

Technical Analysis of Turf Protection Systems

INTRODUCTION

Turf protection is key to any successful outdoor event. To the casual observer, the turf upon which stages and platforms are built, pedestrians walk and vehicles traverse, is likely of the least concern. The event is the draw and the turf is just there; neither noteworthy nor special. But to owners of the turf it is everything and the condition of the turf is likely the very reason why the events occur there in the first place.

Upon scouting for a site an event organizer has many logistical concerns but one at the top of the list is the very ground upon which everything will happen. Will the ground be stable, will it turn to mud if it rains, will it handle vehicles, stages and staging areas, intense pedestrian and vehicular traffic and will it be the last thing anyone talks about? After all, the attendees came for the event and the satisfaction gained from attending the event.

The organizers do not want the topic of conversation to be about poor access and poor/muddy/wet ground conditions that may have sullied the attendee's experiences and the owners do not want a hefty post-event price tag to restore the turf.

TYPES OF SPECIAL EVENT FLOORING

Portable event flooring comes in two basic forms; solid sheets of plywood or plastic/synthetic materials and sheets of open grid made of high density polyethylene. The problem is deciding which is best for the specific situation. And while not an abundance of studies have been performed with respect to this issue, recent studies (Royse 2012; Beard 2006) have used science to provide the facts and details that can lead the user to the best conclusion and the best material selection.



Matrax Closed Back System



Matrax Closed Back System Turf Result

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To better select the appropriate turf protection method for a specific use, detailed analyses have been performed giving consideration to A) turf effects from the use of protection materials, B) scientific measurements to assess turf health, C) evaluation of protection materials, D) field testing, and E) results.

Four types of turf protection covers are currently available, used either singularly or in combination. They include plywood, polyester mesh fabric, and durable composite mats in the form of single-sided plastic covers (open back system) and double-sided plastic covers (closed back system). The use of each is generally situation-dependent. For example, event flooring that does not allow irradiance may be used under a stage while flooring that allows irradiance may be used for seating, pedestrian, and vehicular travel areas.



Open Back System



Open Back System Turf Result

Stress to turf grass is caused primarily by wear and soil compaction (Beard 2006). Wear injury occurs from the tearing caused by the abrading of the turf leaves by both pedestrian and vehicular traffic. Soil compaction has an indirect influence on plant responses by altering the physical characteristics of the soil (Royse, 2012; Carrow, 1980). When grass protection mats are in place direct wear injury does not occur but soil compaction does occur. The protective covers, however, create other stresses such as restricted airflow, blocked or restricted moisture, heat accumulation and irradiance infiltration. These covers may be in-place for a typical period of four to eight days but events lasting up to 20 days are not uncommon.

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COMPARING TRANSLUCENT AND OPAQUE EVENT FLOORING

Applying science to the study and use of turf protection is becoming more sophisticated and is providing the type of data that allows the user to make an informed choice of turf protection covers. There are five main types of scientific measurements that have been made to assess the levels of stress on the individual plants. Light energy is necessary for photosynthesis; a critical factor in plant health (Cooper, 1970). In the area of turf protection, translucent covers provide exposure of plants to the sun and photosynthesis. In tandem with light energy is the orientation of the individual leaves. Plant leaves that are nearly vertical only absorb light in the upper part of the leaf (Adams et al., 1996). Translucent covers provide the only opportunity for photosynthesis to continue while the turf is being protected. Light quality and light quantity both play an important role in turf health. The growth and development of turf grasses are greatly influenced by the quality and quantity of light available for photosynthesis. Opaque ground covers do not provide for the absorption of light so leaf quality suffers distress. Multispectral radiometry measures plant light reflectance in the visible and near-infrared ranges and provides an objective method for estimating turf grass quality or green cover (Royse, 2012).

Studies were conducted in growth chambers at the Virginia Bioinformatics Institute facility and in the field at Virginia Tech Turf Grass Research Center. The growth chambers were established to evaluate two different irradiance and soil moisture conditions. Field studies were conducted in spring, summer and fall with event covers in place from two to twenty days. (Royse, 2012). Four covers were evaluated in the growth chamber and in the field:

1. Single Layer Plywood 1.9 cm thick, opaque cover
2. Plywood with polyester mesh fabric, opaque cover (Enkamat Plus, Coldbond Netherlands)
3. Single sided plastic, translucent cover (Terratile, Kilgore, Texas)
4. Double-sided plastic, translucent cover (Matrax, Newfoundland, New Jersey).

Various combinations of light, moisture and compaction were used to evaluate the turf grasses under different levels of distress all compared to a well-maintained control sample.

THE RESULTS

Field trials were conducted over a two year period with two trials of each type of cover in each season of the year; spring, summer, and fall. Temperature, moisture, compaction, light quality and quantity and other factors previously discussed were closely monitored. From the growth chamber and field tests the findings were documented as follows:

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- › Turf under Matrax displayed a lower degree of heat stress symptoms in summer compared to the other covers. The air space between the top surface & the solid back act as an insulator.
- › Terratile and Matrax both being translucent, maintained the best percent green cover and the calculations predicted that the maximum number of days the turf could be covered and still recover was greater than 20 for Matrax and Terratile.
- › Matrax allowed for better green cover during high temperature periods when compared to Terratile. Temperatures under the Matrax mats were up to 30% cooler than Terratile.
- › The Terratile and Matrax panels provided excellent long-term protection (>20 days) and turf recovery. However Terratile sunk into the turf (when driven over) resulting in damage to the turf grass and compaction of the soil (saturated soil conditions present at the beginning of the 2010 season) leaving the potential for an uneven surface that might affect footing or ball bounce/roll and turf recovery. The solid back of Matrax eliminated such “creasing” but matted the turf in a consistent manner. However, use of a backpack blower, rotary mower or other grooming activities easily correct this result.
- › Matrax provided the advantages of greater protection in summer heat and quality retention in all seasons and significantly decreases soil compaction when compared to Terratile or any other open back cover.

The testing program was prepared and conducted by John Paul Royse, submitted as his Master of Science thesis in crop and soil environmental sciences, Virginia Polytechnic Institute and State University, 2012. Copies of the testing program are available [here](#).

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