Editor: Al Bathum

Western Views

May-June, 2000

Official Publication of the West Michigan Golf Course Superintendents Association

President's Message

The summer is half over and the weather seems as though it may be a bit kinder than the two previous have been. I hope you have taken some time to enjoy life with your family and friends. There's still more summer to go and sometimes August can be a brutal month on turf and the people that tend it.

Saturday, August 5, is when the West Michigan Superintendents will be hosting the Grand Rapids Area Big Brothers and Sisters at a White Caps game. I believe there may be some left-over tickets. If you care to attend, please give Paul Richter a call.

Monday, September 19, is the date for our annual Golf Day. This year it will be held at Egypt Valley. Be sure to attend and support turfgrass research in Michigan.

That's it for now. Enjoy the remainder of the summer!

Sincerely,
Al Bathum, President

Pilgrims Run and Quail Ridge Meetings Held

In June, we were the guests of the great staff at Pilgrims Run Golf Club. The weather turned out fine and the golf course was in great shape. We appreciate Ken Hunt and his staff, plus the clubhouse staff, hosting this meeting.

At the meeting, we announced the winner of our essay award. Rick Hakken's daughter, Elizabeth, wrote a nice article about her father and how golf and his career helped influence her values about life.

In July, we held our Chapter Championship at Quail Ridge in Cascade. Tim Topolinski and the staff did a great job prepping the golf course, and the meeting was a success.

I would like to thank the golf course owners and the people that helped make these two meetings successful. We appreciate the hospitality.

2000 Monthly Meetings and Locations

Sept. 18	Egypt Valley Country Club Golf Day
October 9	Muskegon Country Club Annual Meeting and Elections

Editor's Note: *Please write me if you have any corrections or if you are interested in doing an article for us at:*

Western Views
8121 Cowan Lake Drive
Rockford, Michigan 49341

Welcome... New Members

Please welcome these new members to our organization:

Jay Danek, Assistant Golf Course Superintendent
Travis Pointe C.C.

Mike Kuhn, Designer/Consultant
C.J. Colein & Associates

Paul Sheaffer, Golf Course Superintendent
St. Ives Golf Club

The Winning Essay

by Elizabeth Hakken

For as long as I can remember, my father has been a golfer; if not always on the course, always at heart. I grew up driving golf carts, taking golf lessons, and weeding sand traps. As a high school student I was dragged out to the course way too early in the morning, to get cups changed or fill the water coolers. To be honest, I didn't always love the golf course and Dad's job. I never understood my father's undying love for the sport, on TV, at six-o'clock in the morning or ten-o'clock in the evening. It wasn't until I began my college search that I began to understand my father's devotion to the sport and his career as a Golf Course Superintendent. As essay deadlines approached and tuition payments became immanent, I watched my father leave every morning for a career he loved and that offered him the satisfaction and affirmation he needed to maintain a happy, healthy lifestyle. By watching my father, I learned that doing what you love is the most important career de-

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Effects of Friction on a Golf Green

by Dan Hanson

Introduction

Most people who enjoy golfing realize that the old saying "Drive for show, putt for doe" has a lot of truth to it. Most strokes are made and lost on the putting green. When putting, a lot of factors need to be considered, with the speed of the green being an essential factor. Many factors affect the speed of the green—the slope of the green, moisture on the green, the hardness of the green, and the length of the grass, to name a few.

The United States Golf Association (USGA) has a standardized method for rating the speed of a green. They use a device called a Stimpmeter, which sends the ball rolling at a constant speed. The distance the ball rolls on a level surface is called the Stimpmeter reading for the green.

However, not all greens are level. In fact, on some courses every green is sloped to the effect that no accurate readings can be taken for any hole. However, using physics, a formula can be developed for finding the 'true' Stimpmeter reading of an unlevel green.

Another problem with a Stimpmeter reading is that it is only a reading for a certain set of conditions. A reading taken on a dry day when the greens had just been mowed will be very different than a reading taken on the same green on a wet day when the greens had not yet been mowed. And, of course, all greens are not the same on a golf course. The green on hole #1 could be slower than the green on hole #2, for example.

This article, which loosely follows "Green Speed Physics" by Arthur P. Weber (USGA Green Section Record, March/April 1997), will investigate the effects of slope and wetness on a golf ball, show differences in greens on the same golf course, and derive a formula that can be used to find the 'true' Stimpmeter reading on a sloped green.

Theory

In the article "Green Speed Physics," Arthur P. Weber models the situation using conservation of energy. However, he incorrectly asserts that energy can be broken down into components; energy is a scalar. Weber also fails to take into account the rolling energy of the golf ball, modeling the situation as if the ball were not rolling on the green, but sliding.

Conservation of energy can be used to model the situation, if treated as a scalar. The ball will have an initial potential energy caused by the raising of the Stimpmeter. As the ball rolls down the Stimpmeter, potential energy (P.E.) will be converted to kinetic energy. The total energy of the golf ball is the sum of these energies.

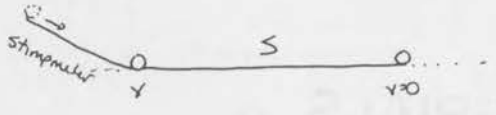
$$\text{Kinetic energy (translational)} = (\text{K.E.}_t) = \frac{1}{2}mv^2$$

$$\text{Kinetic Energy (rolling)} = (\text{K.E.}_r) = \frac{1}{5}mv^2$$

$$\text{Kinetic Energy (total)} = \text{K.E.}_r + \text{K.E.}_t = \frac{7}{10}mv^2$$

$$\text{E(total)} = \text{K.E.} + \text{P.E.} = \frac{7}{10}mv^2 + \text{P.E.}$$

For a level surface, the potential energy when the ball is on the ground will be 0.



$$\text{Potential Energy} = 0$$

$$\text{E(total)} = \frac{7}{10}mv^2 + 0 = \frac{7}{10}mv^2$$

Winning Essay, *continued*

cision a person can make. My father routinely puts in more hours than my friends' parents do. He is constantly obsessed with grass and rain. Yet, he is more physically fit and mentally content than most of my friends' parents. In choosing my own career, I have modeled myself after my father. I've decided to pursue what I love with the same devotion. I am content in the knowledge that as long as I am happy, I am successful.

As a child, my perception of golf was golf cart rides. I didn't understand why we had to get out of the cart and swing at the ball. It seemed a disruption in an otherwise quite nice ride around the course. With the advent of golfing lessons, I learned the precision and skill necessary to be a good golfer. Sadly, I inherited my mother's genes and do not have my father's golfing skills. Yet, I still enjoy a day at the golf course. I enjoy the calm beauty of the carefully landscaped course and the long relaxing walk. I have also found that most golfers tend to be sociable people who enjoy a nice conversation. I also still enjoy the cart rides. In my second year of college, I discovered, to my amazement, that I enjoyed watching golf on television. I was usually the only one in my dorm that could explain what was happening. My father's years of devotion to the televised sport had rubbed off after all. The older I become, the richer and more nuanced my perceptions of the sport have become. I now understand golf to be a sport of agility and skill as well as a time for careful meditation and reflection.

My perceptions of my father's own career in golf course management has also changed. As a child, I knew my father as a golfer and not as professional. I would watch him play and admire his skill. I clearly remember his time in turf school. I remember the flashcards of tree names and taking walks to identify types of grasses and molds. I remember the weeks when I wouldn't see Dad in the summer and the weeks when he wouldn't go away in the winter. (My father always seems lost in the winter. No doubt, he is dreaming about spring.) Working with my father on the course allowed me to witness his immense knowledge of the needs of the golf course. I have watched my father practice his trade with great skill and I respect him very much for that. As I pursue a Masters in Divinity to become ordained in the Presbyterian Church, I hope that I can bring that excellence to my own work. Much like golf, ministry doesn't make you rich. Instead, it provides a rewarding and fulfilling career doing what I love and find important. I am proud to say that I will be pursuing this career at either Harvard or Yale Divinity schools next year. I attribute my own academic successes to both my mother and father and the roles that they have played in shaping my own personal standards of excellence and providing me with fantastic examples.

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Effects of Friction on a Golf Green, *continued*

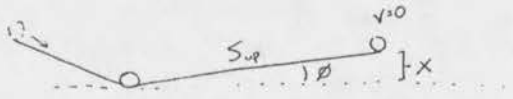
As the ball rolls, friction acts on the ball and brings it to a stop. The total work done by friction will equal the total energy of the ball. (It will be assumed that friction is the only force resisting the motion of the ball, and that this force is proportional to the normal weight of the ball.) The work done by friction is equal to the frictional force, $\mu mg \cos \phi$, multiplied by the distance traveled, S. For the level case, $\cos \phi = 1$.

$$\text{Work (friction)} = \text{E(total)} = \mu mgS = \frac{7}{10}mv^2$$

$$(1) \qquad S = \frac{\frac{7}{10}mv^2}{\mu mg}$$

where μ is a coefficient of some frictional force, which is directly proportional to the weight of the ball.

For a surface that is sloped uphill,



Potential energy = -mgx, where $x = S_{up} \sin \phi$

Again, the work done by friction to bring the ball to a stop will equal the total energy of the ball.

$$\text{E(total)} = \text{K.E.} + \text{P.E.} = \frac{7}{10}mv^2 + -mgS_{up}\sin\phi$$

$$\text{W(friction)} = \mu mg\cos\phi S_{up} = \frac{7}{10}mv^2 - mgS_{up}\sin\phi$$

$$(2) \qquad S_{up} = \frac{\frac{7}{10}mv^2}{mg(\mu\cos\phi + \sin\phi)}$$

For Downslope,

Potential energy = mgx, where $x = S_{down} \sin \phi$

$$\text{E(total)} = \frac{7}{10}mv^2 + mgS_{down}\sin\phi$$

Using the same process,

$$\text{W(friction)} = \mu mg\cos\phi S_{down} = \frac{7}{10}mv^2 + mgS_{down}\sin\phi$$

$$(3) \qquad S_{down} = \frac{\frac{7}{10}mv^2}{mg(\mu\cos\phi - \sin\phi)}$$

These formulas can be manipulated to find an expression for S, the true Stimpmeter reading of a green, in terms of S_{up} and S_{down}:

$$S_{up} \times S_{down} = \frac{(\frac{7}{10}mv^2)^2}{(mg)^2(\mu\cos\phi - \sin\phi)(\mu\cos\phi + \sin\phi)}$$

$$S_{up} + S_{down} = \frac{\frac{7}{10}mv^2(\mu + \sin\phi + \mu - \sin\phi)}{mg(\mu\cos\phi - \sin\phi)(\mu + \sin\phi)} = \frac{\frac{7}{10}mv^2(2\mu)}{mg(\mu\cos\phi - \sin\phi)(\mu + \sin\phi)}$$

$$\frac{S_{up} \times S_{down}}{S_{up} + S_{down}} = \frac{\frac{7}{10}mv^2}{2\mu mg\cos\phi} = \frac{1}{2\cos\phi}S$$

$$S = \frac{2 \times S_{up} \times S_{down}}{S_{up} + S_{down}}(\cos\phi)$$

For all greens, the $\cos \phi$ can be ignored, because the cosine of a small angle is approximately 1. If a green is severely sloped, say to the extent of 10 degrees, a golf ball will not stop rolling until it is either off of the green, or the slope levels out. Obviously, if the ball does not stop rolling, a Stimpmeter reading cannot be taken. So the following approximation will be accurate within 3" for all readings:

$$(4) \qquad S \cong \frac{2 \times S_{up} \times S_{down}}{S_{up} + S_{down}}$$

In general, downslope will have a more pronounced effect on the ball than upslope will. Figure 1 shows calculated Stimpmeter distances using formulas (1), (2) and (3) for μ = 0.100. The velocity of the ball at the foot of the Stimpmeter was approximated by conservation of energy (the ball will lose some velocity when hitting the ground).

$$E = K.E. + R.E. = mgh + \frac{7}{10}mv^2$$

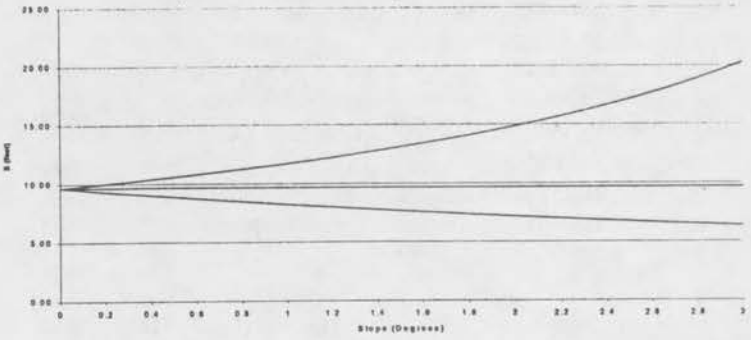
$$E(top) = mgh + 0 = E(foot) = 0 + \frac{7}{10}mv^2$$

$$\frac{7}{10}mv^2 = mgh$$

$$v = \sqrt{\frac{10gh}{7}}$$

where $h = L\sin\theta$

Figure 1: Effects of Slope on a Golf Ball



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Effects of Friction on a Golf Green, *continued*

Figure 1 shows how downhill slopes have a greater affect than uphill slopes. A ball going down a 3° slope travels about 10.6 feet farther than it would if the slope were level. A ball going up a 3° slope will travel only 3.3 feet shorter than it would if the slope were level.

Methods & Materials

A Stimpmeter is simply a plastic half-tube with a notch cut out of it 30" from the end. The tube was laid flat on the ground, and a golf ball was placed in the notch. A tee was placed alongside the end of the tube, marking the spot where the ball first touched the ground. The back end of the tube was slowly raised until the golf ball began rolling down the tube. The tube was then held steady until the ball hit the ground rolling. The ball will always begin rolling when the Stimpmeter is at a certain angle with the earth (20°), and therefore roll with the same initial speed. The position where the ball came to rest was marked.

The process was repeated three times, and the average finishing position of the three balls was marked with a tee. If the three balls were not within 8 inches of each other, the readings were thrown out and the process was repeated. The distance from the foot of the Stimpmeter (marked by the tee) to the averaging finishing was measured and recorded. This distance is the Stimpmeter reading.

To get a level Stimpmeter reading, another set of measurements were taken in the opposite direction, as directed by the USGA. If the two average readings were within 18" of each other, the surface was deemed level. The 'true' Stimpmeter reading is the average of these two readings.

When a sloped area was measured, the angle of the slope was recorded using a digital level. It was critical (and difficult) to find an area with a constant slope (i.e. the slope was the same at the foot of the Stimpmeter and where the ball stopped).

In order to compare the theory of formula (4) with experimental data, the readings had to be taken on a green that had both a level area and a constantly sloped area. Greens #10 and #16 at The Meadows met these requirements.

Results

The average distance the ball rolled for different slopes (uphill, downhill, level), different green conditions (wet, dry, mowed, unmowed) and different greens (#10, #16) is tabulated below.

Trial	Date	Hole	Green Condition	Direction	Avg. Distance (feet)	S*
1	10/27/99	16	Mowed	To	9.23	
	10/27/99	16	Mowed	From	9.19	**9.21**
2	10/27/99	16	Mowed	Uphill (.6)	7.55	
	10/27/99	16	Mowed	Downhill (.6)	12.47	***9.41**
3	11/19/99	16	Unmowed, wet	To	7.11	
	11/19/99	16	Unmowed, wet	From	7.79	**7.45**
4	11/30/99	16	Unmowed	To	7.00	
	11/30/99	16	Unmowed	From	8.28	**7.64**
5	11/30/99	10	Unmowed	To	6.01	
	11/30/99	10	Unmowed	From	6.61	**6.31**
6	11/30/99	10	Unmowed	Uphill (1.0)	5.22	
	11/30/99	10	Unmowed	Downhill (1.0)	9.03	***6.62**

**Calculated using (4)*

Discussion

Formula (4) provides an effective method to calculate the Stimpmeter reading of a green where no sufficiently level spot exists. Trial 1, taken on a level surface, gives a Stimpmeter reading of 9.21 feet. Trial 2, taken on a sloped area of the same green, gave an uphill Stimpmeter reading of 7.55 feet and a downhill Stimpmeter reading of 12.47 feet. Inserting these values into formula (4) gives a calculated level Stimpmeter reading of 9.41 feet. This deviated by only 0.20 feet. So, the calculated and measured Stimpmeter readings were within 3 inches of each other. For Trials 5 and 6, they were within 4 inches of each other.

The length of the grass on the green had a large impact on the speed of the green. Trail 1 was taken a few hours after the greens had been mowed. Trial 4 was taken on the same green, except this time the green had not been mowed for over a week. The unmowed green produced a reading of 9.21 feet, while the unmowed green produced a reading of 7.64 feet, or 83% of the mowed reading. So long grass slows the ball down.

Readings varied from green to green. Trials 4 and 5 were taken at the same time, but on different greens. The Stimpmeter reading on hole #16 was measured as 7.64 feet, compared with 6.31 feet on hole #10, a variation of 1.33 feet or 19%. But since these readings were taken several weeks after the greens had been mowed, it is possible that the grass on hole #10 had grown more than that on hole #16. So while green speed may vary from green to green, it is unlikely that recently mowed greens will vary as much as these two greens did.

Water soaked into the green, where no puddles formed, did not appear to have a large impact, as evidenced by the fact that Trials 3 and 4 varied by less than 3 inches. ("Standing water" would have a large impact on green speed.) However, since these trials could not be taken at the same time, the grass length could have varied. Since the dry reading (Trial 4) was taken 11 days after the wet reading (Trial 3), and the greens had not been mowed in that span, the readings may be slightly closer than what they would have been had the grass length been constant. However, the greens had not been mowed or watered for weeks before Trial 3 due to the cold weather. So, it is possible to assume that the grass did not grow a great deal between Trials 3 and 4. But, more measurements are needed to conclusively say that water has little affect on green speed.

Acknowledgments

Special thanks to Kathy Anataya, Green Superintendent at The Meadows Golf Course for use of equipment and golf course.

References

Green Speed Physics. USGA Green Section Record, March/April 1997.

The MSU Turf Team and the Michigan Turfgrass Foundation are pleased to announce

Summer Field Day 2000

Wednesday, August 23

at the Hancock Turfgrass Research Center on the campus of Michigan State University

Featuring:

Morning tours of the research trials involving golf turf, athletic field/ sports turf and commercial turf management. Turfgrass suppliers from throughout the industry will display the latest equipment and supplies during the vendor show. After lunch, the afternoon will conclude with a series of educational classes along with a special athletic field tour.

Plan to bring your whole staff and pass the word to your colleagues!

Look for registration brochures to arrive soon!

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Thank You for Your Support

I wanted to take a minute to thank the Board of Directors, voting delegate and all the members of the Western Michigan Golf Course Superintendents Association for your support of me during the elections at this past national GCSAA conference and annual meeting. It means a great deal to me and I will try and represent you well.

There are many changes being proposed with regards to our future and the future of GCSAA. You need to review these and express your opinion to the chapter delegate by September 7. More information will be coming to you in August.

It looks like I will be running this year for Secretary/Treasurer and I look forward to your continued support. Thank you and have a great 2000 season.

Sincerely,
Jon D. Maddern, CGCS
Elk Ridge Golf Club

Classifieds

FOR SALE: The following pieces of equipment were used to build one course and are in good condition. Anyone interested in seeing, or any questions, please contact Jon Maddern at Elk Ridge Golf Course, 517-785-2275 ext. 225. **1989 Glenmac Harley Rock Picker:** Model A Hi-Lift, asking $15,000. **1989 Glenmac Harley 12-ft. Rock Rake:** asking $10,000.

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