Benchmarking durability

What does measuring natural turf surfaces tell us?

Natural Grass Construction Upgrade Performance Quality Standard

ELEMENT	LIMITS	METHOD OF TEST
Sward Height mm	20-60 PS 20-75 SM	BS 7370 : P3 A3
Hardness in g	35-200	STRI method of test using a 0.5kg Clegg Impact Hammer from a drop height of 0.55 m
Water infiltration rate mm/hr	5	BS 7370 : P3 A8
Evenness – 2 meter straight edge	< 20mm	BS 7370 : P3 A4
Slope – Direction of Play Across Play	< 1.25% <2.5%	BS 7370 : P3 A5
Ground Cover %	>70 for SH 25-30 > 80 for SH 30-35	BS 7370 : P3 A6

TheFA.com - Performance Quality Standard
http://www.thefa.com/Grassroots/FacilityDevelopment/Guidance+Notes/Postings/2004/12/Pitches_PerformanceQualityStandard

IOG PQS

GUIDELINE

PERFORMANCE QUALITY STANDARD

Facility: SOCCER PITCH (Natural Turf)

Key: P = Part; D = Date; ALT = All the year; A = Appendix; AT = All the time; GS = Growing Season; WP = When Planted; WPP = When prepared for play; NGS = Non Growing Season; SSA = Spring, Summer, Autumn

When tested in accordance with the Methods of Test indicated in column 2 in the locations as indicated in column 3, the facility must meet the appropriate performance quality standards as indicated in column 4 under High, Standard or Basic which ever is appropriate.

1	2	3	4					
STRUCTURAL QUALITY	METHOD OF TEST	LOCATION	HIGH		STANDARD		BASIC	
			LIMITS	PERIOD	LIMITS	PERIOD	LIMITS	PERIOD
HERBAGE								
Length of herbage between	BS 7370 : P3 A3	Anywhere	25 to 40 20 to 40	GS NGS	25 to 50 20 to 60	GS NGS	30 to 60 20 to 70	GS NGS
Bare area % - No more than	BS 7370 : P3 A6	Anywhere	10	AT	15	AT	25	AT
Ground cover % No less than	BS 7370 : P3 A6	Anywhere	90	AT	85	AT	75	AT
Weeds % - No more than Broad leaf Narrow leaf	BS 7370 : P3 A6	Anywhere	NIL NIL	AT	2 5	AT	10 5	AT
Moss % - No more than	BS 7370 : P3 A6	Anywhere	NIL	AT	NIL	AT	2	AT
Algae/lichen % No more than	BS 7370 : P3 A6	Anywhere	NIL	AT	NIL	AT	NIL	AT
Poa annua % No more than	BS 7370 : P3 A6	Anywhere	10	AT	20	AT	30	AT
Undesirable grass species % No more than	BS 7370 : P3 A6	Anywhere	NIL	AT	5	AT	10	AT
Desirable grass species % No less than	BS 7370 : P3 A6	Anywhere	80	AT	70	AT	60	AT
PESTS AND DISEASES								
Pests % - No more than	BS 7370 : P3 A6	Anywhere	NIL	AT	NIL	AT	2	AT
Diseases % - No more than	BS 7370 : P3 A6	Anywhere	NIL	AT	2	AT	2	AT
Worms % - No more than	BS 7370 : P3 A6	Anywhere	1	AT	5	AT	10	AT
PROFILE								
Root depth mm No less than	BS 7370 : P3 A7	Anywhere	150	AT	100	AT	75	AT
(Growing medium) Root zone profile mm No less than	BS 7370 : P3 A7 and SFAL	Anywhere	200	AT	150	AT	100	AT
Thatch mm - No more than	BS 7370 : P3 A7	Anywhere	5	AT	10	AT	15	AT
Rootzone:- Silt and clay content %	PSD	Anywhere	6	AT	17	AT	25	AT
Infiltration rate mm per hour	BS 7370 : P3 A5	Anywhere	10 mm	AT	5 mm	AT	2 mm	AT
Evenness 3 metre straight edge mm or a 5 metre straight edge	BS 7370 : P3 A	Anywhere	15 mm 8 mm	AT	18 mm 10 mm	AT	25 mm 12 mm	AT

Note:- ***Poa annua*** is an undesirable grass. However, it has to be tolerated, therefore, limitations need to be stated.

GUIDELINE

PERFORMANCE QUALITY STANDARD

Facility: SOCCER PITCH (Natural Turf)

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1	2	3	4					
PRESENTATIONAL QUALITY	METHOD OF TEST	LOCATION	HIGH		STANDARD		BASIC	
			LIMITS	PERIOD	LIMITS	PERIOD	LIMITS	PERIOD
Debris %	NCC SFAL or visual	Anywhere	Nil	AT	Nil	AT	Nil	AT
Goal Posts	NCCSFAL A6 Method A Method B	Anywhere	Posts maintained upright at right angles to the gradient of the surface of the pitch. Crossbars at right angles to the uprights. All measurements to be in accordance with the rules of the game + or - 10mm.					
Appearance %	Visual	Anywhere	100% Uniform Texture	SSA	90% Uniform Texture	SSA	70% Uniform Texture	SSA
Colour %	Visual	Anywhere	100% Uniform	SSA	90% Uniform	SSA	70% Uniform	SSA

1	2	3	4					
PLAYING QUALITY	METHOD OF TEST	LOCATION	HIGH		STANDARD		BASIC	
			LIMITS	PERIOD	LIMITS	PERIOD	LIMITS	PERIOD
Ball roll distance metres between	BS 7044	Anywhere	7 to 10	WPP	4 to 12	WPP	2 to 16	WPP
Vertical ball bounce % between	BS 7044	Anywhere	32 to 42	WPP	25 to 45	WPP	20 to 55	WPP
Traction Nm No less than	BS 7044	Anywhere	40 Nm	WPP	30 Nm	WPP	20 Nm	WPP
Hardness gravities between	BS 7044	Anywhere	65 to 120	WPP	55 to 140	WPP	35 to 200	WPP

Key questions

- Which is most important:
  - Controlling spatial variability?
  - Controlling temporal variability?
- When should we bench mark?
  - Are we benchmarking for ‘best case’?
  - What about ‘worst case’?
- To what extent can we manage variation?
  - Need to understand the causes of variation

What is causing variation?

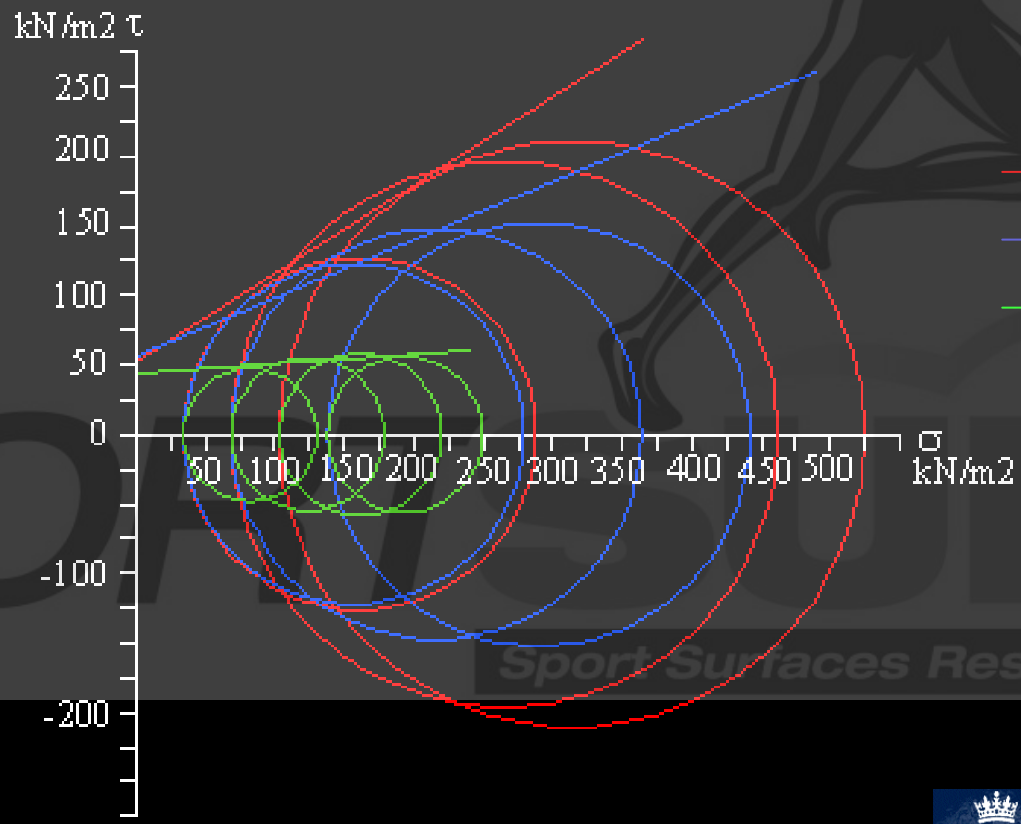
Data from: Gale, L W (2003). A preliminary investigation into the relationship between EMI and soil chemical and Physical properties of a low maintenance football pitch. MSc Thesis, Cranfield University

Cranfield UNIVERSITY

The effect of moisture content (~ rainfall)

Quick undrained

Ongar loam cricket soil
S:28% Z:43% C:29%



ECB

EPSRC
Engineering and Physical Sciences Research Council

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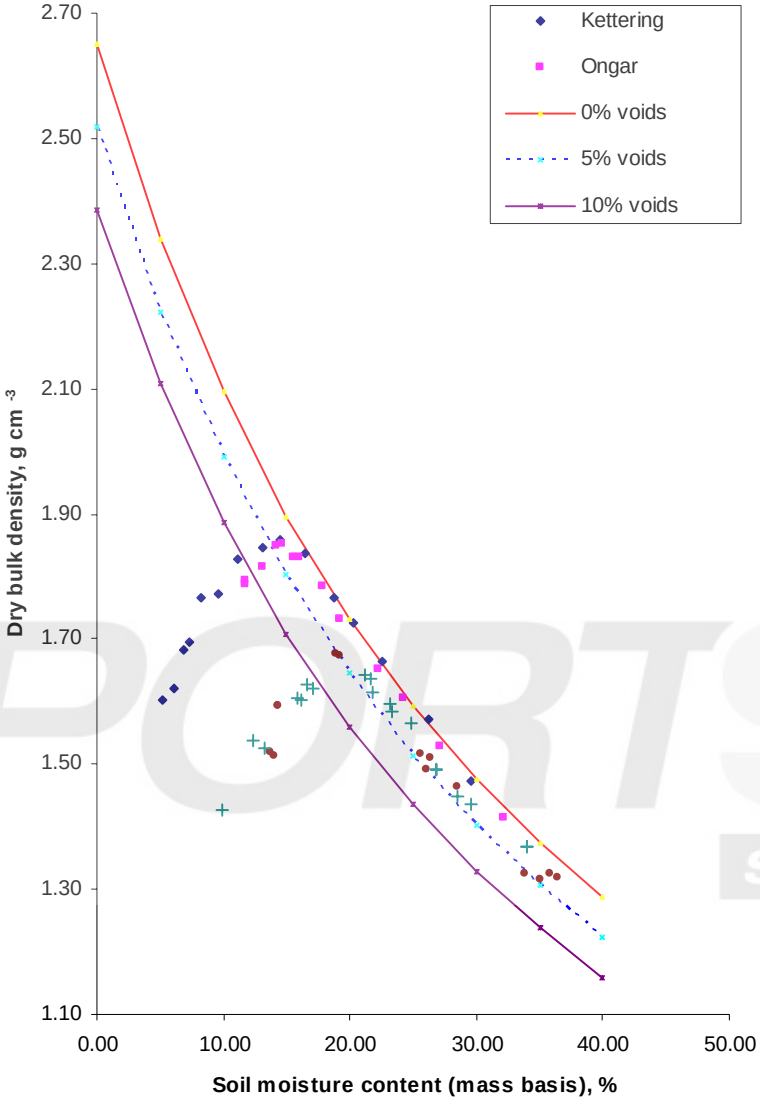
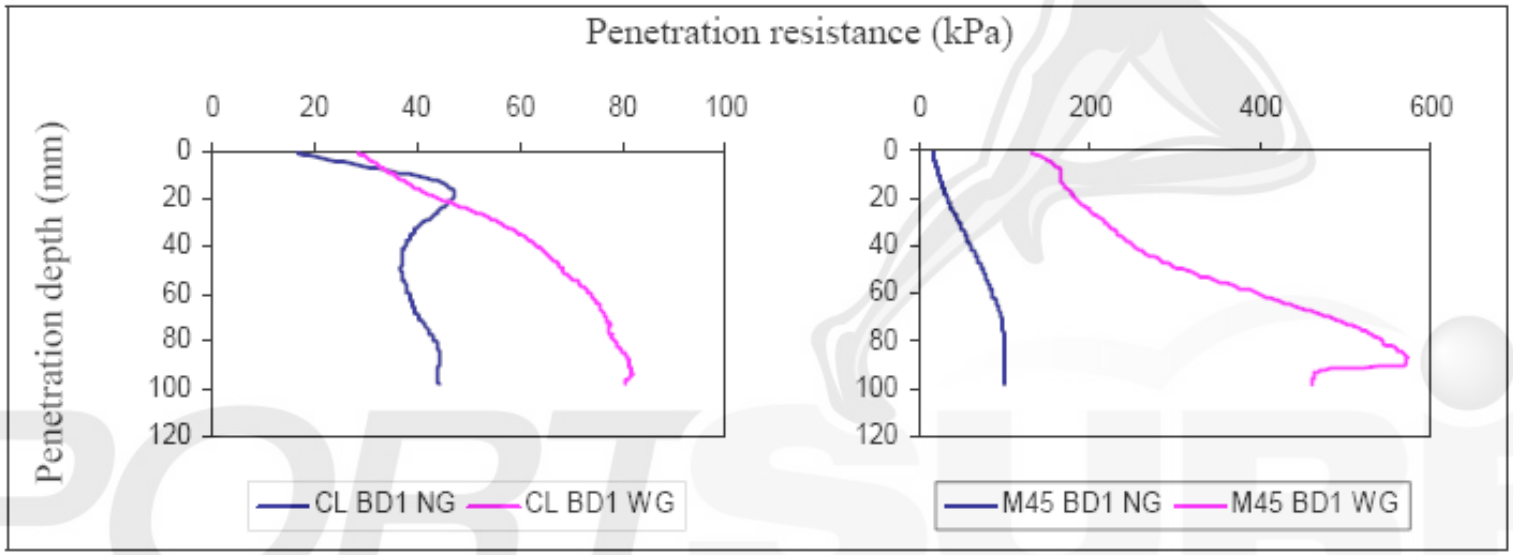
Compaction



ECB

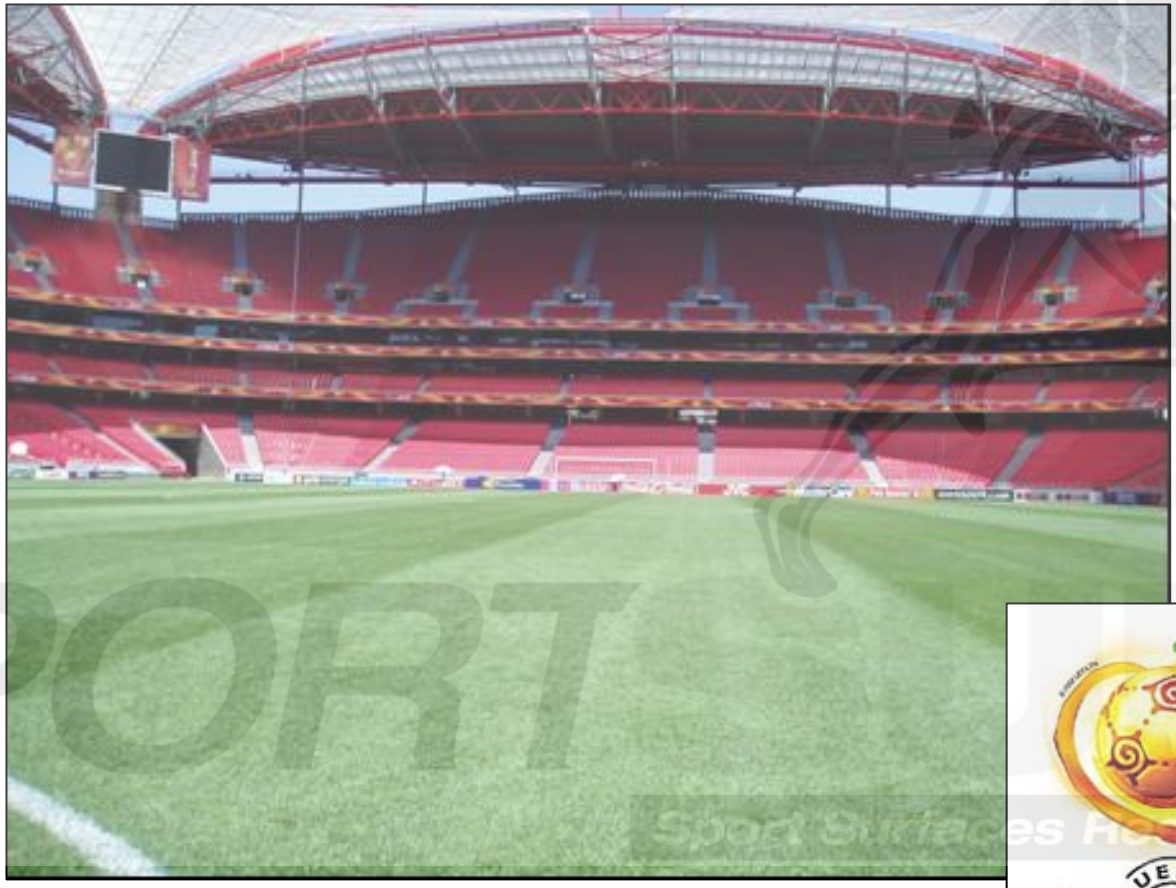
EPSRC
Engineering and Physical Sciences Research Council

The effect of roots



Data from: Jennings-Temple, M (2005). Linking soil moisture status of winter sports pitches to measures of playing quality. EngD Thesis, Cranfield University

The effect of usage

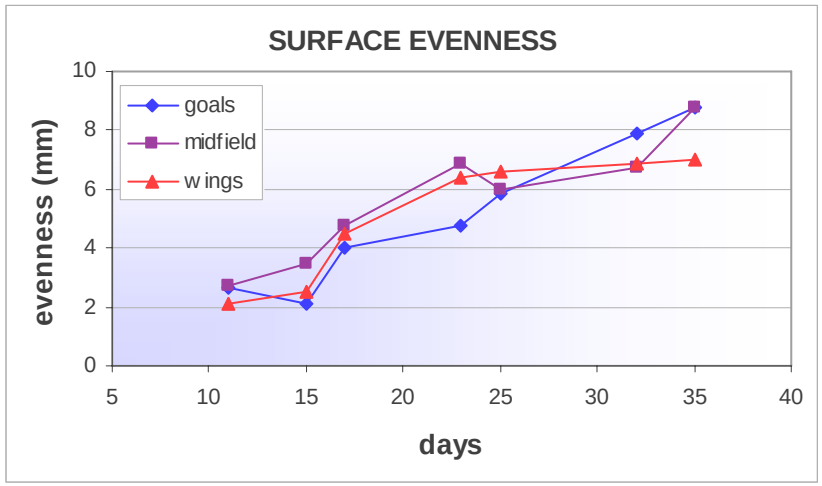


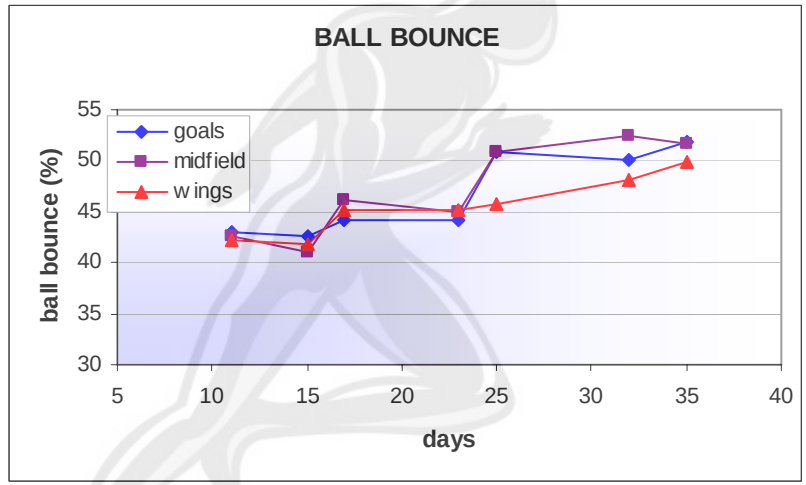
The effect of usage

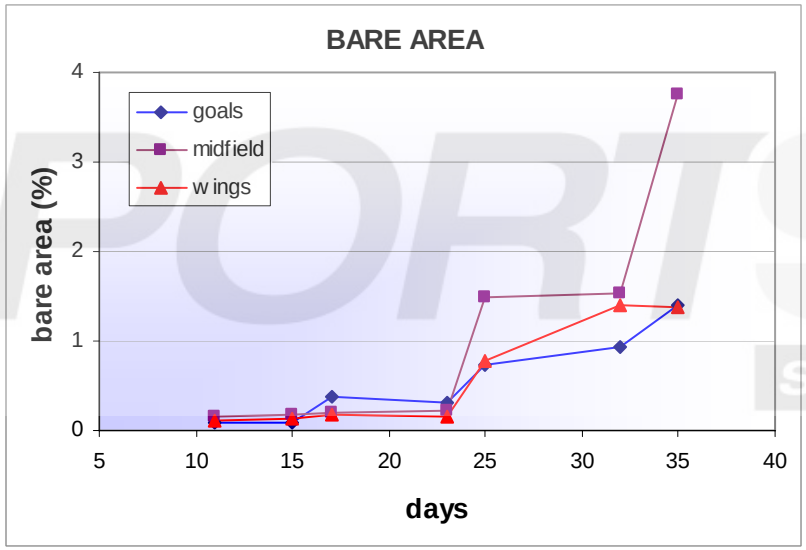
PLAYING QUALITY	High	Standard	Basic	Before	After
Ball bounce (between %)	25-45	25-50	15-55	43	51
Ball roll (between m)	5 to 12	3 to 12	2 to 14	5.32	5.71
Hardness (between GR)	65-120	55-140	35-200	119.44	-
Infiltration rate (no less than mm/hr)	10	8	4	618.8	543.6
Evenness (no more than mm)	12	18	25	2.5	8.2

Data from: Coriani, C (2004). Changes in pitch quality and playability during the European Championships 2004 in Benfica Stadium. MSc Thesis, Cranfield University

Estadio da Luz, Lisbon – Euro2004







Data from: Coriani, C (2004). Changes in pitch quality and playability during the European Championships 2004 in Benfica Stadium. MSc Thesis, Cranfield University

Lights? Rootzones? Turfgrass Science?