Evaluating Sports Field Quality

Turf quality for sports fields may be evaluated from several aspects. For example the appearance of the field, or visual quality, is of concern to those viewing the game, either from the stands, or on T.V. On the other hand the coach may evaluate the quality of the turf from a safety aspect; a must in these days of litigation for injury to the player. The player evaluates the turf from the standpoint of how the ball rolls, the hardness of the field, the smoothness of the surface, or the ability to make manouvers as he runs.

Peter Canway and his associates at the Sports Turf Institute at Bingley, U.K., believe the non-visual aspects can be collectively termed "playing quality." They divide "playing quality" into two characteristics: ball/surface properties and player/surface properties.

Ball/surface properties include ball rebound resilience and ball roll. Player/surface properties include traction and friction (grip) and hardness (stiffness and resilience). Surface evenness and turf density or cover are additional factors which should be considered.

If the properties for these two characteristics for playing quality are satisfied, safety and visual quality of the field should be optimal.

While sports managers, coaches and players agreed with Canway on the two characteristics, no definitive methodology has been developed and accepted by all concerned. Furthermore, no set of standards have been developed and accepted for the methods of field testing by the constituency of users of sports fields.

To resolve the methodology aspect, Canway conducted playing quality tests on 49 soccer fields in the U.K. Five types of fields, ranging from native soil fields without tile drainage to sand based rooting zones, were examined over a two year period. At least two visit were made to each field and measurements were made on six test areas on the fields. The test areas were the centre of each goalmouth (high wear), on the centre circle opposite each goalmouth (medium wear) and inside the side line at mid point on each half, or wing area (low wear).

Five measurements of quality were made at each test point. The selection of characteristics to measure were those which used simple, relatively inexpensive, robust and readily transportable equipment. The measurements were 1) football rebound resilience, 2) surface hardness, 3) traction, 4) distance rolled by the ball and 5) surface evenness. In addition percent ground cover was recorded for each test site. Over 600 measurements were made for each quality factor.

At each visit the players were asked to fill out a nine-point questionnaire concerning their opinion of those characteristics of the field that the measurements were designed to evaluate. The results of the questionnaire were correlated to the physical measurements made on the fields prior to play on the same day.

The results of their study are recorded in Table 1. The range of values indicate the diversity of playing conditions that can occur on natural turf playing surfaces. Zero values for rebound resilience and hardness were associated with very wet and muddy conditions.

Separating the data according to field position showed somewhat similar values for the goalmouth and centre field areas. Field edges or wings had lower rebound resilience and Clegg impact values, indicating a generally softer surface as a result of less wear and compaction. Traction values were also lower in these areas of less play, probably a result of more dense and taller grass. The player questionnaire indicated a preference of the players for the turf conditions on the wings.

The highest degree of player satisfaction with rebound resilience was obtained for values between 20 and 30% although values as high as 50% were acceptable (see Table 2).

The Clegg impact hardness measurements were related to player response by two criteria 1) falling/diving on the surface and 2) running on the surface. The greatest satisfaction with the surface for falling or diving was with a hardness ranging from 60 to 80 g. The 60 to 80 g range was also considered ideal for running.

Satisfactory traction was considered by the players to fall in the 20 to 40 N.m range. Poor traction was a concern were values less than 20 N.m were measured.

The players were willing to accept as satisfactory any value for ball roll that was between 5 and 10 metres. The wide range of values was considered to be due to players perception of ball roll on wet surfaces and the amount of spin imparted on the ball during a pass.

Ninety eight percent of the players considered the surface satisfactory where playing surface had an evenness reading between 2 and 4. A rating of 10 or more was considered excessively bumpy.

From this array of field measurements

Table 1: A summary of six measurements of turf quality on English soccer fields.

	All Test Points			Specific Field Positions		
Measurement	**Min.**	**Max.**	**Ave.**	**Goalmouth**	**Wings**	**Centre**
Rebound resistance (%)	0.0	8.8	32.5±0.5	34.5	29.1	33.9
Clegg impact hardness (g)	0.0	198.0	42.6±1.2	51.7	29.5	46.7
Traction (N.m)	9.0	51.0	29.2±0.3	27.1	33.0	27.4
Ball roll (m)	3.6	12.0	6.9±0.1	7.2	6.0	7.4
Surface evenness (mm)	1.9	14.2	5.6±0.1	5.8	5.6	5.3
Ground cover (%)	0.0	100.0	55.4±1.3	37.0	85.3	43.6

Table 2: The accepted standards for soccer field quality determined by the Sports Turf Research Institute, Bingley.

Measurement	Acceptable Levels
Rebound resilience (%)	
Low level of play	15 - 55
Medium level of play	20 - 50
High level of play	25 - 38
Surface hardness (g)	
Preferred	20 - 80
Acceptable	10 - 100
Traction (N.m)	
Preferred minimuum	25
Acceptable minimum	20
Ball roll (m)	
Preferred	3 - 12
Acceptable	2 - 14
Surface evenness (mm)	
Preferred maximum	8
Acceptable maximum	10

and their relationship to the actual player acceptance of the surface during a game within two hours of the time of measurement, Canaway and his associates have devised a table of acceptable standards for each of the tests on soccer fields (Table 2). The range of preferred values is sufficient to include the range of values found in the three field positions where the measurements were made. Likewise the range in values for the acceptable field is wide enough to include changes due to weather conditions.

Use of the standards developed in the U.K. could serve as a basis for evaluation of field conditions in Canada. No doubt some adjustments in the values may become necessary as more data is accumulated. The study also serves as a base from which to develop standards for other sports using turf, such as field hockey and rugby football. One would expect the standards to be similar.

Devlopment of procedures and standards for Canadian conditions would be a large step toward consistency between venues for games. As a result the outcome of the game would be a factor of the ability of the team, not the condition of the field.

A further use of the methodology and associated standards would be in the field renovation and new construction. Design systems and material selection for the rooting zone would have to produce a playing surface which met the accepted standards.

(Summarized from: Canway et al. 1990. ASTM STP Pub. 1073, pp.29-47, R.C. Schmidt et al., Editors.)

New GTI Director Appointed

The Advisory Board of the Guelph Turfgrass Institute (GTI) has announced the appointment of Rob Witherspoon as Director of the Guelph Turfgrass Institute. He becomes the first full-time Director of the Institute.

After completing B.Sc. (Agr.) and M.Sc. degrees from the University of Guelph, he worked as an instructor in the turfgrass management program at Fairview College in Alberta. He returned to Guelph to manage the Independent Study Ontario Diploma in Horticulture program. Rob was appointed Assistant Director of Independent Study in 1989. Most recently, he was the Director of the Ontario Horticultural Human Resources Council. Rob will be working to enhance and expand GTI programming and services for the turfgrass and urban horticulture industry.

"GTI was developed as a result of the foresight of turfgrass professionals," says Witherspoon, "I plan to help fulfil their vision of a centre for excellence in turfgrass education, research and the promotion of turfgrass as an integral component of the landscape."

Alternative Procedures

Steve Cockerham, a turf researcher at the Univ. of California, Riverside has developed an alternative method for measuring football rebound resistance.

The Canway procedure (see article opposite) involved the dropping of the ball through a set vertical distance, with a visual recording of the height to which the ball bounced. An additional measurement was used for ball roll by recording the distance travelled by the ball after rolling down an incline.

Cockerham's procedure determines both parameters in one operation. The ball is rolled down an incline and the height of the bounce as the ball hits the turf surface is recorded by a "hop indicator." The "hop indicator" is a stand with a series of horizontal aluminum bars set on roller bearings positioned at two cm intervals along the height of the stand. The stand is placed one meter from the base of the ramp.

As the ball bounced at the base of the stand it deflects some of the bars; the lowest bar deflected was taken as the measure of the ball bounce. The distance the ball rolled from the base was recorded as the distance of ball roll.

While the distance rolled may be slightly less due to energy loss from to deflecting the bars, the Cockerham procedure has the advantage of dropping the ball on to the turf at an angle which is closer to the contact angle of a kicked ball with the turf.

[Adopted from SportsTurf, Vol. 11, 22-23, July, 1995.]