Golf & Turf Drainage

Keeping golf courses and athletic fields playable—and profitable
PLAY LONGER, BETTER—AND DRIER—WITH ENGINEERED TURF DRAINAGE

The increasing popularity of golf, field sports, and other outdoor events places growing demands on turf design and maintenance. Technology is responding with new soil/sand composites, hybrid seeds, improved forms of artificial turf, and other advances.

But underneath it all, proper drainage is perhaps your most productive investment in the long-term health and playability of recreational surfaces. Consider the following benefits of a well-designed and maintained drainage system:

HEALTHIER GRASS AND SOD
Good drainage promotes deeper root growth and the “knitting” effect of the roots, which stabilizes your playing surface and lessens the tearing of the turf.

MORE EFFECTIVE USE OF SOIL NUTRIENTS
A well-drained field will improve the uptake of nitrogen, potassium, and magnesium.

REDUCED RISK OF DISEASE
Turf that does not continuously sit in damp soils will be more resistant to fungus and disease.

MAXIMUM PLAYABILITY
Fewer games and events will be cancelled or extensively delayed due to heavy rain. A well-drained golf course allows golfers to resume play faster, with less damage to the course.

REDUCED COMPACTION
Drainage lessens the surface deformation caused by heavy traffic and soil compaction.

REMOVAL OF SOLUBLE SALTS
Drainage improves turf quality in arid and semi-arid areas through the leaching of soluble salts.

SAFER SURFACES
Good drainage reduces field damage and turf instability, providing players with better footing and less chance of injury.

The bottom line for designers, owners, and managers is that proper drainage increases the playability of turf surfaces while reducing maintenance and repair costs.

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ADS: EVERYTHING FOR TURF DRAINAGE

No other company can match our broad product offering of pipe, fittings and accessories. Those suited for the turf industry are detailed below:

**N-12® SMOOTH INTERIOR PIPE**
Provides excellent flow and durability for rapid outlet and transfer of collected storm water. Available with soil-tight or water-tight built-in gasketed bell and spigot joints for quick installation. Delivered in 20’ (6m) lengths, 4” (100mm) through 60” (1500mm) diameters, perforated or non-perforated.

**SINGLE WALL CORRUGATED PIPE**
3” (75mm) through 24” (600mm) diameter perforated or solid pipe serves well for localized collection and drainage. Coils available in 3” (75mm) through 6” (150mm) and 20’ (6m) lengths in larger sizes.

**FITTINGS**
ADS offers a complete line of couplings, elbows, tees, wyes, and reducers for joining corrugated pipe. In 4” (100mm) through 8” (200mm) diameters, fittings are injection molded and provide quick, snap-together connections for soil-tight or water-tight joints. Fabricated fittings are available for larger pipe sizes.

**ADVANEDEGE® FLAT PIPE**
A perforated panel-shaped polyethylene core in 12” (300mm) and 18” (450mm) widths and in coils up to 100’ (30m) Can be used with or without a covering geotextile sock for filtration of fines. The primary benefit of the panel design is rapid drainage response: 12” (300mm) AdvanEDGE has twice the response rate of 4” (100mm) round pipe, removing a given quantity of water 60% faster. AdvanEDGE can be installed vertically in narrow trenches for field and perimeter drainage, or laid flat directly on the subgrade of greens, bunkers and athletic fields.

**DRAINTECH™ DRAIN BASINS, GRATES, AND VALVE BOXES**
ADS now offers a full line of basins, grates, channel drains & valve boxes made of rigid, lightweight polyolefins. DrainTech structures easily adapt to the most common types of pipe, including corrugated and smooth wall polyethylene, and schedule 40 PVC.

**NYLOPLAST® INLINE DRAINS AND DRAIN BASINS**
Designed for rapid collection of surface water from all types of playing surfaces. Ductile iron grates will easily withstand loadings from carts, mowers and tractors.

**DURASLOT® SURFACE DRAINS**
Linear drains designed to capture sheet flow from sloping surfaces. Made from 4” (100mm) through 36” (900mm) N-12 pipe with an aluminum slot mounted on top. Typically specified for parks, cart paths, parking lots, dugouts, running tracks and similar applications.

**TURF FLOW PIPE**
Turf Flow 2” (50mm) diameter pipe is the answer for quick drainage response. The flexibility enables it to be used in many applications other pipes cannot accommodate. Available in plain, wide and narrow slot, the pipe join easily with a full line of twist-on fittings, including: coupler, end cap, 2” (50mm) x 4” (100mm) reducer and blind tee/elbow.
PUTTING GREENS
For more than four decades, the USGA has been publishing a wealth of data on golf course design and construction, and is considered the world's foremost authority in this field. In 2004, after three years of research in conjunction with The Ohio State University, the USGA issued a revised recommendation for putting green construction.

For the first time, this new standard permits both round pipe and now flat pipe for green drainage. The flat pipe must conform to ASTM D 7001, be a minimum of 12” (300mm) in width, and not covered by a geotextile sleeve (waffle drains or any tubing encased in geotextile sleeves are specifically prohibited). AdvanEDGE flat pipe is in full compliance with all the specifications of ASTM D 7001.

TRENCHLESS GREEN DRAINAGE
The use of AdvanEDGE flat pipe placed directly on the green’s sub-base has two distinct benefits: better drainage performance and lower installed cost. The panel pipe’s large surface area results in a water removal rate almost twice that of 4” (100mm) round pipe. And because there are no trenches to dig, no gravel backfill to buy or install, and no trench spoils to dispose of, green construction costs can be significantly reduced.

An AdvanEDGE drainage layout can be installed in less than two hours, compared to a full day for trenched round pipe. One expert has estimated the cost savings to be as much as $40,000 for 18 holes.

USGA GREENS
In the United States today, two basic types of putting greens are predominant. USGA greens are more prevalent nationally, employing a soil mixture root zone above a layer of gravel.

CALIFORNIA GREENS
California greens feature an all-sand root zone with no gravel layer. AdvanEDGE flat pipe is recommended for use with both types. California green specifications call for the flat pipe to be covered with a geotextile sock.
TRADITIONAL GREEN DRAINAGE
ADS round pipe and fittings are also well suited for drainage of putting greens. Illustrated at right is a typical layout using 4” (100mm) perforated laterals and 6” (150mm) solid N-12® pipe installed in gravel-filled trenches in the subgrade.

COURSE DRAINAGE
Unmanaged storm water can result in ponding and over saturated area’s which damages turf and reduces the number of rounds that can be played. Tee boxes and fairways can be effectively drained with ADS polyethylene pipe. Smaller diameter, perforated, single wall pipe is used for laterals and local collection, feeding larger trunks and outlet lines made with N-12 pipe. Nyloplast inline drains and drain basins collect surface water from low spots.

For minimal disruption to turf on greens and fairways 2” (50mm) Turf Flow is a perfect option. Turf Flow’s flexibility enables it to be used in many applications other pipes can’t accommodate. Turf Flow can be snaked around obstructions.

Turf Flow’s exclusive narrow-slit perforation design requires no filter wrap to prevent sand from entering the system for long-term, effective drainage. The product is available in rolls up to 500’ (150m).

Turf Flow has a spiral corrugated interior and exterior corrugations. Minimum inside diameter and average outer diameter shall be 1.91 inches (48mm) and 2.3 inches (58mm) respectively.

A full line of twist-on fittings including: 2” (50mm) x 4” (100mm) reducer, blind tee/elbow, coupler and end cap as depicted in the photo on right.
PIPE DEPTH
Most athletic fields have uniformly structured soils in the root zone, which drain relatively quickly. The depth of the pipe is primarily determined by the permeability of the surrounding soil, and the inches of water that need to be removed in a 24-hour period.

Turf grass root zones are fairly shallow, and drainage for most athletic fields is needed in only the top foot of soil. This, plus rapid water removal requirements, dictates a drain depth of one to two feet. However, in areas where salinization may be a problem, a deeper drain depth may be warranted.

Many times, particularly in stadiums, a 6” (150mm) to 8” (200mm) soil/sand mix is imported to the site. This soil is usually of higher permeability than the existing subgrade, which can be compacted up to 95%. Because the imported soil drains quickly, it is important to position the drainage lines close to the soil mixture in order to accept and carry the water away to an outlet. Pipe should never be covered with an impermeable layer of soil.

Turf aeration equipment should also be considered. Some aeration tines can penetrate to a depth of 9” (230mm), which could damage the buried pipe.

WATER REMOVAL RATE
Professional sports stadiums, particularly those subject to frequent heavy rainfall, may call for several inches per hour of water removal, while for most other venues, a removal rate of a half-inch per hour would be adequate.

EXAMPLE CALCULATIONS
The example below will briefly discuss how one may determine the amount of rainwater to drain from a synthetic turf field, and present a typically drainage layout. We will assume a catchment area of 380ft x 170ft (116m x 52m), a runoff coefficient of 1.0 (no runoff), and a rainfall intensity of 1.0 (25mm) inches per hour.

RATIONAL EQUATION:
\[ Q = CIA \]
Where,
\[ Q = \text{Flow Rate, gallons per minute (gpm) or liters per minute (lpm)} \]
\[ C = \text{Rainwater Runoff Coefficient (1.0 for no runoff for synthetic turf)} \]
\[ I = \text{Rainfall intensity, inches per hour (1.0 in/hr) or mm per hour (25mm/hr)} \]
\[ A = \text{Catchment Area, square feet (380ft x 170ft = 64600SF), (116m x 52m = 6032m^2)} \]
\[ Q = CIA \rightarrow 1.0 \times 1.0 \frac{\text{in}}{\text{hr}} \times 64,600 \text{ ft}^2 \left( \frac{1\text{ft}}{12\text{in}} \right) \left( \frac{1\text{hr}}{60\text{min}} \right) \left( 7.48\text{gal} \right) = 671 \text{gpm} \]

Metric \[ Q = CIA \rightarrow 1.0 \times 25 \frac{\text{mm}}{\text{hr}} \times 6032 \text{ m}^2 \left( \frac{1\text{m}}{1000\text{mm}} \right) \left( \frac{1\text{hr}}{60\text{min}} \right) \left( \frac{1000\text{L}}{1\text{m}^3} \right) = 2513 \text{lpm} \]

We will assume the field has two outlets and so will divide the field into two drainage areas or 335.5 gpm (1270 lpm) per side. We will also assume the collector pipes to be 12” (300mm) AdvanEDGE with a flow rate of 21 gpm (79 lpm) which has been third party certified to ASTM D4716.

<table>
<thead>
<tr>
<th>Determine the quantity of AdvanEDGE:</th>
<th>Determine the spacing between collector lines</th>
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<tbody>
<tr>
<td>335.5 gpm/21gpm = 15.97 = 16 runs per side</td>
<td>380 ft/16 runs = 23.75 = 23 to 24 ft between runs</td>
</tr>
<tr>
<td>1270 lpm/79gpm = 16 runs per side</td>
<td>116m/16 runs = 7.25m between runs</td>
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DRAINAGE LAYOUT

The proposed layout, figure 1, depicts 12” (300mm) AdvanEDGE on 20’ (6m) lateral spacing; and because the herringbone design, results in 22 runs of AdvanEDGE per side.

This drainage provided with this layout will be:

21 gpm per run of AdvanEDGE × 22 runs per side
= 462 gpm per side or 924 gpm for the entire field

79 lpm per run of AdvanEDGE × 22 runs per side
= 1738 lpm per side or 3476 lpm for the entire field

The additional lines of AdvanEDGE along with narrower spacing results in a higher flow rate and thus the rainfall removal of a larger storm event may be achieved.

\[
I = \frac{Q}{CA} \rightarrow \frac{924 \text{ gpm}}{1.0 \times 64,600 \text{ ft}^2} \left( \frac{1 \text{ ft}^3}{7.48 \text{ gal}} \right) \left( \frac{60 \text{ min}}{1 \text{ hr}} \right) \left( \frac{12 \text{ in}}{1 \text{ ft}} \right) = 1.37 \text{ in/hr}
\]

\[
I = \frac{Q}{CA} \rightarrow \frac{3476 \text{ lpm}}{1.0 \times 6032 \text{ m}^2} \left( \frac{1 \text{ m}^3}{1000 \text{ L}} \right) \left( \frac{60 \text{ min}}{1 \text{ hr}} \right) \left( \frac{1000 \text{ mm}}{1 \text{ m}} \right) = 34.6 \text{ mm/hr}
\]

TRANSPORT PIPE

Lastly the transport pipe, or what may be commonly referred to as the perimeter drain, can be sized. With the current layout having two outlets, the collector pipes for half the field will need to drain 462 gpm. Using the Manning’s equation or available pipe flow charts, an appropriate transport pipe may be chosen. In this case a 10” (250 mm) diameter N-12 pipe with a 0.5% slope will carry 750 gpm (2839 lpm); more than enough required flow for half of the field.

The infields of baseball/softball diamonds may require more intense drainage than the outfields because of the extra play. Drain lines on the infield should be spaced at intervals of 15’ (4.5m) or less. Drainage spacing in the outfield will vary according to soil permeability and the frequency and severity of rainfall events.
Innovation in product, process and technology.

That’s ADS.