Artificial turf for airport safe zones

Synthetic turf, long-regarded as the province of sports and recreation surfaces, expands into civil infrastructure

Synthetic turfs used to conjure up images of the Houston AstroDome or roll outs used for pontoon decks and home putting greens. The newest generation of artificial turf, however, is vastly different. It provides a true look and feel of grass, and long-term cost-savings. Furthermore, it's being used for more than just convenience.

Artificial turf products can provide a safety-enhancing groundcover alternative for safety and operational areas at airports. Also, these products can offer significant long-term cost benefits to airport operators.

Michigan-based Air FieldTurf™ has designed an airfield-surfacing product that has been approved by the United States Federal Aviation Administration (FAA) and tested at major airports across the country. The product has been specifically developed for the safe zone areas around runways and taxiways of air carrier, military and general aviation airports. The turf is engineered with polyethylene fiber (120 microns thick), and tufted into a black urethane-coated mesh backing. It is manufactured with a depth of approximately 2 to 2.5 in.

The turf is ballasted with approximately 1.5 in. of silica sand infill. The infill is held in place with a unique honeycomb structure of the artificial blade fiber. This geometry traps the sand to anchor and ballast the turf product to the surface it covers.

Photo 2. Fire tests found that flames were extinguished quickly, in part because the turf infill snuffs out the oxygen.

Photo 1. The visual difference between natural and artificial turf is stark, as is the difference between their maintenance value.

Anchored and ballasted

The subgrade may be prepared to be a load-bearing or a non-load-bearing base. The turf product can be configured to be permeable or non-permeable, depending on a site's drainage requirements.

A 6 x 6 in. notched header product is anchored adjacent and flush to hard surfaces by 16 x 0.63 in. steel rebar. This header product is made from recycled plastic and has a 2.5 x 1.5 in. notched recession. The turf carpet is glued to this notched recession and further secured with nails. This forms a secure header to the turf installation, which is flush with its adjoining surface.

Any portion of the artificial turf product that cannot be attached to a hard surface is trench-buried in a 12" deep hole, then pegged, and backfilled. The trenched turf, in combination with the curbing header, provides a firm footing. The entire turf is then in filled with silica sand. This sand is brushed into the turf to further ballast the entire product making it tough and tight

Dry to the touch

Excellent drainage is one of the key attributes of the turf. The non-permeable turf allows run-off from a two to three percent grade off the asphalt shoulder. The turf, attached to its curbing, abuts the asphalt shoulder. Water runs down the asphalt shoulder, across the turf and into the airport drainage product.

The permeable turf percolates at a rate of 60 g/ft.^{2}/hr. After a deluge of rain, the soil near the runway or taxiway area may be saturated and freestanding water may remain on or near the area. This is of great concern in an aviation environment, as pooling and ponding of water is a potential hazard for transiting aircraft and ground support vehicles. Such conditions may create a hydroplaning effect.

With the artificial turf, water percolates through it and is quickly gone. When the FAA tested the turf, they applied water to simulate a pooling effect and to see how water percolates through the product. Most of the water percolated through in two to three minutes, and was completely gone within five minutes. After 30 minutes, the area was dry to the touch. (See drainage note in sidebar.)

Supporting safety

Part of the turf's technology was originally developed for professional sports venues. (See sports note in sidebar.) The material's durability—key, of course, for sport use—lends itself well to the airfield environment. On airfields, safety is a primary concern; the federal testing shows that the turf is a safe groundcover for this environment.

The sand infill layer of the turf installation is about 2 in. deep. Therefore, about 0.5 in. of the 2.5 in. turf fiber is exposed. When tested at the FAA's William J. Hughes Technical Center, aircraft rescue and fire fighting crews simulated fire, heat and smoke scenarios of an aviation accident. The material was tested with JP-8 military fuel for its low flashpoint. A variety of other fuels common to airport environments were also tested.

FAA tests did not cause the turf to propagate a flame or act as an accelerant – even in the presence of 16 km per hour winds. The exposed half-inch top fibers melted instantaneously, yet they did not burn beyond the 2 in. layer of infill. The sand acts as a barrier or oxygen snuffer. It absorbs the fuels or oils, snuffs out the oxygen content, and breaks the fire triangle. As expected, the fire burned out quickly with minimal radiant heat remaining.

According to Joe Dobson, vice president of Air FieldTurf, the agents in charge of testing applied torches directly to the fiber in order to force a propagation of the flame, but the fires did not spread. The fibers melted quickly and the oxygen was snuffed out in fill, as designed.

The subsequent chemical analysis of the fiber found that no additional toxicity had been added to the environment or endangered personnel. Additional apparatuses were not required. The existing extinguishing devices in the aircraft and commonly available to emergency response teams were sufficient to extinguish the fire. GFR

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Photo 3. San Francisco International Airport, after installation of artificial turf. In addition to its safety value, the turf provides aesthetic value to arriving passengers.

A note about drainage

Artificial turf provides a notable respite from maintenance. It is not subject to drought or erosion or rutting from vehicles. It's going to remain green in all seasons, which has a number of advantages; for example: an elimination of watering costs and stark outlines. Saving on water is both good for the environment and for facility owners. The visual clarity between the turf and other surfaces (e.g., paved runway) can be of great importance to small airports and emergency situations in which pilots must rely more on visual cues than electronic coaching.

As described in this article, the drainage properties of the material are more than satisfactory, and the turf backing can be engineered for site-specific concerns.

However, it must be noted that this is not a panacea for drainage issues. The turf provides many sought after characteristics, but its effectiveness is dependent upon other aspects of an installation/facility being met. Ground preparation and appropriate drainage plans (e.g., inlets) must still be observed.

A global sports trend

Water savings alone are helping this new form of turf overwhelm the sports market. Even high schools in the United States have installed this form for its grass look and feel, but mostly for its long-term cost-savings.

One of the most notable acknowledgements of this trend was in the late March announcement that FIFA—the governing body of international football—and the Confederation of African Football (CAF) have agreed to allow artificial turf on competition pitches during the forthcoming African Nations Cup. The championship match host, Libya, will use a synthetic turf.

FIFA is not known for accepting change lightly. Having been assured that the new surface plays like grass (texture, ball bounce, etc.), FIFA's stamp of approval on such a major international event is a testimonial by example.

–Christopher Kelsey