Synthetic Turf Maintenance

The American Sports Builders Association (ASBA) is a professional resource for designers, builders, and suppliers for sports facilities, as well as for owners and operators of these facilities. ASBA has more than 350 member companies who are committed to quality construction, and the organization is recognized as a central source for technical information. Please see www.sportsbuilders.org. for publications, including the "Buyer's Guide for Synthetic Turf Field Construction," (free of charge), membership information, and a searchable member database.

Here we reprint portions of Chapter V of ASBA's new publication, *Synthetic Turf Sports Fields: A Construction and Maintenance Manual.*

A well-constructed and well-maintained synthetic turf field will offer years of play. However, synthetic turf is not, as some have claimed, maintenance free. To maximize the useful life of the field, the owner should develop and implement a regular schedule of maintenance. The goal of the maintenance program is to insure a consistent and attractive playing surface, to promote player safety and to protect the turf system. Regular maintenance is more cost effective than allowing the field to deteriorate to the point where it requires major work. A maintenance plan will include routine cleaning and grooming, as well as periodic inspection, repair of minor irregularities, testing, and topdressing.

These recommendations describe typical regimens. However, most manufacturers will provide a detailed operations and maintenance manual. In fact, some maintenance services may be included or may be provided by the manufacturer or installer as an option. Failure to follow procedures recommended by the manufacturer may void your warranty.

Cleaning

The most important step in maintaining a synthetic turf field is to keep it clean. Begin by practicing preventive maintenance. Prohibit food and beverages on the field. Even water stations should be placed off the turf to minimize contamination by spit. Prohibit smoking on or near the field. Not only are burns difficult to repair, but cigarette ash and butts must be removed.

If possible, ban chewing gum, chewing tobacco and sunflower seeds on or near the field. Removing chewing gum, though not difficult, is time consuming. Maintenance personnel should first chill the gum with ice or aerosol spray to make it brittle and, then, gently break it up to remove it.

Remove debris immediately. This will include trash – food wrappers, pompom shreds, tape – dust and dirt, and environmental debris such as leaves, pine cones, needles, pollen, bird droppings. If left in place, organic material will quickly decay and filter into the infill, where it will impede drainage and serve as a medium for the growth of bacteria, algae, and fungi.

Cleaning will require at least some hand labor. A soft broom or rubber-tined rake may be used for removing surface debris. A mechanical leaf blower or sweeper or a vacuum, specially designed for this purpose, if approved by the manufacturer, is especially efficient. A soft-

bristled broom pulled behind a golf cart or Gator also may be used. The goal is to remove the debris without picking up any of the rubber infill. This may take care. Both manual and mechanical cleaning equipment will tend to remove some infill during the first few months. As the infill settles and the fibers fibrillate, this will cease to be a problem. In the first year, litter removal also may include some loose fibers.

The amount of maintenance required by a particular synthetic turf facility will vary depending upon the geographic location, the amount and type of use, player conduct and alternative use, if any.

With light use, monthly full cleaning, coupled with occasional spot pickup, may be sufficient. With heavy use, cleaning may be required bi-weekly or more. Mechanical sweeping should include 5-6 passes in opposite directions, sometimes longwise, sometimes across the field, and may take 2-3 hours.

The owner should develop an appropriate maintenance plan, ensure that maintenance is performed correctly to avoid damaging the surface and keep records of maintenance procedures and problems noted. The need for excessive maintenance may be an indicator of more serious problems.

Spot clean spills as soon as they occur. Because the rubber infill holds heat, most liquids dry quickly. Removing them while still wet is recommended. For that reason, careful post-game inspection and cleaning is optimum.

Most spills are easily removed with hot (not boiling) water and a mild soap, such as liquid dishwashing detergent. Oily marks may require a small amount of mineral spirits, if approved by the manufacturer, but in general solvent cleaners should not be used. Once the spill is loosened, rinse the area thoroughly as any residue remaining may serve as a growth medium for bacteria, algae and/or mold.

Blood, vomit, urine, sweat and spit

Grass fields contain billions of naturally occurring beneficial organisms which break down organic contaminants including blood, vomit, urine, sweat and spit, as well as insect, bird and animal droppings. Synthetic turf fields contain few if any such beneficial bacteria. For that reason, organic contaminants must be cleaned and the fiber and infill must be disinfected.

First, pick up any solid material that can be removed. To remove any remaining material and disinfect the field, apply an organic or enzymatic cleaning agent or one of the proprietary products now being developed specifically for this purpose. Mix up a fresh batch of cleaner according to the manufacturers' instructions for each cleaning. Apply the solution with a low-pressure sprayer to thoroughly wet the surface. Allow the surface to remain wet for at least 10 minutes and rinse thoroughly. The goal is to wash the contaminant and the cleaning solution all the way through the surface.

Just as wrestling programs regularly disinfect their mats, some synthetic turf owners are beginning to disinfect their fields on a regular schedule, as often as twice a month. Some programs also are disinfecting the sideline areas, where contamination concentrates, more often, even after each use.

Metal objects in the field are hazardous. Part of the grooming routine should include regularly dragging a magnet over the field to remove such objects.

Health and hygiene

Those responsible for athletic facilities and programs should be sensitive to the general societal concern regarding transmission of infections, some of which are resistant to antibiotics and very difficult to treat. Such infections are being seen more frequently in a wide variety of settings, including hospitals, nursing homes and athletic facilities, and in other circumstances where the source of exposure cannot be identified. Infections may be spread in athletic programs by skin to skin contact; by sharing of uniforms, towels, pads and equipment; or by contact with a contaminated surface.

While modern synthetic turf products are only half as abrasive as older versions, it appears that players still suffer more abrasions on synthetic turf than when playing on well-maintained natural grass. A greater number of abrasions provide more avenues for entry of infectious organisms. Additionally, as previously mentioned, these fields must be disinfected because they lack the beneficial bacteria found in natural grass fields; those bacteria break down organic contaminants, which might provide a growth medium for infectious agents.

Experts say that good hygiene throughout the athletic program is the key to preventing the spread of infections. In addition to field hygiene, experts recommend that players and coaches in all athletic programs thoroughly wash and disinfect any open wounds or abrasions, no matter how minor, as they occur and keep all wounds covered until they heal. Proper cleaning and maintenance of locker rooms, whirlpools, and other facilities used by the athletes is necessary. Additionally, players should shower thoroughly after every practice and game, and should avoid sharing uniforms, towels, or personal equipment, including soap and razors. Any athlete with a skin wound that leads to fever, muscle pain, fatigue, or develops a blister, boil, redness or swelling should seek prompt medical attention.

Moss, mold, and algae

Clean synthetic turf fibers and infill will not support the growth of moss or algae. However, over time, if organic material (including food spills) filter into the infill and, if conditions are right (dampness, shade) moss, mold, or algae may appear. Generally, such growth will be limited to less used areas of the field.

Many manufacturers can supply appropriate products to remove such growth. Any product that is not oil-based may be used. Moss, mold and algae should be treated immediately. If allowed to become established, removing such growth can be very difficult. Even if all the living organisms are killed and removed, spores will remain. Therefore, successful treatment may require several applications. In the worst case, eradication may necessitate removal of the infill, sterilization and replacement.

While a clean synthetic turf field will not support the growth of grass or weeds, seeds which fall or blow onto the field may germinate, especially if the field is regularly irrigated. Small numbers of weeds can be removed by hand without damaging the surface. Care should be taken to remove the full root. If weeds are deeply rooted, such that they cannot be pulled by hand, commercially available weed killer may be used, as long as it is not oil-based.

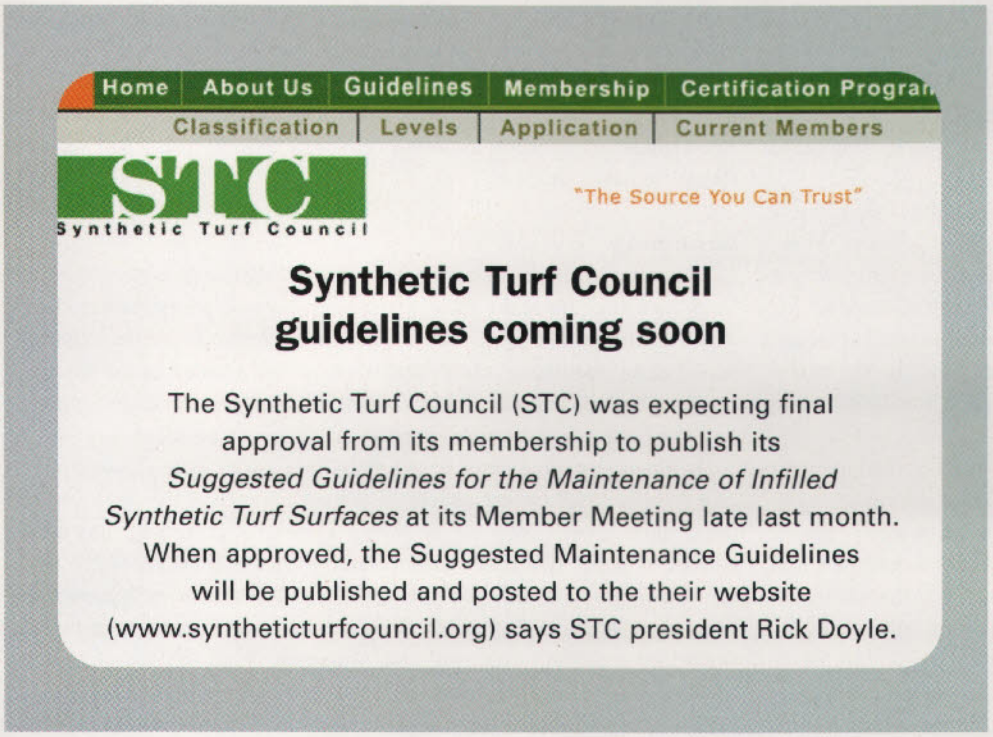
Problems may develop where synthetic turf fields abut natural grass areas. Grass and/or weeds may invade the edge of the synthetic turf, especially when the grass is reseeded. Fertilizer, pesticide, and other chemical overspray may contaminate the turf. In fact, the synthetic turf may look so much like grass that inexperienced grounds personnel may even attempt to mow or trim it. A divider strip of pea stone, mulch or other material between synthetic turf and natural grass will help to delineate the boundary.

Grooming

While an ungroomed surface may be usable, regular grooming can prolong the useful life of the surface and keep it looking fresh and inviting. The recommended frequency of grooming depends on the schedule specified by the manufacturer and often on the amount of use the field receives and its location. It may be advisable to groom more frequently if the field is heavily used, shaded or subject to pollution.

Regular grooming helps to maintain the performance characteristics of a synthetic turf surface as well as the appearance of the field. On the other hand, overly frequent or overly aggressive grooming may cause excessive wear. For that reason, each owner should carefully track grooming practice, observe the results and establish an appropriate grooming regimen. Failure to follow your manufacturer's guidelines regarding grooming may void your warranty.

Grooming serves a number of purposes, including preventing and/or breaking up compaction, redistributing and re-leveling infill, and,



importantly, restoring fibers to vertical. Fibers in synthetic turf have a tendency to lay over in use, especially with repetitive traffic. Fiber lay-over may lead to poor footing, decreased drainage, compaction and poor appearance. Once the fibers are bent all the way over, it may be difficult to get them to stand up again.

One form of grooming is dragging, in which a piece of synthetic turf or soft brush is dragged behind a small tractor, golf cart or utility vehicle. Dragging, if recommended by the manufacturer, can be used to redistribute infill, reduce static electricity and give the surface an attractive striped effect like new mown grass.

Brushes that have a rotary action, mounted in front of a power unit, are effective for standing up the pile. The bristles should be hard enough to lift the fibers, but soft enough not to cause excess fibrillation. If fibers in the turf are completely laid over, power brooming may be necessary; however, all brooming causes some fibrillation. Wetting down the

surface prior to brooming may help to protect it from excessive wear.

Another form of grooming is scarification to prevent and/or remediate compaction. Increased compaction in the field will lead to poor ball bounce, decreased drainage, poor footing and possibly a greater incidence of player injury. Testing has shown that scarification reduces G-max considerably and improves traction. Generally, a sweeper or greens groomer is used for scarifying synthetic turf fields. It is important to minimize compaction from the outset by keeping the field clean so that dirt and other contaminants do not filter into the infill, filling up the voids. Preventive maintenance also should include protecting the field from vehicles not designed for athletic fields such as pick-up trucks, loaders and concert cranes.

Maintenance equipment

As these fields become more popular, turf managers are discovering new and better practices and manufacturers are creating specialized equipment for field maintenance. A number of manufacturers make cleaning equipment specifically for use on synthetic turf. These machines may perform one or more cleaning operations and vary in their aggressiveness. It is important to consult the manufacturer of the surfacing system regarding appropriate maintenance equipment.

Machinery used on or near the turf must be well maintained so that it does not leak oil or other fluids onto the surface. It should feature wide soft tires, sometimes called "turf tires," and should be kept moving slowly, making wide turns, so as not to move the aggregate base. Heavy equipment should be prohibited. Bobcats, skid-steers, backhoes and other heavy-duty machinery may cause ruts in the sub-base that will be reflected and visible in the turf. Additionally, this type of machinery may break the glue bond between the turf and an e layer, where present. Maintenance equipment should be stopped or parked off the turf surface.

Heavy equipment should be prohibited. Therefore, when the field is used for alternative events requiring staging or seating on field, set up cranes must work from off field and chairs should be set on plywood, mats or plastic tiles to distribute weight and prevent divots. If they occur, divots must be repaired by cutting out the turf, adding or redistributing base material and replacing the turf. Simply adding additional infill to bring up the level will create a soft spot which players cannot see, constituting a hazard.

At the end of the playing season, inspect all field equipment and order any replacement parts so that the equipment can be repaired during the off season. If new equipment is needed, the end of the season may be a good time to shop for bargains.

Seam failures and tears

Seams, whether in the field or in permanent markings, should be checked regularly to insure that they remain secure. It is recommended that seam failures be called to the

attention of the installer for repair. However, if the warranty has expired, a number of specialty companies offer seam repair services.

Irrigation systems

While synthetic turf fields do not require irrigation, they benefit from watering in several ways. Watering helps to settle the infill, control static electricity, and increase the consistency of ball roll and bounce. Players have stated a preference for fields that have been watered prior to play because they feel it makes the surface slightly firmer. During hot weather, irrigation can help to cool synthetic turf fields, though the effect is temporary.

Ideally, an irrigation system should be included in the field design. Water pressure, water volume, sprinkler radius, friction loss, prevailing winds and other environmental conditions will affect the design of a suitable layout for an irrigation system and the type or types of sprinkler heads to be used, though most commonly large radius sprinkler heads are chosen.

Water lines must supply sufficient volume to each sprinkler head to provide adequate coverage. Galvanized steel, copper, polyethylene or PVC pipe can be used for water lines. In designing any irrigation system, caution should be exercised in determining the location, elevation and type(s) of sprinkler heads to minimize any potential hazard to players.

Irrigation systems can be connected to timers that automatically turn the sprinklers on and off.

Where irrigation has not been included in the field design, water cannons are an option. Six cannons, placed at midfield and at the 30-yard line on each side, will water an entire field. The amount of water required for optimum benefit will vary from field to field.

Marking

On synthetic turf, field markings can be permanent or temporary. Permanent markings are either tufted in at the factory or cut and inlaid during installation. Where the field will be used most of the time for a single sport, permanent lines are generally used and represent one of the most obvious benefits, since marking natural grass fields each time they are used is time consuming.

If the field is to be used for multiple sports, permanent lines can be painted over and obscured and/or temporary lines painted on. Typically in high schools, football and soccer markings are permanently tufted or inlaid, while markings for lacrosse are painted on after the final football game in the fall for spring use. Because the markings for boys and girls lacrosse are different, two different colors will be used, often red and blue.

Historically, paints used for this purpose have been difficult to remove. They have stained fibers and infill, and left "ghost" images after cleanup. Paint residue also can cause compaction and increase G-max. Repeated scrubbing is necessary to remove temporary markings has caused increased wear of fibers in those areas. Now however,

special paints are being developed for this purpose; these new paints break down over time, are easily cleaned and leave no residue.

While field marking should be in accordance with the manufacturer's guidelines, general recommendations for minimizing problems with paint include:

- Choose the right paint for the job. Ask for a recommendation from the manufacturer of your synthetic turf system.
- Use a paint machine that allows for as low a psi as possible.
- Do not drive paint into the infill.
- Prior to cleaning, lightly brush the area so that the fibers are vertical and the infill is loosened.
- When possible, use more water and cleaning agent, less scrubbing.
- Extracting paint and cleaning solutions with a water hog or other extractor will help to minimize paint residue left behind. Chalk lines are sometimes used, but tend to leave a lasting powder spread and are not recommended. Marking compounds for natural grass should not be used.

Permanent lines require no special attention except that, if cut in as seams, they should be checked regularly.

Inspection

Where fields are used seasonally, a comprehensive pre- and post-season inspection is recommended. Where fields are used heavily year round, regular inspections at an appropriate interval should be scheduled.

A thorough inspection should include at a minimum:

- Seams. Insure that all seams, whether in the field or in logos or markings, are tight. Every place where one color of turf is inlaid into another area is an opportunity for failure. Loose seams can be a tripping hazard and will continue to deteriorate until corrected.
- Infill. Check rubber depth, especially in areas of wear such a corner kick areas, lacrosse goals, midfield between the hash marks. Redistribute infill or topdress as necessary.
- Patterns of wear. Wherever possible, the cause of wear should be determined. Is wear caused by inadequate maintenance, infill moving or compaction? Before the problem can be corrected, the cause must be determined.
- Border systems. Depending on the system, border systems can move, crack, heave or simply fail.
- Drainage systems. Perimeter drains, catch basins and retention ponds only function if the water moves. They can become clogged and should be checked.
- Line movement. In training areas or in areas where band practice results in repeated movement in the same direction, lines may move.

Removing snow and ice

Snow and ice are not harmful and can be permitted to melt through the surface. In fact, if possible, snow removal should be avoided. If

snow or ice must be removed for scheduled play, consult the manufacturer of your turf system for approved procedures.

Brushes, wooden, rubber or plastic scrapers are sometimes used. Metal shovels or scrapers should not be used, nor should rock salt. Some manufacturers claim that calcium chloride, urea and other chemical ice-melting products are safe for the turf. However, they may be retained in the turf surface and until they rinse away, will burn players who are exposed to them.

For power snow removal, use a rubber tipped blade set above the turf, a rolled blade or a blade covered by a piece of split PVC pipe on a small Gator-type utility vehicle with turf tires. Do not use ordinary snow removal equipment. It is not necessary to remove all the snow. A layer 1/2" - 1" thick will quickly melt in sunlight.

During freezing rain or freezing temperatures following rain, water within the infill may freeze. The field may be used when frozen, as long as it is not slippery and footing

Daily	Weekly	Monthly	Annually
Remove leaves and trash.	Check seams and inlaid markings and report any failures to installer.	Treat weed infestation, moss, mold or algae.	Treat moss, mold and algae.
Hand pull weeds.	Brush the surface to redistribute infill and maintain vertical fibers.	Check for over-compaction and groom as necessary. Inspect, test.	Topdress with infill, as required by O&M manual.
Spot clean spills.			
Set up events – marking, moving benches. Setting up goals.			

March	Inspect field. Sweep. Groom.
April	Brush lightly. Sweep. Paint for spring sports if not sewn in.
May	Brush lightly. Sweep.
June	Brush heavily. Sweep. Groom.
July	Sweep. Test.
August	Inspect. Brush lightly. Sweep. Paint for fall sports if not sewn in.
September	Brush lightly. Sweep.
October	Brush lightly. Sweep.
November	Brush heavily. Sweep. Groom.
December	Inspect field.

is adequate; however, care should be exercised as the fibers will be brittle and more subject to damage and the shock absorption of the surface will be reduced. Player safety should be the primary concern.

A synthetic turf field can be prevented from freezing or from accumulating snow with a subsurface heating system, composed of miles of tubing filled with water and glycol. While a significant cost, the inclusion of a heating system may significantly increase the number of days the field can be used in extreme climates and may reduce maintenance and extend the life of the field.

What to expect of a new surface

It may take up to twelve months for the infill to settle completely into the fiber of the synthetic turf surface. Regular grooming will assist with settlement. New rubber will generate static electricity. Rubber will stick to players' skin (sweat attracts crumb rubber), clothing, even mouth guards, and will collect in their shoes. Over time, rain generally solves the problem and pre-game watering helps, but turf manufacturers recommend anti-static products to minimize loss of rubber and the inconvenience. Many grounds managers spray their new fields with diluted fabric softener prior to play but not right before a game as the wet solution may make the surface slippery. Please note that this is outside the product's labeled and intended use, though it appears to be effective. Crumb rubber is an eye irritant, as well. Trainers should keep a first aid kit including eyewash on hand.

Until the field settles and the fibers fibrillate, expect some movement of infill. Rubber particles may accumulate in corners or the bleachers or any other area that traps them.

Topdressing

The owner's maintenance guidelines may suggest topdressing the surface with additional infill during its lifetime to retain performance characteristics and to extend the life of the field. Over time, infill will move, settle and leave the field on shoes, uniforms and maintenance equipment. Restoring lost infill will help to maintain the G-max rating, along with consistent ball roll, bounce and other performance characteristics.

Approximately 20 tons of crumb rubber

will cover the field to a depth of 1/4". Various equipment can be used for this purpose - either topdressing equipment designed for use on natural turf (golf courses may have this equipment) or newer equipment specially made for use on synthetic turf. Once the infill material is spread, it must be brushed into the fibers.

Ideally the identical material, whether rubber or rubber/sand mix, from the same source as used in initial construction should be used for topdressing. Consult your installer to locate infill for topdressing.

Removing and replacing infill

Some manufacturers and/or turf managers suggest that removing and replacing all the infill can significantly prolong the useful life of the field. One question that arises is what to do with the used infill material that is removed. Because of the proliferation of synthetic turf fields at all levels, many companies are working on this problem.

Testing

All fields should be tested when they are installed and at regular intervals of not more than one year during use. Testing should be performed during the season when play actually occurs, not during the off season, if any. Testing should be done by an independent testing laboratory and should include the center of the field, the hashes and the sidelines at a minimum.

Most attention has focused on G-max testing. Industry-wide accepted values for G-max safety call for a newly installed field to yield an average of 100 Gs at an ambient temperature of 70 degrees F and G-max measurements should not exceed 200 Gs at any time during the useful life of the field.

Drainage maintenance

Proper drainage helps to remove water from the surface and redirects water that may flow over or under the turf from surrounding areas. Incorporating proper drainage alone is not sufficient to prevent problems. Drainage must be maintained.

Swales, French drains and catch basins can become clogged by vegetation and silt. Keeping vegetation properly trimmed, neutralizing roots or using root barriers, and/or occasionally cleaning systems with a pressure hose may help to keep the water flowing. Including cleanouts in system design facilitates regular maintenance.

If clogs cannot be cleared with a hose, it may be necessary to locate them and repair them by excavation. Most obstructions occur where there is a change in direction or elevation. Identifying those areas on a drainage plan will be important should a problem occur.

Fence maintenance

Regularly check the fence fabric for damage. Touch up nicks and scratches in vinyl or other coatings. Ensure that all sharp edges and protruding wires are bent back or removed to pre-

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	Existing Soil Field	New Soil Field	New Sand-Based Field	New Synthetic Turf Field
Initial Construction	0	$20,000 - $200,000	$350,000 – $1,000,000	$600,000 - $900,000
Annual Maintenance Cost	$15,000*- $50,000	$15,000 - $50,000	$15,000 - $50,000	$5,000 - $15,000
Remedial/ Major Repairs	$0 - $50,000	$0 – $50,000	$0 - $150,000	$0 - $10,000
Ten Year Maintenance Cost	$150,000 - $550,000	$150,000 - $500,000	$150,000 - $650,000	$50,000 - $160,000
Ten Year Cost	$150,000 - $550,000	$170,000 - $750,000	$400,000 - $1,650,000	$650,000 - $1,060,000
Cost per Year	$15,000 - $55,000	$17,000 - $75,000	$40,000 - $165,000	$65,000 - $106,000
Events per Year	60 – 120	60 – 120	60-120	200 - 365**
Cost per Event	$125 - $916	$141 - $1,250	$345 - $2,750	$178 - $530

vent player injury. If the fabric is stretched or bulging, it may be possible to re-stretch it or, even to turn it upside down on the framework; however, this is a fairly difficult job requiring heavy equipment, more akin to renovation than to maintenance.

Inspect cable ties and hog rings to insure that they are securely fastened and reattach them to the bottom tension wire as necessary. Check all post caps, hardware and fasteners. Repair or replace missing or damaged items.

Examine gates, hinges and latches. Clean and lubricate them so that gates swing easily and the latches operate smoothly. If the gate is out of plumb, adjust and rehang it.

Observe the base of all fence posts at the footings. Check for deterioration and patch where necessary.

Landscape maintenance

Regularly trim the grass and landscaping around the field for a clean appearance and to ensure proper drainage. Weeds left growing around the perimeter will invade the surface at its edges. A 2 x 5-foot border around the perimeter should be left free of all vegetation to prevent damage.

Tree roots that extend under the field should be neutralized or removed prior to construction. Where removing tree roots and vegetation is not practical, root barriers sometimes are used. Even when nearby roots are removed prior to construction, they can travel great distances, especially where fields are regularly watered. Some tree species are more likely to be troublesome than others; white pines are especially difficult.

Where new landscape materials are used on site, use native plants if possible, and choose additional plants which are drought resistant, low maintenance, disease and pest resistant and hardy. Avoid invasive species.

Use mulch on plantings to conserve soil moisture, minimize growth of weeds, reduce maintenance, restore fertility and reduce the need for fertilizers. If possible, compost grass clippings, plant debris and fallen leaves for use as a soil amendment in place of inorganic fertilizers or peat moss (a non-renewable resource).

Rental fees

One argument often used to support the installation of synthetic turf fields is that because the field can be used for many more events each year, it can be rented out and rental fees will offset the cost of installation. When calculating the potential income from rental fees, be certain to offset that income with the cost of set up and clean-up, painting and cleaning markings, security, staffing, and use of lights and similar costs for a realistic picture of the net benefit of renting. Be certain to read your warranty, carefully, as well. Warranties may have limitations based on specific use, amount of use or other considerations.

Maintenance costs

The chart on the page 32 presents typical cost ranges. Because of the number of variables, a prospective owner should compare costs based on actual and intended use and maintenance practice. This chart does not consider the cost of irrigation.

*According to professional turf managers, the cost to maintain a natural grass field in optimal condition is approximately $50,000 per year. However, most high schools spend more in the range of $15,000 per year; many spend much less.

** While theoretically, a synthetic turf field has unlimited use, it is unlikely that it will host more than 365 events per year and, likely, it will host many fewer events. Fewer events will increase the cost per event, while a greater number will increase maintenance costs and, therefore, cost per event.

Typical maintenance schedules

The schedules on page 25 and 26 are presented only for information as typical examples. Maintenance schedules depend on system, climate, use and other factors. Failure to follow your manufacturer's guidelines may void your warranty. ■