Test methods for assessing the performance of sports surfaces

By

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Why do we need standards & test methods?

- To control the way the game is played
- To provide a safe playing environment
- To ensure adequate durability
- To provide reassurance to players
- To allow consumers to compare surfaces objectively
- To aid product development
Who develops standards?

- National sports governing bodies
- International sports governing bodies
- National / International standards bodies (ASTM, BSI, DIN, CEN etc.,)
- Trade associations
<table>
<thead>
<tr>
<th>Year</th>
<th>Body Acronym</th>
<th>Sport</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>FIH</td>
<td>Field hockey</td>
</tr>
<tr>
<td>1990</td>
<td>IAAF</td>
<td>track &amp; field</td>
</tr>
<tr>
<td>1995</td>
<td>WBB</td>
<td>bowls</td>
</tr>
<tr>
<td>1997</td>
<td>ITF</td>
<td>tennis</td>
</tr>
<tr>
<td>2001/06</td>
<td>FIFA</td>
<td>football</td>
</tr>
<tr>
<td>2003</td>
<td>IRB</td>
<td>rugby</td>
</tr>
</tbody>
</table>
## National standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 14904</td>
<td>Indoor surfaces for multi-sports use</td>
</tr>
<tr>
<td>EN 14877</td>
<td>Synthetic surfaces for outdoor sports areas</td>
</tr>
<tr>
<td>EN 15303-1</td>
<td>Synthetic turf surfaces intended primarily for outdoor use</td>
</tr>
</tbody>
</table>
Criteria for tests

- Fully described
- Reproducible
- Repeatable
- Ideally suitable for use in lab and site
- Commercially viable
<table>
<thead>
<tr>
<th>Ball - surface interaction</th>
<th>Player - surface interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Ball rebound</td>
<td>• Shock absorption</td>
</tr>
<tr>
<td>• Angle ball rebound</td>
<td>• Deformation</td>
</tr>
<tr>
<td>• Ball roll</td>
<td>• Head Injury Criterion</td>
</tr>
<tr>
<td>• Pace</td>
<td>• Gmax</td>
</tr>
<tr>
<td>• Spin</td>
<td>• Friction</td>
</tr>
<tr>
<td></td>
<td>• Traction</td>
</tr>
<tr>
<td></td>
<td>• Skin friction/abrasion</td>
</tr>
</tbody>
</table>
Durability

- Wear resistance
- Artificial weathering
- Simulated wear
- Environmental impact
- Joint strength
Ball rebound

- Ball dropped standard height
- Rebound measured
- Result expressed as absolute, % of drop height, % of bounce on concrete
Ball roll & velocity change
Ball / Surface Pace
Tennis Pace

\[ \text{SPR} = 100 (1 - \mu) \]
\[ \mu = V_{ix} - V_{fx} \]
\[ (1 + e) V_{iy} \]
Force Reduction / shock absorption

\[ FR = \left( 1 - \frac{F_{\text{max(testpiece)}}}{F_{\text{max(concrete)}}} \right) \cdot 100\% \]
Force Reduction

‘Flat foot’

Studded foot
Peak deceleration / Gmax
Vertical Deformation

\[ VD = \left( \frac{1500}{F_{\text{max}}} \right) \cdot d_{\text{max}} \]
Rotational Friction
DIN friction test
Slip resistance
Slip resistance
Stud slide - declaration
Sliding Distance
Skin abrasion
Durability
LABOSPORT
What is missing?

- Spin (cricket & tennis)
- Slide (tennis)
- Linear friction (football, hockey, rugby)
- Surface pace – football
- Energy restitution (all sports)