POP QUIZ

1. WHAT DO YOU CALL A TALL FESCUE THAT LOOKS LIKE BLUEGRASS?

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- ☐ TALLTUCKY GRASS
- ☐ BLUE FESCUE
- ☑ MUSTANG TURF-TYPE TALL FESCUE

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wait to put Banner on the spot.

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SAFTEY *from page 20*

optimal condition should be," Schefsky says. Rogers agrees that his research could lead into sports turf managers knowing what cultural practices to use, such as watering to soften the field.

What's safe?

ASTM has given labs and artificial turf manufacturers a standard to follow in performing tests. But they qualify the test with this statement: *This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

But what does it mean to the turf manager or player safety?

One major synthetic turf manufacturer has determined that *G-max* levels using a 20 lb. missile dropped from 24-inch height of "good grass" is about 75-100, while frozen earth is about 275. This manufacturer aims for the product to have a *G-max* of 200 using the 20 lb., 24-inch test.

Except for the current work by Rogers and Waddington, no one in the natural turf industry has set *G-max* guidelines for natural fields.

"What are we talking about here?" Holland says. "What's safe? Do you fall from 24 inches or do you fall from your height?"

"It would be nice to write a specification and say 10Gs is safe," says Roger Schmidt, who's in research and development for Uniroyal and on the ASTM sports committee. "But it needs to be technically and logically feasible."

In a new standard which ASTM is proposing for playground surfaces, *G-max* levels will be taken at one foot intervals so that manufacturers can compare the values to the height of the equipment.

Still, Schmidt admits that *G-max* levels alone mean very little.

The severity index can better determine effects on player safety. "Instead of looking at just the maximum force, the severity index looks at a time interval of the force applied," explains Schmidt. "Severity index is more complicated to calculate and more related to head injury."

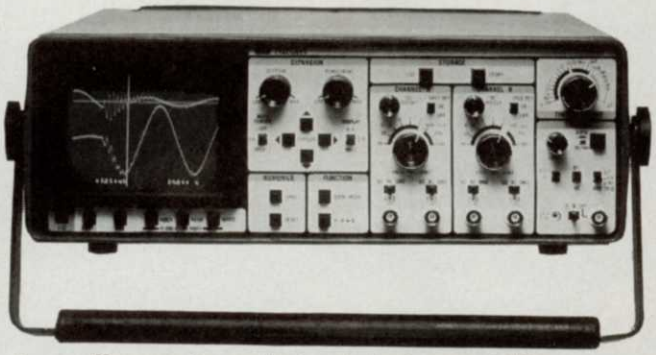
continued on page 26

G-MAX VALUES

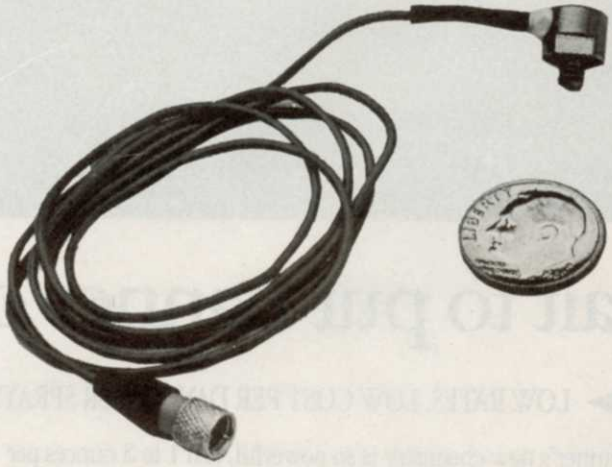
A major synthetic turf manufacturer has assigned these G-max values using F-355, to the following conditions:

Hard frozen earth/gravel	275
Hand-packed dry earth or "Normal" frozen soil	175-200
P.A.T. system	125-140
"Good" grass	75-100
Soggy, wet grass	70-75

Penn State University uses a Clegg impact tester and vibration analyzer with three different weights for their impact absorption research.



An oscilloscope is an electronic instrument, like a television screen, which gives a visible trace of the voltage vs. time.



An accelerometer is a device which produces a voltage porportional to the acceleration it senses.

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The low-profile design distributes the weight over each drive wheel for full ground contact and a softer touch on turf. Positive four-wheel hydrostatic drive combines with four-way articulation to give you the flotation and traction you need in rough spots and soft spots, and adds extra stability on slopes and rough terrain.

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Powered by a 53-hp diesel engine, the backhoe has a digging force of more than 10,000 pounds, and digs 11′-13′. The 5/8 cubic-yard capacity loader moves into the load with a breakout force of 6,442 pounds. Dump height is more than nine feet.

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SAFETY *from page 24*

Severity index

Severity index takes into consideration the Gs as well as the time over which the force is applied.

"Studies show that a person can tolerate a hard surface for a short amount of time. That's usually figured in milliseconds," Schefsky explains. In other words, if the surface absorbs the shock of the impact quickly, then that surface may not be as "hard" to a human body as a surface which absorbs the impact slower. One surface with a G-max of 200 may have a higher severity index than another surface which peaks at 200Gs.

Most standards such as ASTM and the severity index are based on head injuries. Original tests in this area dealt with heads hitting automobile dashboards.

Some researchers went as far as dropping animals on surfaces and even cadavers. "What damage occurs in a cadaver's head may be undetectable, while it could produce a concussion in a human being," says Bruce Martin, Ph.D., of the biomechanical engineering department at the University of California at Davis. Martin, along with Dr. Douglas Bowers of West Virginia University Medical Center, completed perhaps the study most critical to the natural turf industry on impact absorption of natural vs. artificial surfaces.

The 1974 test showed that five-year-old synthetic turf was almost as hard as asphalt, while bluegrass sod provided a softer surface. Bowers had planned to re-do the test this year, but the field he had been testing was ripped out. His plans are currently on hold.

The future

Rogers' impact absorption research, along with the work of other turfgrass scientists on turf strength and cultural practices will have profound effect on the future of the athletic turf industry.

"There are many things it could do," Rogers says. "I think we'll start seeing more people in the athletic field service industry. It's cheaper for schools to hire out for services. I think we need this research for athletes and parents of kids at the high school and junior high school level."

"There are many variables to be considered," adds Waddington. "We don't have the resources to do everything at once, but we are making progress." **LM**

PRACTICE MAKES PERFECT

It's an ironic situation, but it happens at schools everywhere: athletes spend more time on practice fields, while turf managers spend more time on game fields.

In 1984, Penn State University researchers published the first study correlating field conditions with player injuries. The researchers found that more injuries happened on practice fields, and that turf managers work less on those fields.

Since the publication of that study, the hardness issue also has come to the forefront of athletic turf management. The two issues combined have given athletic field researchers a new perspective on field management. While natural turf managers need to be aware of "G-max" levels on game and practice fields, the actual turf surface also is a concern.

Matt Leonard and Steve Cockerham look over the traffic simulator they created to produce wear on athletic field research plots.

Rich Henderson, who completed a masters thesis at Penn State in August, looked at the impact absorption properties of various surfaces. "Rich laid the groundwork for my research," says Trey Rogers, a doctoral candidate at Penn State. "He did his research in the lab, while my system is portable."

Henderson's results show that the presence of bluegrass sod on clay and coarse sand soils made the surface softer, but had little effect on a silt loam soil. A turf cover of 60-day-old ryegrass on the silt loam was softer than bare soil. Core cultivation decreased surface hardness of a silt loam soil.

The drop-test instrument used to measure impact absorption is not the only instrument which is important in evaluating turf strength.

Henderson also looked into the use of the pentrameter, a device which is pushed into the soil and measures the force per unit area.

Turf density, soil moisture and bulk density influenced the ease of pushing it into the soil. Turf density influenced a pentrameter with a 1.0 or 2.0 sq. cm. cone, while bulk density influenced a 0.25 or 0.50 sq. cm. cone. The 1.0 sq. cm. cone correlated best with soil moisture.

More research

Another problem researchers face is simulating actual field conditions on research plots. In order to do this for athletic turf, Steve Cockerham, superintendent of ag operations at the University of California-Riverside developed a "traffic simulator."

Cockerham says the invention evolved from "25 to 30 ideas" from other researchers across the country.

"Visualize the center of a football field," Cockerham explains. "It's torn up and compacted. In trying to develop new grasses you have to duplicate the wear of a football player over a plot. You can't tell a turf manager what to do if we're evaluating turf under different conditions than he lives with."

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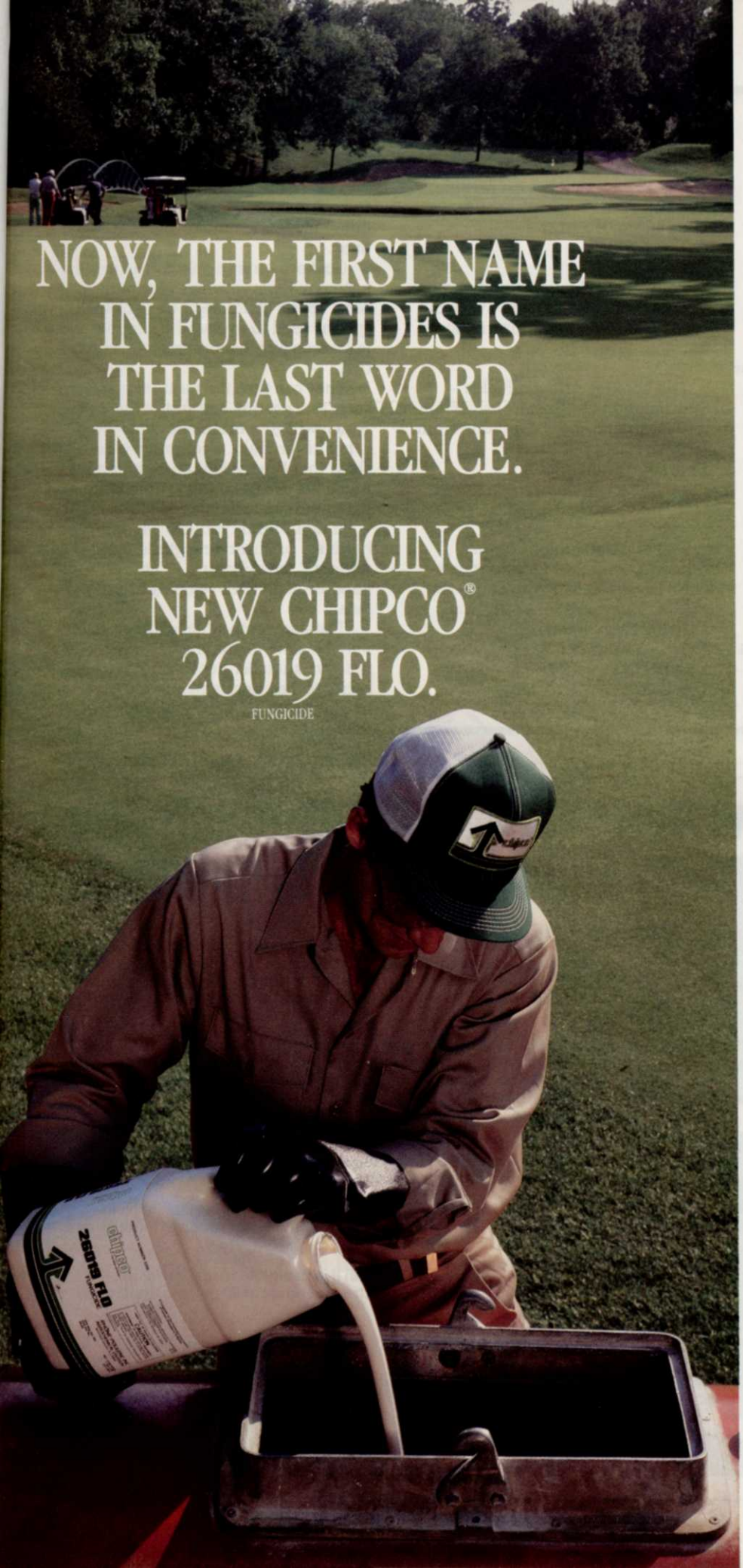

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Reprints of the September 1986, WEEDS TREES & TURF are available for $1 from Business Information Services (216) 826-2839.

The booklet *Athletic Fields—Specification Outline, Construction and Maintenance* is available from:
John C. Harper II, Ph.D.
Dept. of Agronomy
Penn State University
University Park, PA 16802

The booklet *Athletic Field Construction and Maintenance* by D.H. Taylor, G.R. Blake and D.B. White are available for $1 from:
Distribution Center
Extension Service
Coffey Hall
University of Minnesota
St. Paul, MN 55108

PRACTICE *from page 26*

The machine consists of two steel rollers, one foot in diameter with cleats welded to the rollers and connected by bike chains. The rollers move at different speeds.

The traffic simulator hooks onto a Kubota tractor. It is run over plots at different rates to imitate different conditions.

Cockerham and his colleagues are testing a Bermudagrass plot built as a sand sports field; various cool-season species used to overseed Bermuda; and tall fescue which represents golf fairway turf.

They can then test cultural practices, such as irrigating and fertilizing, to tell which will give an athletic field manager a healthier field. Preliminary results show that *Poa trivialis* on common Bermuda wears out rapidly, while Caliente perennial ryegrass holds up to wear best.

"I don't think you can say whether hardness or shear strength is more important," says Rogers. "They both go hand-in-hand in developing a good surface.

The answers to athletic turf problems may be slow in coming, but new technology, such as accelerometers and oscilloscopes, pentrameters and the traffic simulator, will provide safer turf in the future. **LM**

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THREE STRIKES YOU'RE OUT!

A LANDSCAPE MANAGEMENT survey paints a bleak picture for athletic field managers. But some innovative managers are changing the scene.

by Heide Aungst, managing editor

Lack of community support, low budgets and over-scheduling fields are three stikes against even the best athletic field managers.

"When a field goes bad we receive negatives, but no support," says Bill Dunn, parks and recreation director in Medina, Ohio. "We're expected to have the fields in good shape."

"They just want an area to conduct their events," echoes Bob Marchesano, landscape grounds administrator at California State University in Long Beach.

Most of the field managers in a LANDSCAPE MANAGEMENT survey complained about minimal community support. But one had a different story to tell.

"It's excellent," says Harry Gross, parks director in St. Petersburg, Fla. "The leagues assist in renovations."

Gross is responsible for six acres at a softball complex, seven acres at a baseball complex and 21 acres of soccer fields. They are used about 9,300 hours year-round. "There is no off-season in Florida," Gross says.

Reviving renovations

Every five years, Gross and his crew of five for athletic fields (18 overall) completely renovate the Bermudagrass/sand fields. The renovation includes removing the existing turf, regrading the area and sodding or sprigging. Cost is about $12,500 to sod; $7,000 to sprig.

Some respondents never renovated fields. Others renovate only when problems arise. Still others have regular renovation programs.

One respondent, Rod Perry, landscape supervisor at a community college in Marysville, Calif., renovates baseball fields every two years. He spends about $5,000 to regrade, topdress, reseed and upgrade the drainage systems.

Every five years Perry renovates football fields for $2,500; softball every two years for $1,000; and track every five years for $1,500.

He says his fields are used up to seven days a week, 10 months out of the year. His crew of three spends about 20 hours a week on the fields.

Henry Indyk, Ph.D., of Rutgers University has compiled some of the first statistics on field renovation (see table). A complete field excavation and replacement costs between $167,000 and $223,000. Indyk worked with consultants who reconstructed high school fields in New Jersey to get his figures.

Most field managers spend well below $167,000 for field renovations, when they renovate at all. Indyk says he doesn't have figures for field maintenance.

Maintenance budgets varied greatly among survey respondents. School budgets often included the surrounding landscape, while park budgets included everything from public cemeteries to roadsides. Respondents said it was difficult to break out figures for chemicals and equipment used solely on athletic fields. But the average annual budget among respondents—including labor, equipment and chemicals—was $63,991.

Budgets seemed to correlate with community support. When support was low, so was the maintenance budget.

Injuries

Support from coaches and athletic staffs got a mixed review from respondents. Tom Rudberg, grounds supervisor at a college in St. Paul, Minn., says he feels coaches and athletic directors need information to understand the problems and procedures in maintaining and renovating fields.

"I now have the coaches and athletic director justify and budget for major work on athletic areas," Rudberg says. "If they don't like the condition of a field, then they are responsible to correct the problem. I am used as a consultant and estimator. If a project is approved, then I oversee it. If it is not approved, then it is not my problem, but the athletic director's. This makes the athletic department realize the total actual cost of their fields."

Doug Jacobs, superintendent of parks in Sterling, Ill. says his coaches point out areas which may cause injuries to players.

Most respondents agreed that ankle sprains and knee injuries are the most common natural field-related injury.