the area the size of a football field, ready for grading in as little as one day. In a situation such as a baseball infield where flatness and pitch is so important laser grading will be the preferred method in order to achieve the proper pitch for optimum drainage and playability. The same holds true when creating a soccer pitch, football field or many other types of sport and non-sport installations. **(Fig 9)** Qualified earth moving companies will have the proper laser equipment that is required to achieve these exacting results. The use of the laser will not only achieve proper grading but will ensure exact pitch is achieved for the perimeter drainage system. **(Fig 10)**

Fig 10

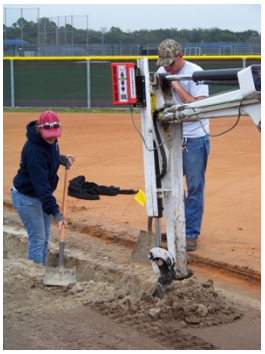


Fig 9

For installations that do not require the exactness of laser grading simply removing the sod and grading the area by eye is more than acceptable if the customer agrees. In many cases the exactness of the laser graded area is not necessary and because of the flexibility of the UBS panels, not required. This gives you the installer the option as to what level of ground preparation to proceed with, which can save the customer valuable time and money.

When it becomes apparent that the existing ground has a heavy level of organics it may be necessary to remove a portion of these organics and replace with stone in order to achieve compaction. Our goal is to achieve a compacted stable base. If you need to add stone in some cases then that is what will be necessary. The hope is that stone for the most part can be avoided but may sometimes be necessary if unstable soil is not achievable through compaction alone. In this case the selection of the proper amount of stone and size should be consulted with the engineer.

In the three examples given above the goal is to achieve an area that is graded to the necessary requirements and free of erratic high spots or holes and thoroughly compacted, essentially creating a smooth sub base. **(Fig 11)** Smooth does not mean flat, it means the area must be a smooth free-flowing base. Once this sub base has been graded it is extremely important that full compaction take place. We recommend 95% compaction which is outlined in our geo-engineering study reports available on www.ultrabasesystems.com. This compaction can be achieved via a plate compactor for small areas or a vibratory roller for larger

Fig 11

installation areas. When done properly a smooth solid sub base ready for panel installation is achieved.

For areas with soils that are not up to the task of accepting all of the rainwater that could occur during a heavy storm the use of a perimeter drainage system may be the answer. **(Fig 12)** The size and depth and grade of stone needed for a perimeter drainage system should be consulted with a qualified civil engineer. In most cases the use of perforated pipe ranging from 5 to 8 in (12 to 20 cm) and buried 12 to 18 in (30 to 45 cm) below grade will be recommended. It is always important to remember in every installation be it a small putting green, dog run or athletic field, water that will be entering through the top of the turf must have the ability to drain into the earth and/or collected and be moved away from the athletic field in some manner or the other. These are the decisions that should be consulted with a qualified engineer to achieve the proper results.

Fig 12

Geotextile Selection

An extremely important part of a UBS installation system is the proper selection of the geotextile fabric. It is so important that we have taken it upon ourselves to manufacture our own geotextile fabric. There is always the question about the settling of the panels into the earth in especially wet areas. Our team has performed testing on installations that have been heavily saturated by rainwater. Not only did we park vehicles directly on panels and allow them to sit for hours but also continuously drove back and forth on a single panel located within the entire installation in an effort to try force settling into the ground. Tests have concluded that due to the strong makeup of our geotextile and the fact that the Geo is placed on the ground and held taunt by the existing panels, the settling of the UBS panels into the ground was very minimal. This is exactly why the geotextile fabric step should never be eliminated or quality skimped on when installing over an earth base. **(Fig 13)** The geotextile fabric supplied by UBS or one that is comparable in manufacturing specifications is imperative. We provide our own 6-8 ounce woven poly propylene product as the fabric of choice. We have selected this material due to the incredible stability it provides under the panels. When placed over properly compacted Earth our geotextile fabric spreads the load of the panel onto this fabric creating an incredibly stable layer in which the panels will rest. By using this style of geo-fabric we have proven that with time the panels do not imprint deeply into the sub base due to the stabilization properties of the fabric.**(Fig 14)** This is not dissimilar to the same reasons geotextile fabrics are selected for road construction and more similarly interlocking brick paver construction. The job of the geotextile is to not only block new organic growth but create a strong, stable sub base under the panels. I oftentimes refer to the geotextile fabric as a snowshoe which helps distribute the weight of the hiker on top of the snow and preventing them from sinking into the snow. I cannot express enough how important the proper selection of geotextile fabric is, which is again why we have decided to produce our own to ensure proper performance.

Fig 13

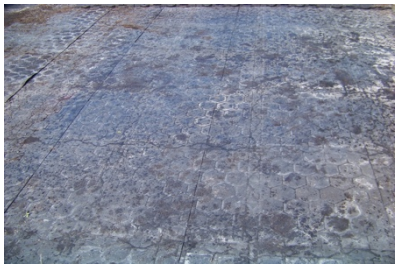


Fig 14

Geotextile fabric is available in both permeable and impermeable versions. This selection is also a very important part of the installation process. A simple rule is if you have soils that are capable of accepting rainwater percolating through the panels and the geo-textile fabric and into the ground then permeable fabric is advisable. However, impermeable can also be used if no percolation is desired. If you have a soil content that is incapable of accepting percolation such as compacted clay or a high water table then use of an impermeable geotextile may be the proper choice. By using an impermeable geotextile you will eliminate water flowing into the ground increasing the volume that will exit to the perimeters. This is why it is imperative that engineers are consulted to properly design the storm water management system for the synthetic turf area. For small areas such as putting greens or small dog kennels it may only be necessary to pitch the ground to a low area of the yard or facility and allow the water to run to this area thus keeping the synthetic turf area high and dry. Remember in many cases we are looking to build the panels on top of the existing grade in an effort to make the panels the highest portion of the space. By doing so water will flow rapidly through the turf, through the panels and out to the perimeter which can then seep into the existing ground.

The selection of geotextile fabric is also an important decision if the installation is occurring in a frost heave susceptible zone. By starving the water that flows into the ground either completely or a large percentage with the use of a low flow permeable geotextile, the ability to dramatically control frost heave is achieved. Remember frost heave occurs when temperatures are cold for an extended period of time, water is present either from the ground up or sky down and excessive load is present. Our panel system is only 1 lb/ft^2 (5 kg/m^2) and even with full infill systems not more than 6 lbs/ft^2 (29 kg/m^2) so load is not an issue. Our panels when outfitted with a synthetic turf with only 2 lbs (1 kg) of sand or rubber will achieve an R factor of 3.4. This is equivalent to 18 in (46 cm) of concrete or 36 in (91 cm) of sand. In essence we are helping create an insulation factor from the external temperatures, translating this to the ground. This coupled with the extreme heating capabilities of the turf, allows for the airspace under the panels to act as an insulator effectively reducing frost heave probabilities. Engineering studies show that if the soil in the area is consistent when UBS is installed, movements in the earth due to cold temperatures will be uniform and not negatively affect the playability of the field.

Be sure to remember that if you are installing a perimeter drainage system around the field, to make certain that a high flow geotextile fabric is placed over the rock which fills the drainage system so that water will flow rapidly into the drain system. This is true whether you are using an impermeable or permeable geotextile under the panels. Do not restrict flow into your drainage system! It is also acceptable to eliminate the use of the geo textile directly over the perimeter drain field. This will allow the most unrestricted flow to the drains and will not affect the panel stability.

When installing a dog kennel or pet play area it will be necessary to select a geotextile fabric which is a high flow woven polypropylene fabric. This style fabric is still very tough and will create great stability but will allow urine and water to quickly wash through the geotextile fabric and into the earth without any of the unwanted liquids becoming saturated into the geotextile fabric. The woven polypropylene geotextile will not allow liquids to be absorbed hence reducing any unwanted smell. This is very important when installing a pet area. Too many pet areas have failed not due to poor turf performance but do to overwhelming odor being trapped in the geotextile fabric. UBS helps eliminate this problem. There is also a product on the market known as Sweet PDZ which acts as a urine deodorizer. This product is available in either a powder or more preferably as a granular product which will not only deodorize but be added ballast to your pet turf.

New Ground Construction

When installation is going to occur in what we would refer to as new construction many of the techniques described in the retrofit area above will be applicable. The goal again is to create a smooth compacted sub base coupled with the proper geotextile fabric. You'll always want to have an engineer evaluate the existing soils to determine the consistency of the soil and its ability to be compacted to the proper levels. If necessary subsoil may need to be removed and replaced with suitable material that can be compacted such as rock and gravel. The goal always is to reduce the amount of excavation and fill material as much as possible and allow the UBS panels to take the load.

However if the situation arises where soil conditions are incapable of achieving compaction such as a extremely sandy environment the use of the UBS cellular containment system can be a great choice. **(Fig 15)** If not familiar with cellular containment systems they are essentially an expandable grid structure that allows material to be compacted into the structure creating a very strong sub base. The system was used extensively in the first United States Gulf War where it was necessary to create landing fields in the desert that were capable of supporting the load of an aircraft. When installing this cellular containment system over top of a geotextile fabric and filling the cavities with sand and compacting, an incredibly strong structure was achieved. We like to compare it to going to the beach and filling a bucket with sand and turning it upside down. You now have something strong enough to stand on. This is the basic premise of a cellular containment system. **(Fig 16)** Our material comes in a variety of heights from 2 to 6 in (5 to 15 cm) depending upon geological area, existing soil conditions and climatic regions. Incredible results have been achieved by only using a few inches (cm) of the cellular containment filled with stone or acceptable fill material in dramatically reducing earth movement and frost heave susceptibility. This superstructure placed under the panels will create an incredibly solid base structure ready for panel installation. This use of a cellular containment system is an important part of our construction of basketball courts and tennis courts in an effort to maintain flatness. The use of a cellular containment will effectively reduce the amount of fill material needed to achieve a base supporting the UBS panels and turf. The use of a geo grid in combination with a woven geo fabric is also a great way to stabilize less than perfect soils. Your UBS sales team can help you better understand all of these soil stabilization products. Again our goal is to do everything possible to reduce the amount of time, energy and money needed to create a base suitable for the rigors of athletic play or recreational activities. Throughout this manual we will be giving you many tips and techniques which can be studied and evaluated for their merits for the particular installation scenario you're facing.

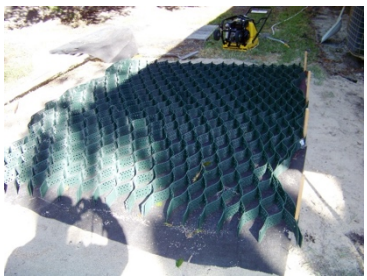


Fig 15

Fig 16

You can see why ground preparation can be achieved at speeds never before realized with results that will produce a smooth consistent turf installation that many installers have never experienced before. There is not a week that goes by when turf installers do not comment on the fact that they have never seen their turf roll a ball more smoothly or witness ball bounce more consistent than when placed on our panel system. From a homeowner with a backyard putting green to the head groundskeeper of a major-league baseball franchise the comments are the same, turf feels better and balls roll better on panels than they do on rock.

Installing the Geo Textile Fabric

Fig 17

After your site has been prepared properly the next step is the installation of the geotextile fabric. It is important to design the layout of the fabric in order to ensure the best drainage possible. The goal is to run the geotextile fabric in such a way that water will run over the lapping sections of fabric and not under, much like the shingles on the roof. For example, when we install geotextile fabric on a baseball infield, regardless of permeable or impermeable, we will start at the outer edges on the baselines creating a square of fabric around the outer perimeter. **(Fig 17)** Acclimating panels can be used to temporarily secure these pieces of fabric to the ground, or commercially available landscape spikes can be used with permeable geotextile fabric. **(Fig 18)** The next layer is installed overlapping the outer piece by 6 in (15 cm) and continuing with another square of fabric around the outer perimeter. **(Fig 17)** We then secure these pieces of fabric to the ground using commercially available landscape spikes. **(Fig 18)** The next layer is installed overlapping the outer piece by 6 in (15 cm) and continuing with another square pattern. By continuing this technique up to the pitcher's mound you have created a situation that because the area is pitched towards the baselines and outfield grass, emanating from the pitcher's mound, water will flow to the outer edge of the installation over top of the geotextile and not under. **(Fig 19)** As stated earlier the goal is to install the geotextile fabric as if you were installing shingles on a roof keeping the water running over geotextile not under the geotextile. As you move around the installation continue to secure with landscape spikes to prevent movement of the geotextile fabric. Each installation scenario will be different so examine where the water will be flowing and create an overlap pattern which best directs the water to these drain areas. Another example would be if the drainage is occurring on sidelines of a football field, the geotextile would start along both sidelines and work its way towards the center of the field. **(Fig 20)** Water will flow over the geotextile and to the perimeter drainage of the field. Following this plan you will be very pleased to see water not flow under the geotextile fabric and produce any potential erosion but seep in to the ground and/or flow to the desired perimeter edge.

Fig 18

Fig 19

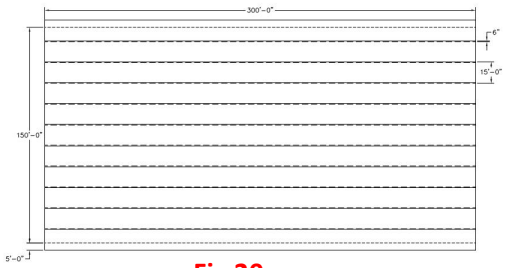


Fig 20

Panel Preparation

Your UBS panels will arrive to you packaged on pallets or in boxes. Before installation of the panels begins it is a good idea to unload the panels from the delivery truck and stage them around the perimeter of the installation in order to make the most efficient use of your time. **(Fig 21)**

Fig 21

Every installation is different and requires a different planning scenario as to where and how the panels should be cut and assembled. In most cases you will want to remove the outermost teeth of the panels regardless if you are building in a wide open field or up against an existing barrier such as a wall or curbing. The outer teeth can be cut off very easily by using either a table saw or circular saw. Each panel is designed with an inner wall that runs just inside of the teeth. Whenever possible, cut to the outer side of this inner wall. **(Fig 22 & 23)** This will leave a strong and rigid outer edge to the panel. If placing a panel in a corner simply cut the teeth off on two sides which will make a very nice right angle edged panel. Calculate the number of panels that need to be cut and whenever possible use a table saw as it is much faster than being on your hands and knees with a circular saw. There are products on the market that allow the installer to attach a circular saw to a walk behind device. It's much like pushing a lawnmower that has a circular saw attached. This could be a very fast way of cutting the outer teeth off of panels that are installed in a long row in the middle of a field area. You would simply strike a chalk line and cut the panels as if you were mowing the grass. Either way the panels cut very easily and should be a simple process. Now that you have your starting course of panels precut it's time to begin installation. As in all projects planning is the key to a successful installation.

Fig 22

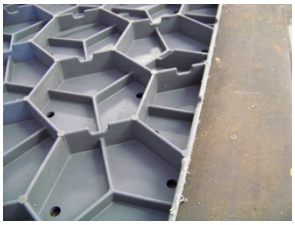


Fig 23

Installing the panels and creating proper gaps

When installing up against a rigid structure such as a concrete parking lot, running track or a fixed wall it is important to make sure that you <u>always</u> leave a minimum gap of 1 to 1-1/2 in (2,5 to 3,8 cm) depending on the turf thickness between the rigid structure and the panels. This can be achieved in several ways by either temporarily laying in a piece of PVC pipe up against the structure which will create the temporary gap or use wooden stakes every two or three panels to maintain the gap **(Fig 24)** It is very important to understand that if you are going to use the fixed structure as the outermost border and positioning the panels up against the structure, it must be perfectly square and straight or the panels must be cut at a taper to accommodate any deviation in the fixed structure. Our panels will only go together in a perfectly square scenario. What we mean by that is if you are assembling panels that for some reason are being forced out of square because you're following a crooked fixed object this will inevitably cause the panels to not install properly. Our panels are molded perfectly square and must be assembled in the same manner. An example of this is a recent installation we performed on a 15,000 ft^2 (1400 m^2) area. Two of the edges of this field were up against fixed structures. We assumed after taking what we thought were accurate measurements the entire 80 ft (24,4 m) runs on both sides were at a perfect right angle. We installed stakes along both sides to ensure our gap was uniformed and built our first row of panels along the two sides which created a

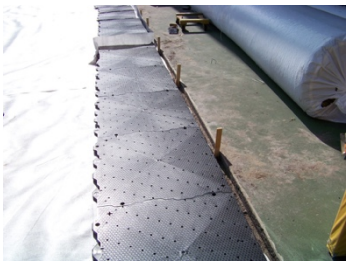


Fig 24

large right angle. Panel installation was moving ahead perfectly until we were on our 10th row of panels. Suddenly the panels were not engaging properly and every panel we installed next to the other was becoming more and more out of alignment. Eventually it got to a point where the panels would not even engage. After examining the problem and determining that the panels were perfect, we realized much to our dismay the concrete basketball court we used as a guide was not square and by having stakes up against it we were forcing the panels out of square. We simply removed the stakes which allowed the panels to adjust themselves and suddenly everything went back to square and installation proceeded perfectly. However we had to go back with a saw and re cut the panels up against the court to the achieve the 1 inch (24 mm) gap that was lost because of the court not being as straight as assumed. No one likes ever having to do work twice but it was a lesson well learned and we will not make that mistake again anytime soon. The panels when assembled will result in perfectly straight seam rows that when a string line is stretched along the entire length it will be a perfectly straight seam in
both North and South and East and West directions. **(Fig 25)** This does not mean you need to only build a perfect square or rectangle as you can cut the panels in to any shape, it just means that you cannot force the panels together if the panel next to it is out of square alignment. Be sure of this and installation will be a breeze.

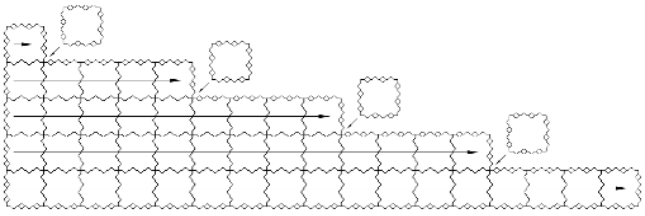
Fig 25

When building a large area such as a baseball diamond we like to use the method of building a large right angle area and filling in the center of that apex with a bank of panels. **(Fig 26)** This helps us take the measurements from corner to corner and make sure everything is running square. This is especially helpful when you are building something as critical as a baseball infield that needs to run in a perfect square to fit within the baselines. It's a simple way to keep the installers on track and make sure everything is going smoothly. Just like building a house if the framework is out of square everything in the entire house will wind up out of square. Have a good plan, execute the plan and panel installations will be easier than you can imagine.

Fig 26

The technique for installing the panels has been explained many times with the Tour Links panels and is no different with UltraBaseSystems. The first rows of panels are assembled by simply sliding one panel directly into the other. Each additional row of panels is assembled at a 45 degree angle into the panels on either side. **(Fig 27)** Simply lay the panel flat on the ground and while kneeling on the previously assembled panels, slide the panel in at a 45 degree angle to the neighboring panels and position where the teeth are just starting to engage and give a quick snapping motion to engage the panel. Be sure not to place your knees too far out near the teeth as this could bind the panels and make installation more difficult. A good installer on the ground would require three helpers bringing panels to him in order to keep up with installation. This is why we always have many helpers laying out the rows of panels well ahead of the installers.

Fig 27



(Fig 28) After the rows of panels have been laid and positioned waiting for the

Fig 28

installer, it's also advisable to have another helper assigned to each installer to ensure the next panel is within arm's reach. This makes very fast work of the installations. When doing a large area have installer one start with row one and work their way forward about 10 panels. Installer two will then begin on row two and will move forward. In essence you are creating a staggered line of installers who are working 5 to 10 panels behind each other. This method is very efficient and when installer one finishes their row they proceed back to the starting point to continue. **(Fig 29)** The more rows going at a time the faster the installation occurs. If the installer is working by themselves in an open area with no fixed objects they can simply go up one row, reverse the direction and go back the other way. But when working in teams proceeding back to the starting point is necessary. If working up against a fixed object it is advisable to start up against the object and work out to open area. Always have someone walking on the installed panels to insure they are solid on the ground and not rocking due to uneven soil preparation. The ground work does not need to be flat as the panels will easily follow terrain but the area must be smooth. If you simply drag the site with a wide rake or a drag mat all these unwanted humps and lumps can be easily eliminated.

The weather conditions during installation will affect the overall size of the panels slightly. Our panels are designed to expand while maintaining the connection between the panels but allowing movement to occur within the confines of the installation and very little movement on the outer edge of the perimeter of the installation. However it must be taken into consideration how tightly the panels should be installed depending upon weather. On a hot day when the panels are hot and expanded, slide the panels together and then simply proceed to the next panel. Allow slight gaps between the panels to help if additional expansion occurs. If the panels are very hot to the touch (around 150 degrees F) they have already expanded about as large as they are going to grow so maintaining gaps is not quite as imperative. **If the panels are cool to the touch during installation slide the panels together but don't try to force the panels as tightly as possible against each other. Allow the panels to have a gap between each panel as this will allow for future expansion to occur when panels become hot. About a 3/16 in (4,8 mm) will be good. (Fig 30) This is easily achieved by not pulling the panels together as tightly during assembly or simply jarring the panels a bit with your foot to create the required gap. The panels are designed to allow for these gaps without disengaging, this is why the system works. Gaps are your friend when panels are below 80 degrees F. This is why having someone following the installers and checking gaps and adjusting on every panel is a good idea.** It's always interesting to watch an installation that occurs in the hot sun were the panels are all tightly fit due to expansion with very little gap between each panel and then returning in the morning and to see a uniformed gap between each panel. This is how UBS panels are designed to work. By allowing the gap to occur within the interior area of the installations the outer perimeter of the installation remains relatively constant. This will also prevent any unwanted warping or upward heaving of the installation area. This is one of the patented secrets of UltraBaseSystems.

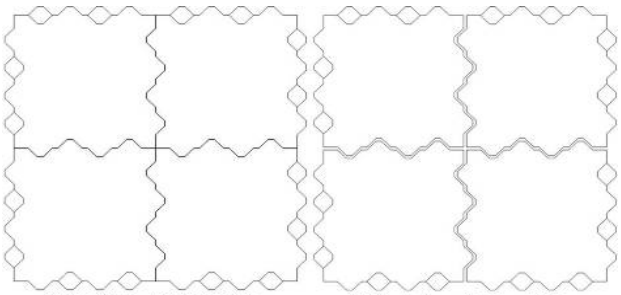


Fig 30

You must always leave a gap of 1 to 1-1/2 inches depending upon the turf thickness around the fixed objects to allow for expansion and this gap allows for the tucking of the turf up against these fixed objects which create a beautiful finished edge. I wish every installation could occur when the panels are fully expanded due to being hot as this would insure that the installation will not get any larger than the day it was installed. However because weather conditions are always changing there will be instances that we will install when the panels are cool so it is imperative to be cognizant of this need to allow slight gaps to

accommodate further expansion when the weather changes. If it is not done properly once the temperatures rise above 80 degrees F and the panels expand and space was not left between every panel the entire structure will grow and could jam against the outside wall or curb and distort the panel assembly. Leave plenty of gaps and you will be ok**. It is really simple physics, the panels will expand and that can't be stopped but if gaps are left between the panels to allow for future expansion and gaps left on the outer edge if going against a wall or curb you have overcome the physics of expansion and the system will stay flat.**

Fig 31

We have found that when doing large areas using a device such as an inflatable tire wheelbarrow is an easy way to help bring panels to the installers. Do not run a forklift or vehicles overtop of the geotextile fabric as you could cause unwanted indentations into the earth. However you can run inflatable tire forklifts or four wheel vehicles over the panels to deliver panels to the installer. Do NOT use hard tire vehicles. If you have enough unskilled labor to help distribute the panels to the installers it is easy work. A good example would be a 15,000 ft^2 (1400 m^2) area that was recently completed in Tampa Florida. With the help of 20 student volunteers averaging age 12, four installers and one supervisor, this 15,000 ft^2 (1400 m^2) of geotextile fabric, panels and half of the turf volume was installed in under five hours. **(Fig 31)**

On many installations you will inevitably come to obstacles that will require panels to be cut and installed. Examples would be electrical boxes, fence posts, trees or walkways. These panels are easily cut using a tape measure, marker and a basic circular saw or jigsaw. **(Fig 32)** The technique is not any different than installing a plywood floor or ceramic tile. Try not to box yourself into a corner with the panels but it can and will happen. Remember the panels need to slide in and are not designed to drop straight down so a wall or fence can be an issue. If you get to a situation where panel installation is impeded by a fixed object it will need to drop in to existing panels on multiple sides. If a situation arises where you need to install up against a wall and there is no room to slide the panel in, the following technique will make easy work of this scenario. You will need to cut off the entire lower teeth of the panel to be inserted, as well as the lower step portion of the upper teeth. **(Fig 33**) You will need to determine how many sides of the panel you need to do this to in order to get the panel to drop straight in. For example if this was a panel that was surrounded by adjoining panels on all four sides then the process of cutting these teeth off would occur on all four sides of the drop-in panel. If you simply need to do this on one or two or three sides then do so. Once the panel is in place you can use the UBS fasteners to screw through the drop-in panel's mail tooth and into the lower tooth of the adjoining panels. This will effectively lock the drop-in panel to the adjoining panels. This technique will allow you to drop the panel directly in place. We have never encountered an obstacle or installation scenario that we were not able to overcome by using this or other creative methods. Use your imagination and your skills and the installation of UltraBaseSystems will be easier than you had ever imagined.

Fig 32

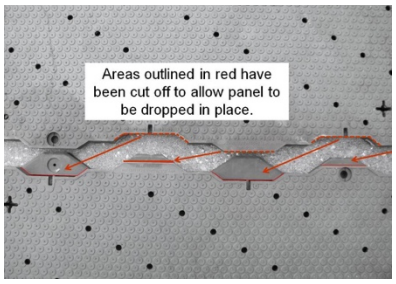


Fig 33

When it is necessary to cut panels to fit around the fixed objects understand that a panel can be cut and the remainder of the panel can often times be the scrap piece used to make another cut. This is one of the advantages of having a symmetrical interlocking panel system; we can substantially reduce the waste by intelligently using the scrap. When the time comes to cut a small piece of panel to fit in to a particular area it may not want to stay engaged as well as you would like into the panels surrounding it. This is where the UBS screws come in handy. Simply install the screws into the larger surrounding panels and into the holes of the smaller cut panel. **(Fig 34)** You will not need to install screws in every panel of the installations. This is not necessary nor is it recommend. The screws are used in small pieces of panels around a perimeter edge or on an outer perimeter border that may have excessive traffic. If going over a severe contour as those found is some putting greens screws can often help keep the panels aligned properly. Again in most cases the fasteners are not needed but the holes are there if you want them.

Fig 34

Although we never endorse pounding or kicking the panels in place sometimes a gentle nudge by the toe of your foot will engage a stubborn panel in place to minimize a gap. If a group of panels is already installed and needs to be moved slightly to close a gap a technique which we call a bunny hop will move the panels easily in place. Simply hop from panel to panel driving your feet into the panel and forward. Hop from panel to panel and you can close up any gaps that are unwanted or reverse this technique to open gaps if needed. The panels are incredibly strong and will not break and do not need to be forced into position in most cases. The system is designed so that even a child can install the panels and has been proven to do so on many occasions.

One thing to pay particular attention to is that while pulling the panels together, especially on the first several rows it does create an outward force which could throw the first rows out of alignment. Be certain that your spacer devices are staying exactly where you want them until the end of the installation. You do not want the sudden surprise that the installation energy of installing the panels has eliminated your gap and you have no choice but to re-cut the desired tolerance between the fixed structure and the panels or tear the installation apart and start again. We have made this mistake before and you can trust us when we say it is no fun trying to move a large bank of panels and may prove to be impossible, which leaves no alternative other than to disassemble and start over. Make sure your spacers are secured in place until the installation is complete and all will be well.

The panels do have the ability to be left uncovered without turf for a certain length of time. The black UBS panels are manufactured with a certain amount of natural ultraviolet inhibitors and with some of our other blends, inhibitor is blended into the polymeric mix in order to allow the panels to be left uncovered indefinitely. Panels used without turf such as a court or dog kennel will have this UV inhibitor added in as part of the blend. However many of the gray and black panels used for athletic fields or other areas are made with recycled material that has carbon black as the inhibitor. Bottom line is the panels can remain uncovered for periods of time without any damage or degrading but to be safe cover them with turf when convenient. We mention this because we're often asked is it okay to build the UBS base and come back weeks later and install the turf? With some products on the market it is recommended that the pads be covered within 72 hours to prevent UV damage. This is NOT the case with the UltraBaseSystems panels.

Panel flow direction

For all installations the panels can be installed in any orientation to achieve highly effective vertical and horizontal drainage. However you'll notice that on the underside of the current UBS panels the underside drain slots are of a diagonal nature and flow towards one direction more than the other. **(Fig 35)** Tests have shown that this single directional flow has very little effect on the flow rate of water escaping from under the panels. It is worth noting that the panels could be arranged in such a way that the drain slots are flowing towards a preferred escape route for the overflow water. By taking the time to look at the underside drain slots and aligning each panel in the same orientation you do have the ability to slightly direct the water towards a particular area or away from a particular area.

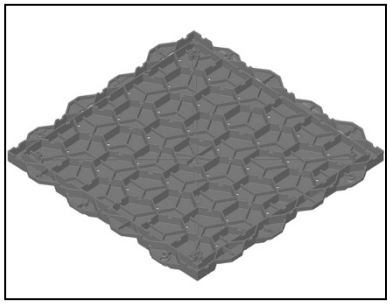


Fig 35

Again the flow rate is a minimal change but is a change that could be advantageous for your installation. In most all cases we pay very little attention to the orientation of the panel due to the fact that they do drain so well in all directions but we felt that this added feature of the current panel is worth noting.

Installing on a solid substrate

When it becomes necessary to install on a solid substrate such as a concrete floor, rooftop or parking lot the installation of your UltraBaseSystems panels will essentially be the same as the installation which occurs over a compacted earth sub base. The only difference being that the use of the geotextile fabric may not be necessary and a one inch screw will be used instead of the exterior one and a half inch screw for small panel piece assembly. **(Fig 36)** All other techniques are the same. UBS is a great solution over a hard substrate as the panels will turn any surface in to a great feeling playfield. This system will open many doors for installations that could otherwise be ignored.

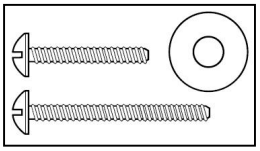


Fig 36

It will be your responsibility as the installer to ensure that the pitch of the area is leading towards a drain system in the floor or other type of water removal. Remember if the substrate you are building on is a concave dish with no drainage at the low point there will be absolutely nowhere for water to flow and you will essentially create a bowl that will hold water.

Using UltraBaseSystems on a solid substructure is in our opinion the most logical choice for synthetic turf installation given the fact that the panels allow for a non-slip turf installation even without infill coupled with the ability to fasten the turf directly into the panels around the perimeter using staples. No messy glue here. UBS is the best choice for hard substructure installations either indoors or outdoors.

If you are installing panels on an interior floor and you want to be certain to eliminate any sound reverberation between the UBS panels and the concrete or asphalt sub floor, the use of an inexpensive needle punch geo fabric or some other type of thin covering over the sub floor will help to prevent any unwanted tapping sound of the panels against the hard substrate. This tapping sound could be a result of slight deviations of panel flatness that can occur during manufacturing or inconsistencies of the rigid sub floor. This may not be necessary for heavily infilled turfs as the weight of the infill will potentially eliminate any sound issues. Testing should be done first to see if it is an issue and if so choose the solution that best insures the installed panels are as quiet as if installed over earth terrain. To prevent the subfloor from becoming scratched or marred such as a tennis court or hardwood floor, the use of the geotextile fabric as a barrier between the panels and the floor to be protected is a viable option.

Installing indoors

When installing indoors most all of the techniques used on an outdoor hard surface sub base will apply. The techniques used to cut and install the panels will not change. The only consideration is that the gapping of the panels is not as critical due to the fact the panels will not be subjected to the extreme temperatures of the sun. That being said it is still advisable to leave a slight gap between the panels that will occur naturally during installation and the one inch minimum gap between the panels and any fixed obstructions such as a wall. This will become very important when it comes time to tuck the turf into the gap around the perimeter of these obstacles to create a beautiful finished look. You don't want to fight tucking the turf in to a narrow gap. This will just frustrate the installer and slow down the installation so be aware of the gaps around fixed objects and use your temporary spacers!

If the panels are to be used for installations such as dog kennels were water will be flushed onto the turf and panels to remove any waste material, is important that proper drainage and pitch is present in the existing floor. We recently had the opportunity to install nearly 15,000 ft^2 (1400 m^2) of turf over concrete for a large pet boarding facility. Proper planning and good drainage has made the elimination of odors and waste material very easy for the staff to manage. Previous installs over rock and gravel were just not working for this customer and UBS proved to be a perfect solution.

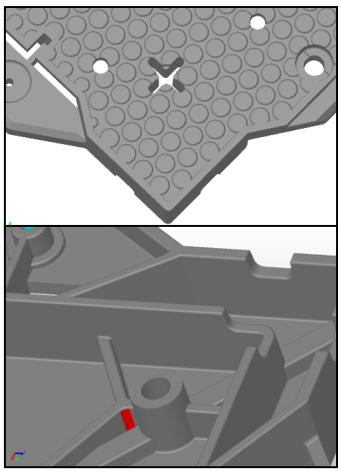
Fig 37

If you are using UltraBaseSystems panels to build a putting green indoors the Tour Links Styrofoam contouring systems will make easy work of creating realistic breaks in the putting surface. Keep in mind due to the inch and one quarter depth of UltraBaseSystems this will create a shallower cup than when using the two inch Tour Links panels. This can be overcome by installing the cups on our foam contour which will allow the installer to achieve a greater depth, or by going through the exercise of shallow core drilling the existing subfloor to allow for the recessing of the desired length cup. It is also the option of the installer to lay down a full layer of Styrofoam onto the installation area in order to achieve the depth required to use a standard Tour Links 2 inch cup or other cups on the market. **(Fig 37)**

Fastening the panels to the ground

Fig 38

Fig 39



There may be instances where it becomes necessary to attach the panels directly to the ground. Although we believe this is not necessary on 99% of installations it can be achieved and has been provided for in the design of the panels. The panels are equipped with two different locations for spikes to drive into the ground. There is an X opening in two corners of each panel. This X opening is to be used with the ultra base systems plastic spike that is designed to drive into this opening and prevent the panel from moving laterally or lift off of the spike**. (Fig 38)** In the opposite corners of the X opening there are two holes that when viewed from the bottom are designed with an outer

sleeve molded around the hole. **(Fig 39)** This hole is designed to receive a 1/4 or 5/16 in (6,4 or 8 mm) metal rod. A perfect example of utilizing this rod fastener was on an installation that occurred on a very steep incline. Although the panels do have enormous friction when resting on the ground it was decided that every fifth panel would be anchored to the ground using an 18 by 1/4 in (47,7 by 0,64 cm) metal rod through this mounting hole. **(Fig 40)** We simply drove the rod into the ground and flush to the top surface of the panel and this effectively eliminated any slide or lateral movement of the panels. It's a very easy and fast way if there is concern the panels could slide due to a severe incline. Please bear in mind this particular installation was done on a near 45° slope as part of a spring training hill so the panels sliding was a distinct possibility. The panels were the perfect solution due to the fact they would not slide down the hill and the turf would be able to mount to the panels and would create a non-slide surface for the athletes to train. UBS was the perfect solution and one that was accomplished in just a few days.

Although we have not been able to perform some of the hurricane testing experiments we would like to due to the extreme expense of these tests, we have had the opinions of many engineering experts who agree that due to the fact that there is adequate air movement flow under the panels as well as through the panels and as long as the turf is perforated effectively this will create an equalized air pressure on the bottom, side and top side of the UBS system and will prevent lift of the panels due to air pressure caused by wind. Keep in mind at ground level even with 70 mph (113 km/h) hurricane winds, airspeeds are near zero directly at ground level. In fact we have never had a single installation lift or shift due to ground speed winds. The spikes are an option but must be taken into consideration during the panel assembly process. If you are going to use spikes you're effectively locking the outer perimeter in place and eliminating any outward expansion of the panels along the perimeter edge. If spikes are being used then it is necessary to make sure there is **adequate gap left between the panels to allow for future expansion which will not be able to occur outwards.** This is especially true when the panels are assembled when cool. The rods are great tool for situations as described above or potentially helping to reduce vandalism but in all honesty one that we do not think it is oftentimes needed.

There are situations where the attachment of the panels directly to an existing substrate is necessary and can also be achieved easily by fastening through bolt holes in the panels directly into the substrate. In this case depending upon the substrate you would use fastener such as Tap Cons or wood screws or a sheet metal screw. You may only need to do this every few panels in order to ensure you are securing the panels to the substrate. Be sure to use a screw that is no greater than 1/4 in (6,3 mm) diameter so that the panels have the ability to freely move during expansion and contraction. We want there to be plenty of slop in the bolt hole to allow for movement. We have also done a much more elaborate technique where we have utilized our panels that are equipped with holes for golf cups and have created a mounting plate system that can mount directly to a substrate such as the deck of a cruise ship. A cruise ship is a different installation than one directly on the ground. The installation may be four or five stories above the ocean and vulnerable to strong winds coming across the bow of the boat. We have much experience with this type of installation and proper planning has eliminated any problems. I will say once again preparation and planning is the key to an easy and successful installation using UltraBaseSystems.

Installing the turf

Once the panels have been properly installed, trimmed and blown off to remove any debris, the next step is turf installation. Keep in mind one of the advantages of UltraBaseSystems is that turf installation can proceed as soon as the first rows of panels exceed the width of the first section of turf. **(Fig 41)** This is an amazing timesaver as turf installers can be laying out the turf as the panel installers are preceding forward. Just be certain that if any screws need to be added it is done so prior to turf going down and a leaf blower has been used on the panels to remove any dirt or debris which could protrude upwards through the turf.

Fig 41

There are many different techniques of rolling out the turf and installing it on the panels and although we have seen many of these techniques, we do not profess to be turf installation experts. We will however share with you some of the techniques that we have seen used which will undoubtedly help you with your installation. The panels are designed to be able to support heavy loads so the use of turf handling equipment can be moved across the panels without fear of damage. In some cases turf

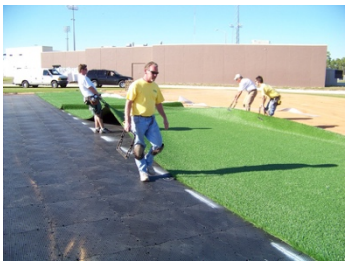
installers will use a mechanized device to transport the turf across the entire field of panels making easy work of laying out large rolls and then others simply insert a long pipe through the core of the turf and either pull it with a four-wheel motorized cart or simply rely on manpower to unroll the turf. **(Figs. 42, 43 and 44)**

Fig 42

Fig 43

Fig 44

Fig 45



Installers will typically mark the panels to the desired width as to where the turf rolls should be aligned. **(Fig 45)** Try to achieve as accurate of a roll out as possible to minimize sliding the turf. **(Fig 46)** The turf can be moved over the panels using turf grippers that installers have. We have had many installation companies install the turf over the barbed panels and once they get used to the technique there are no complaints, in fact we get more compliments on how well the turf stays in place.

Fig 46

Once the turf panels have been placed into position, standard seaming methods are used as with any other sub base methodology. The only caution is that when using glue it is imperative that impermeable seam tape is used so that glue cannot seep through the seam tape and adhere to the panels. We DO NOT glue turf to the panels. Everything is designed to move and breath. Fastening of the turf will occur around the outer perimeter which will be explained in this manual.

One of the many advantages of the UltraBaseSystems panels is that when turf is laid over the base system there is absolutely no unwanted movement of the panels which can cause in an even surface in the turf. In essence the turf is being installed over a precision molded surface, one that many installers have never had the privilege to see using a rock base. This was evident in an installation that was contracted by a major-league baseball team. This team had the experience of a rock sub base and once they played on a new field constructed with UltraBaseSystems the reaction was that they had never experienced such a perfect roll, ball bounce or drainage. In fact they have recommended the system to other teams who are experiencing the inconsistencies of rock base and recognizing the amazing consistency of play UltraBaseSystems provides.

Once the turf has been completely installed, seamed and trimmed around the outer perimeter edge it this time to secure the turf to the panels. A huge advantage of the UltraBaseSystems product is the elimination of nailer boards or curbs around the perimeter of the installations. The panel system is the nailer board and allows the turf to be fastened directly into the panel eliminating the cost, time and energy to pour or install a nailer. **(Fig 47)**

Fig 47

If the installation is not going to have any infill then the following procedure of fastening the turf to the panels is recommended. It is important to have all winkles removed from the turf prior to fastening. This can be achieved by pure muscle and pulling the turf to the outer perimeters to remove any wrinkles. On small installations such as putting greens start in the middle and work the wrinkles out to the edge before you fasten the turf to the panels. On larger installations you may use a pull behind broom system, systematically going back and forth across the turf forcing any existing winkles to the outer perimeter edge. Start in the middle of the installation area and slowly work the wrinkles out towards the perimeter. You need to move slowly across the turf in an effort to prevent additional wrinkling from occurring. Do not make sharp turns but gentle slow turns when it is time to change direction or it is preferable to run off of installation make the turn and enter back onto the turf. Once you have removed the wrinkles begin to secure the turf to the outer perimeter of the panels. When installing an athletic field type turf we recommend using a pneumatic staple gun which utilizes a 1/2 in (1,27 cm) crown x 1 in (2,54 cm) long x 18 gauge stainless steel staples. **(Fig 48)** You will need to adjust the pressure of the compressor so that the staple just barely presses against the backer of the turf. You do not want to puncture the backer so be sure to do test firings first to achieve proper setting. We recommend starting at one side of the turf and install staples every 3 to 6 in (8 to 15 cm) around the perimeter. Continue around the entire installation until your turf is secured to the panels. When doing this type of installation one of the advantages is that as the panels are expanding during the daytime they will take the turf with it maintaining a flat wrinkle free area. At nighttime when the turf contracts it will work to pull the panels in slightly with it keeping everything perfect. This atmospheric dance will occur continuously creating a beautiful smooth installation that will perform extremely well in all weather conditions. We do however always recommend stapling hot turf over hot panels or cool turf over cool panels. If the panels are hot to touch make sure the turf is hot before fastening to the base. If the panels are cool to the touch install the turf when it also is cool. The goal is to not install a hot turf on top of a cold panel and vice versa. This would be more prone to happen on an area such as a putting green were perhaps the panels had been sitting in the sun and the turf was in the air-conditioned garage. You would not want to pull the turf out of the garage drop it onto the panels and secure it. By doing so you will have taken a contracted turf and mounted it to an expanded panel which is the exact opposite of what we are trying to accomplish. Our

Fig 48

technique is to have expanded turf to expanded panels or contracted turf to contract panels. This simple system will keep everything working in harmony with each other during continuous hot/cold cycles.

Fig 49

If infill is to be used we recommend that the first row staples be installed at one end of the field with the grain running to the edge that will be stapled. **(Fig 49)** The use of an infill distributing system such as Sandmatic or pull behind hopper system is the ideal method of installing the infill. **(Fig 50)** By starting to deposit infill at the stapled edge and slowly moving towards the opposing side you will begin to push any potential wrinkles out of the turf while also creating a slight stretch on the turf. You may very well see some wrinkles being pushed out at first but once the machine has passed over the area the turf barbs will help keep the turf in place stretching the turf somewhat like that of a canvas on a frame. The process is continued back and forth until enough ballast is placed in the turf and all winkles have been pushed to the opposing direction of the original staple line. Again keep your movement on the turf slow and use large radius turns in an effort to prevent additional wrinkles from unnecessarily occurring. Once enough ballast is installed and the turf can no longer move it is simply a matter of stapling around the remaining perimeter edges. The turf has now been secured to the panels, locked down firmly by the turf barbs and the ballast of the infill creating a solid feeling secured turf play area for virtually any application from sports fields to pet runs. For most field installations and other recreational installs stapling every 3 to 4 in (8 to 10 cm) is adequate and it may be advisable to use a double row of staples for high traffic entrance areas such as gate entrances or wheelchair accessible ramps.

Fig 50

If the only feature UBS offered was the elimination of the nailer board it would be a major accomplishment in itself. Nailer boards or curbing is no longer necessary due to the fact our system allows for direct fastening of the turf into the base system creating a secure solid attachment unlike anything before it. Customers ask all the time will the panels really hold the turf and keep it from moving? We like to compare it to shooting staples, nails or screws into a plywood floor. The panels will hold fasteners the same way. This is an enormous advantage to any installer be it an amateur or professional making easy work of securing turf to the panels. Again when coupled with the patented turf barbs system we created an amazing procedure for turf attachment.

The goal in both scenarios is simply remove the wrinkles first before you secure the turf to the panels. It only makes sense. You can see this technique used every day with home carpet installations. Installers will attach the carpet to one portion of the room using the tack strips that are secured around the premiere of the walls and kick the turf into the opposite direction in an effort to remove the wrinkles. This is in essence what you are doing with your synthetic turf but on a much larger scale than the average living room. The turf barbs coupled with stapling or screwing the turf to the panels performs the same operation as the tack strips in your living room.

Panel fasteners

Each UBS panel is equipped with multiple holes to allow for the installation of the UBS fasteners into the panels. **(Fig 51)** These fasteners are not required on every panel but are there to be used in situations where panels are cut to a small shape and need to be secured to the adjoining panel. We do this as a precaution so that the cut panel will not disengage from the larger neighboring panel. When installing outdoors use the 1.5 in (3,8 cm) x number 14 pan head screw and washer as it will provide stronger holding power due to the fact that it will penetrate all the way through the panel and into the ground. Solid base installations such as on concrete or asphalt will require 1 in (2,54 cm) UBS screws to be used due to the fact the panels are only 1.25 in (3,2 cm) tall and we do not want to screw to penetrate past the bottom of the panel.

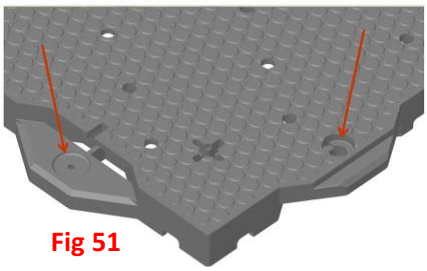


Fig 51

Another scenario that you may choose to use screws is on a high traffic edges where vehicle traffic may be entering on off of the field or play area. The fact is by fastening the turf directly to the panels you effectively keep the panel from being able to disengage or move out of its locking position and the screws can act as an additional support mechanism if so desired. It's our opinion always to be safe than sorry. The screw holes that are in the panels will not cause any negative effect to the turf above or transfer through the turf in the form of indentations. They're there if you want them and if not needed they simply add additional drain holes.

Finishing the turf edges

Once the turf has been secured to the panels is time to do the finished work along the edges. If the panel edge is one that was cut with a saw but not leaving the interior rib as support such as when cutting around the shape of a putting green which would require cutting the panel in a freeform shape, essentially dissecting the hexagonal cells, simply lift the turf and push some fill material into the side of the panel until these small cells are supported with the fill. **(Fig 52)** It won't take very much material to do this but it does help create a solid edge that has maybe diminished slightly due to the cutting of the panels. Once this is done trim off the excess turf to the desired length. Whenever it is possible to staple to the outer edge of the panel use a longer 1.25 in (3,2 cm) staple to attach the turf into the cut ribs or the solid edge wall that was created once the teeth were cut. **(Fig 53)** By doing this you will not only have the turf fastened to the top of the panel but the added security of fastening the turf to the edge of the panel. Trim the turf to the desired length that you wish, to bury the excess into the ground. If possible we would recommend burying 3 to 4 inches into the ground, however in other cases it may be decided that only an inch or so be left. Our installation team typically leaves 3 to 4 inches of turf that can be wrapped over the edge of the panel and secured to the top the panel and sides of the panel and then buried into the ground. By burying the edge of the turf into the ground it helps eliminate any chance of the turf lifting

Fig 52

Fig 53

and creating a trip zone. Once the turf has been secured and buried then it is the decision of installer as to how best finish the outer edge. This can be achieved by grading up to the turf with a decorative gravel, mulch or sod. If bordering the synthetic turf with natural grass we recommend a strong plastic or metal edge be installed along the edge of the turf just below the finished height of the new synthetic grass. This is done to prevent landscape crews from either mowing or hitting the synthetic grass with the string weed eaters.

If the panels were installed up against an existing wall or some other type of fixed structure you would have left a three-quarter inch or more gap between the structure and the panels. You will now trim the turf about 1 inch (25 mm) past the outer edge of the panel. **(Figs 54 and 55)** Using a tool such as a blunt carpet chisel or broad flat screwdriver, simply force the excess turf into the gap and drive the turf down with the chisel. Do this along the entire fixed structure and it will create a beautiful finished edge while also creating a trip free zone. If the area is high traffic apply a second row staples in this area to ensure the turf does not become disengaged from the panel. This technique is perhaps one of the favorites we use for finishing an UltraBaseSystems installation. It makes easy work of the edge treatment and creates a beautiful finished look.

Fig 54

Fig 55

Installing infill material

There are many techniques for installing infill from simply depositing the infill into the turf by hand and brooming it in with brushes as I've seen performed in many installations throughout Asia, use of an infill spreader that is pulled behind a four-wheel power cart or the use of a programmable self-propelled infill installation machine such as the SandMatic. **(Figs 56 and 57)** Regardless of your preferred method the UBS panel will easily handle the load of the equipment and the infill and should not be of concern to the installers. However we do warn that the use of hard tires such as hard forklift tires should be avoided. Inflatable turf tires or car tires are recommended. Equipment that is equipped with inflatable tires will not damage the UBS panels. We have seen machines with nearly 2 tons of material drive easily over the UBS panels without any ill effect.

Fig 56

Fig 57

The amount of material installed and the sequence and method in which it is deposited rests squarely on the shoulders of the installation team but can be achieved easily and without fear of deformation of the panels when the panels are installed over a properly prepared and compacted base.

When using infill simply add additional fill material along the edge regardless if it is the open edge or one that is up against a fixed structure. **(Fig 58)** The use of handheld power broom and small drop spreader along edges which cannot be reached with large equipment will help to make sure the edges have the same amount of infill and great finished look as the rest of the turf.

Fig 58

Repairing sub base issues

Despite how hard we try during ground preparation there could be a situation that arises that something was either overlooked or Mother Nature plays an unfriendly trick on us. In this situation the removal of turf and panels may be necessary. The first step would be to carefully cut the turf along the seam line and role the turf off of the panels. This will become much more difficult if infill has been deposited into the turf but is a scenario that may need to be addressed. Once the panels have been exposed, determine the area that needs to be removed and repaired. Using a circular saw cut an X into the panel and remove this starting panel. **(Figs 59 and 60)** You will now be able to pull the panels out of position one at a time exposing the geotextile fabric underneath. Continue to do this until the entire area that needs repaired is exposed. **(Fig 61)** Carefully cut back the geotextile fabric and fold it out of the way exposing the ground to be repaired. **(Fig 62)** Make the proper repairs to the ground whether it be removal of the soils and replacement with new materials or simply adding additional material to build up an area that has settled improperly. **(Figs 63 and 64)**


Fig 59


Fig 60


Fig 61


Fig 62


Fig 63


Fig 64

Fully compact the repair and rake the area smooth. Fold the geotextile fabric back into place and anchor with landscape spikes. Now begin to install the panels back into the installation a row at a time. **(Fig 65)** The tricky part is to get the last panel of the row in place. This is easier to do when the panels are hot or if using one of the more flexible polymeric blends. However it can be done even in cold conditions. This reinstallation of the last panel in each row may require up to three people to achieve. Position the panel into place while others help to insert it into the locked position. **(Figs 66 and 67)** It is not easy to do at first but once you get the hang of it and get a system it can be done relatively fast. Continue to install row by row until there is only one panel left to put in place which is surrounded by four existing panels. There is no way to bend this particular panel in place so it will be necessary to cut off the teeth of the last panel as described earlier in this manual. Insert the panel directly down onto the lower teeth of the existing panels. Use the UBS screws in appropriate the holes along the four sides of the last panel. You will now have locked the repair panel in place using fasteners. Roll the turf back into position, re seam the turf, reapply infill if necessary and the repair has been made. **(Figs 68 and 69)**


Fig 65


Fig 66

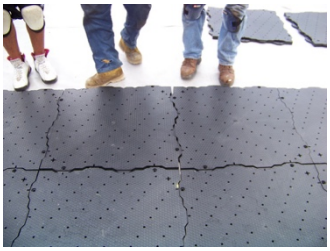


Fig 67

The repair may be necessary due to circumstances beyond your control but please make sure during any installation that any improperly graded area, low area, or poor soil is dealt with prior to panel installation. Take it from us it is much easier to fix the ground prior to panel installation than to face the task of repairing it after. As we said before preparation is key to a good insulation.


Fig 68


Fig 69

Installing over a soft substrate such as existing synthetic grass

Due to the relatively thin profile of the UBS panel it is very important that our system is installed over strongly compacted soils or base work. The panel is not designed to be installed over soft or unstable non-compacted ground without some sort of preparation. UBS panels are incredibly strong when placed over a compacted base and are capable of supporting tremendous loads without fear of deterioration. However if trying to install our panels over something like existing synthetic grass or thick natural grass and subjecting the structure to heavy vehicle or foot traffic there is the likelihood the panels could begin to deform downwards creating a permanent deformation in the panel. A perfect example was when we were recently asked to test our UBS panel as a flooring option to be placed over a 2.5 inch (63,5 mm) filled synthetic turf. We had recently created a baseball field for this team using our system and they were so impressed they asked if we would try it as a floor covering for their indoor stadium for events. Of course were able to build the structure but were not happy with the results when heavy trucks were driven over top of unsupported panels. Had the turf not been there and the panels were resting directly on the concrete floor or some other solid sub base then there would have been no issue whatsoever but over this soft sub grade the panels were completely unsupported and not a good option for this situation. If you find yourself in a situation where a flooring structure is necessary you may find the Tour Links panel to be a better solution due to its added height and strength. It will always be our responsibility to not only emphasizes the positives of our system but to alert installers of any potential problems that could arise by using our panels improperly.

Conclusion

We hope that this installation manual proves to be a very useful tool for all of our dealers worldwide and one that we are certain we will continuously edit and add additional sections in order to improve the ease in which installations are achieved using UltraBaseSystems. Once again our goal is to provide solutions for installation problems of synthetic turf, one panel at a time.