[redacted]

From: Hannah Riddle on behalf of Planning.Responses
Sent: 12 April 2022 11:06
To: Planning Scanning
Subject: FW: App Ref: BN/11/22/OUT - Land between Barnham, Eastergate and Westergate - Sport England Ref: PA/22/SE/AR/60924
Attachments: Sport Facility Calculator Report_Arun_11-04-2022-18-06.docx; Technical_guidance_for_pavilions_and_clubhouses.pdf; ECB_guidelines_for_construction_and_maintenance_of_pitches_and_outfields.pdf; natural-turf-for-sport.pdf

[redacted]

From: Jo Edwards [redacted]
Sent: 11 April 2022 18:27
To: Planning.Responses [redacted]
Cc: Claire Potts [redacted]
Subject: App Ref: BN/11/22/OUT - Land between Barnham, Eastergate and Westergate - Sport England Ref: PA/22/SE/AR/60924

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Dear Claire,

Thank you for consulting Sport England on the above application.

Sport England – Non Statutory Role and Policy

The Government, within their Planning Practice Guidance (Open Space, Sports and Recreation Facilities Section) advises Local Planning Authorities to consult Sport England on a wide range of applications. https://www.gov.uk/guidance/open-space-sports-and-recreation-facilities-public-rights-of-way-and-local-green-space#open-space-sports-and-recreation-facilities

This application falls within the scope of the above guidance as it relates to residential development of more than 300 dwellings and the provision of new playing pitches.

Sport England assesses this type of application in light of the National Planning Policy Framework (NPPF) and against its own planning objectives, which are Protect - To protect the right opportunities in the right places; Enhance - To enhance opportunities through better use of existing provision; Provide - To provide new opportunities to meet the needs of current and future generations. Further information on the objectives and Sport England's wider planning guidance can be found on its website: https://www.sportengland.org/how-we-can-help/facilities-and-planning/planning-for-sport

The occupiers of new development, especially residential, will generate demand for sporting provision. Existing provision within an area may not be able to accommodate this increased demand without exacerbating existing and/or predicted future deficiencies. Therefore, Sport England considers that new developments should contribute towards meeting the demand that they generate through the provision of on-site facilities and/or providing additional capacity off-site. The level and nature of any provision should be informed by a robust evidence base such as an up to date Sports Facilities Strategy, Playing Pitch Strategy or other relevant needs assessment.

The Proposal and Assessment against Sport England's Objectives and the NPPF

The current application relates to the northern portion of the Barnham, Eastergate and Westergate (BEW) strategic site allocation in the Arun Local Plan 2011-2031 adopted 2018. Policy H SP2c (SD5) identifies the allocation will provide at least 2,300 dwellings over the plan period and up to 3000 in total. The residential development is to be accompanied by a well -connected community hub that includes new retail, commercial and community facilities, a library and healthcare facilities. Two primary schools and nursery places are to be provided on site. The policy also requires that two new sports pitches are incorporated within the development with appropriate change facilities.

In accordance with policy H SP2, a Framework Masterplan to inform future planning applications within the strategic allocation was endorsed by the Council in November 2021. This increases the total number of dwellings to be provided across the whole allocation to up to 4,300. Recognising that the increase population generated will increase demand for supporting infrastructure, It identifies a location for a new community cricket pitch and pavilion to the north of the railway line within the proposed Lidsey Rife Linear Park and a sports hub to the south of the railway line comprising three sports pitches for multi-sport use year round, including an Artificial Grass Pitch (AGP) The Framework Masterplan says that the form of sports provision will be determined at the planning application stage and will respond to local need and guidance from officers.

In January 2020 the Council adopted its Sports and Open Spaces Developer Contributions Toolkit SPD, that for playing pitches and indoor sports provision (sports halls and swimming pools) uses Sports England's facility calculators to identify the necessary level of on site or off site provision required. It is recognised that the subsequent adoption of its Community Infrastructure Levy means that the Toolkit is not relevant to every development across the LA area now. However, as a strategic allocation it is understood that BEW allocation is zero rated for CIL and that infrastructure will be secured through a s.106 legal obligation.

Playing Pitches

It is assumed that the total quantum of playing pitches across the allocation area has been assessed by the Council during the consideration of the endorsed Framework Masterplan and is based on its Playing Pitch Toolkit SPD.

With regard to the cricket pitch and pavilion proposed in the current application, Sport England would recommend that any grant of outline planning permission is subject to conditions being attached to secure pitch quality, and future management and maintenance and community access to the facilities. Sport England's model conditions provide a basis for the drafting of those conditions https://www.sportengland.org/how-we-can-help/facilities-and-planning/planning-for-sport?section=planning_applications Alternatively, those requirements could be required as obligations within the s.106 legal agreement. The facilities should be constructed in accordance with the ECB's and Sport England's Guidance attached. It is also recommended that the applicant consults with the ECB and Sussex County Cricket to identify a possible anchor club for the facility.

Indoor Facilities

The estimated population that would be generated by 1250 dwellings in the current outline application area is 3359 as identified in the Environmental Statement. The Council's Toolkit SPD identifies that on site or off site provision towards sports hall and swimming pools will be sought based on Sport England's Sports Facilities Calculator (SFC). The SFC indicates that a population of in this local authority area will generate a demand for;

Sports Halls	
Demand adjusted by	0%
Courts	0.89

Sports Halls	
Halls	0.22
vpwpp	263
Cost	£606,466

Swimming Pools	
Demand adjusted by	0%
Square meters	34.47
Lanes	0.65
Pools	0.16
vpwpp	210
Cost	£670,810

The full SPC report is attached to this email for information. Therefore, Sport England recommends that a financial contribution, or on site provision equivalent to £1,277,276, is secured towards indoor facilities through the s.106 agreement.

Active Design

Sport England, in conjunction with Public Health England, has produced 'Active Design' (October 2015), a guide to planning new developments that create the right environment to help people get more active, more often in the interests of health and wellbeing. The guidance sets out ten key principles for ensuring new developments incorporate opportunities for people to take part in sport and physical activity. The Active Design principles are aimed at contributing towards the Government's desire for the planning system to promote healthy communities through good urban design. Sport England would commend the use of the guidance in the master planning process for new residential developments. The document can be downloaded via the following link:

https://www.sportengland.org/how-we-can-help/facilities-and-planning/design-and-cost-guidance/active-design

Although the application does not specifically reference Active Design, Sport England recognises that a number of the principles are incorporated within the illustrative masterplan including activity hubs, recreational pedestrian and cycle routes as well as direct routes to facilitate Active Travel and co-location of community facilities.

Conclusion

In light of the above, Sport England offers its **support** for this this application subject to the above recommendations in respect of playing fields and indoor sports facilities.

We would be grateful if you would advise us of the outcome of the application by forwarding a copy of the decision notice.

Yours sincerely,

Jo

Jo Edwards MRTPI
Planning Manager

Pronouns: she / her

[redacted]



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Pavilions and Clubhouses [TS5]

Version 1 2009

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The Hub, Regents Park by David Morley Architects © Lukasz Kowalski

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01. Introduction

This document is one of a series of technical guidance notes for cricket accommodation and pitches produced by the England and Wales Cricket Board (ECB). The aim of this guide is to provide practical advice for cricket club officials and designers when planning pavilions and clubhouses. It applies to new buildings and alterations to existing facilities.

Planning
The information in this document is relevant when the accommodation serves cricket exclusively or as part of a mixed-sport facility. It should be read in conjunction with Sport England guidance notes and, when part of a shared facility, the guidance notes of the relevant sports national governing bodies (NGBs). The main points to be addressed when planning pavilions and clubhouses are set out and there is a mixture of information that should be followed closely and advice where the solution could be more fluid.

What makes a good pavilion?
There are many aspects to a good pavilion but mainly it should serve the current and future needs of the club, players, officials and spectators of all ages, culture, ability and gender. It should also be attractive, high quality, efficient, economical to maintain and give value for money. Addressing issues such as design, site, orientation, composition, accommodation, size and arrangement of spaces, flexibility, sustainability, energy performance, materials, robustness, security and costs will make the best use of available money and guide the project towards a successful outcome.

Additional guidance
This document will be supplemented by a picture gallery on the ECB website (www.ecb.co.uk) illustrating different aspects of pavilions and clubhouses ranging from whole buildings in context to detailed elements within a building. The three dimensional illustrations that interpret the advice in this document and selected photos of built projects are intended to show buildings that have been well-designed to respond to local influences.

Who was involved in preparing this document

Bruce Cruse
ECB Funding and Facilities Manager
Who develops and administers grass roots designs and programmes within the ECB's remit and its capital expenditure.

David Morley Architects
Designers with experience of multipurpose sports halls, pavilions and centres of excellence for cricket.

Club Design Limited
Experienced in sports project co-ordination, clubhouse design and applications to funding bodies.

John Austen Associates Limited
Quantity surveyors and cost consultants with experience of cricket pavilions and other sports facilities.

Paul Bedford
Former League Chairman and ECB Head of Non-First Class Cricket
Experienced in managing sites and sports facilities.

Chris Wood
ECB Pitch Consultant

Dr Andrew Lewry
Building Research Establishment (BRE) Sustainable Energy Group

This document has also been circulated for comment to Sport England, the Football Association (FA) and the Rugby Football Union (RFU).

02. Planning the Project

This section provides guidance on planning and developing your project and summarises the design and building process.

Work stages

The Royal Institute of British Architects (RIBA) uses a plan of work to set out five main stages for building projects: preparation, design, pre-construction, construction and use. The main stages are sub-divided into smaller work stages A to L as summarised below. These are usually carried out in sequence.

Main Stage	Work Stage		Brief description
Preparation	**A**	Appraisal	Feasibility study and appraisal enables a client to decide whether to proceed. See appendix A.
	B	Design brief	Key requirements, constraints, procurement method and consultants are identified.
Design	**C**	Concept	
	D	Design development	Planning applications are typically (but not always) submitted at this stage.
	E	Technical design	
Pre-Construction	**F**	Production information	Detailed information for construction followed by the building control submission.
	G	Tender documentation	Preparation of information for issue to contractors to obtain tenders.
	H	Tender action	Evaluation of tenders, potential contractors and specialists.
Construction	**J**	Construction mobilisation	The contractor is appointed and needs time to prepare before starting on site.
	K	Construction to practical completion	
Use	**L**	Post practical completion	

Getting started
Carefully think about the aims of your project and ways to accommodate the current and future needs of the club, including how often the facilities will be used on a weekly and seasonal basis. Organise a project group and appoint a leader to act as the main point of contact for the club. The leader will be a key decision-maker so should have sufficient time to dedicate to the project.

Preparation – work stage A: appraisal
The first stage of a project is called appraisal. It is when a club's needs and objectives are identified along with the business case and any possible constraints on the development. Feasibility studies (see appendix A) should be prepared and the options assessed by the club to enable them to decide whether to proceed. Documenting some ideas and options with approximate costs can be done relatively inexpensively.

Assemble some useful information about your club, the existing facilities and the proposed project. For example:

- Business plan
- How the project will be funded and records of consultation with funding bodies and their feedback
- The site including address, details of the boundary and any rights of way
- Details of the freehold or leasehold, length of lease and security of tenure – in some cases this can take a while to obtain
- Information about the existing buildings or facilities, mains services and utilities, pitches and ground conditions, asbestos survey
- Access audit (a review of how the existing facilities can be approached, entered and used by everyone – all ages, genders, cultures and ability)
- Contact details for key club members
- Existing and future match fixtures and programme of use
- Sports development
- Other events or sports use – if the facilities are shared with other sports then refer to the appropriate guidance notes from the other sports governing bodies
- Outline schedule of accommodation
- Facilities for car parking and public transport links
- Records of early consultation with the local authority planning department, previous planning applications, review of planning guidance documents

As a point of interest, the majority of recent cricket pavilion projects have been the development of existing facilities via grant funding.

02.

Preparation – work stage B: design brief
The second stage of a project is the design brief and this is when the key requirements, constraints, procurement route (see section 3) and consultants are identified.

The range of professional consultants and skills required will depend on the project size and its complexity. These will become apparent during the preparation stage although the design team will probably include an architect, structural engineer, quantity surveyor, mechanical and electrical services engineer. Under the Construction (Design and Management) regulations 2007, a CDM coordinator must be appointed to advise the client (the club) on health and safety issues from the design stage onwards. Some projects might also need specialist input, for example accessibility, environment, ecology, landscape architects, heritage and planning consultants or highways and transport engineers. If club members don't have sufficient time to act as the main point of contact, consider using the services of a project manager to act on your behalf. See appendix B.

Design – work stages C, D and E
Once a project is underway and consultants are appointed, the lead consultant will guide you through the subsequent work stages. All work stages require client sign-off so allow time to review the drawings and reports prepared by the design team, carefully checking your requirements against the design. Early changes and requests are much easier to accommodate whereas late changes can have cost implications out of scale with the amendments.

The design stage is divided into three: C/ Concept, D/ Design Development and E/ Technical Design. Concept design is where outline proposals, specifications and cost plans are prepared and the procurement route (see section 3) is reviewed. The design is developed further in stage D and this is also when planning applications are usually submitted. Stage E is when the technical designs and specifications are developed sufficiently to coordinate all the different elements of the project.

Pre-construction – work stages F, G and H
The pre-construction stage is also divided into three: F/ Production Information, G/ Tender Documentation and H/ Tender Action. Production information is when detailed information for construction is prepared and submitted to building control for approval (see section 3). Tender documentation is the preparation and collation of sufficient information to enable tenders to be obtained. In this instance, a tender is an offer by a contractor to execute the work at a fixed price. Tender action is when potential contractors and specialists are identified and evaluated, then invited to prepare tenders. Once tenders are obtained and appraised, the design team will submit their recommendations to the client. Compiling the list of potential contractors will often start well in advance of the tender period.

Construction – work stages J and K
The construction stage is divided into two: J/ Mobilisation and K/ Construction. Mobilisation is when the contract is let, the contractor is appointed, construction information is issued to the contractor and the site is handed over by the client. The contractor will need time to prepare before starting on site, for example they will organise their construction team, place orders for materials and arrange sub-contracts. Construction is when the contract is administered and the building is built (or refurbished as applicable). The design team will issue further information to the contractor if required and also review information prepared by the contractor or any specialists (for example specialist kitchen equipment or bespoke furniture).

Use – work stage L
The final stage is using the new facilities. The completed building is handed over to the client and the contractor leaves site. Some contract administration takes place after practical completion including making final inspections after the defects liability period. The building users might require some assistance during the initial occupation period, for example training for maintaining the building services or setting alarms. Often the design team will want to review the building performance in use or take photographs.

Getting support
The ECB Funding and Facilities Unit should be your first point of call for advice (facilities@ecb.co.uk). Make contact with them during work stage A, show them your feasibility study and gauge their support. Consulting the ECB at the earliest opportunity allows their input to be more valuable. Funding and planning permission are two important hurdles in the preparation and design stages of a project. The ECB Regional Funding and Facilities Manager will assess the proposals for technical compliance, sports development and financial affordability.

02.

Successful clients
The Commission for Architecture and the Built Environment (CABE) publication Creating Excellent Buildings describes how to be a successful client:

"Each development project is unique, with special local conditions for site, use patterns and social context. However, all projects need well structured project management and can benefit from the ten key ways the client can help achieve design quality."

1. *Provide strong client leadership*
2. *Give enough time at the right time*
3. *Learn from your own and other successful projects*
4. *Develop and communicate a clear brief*
5. *Make a realistic financial commitment from the outset*
6. *Adopt integrated processes*
7. *Find the right people for the job*
8. *Respond and contribute to the context*
9. *Commit to sustainability*
10. *Sign off all key stages*

As noted before, all work stages require sign-off so allow time to review the drawings and reports prepared by the design team, carefully checking your requirements against the design.

Local community
Good communication with the local community is important. Potentially it could lessen objections to your planning application and help towards a smooth relationship with neighbours before, during and after construction. People can be sensitive to change so it's worth finding ways to keep neighbours informed. This could have surprising and beneficial results – one club arranged temporary contractor's access through adjacent land which made larger deliveries possible and shortened the construction period. Good links with the local community also provides the opportunity to make contact with new members.

03. Cost, Value and Time

Buildings have a value as well as a cost. An efficient and well-designed facility is an asset in addition to simply performing its function. Aim to get the best value by carefully balancing the desired quality of the finished building and the cost of designing, building and running it against the time taken to get from the first idea to the building being ready for use.

Since quality, time and cost are inextricably linked, avoid setting over-optimistic (or unrealistic) timescales as inevitably this will affect the project's cost or quality. It's better to spend time getting things right at the preparation and design stages as later changes to the brief will have more impact and could lead to expensive remodelling in the future.

In addition to the cost of engaging a contractor to build the pavilion, there are many other items that incur fees or affect costs. Some of these are listed below:

Phasing
It is possible to plan a small pavilion with scope for future expansion, or to carry out the work in several phases but this should be appraised in the preparation stage and feasibility studies.

Maintaining use of existing facilities
If you intend to maintain use of existing facilities while extensions or alterations are carried out, the cost of phasing the project and any temporary accommodation, screens or hoardings and other health and safety measures should be taken into consideration. Alternatively, if you move off-site during the works and the construction programme overlaps with the cricket season, you could consider either missing a season or consult the league regarding the possibility of sharing premises elsewhere.

Surveys
A topographic survey and measured survey of the existing facilities will be required in some cases. These could be carried out during the preparation stage if funds are available, or at an appropriate time in the design stage. Site levels can be used advantageously to enhance the design.

Site investigations
Abnormal ground conditions will affect the foundation design and costs. The structural engineer will advise if trial pits are required in the design stage.

Professional fees
Professional fees should be budgeted to cover the services of a design team and specialists – see appendix B.

03.

Planning approval
Planning applications incur a planning fee which is payable on submission to the local authority.

Planning requirements
Check if the local authority has planning requirements with cost implications. Some local authorities have a policy to reduce carbon dioxide emissions and require a percentage of the proposed building's energy supply to be provided by on-site renewable energy. This is known as the Merton rule – see section 7 sustainability.

In conservation areas there is often a requirement to protect or enhance the surroundings which could influence the building form or selection of proposed external materials.

Building control
Building regulations approval can be obtained via the local authority building control department or through an independent approved inspector. The local authority has a plan charge payable with the building control submission and a separate inspection charge that will be invoiced during construction.

Upper floors
There are costs associated with having upper floors including lifts and stairs or ramps with handrails as well as emergency exit for from the upper floors. The structure supporting uppers floors requires fire protection.

Furniture, fixtures and fittings
Changing room benches and coat hooks on rails are normally sufficient for changing rooms in cricket pavilions and clubhouses. If lockers are required then the cost and space requirements should be accounted for. Bear in mind the cost of loose furniture such as tables and chairs.

Refreshments and catering strategy
The specification of bar and kitchen equipment will depend on the catering strategy – a full bar with cellar and a commercial kitchen is quite different in scale and equipment to a drinks fridge and domestic-type kitchen suitable only for preparing hot drinks and serving pre-prepared food so should be considered carefully at the outset. Bear in mind the cost of crockery, glasses, cutlery, pots, pans and other kitchen equipment.

Alcohol license
Under the Licensing Act 2003, licensing authorities in England and Wales (usually the local authority) are responsible for licensing the sale and supply of alcohol. Clubs must apply for an appropriate license (most likely a club premises certificate) if they want to supply or sell alcohol at their clubhouse. Refer to the Department of Culture, Media and Sport (DCMS) website for more information including guidance on applications, fees and annual charges. www.culture.gov.uk/what_we_do

External works
The costs of external works will depend on site levels, the extent and specification of paving, proposed fences and boundary treatment as well as landscaping and planting proposals.

Deleterious materials
Asbestos was used as a building material in the UK from the 1950s and any building built before 2000 might contain it. Asbestos comes in a variety of forms for different uses and was considered ideal for fireproofing and insulation. Other typical examples are floor and ceiling tiles, textured coatings, textiles and asbestos cement products. Asbestos materials in good condition are safe until the fibres become airborne which happens when it's damaged. Under the Control of Asbestos Regulations 2006, an organisation responsible for the maintenance of non-domestic premises has a legal duty to take steps to find out if there is any asbestos in those buildings. If so, the amount of asbestos, its location and condition should be recorded. There is also a duty to asses the risks of being exposed to asbestos fibres if it is disturbed, prepare a plan to manage the risk and to periodically monitor the plan. The club must provide this information to a contractor or anyone who is likely to work on the buildings. Refer to the Health and Safety Executive (HSE) website for more information.
www.hse.gov.uk/asbestos/essentials/building.htm

VAT
VAT is usually payable on construction costs, professional fees and building control charges and should be accounted for in the overall costs and cash flow forecast. VAT is not usually payable on alterations to listed buildings where listed building consent has been granted. The level of VAT payable might sometimes be reduced subject to the status of the club so check if there is a club VAT management plan. Don't assume all VAT will be recoverable – it is essential to obtain specialist VAT and partial exemption advice from an accountant with relevant experience.

Tax relief
The government has introduced an enhanced capital allowance (ECA) scheme to give tax incentives on water saving and improving technologies as part of its commitment to the reduction of carbon emissions. Under the scheme, businesses that pay corporation or income tax are able to claim one hundred per cent of their first year allowance against the cost, delivery and installation of water saving products, including taps and showers. All products that have the ECA water technology approved logo are eligible for the scheme.

Obtain independent advice from specialists before assuming eligibility for any tax relief schemes.

03.

Contingency
It's prudent to have a contingency allowance set aside for the design and construction stages to cover the cost of unforeseen items and design growth or changes that might arise during the project.

Funding
ECB booklets on sources of grant aid and funding can be downloaded from the ECB website. www.ecb.co.uk/funding
- Sources of grant aid funding for cricket clubs in England
- Sources of grant aid funding for cricket clubs in Wales

Procurement routes
There are three main methods of procuring buildings in England and Wales:

1. Traditional is where design and construction are separate elements. A design team prepares design and construction information. Several contractors are invited to tender and then one is appointed to build the project. This method follows the linear pattern of work stages shown in section 2. Quality control is the key strength.

2. Design And Build entails a more integrated approach as the contractors tender before the construction information is complete so become involved during the design and preparation stages. The contractor is responsible for developing the design so cost control is the key strength but this can be at the expense of quality.

The work stages shown in section 2 still apply, but are not as distinct and some are carried out in a different sequence so design can continue while the contractor is working on-site. This parallel working can save time but puts quality at risk.

3. Construction Management is when either a client or contractor assumes a central management role and responsibility.

This is a simplified explanation of procurement methods and there are many variations and hybrids of the main types including single or two stage tenders, partnering arrangements, public private partnerships and private finance initiative (PFI) or even self-build. However, self-build is only suitable if club members have sufficient building skills and qualifications and are willing and able to carry out the work. The most appropriate method will depend on the nature and scope of works, how the risks are allocated, design responsibility, coordination and the basis of costs. The final choice could also be influenced by a funding body.

04. Site Planning

Site analysis
The individual circumstances of each project will influence the design. A logical approach to site analysis should be adopted when deciding the best location for a pavilion or clubhouse. Taking advantage of the natural elements and surroundings such as trees, gradients, views and orientation will help make the most of the site. The shape and contours of the land will affect the final location, as will proximity to services and main road access. The availability of land for car parking, any future expansion and space for temporary facilities need to be taken into account during early stages.

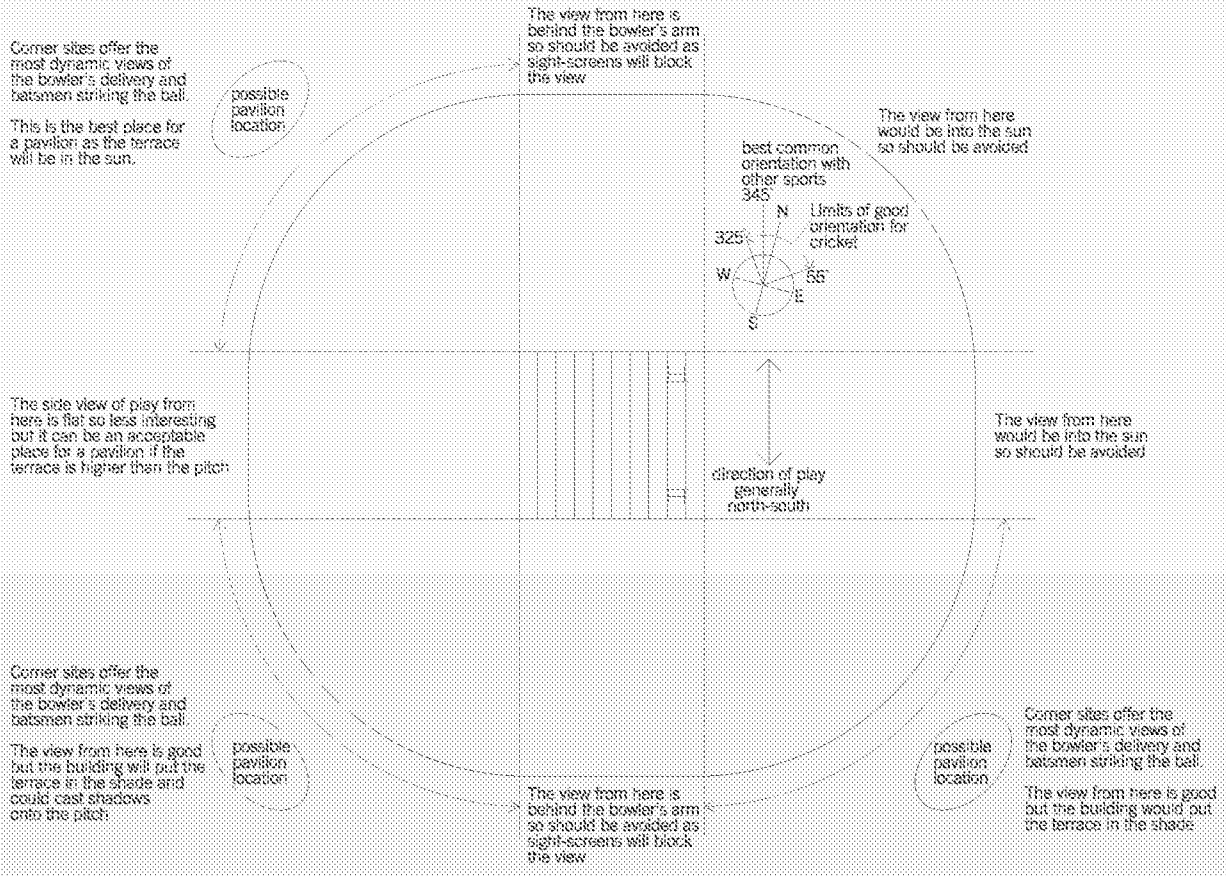
Tenancy and ownership of the land, statutory planning restraints and rights of way are vital to early discussions and will minimise wasted time and money later on.

Another key item is the composition of elements, including the relationship of the cricket table to changing rooms, viewing areas, scoreboard and grounds store.

Pavilion location
Corner sites offer the most dynamic views for spectators and waiting batsmen, giving full context of the field and the best perspective for watching the bowler's delivery and batsmen striking the ball. The best one of these is the north-west corner as the area in front of the pavilion will be in the sun; parasols or awnings can be used to provide shade on hot days. The south-west and south-east corners also give great views of the game but any viewing terrace in front of a pavilion here will inevitably be in the shade of the building for part of the day. The view from the north-east corner of the pitch will be into the afternoon sun and should be avoided, but be mindful that tall buildings, hills and trees around site will affect where the sun sets.

It's not good practise to put the pavilion to the north or south of the pitch as this is directly behind the bowler's arm. Sight screens occupy the area parallel to the batting crease and are moved regularly depending on the wicket in use and the batsman's preference. As you might expect, these could obstruct the view. Other possible pavilion areas are to the east and west. These give a flat side view of the field of play so are less interesting to watch cricket from, but should not be discounted entirely.

04.



Pitch orientation

The cricket pitch orientation should generally run north-south wicket to wicket but the axis can vary from 325 degrees (west-of-north) to 55 degrees (east-of-north). The best common orientation with other sports is 345 degrees. Refer to Sport England guidance for pitch orientation when the cricket outfield is part of a multiple-sport facility as the overlap with the ideal pitch orientation for other sports narrows the zone of flexibility.

Sun

Natural light should be incorporated into the design to create a pleasant environment – having the lights turned off during the day will also reduce running costs. Take account of the path of the sun to avoid over-heating from excessive solar gain. When altering existing facilities, it's not always possible to change the building orientation but the use of roof overhangs, blinds and solar-control glass could be considered to address any problems. Plan for the future by planting trees that give shade in summer but allow light through in winter while giving focus, depth and context to views.

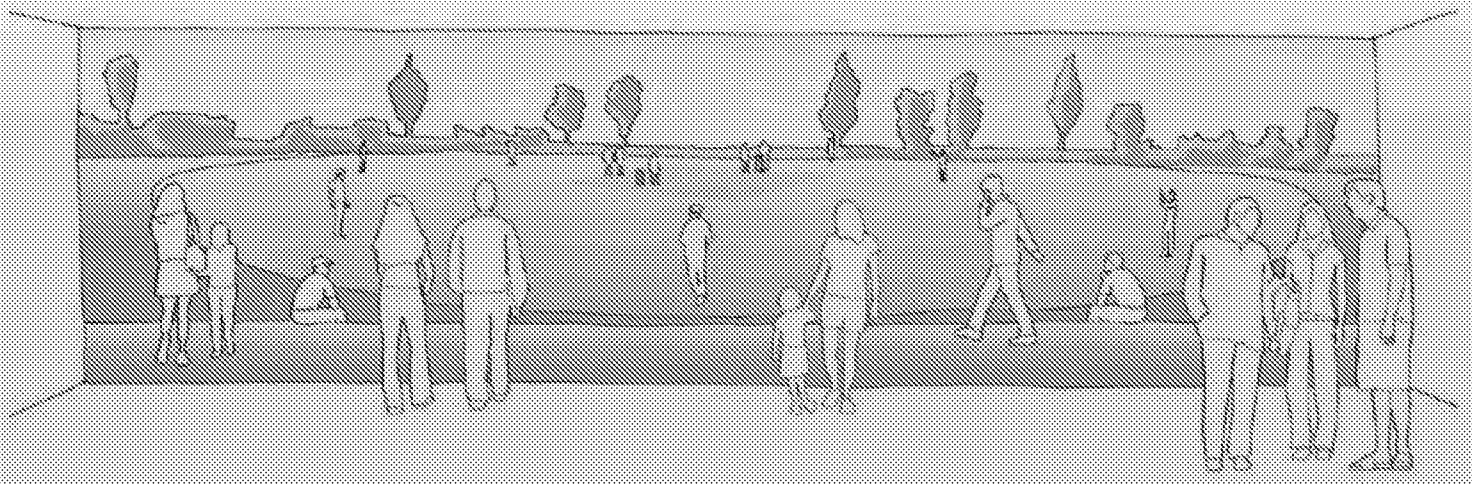
Wind

The pavilion should be orientated away from the prevailing wind to give protection to spectators on the terrace. Opening windows and vents for natural ventilation should be carefully placed to avoid possible sources of pollution such as car parks.

Height above pitch
In first class cricket the players are sometimes separated from the spectators in a first floor viewing gallery, but this might not be appropriate for club cricket which is often more social and inclusive. However, it is possible to use the site topography and gradient to your advantage by positioning the pavilion so it is raised above the field of play, giving advantageous views to both players and spectators while remaining welcoming and inclusive. It can also be cheaper to retain earth on site than sending it away as spoil. This should be balanced against creating easy access to the pavilion and pitch especially where wheelchair-cricket will be played. It could also be difficult manoeuvre heavy equipment up or down slopes to the grounds equipment store.

Views
Players and spectators should be able to see the pitch from the social space inside the pavilion. If the pavilion is raised up above the pitch level then consider full height glazing or a low window sill that preserves a view of the pitch. If the window sill is too high, you won't be able to see the game from inside the pavilion.

Scoreboard
The scoreboard should be visible to players, spectators, scorers and umpires. It could be an electronic scoreboard or mobile board instead of a scorers hut. Scorers need a base with good views of the pitch and umpires where they won't be disturbed.



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04.

Shared facilities
Sometimes cricket clubs share their facilities with other sports: often rugby and football. Where facilities are shared, careful consideration should be given to laying out the pitches and protecting the cricket table during winter. You should also refer to the guidance notes of the relevant sports governing bodies.

Parking and arrival
The car park should be conveniently located while preventing glare from cars causing a nuisance to players and equally cars being damaged by stray cricket balls. It doesn't have to be adjacent to the road or clubhouse although there should be space for drop-off, deliveries and disabled users close to the building along with access for emergency services vehicles. If the car park is behind the bowler's arm then a suitable screen or fence will be required to minimise interruptions to play. Provide a suitable path with appropriate lighting if there is a short walk. The sequence of arrival from the road can add to the drama of the occasion – a glimpse of the building or controlled views from the road to a welcoming entrance. If signs are required, they should be clear, simple and logical. Refer to Sport England guidance on car parking and landscape design.
http://www.sportengland.org/se_facilities_carparking.pdf

Transport options
The way people travel to the ground will be influenced by the location and public transport options. It would be useful to display current public transport information at the clubhouse and on the club website if applicable. While players with large kit bags are unlikely to arrive by bicycle, it is possible that junior players, spectators and umpires will require somewhere secure to lock bikes and a gathering point for coaches could occasionally be required. The number of disabled parking bays is prescribed by the department of transport. At the time of printing, the number of disabled bays in car parks of up to 200 spaces should be three bays or six per cent of the total parking provision, whichever is greater. Always check current guidance at www.dft.gov.uk.

Landscaping
The soft and hard landscaping around the building can improve the quality of the setting and perform other functions like shelter from the wind. Plants can add texture and aroma that will give interest and delight. Sensitive landscaping with native species can enhance local biodiversity. Thoughtful selection of plants and carefully designed irrigation systems can dramatically reduce the need for watering. External surfaces in the vicinity of the building should be well drained and thoughtfully selected as light coloured paving can sometimes cause glare. Permeable surfaces will avoid problems with puddles, avoid the need for surface falls towards drains and reduce the storm-water surge in the surface water drainage system. Resin-bound gravel can be flexible enough to accommodate tree growth. Smooth surfaces are preferable for wheelchair users. Refer to Sport England guidance on car parking and landscape design.
http://www.sportengland.org/se_facilities_carparking.pdf

Advertisements
Occasionally cricket clubs raise funds by displaying advertisement boards around the pitch. The advertisement control system in England consists of rules made by the Secretary of State and falls under the Town and Country Planning (Control of Advertisements) Regulations 2007. An advertisement displayed on enclosed land is normally permitted to be displayed without an application. However, check with the local authority planning officer to confirm if consent is required especially if the proposed signs are visible from the road or public land.

Temporary accommodation for events
Consider identifying a location for temporary accommodation such as a marquee to be erected on the site that could occasionally be used for large events. Install appropriate external power and drainage connection points for convenience.

04.

The Masterplan

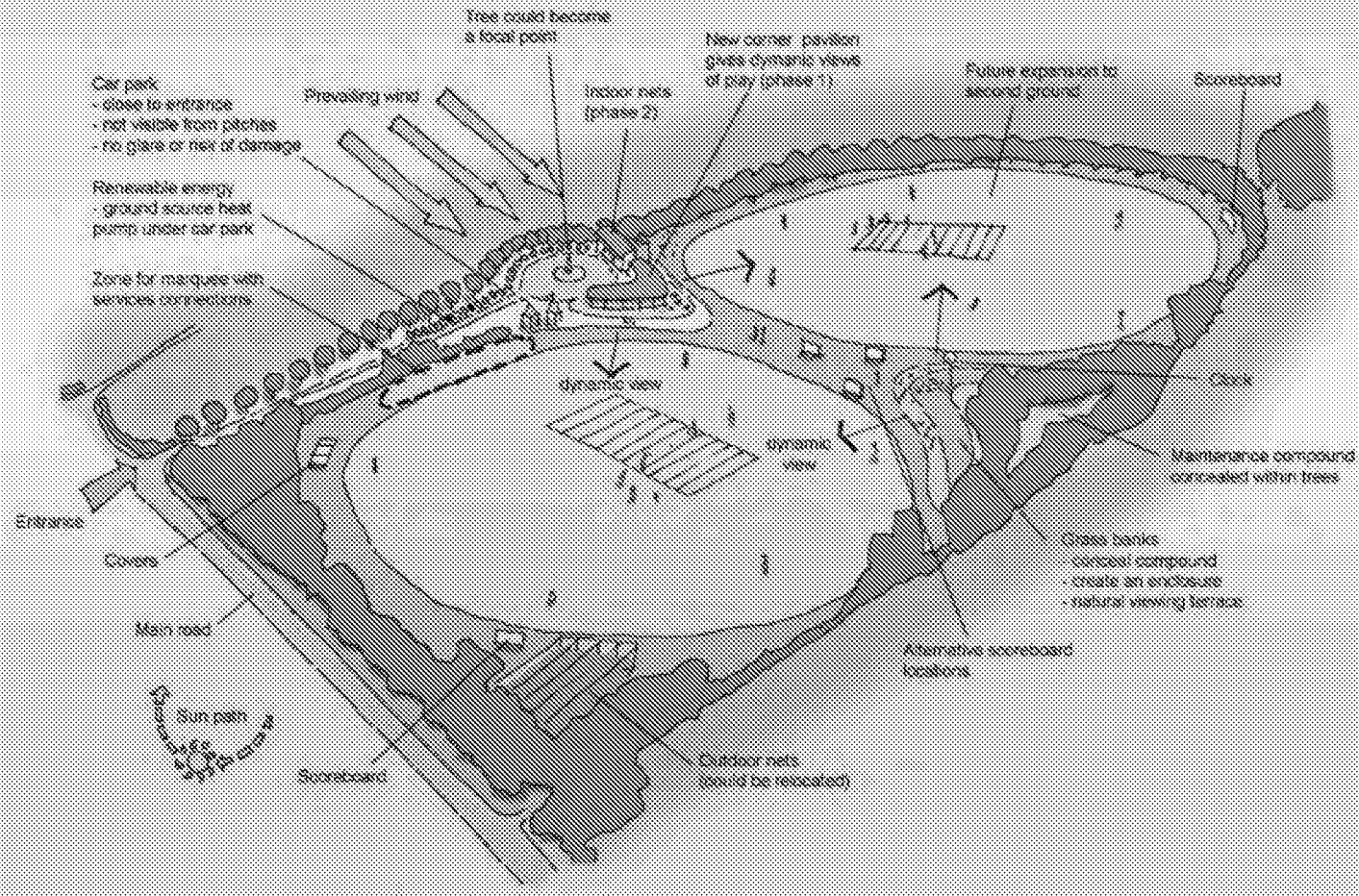
All relevant site and club issues can be addressed, combined and distilled into one masterplan. The masterplan is your opportunity to think about developing your club and site as a whole – it's the big-picture.

A masterplan is a useful tool for setting the context and guiding principles for future development, describing how you want to develop the site, the sequence of that development and how to achieve it.

The masterplan is a fluid process for gathering different opinions and provides a framework for connected thinking towards a solution. It should be reviewed and updated to accommodate future ideas, always taking the long term view.

The intention is to capture your vision for the future. The masterplan should contain a statement of your aims and objectives and how you want to get there, supported by drawings or images that will help formulate and communicate the main ideas and principles.

It will address flexibility and future changes including land for expansion, while keeping a sensible and realistic sense of scale. This should help avoid finding you have spoilt your future plans by building new nets or a car park in the perfect place for a second pitch.



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05. Building Planning and Design

Why design matters

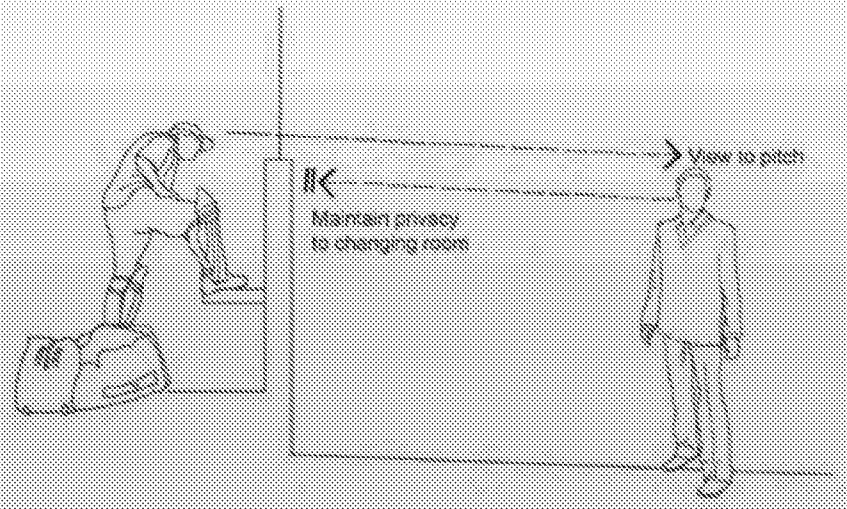
Design is important to a project's success because it provides creative and efficient solutions to complex problems. Good buildings work well in many ways: efficient use of space, rational adjacency, quality of light, thermal comfort, atmosphere and orientation. They take account of how the surrounding space is used, views in and out and form welcoming entrances. Good design takes account of what the building looks like: its symmetry and balance, composition, proportions, beauty, using materials that compliment each other and their surroundings. Good design is also concerned with economy, longevity, energy efficiency, acoustic performance, flexibility and adaptability. The design should be inclusive and provide integrated facilities for players, officials and spectators of all ages, culture, ability and gender. Good buildings should be sustainable, balancing their use of resources and minimising waste (see section 7 Sustainability).

Architecture and sport

Sport is a source of delight and the architecture surrounding it should help reflect and nurture that excitement. It can promote better sporting performance through increased participation leaving a long term legacy that embraces the whole community. It is vital that sports buildings are open and accessible and well integrated with the community they serve while remaining sensitive to their context. Resources will always be limited and in many sports buildings the business plan is a delicate balancing act. This can be helped greatly by doing more with less, by getting one component of a building to play more than one role. The features that help to create a positive atmosphere in the building should not be wilful additions to the brief but a series of elements brought together so that each part serves more than one purpose. Generating an uplifting environment is a natural product of good design and doesn't need to cost any more money.

Cricket

Cricket teams use changing rooms in a slightly different way to other sports because of the pace of the game. Although the fielding side will leave the pitch together at the end of the game, the batting team often change as they come off the pitch and only pad-up shortly before they are called into bat. For that reason, it is desirable to have a visual connection between the changing rooms and the fields of play so batsmen can stay aware of progress and avoid being timed-out while padding up. The view out from the changing rooms must be carefully balanced with maintaining privacy, which is particularly important if there are junior players. Players should also have easy access to the pitch from the changing rooms. Surveillance of the entrance is important to maintain security for valuables left in the batting team's changing room.



This example uses a change of level to help maintain privacy

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05.

Traditional pavilions

Many traditional pavilions follow a tried and trusted building plan with a central entrance facing the pitch into a central social space with changing rooms either side, all with views of the pitch. The kitchen, showers and toilet facilities are located towards the back of the plan. This can work very well in practise and there are many beautiful examples.

The plan or layout of these traditional pavilions is still relevant today and often work well as buildings in use. However, the traditional design, materials and elements such as clock towers, dominant roofs and weather vanes are sometimes less relevant.



Oxford University Parks Cricket Pavilion 1881
© The Curators, Oxford University Parks



Gonville and Caius College Summerfield
© Cambridge2000.com



Wormsley Cricket Club

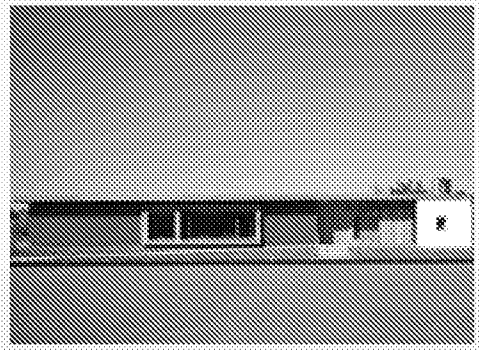
Contemporary pavilions

The aim of this guide is to help create contemporary pavilions with modern concepts and materials while safeguarding the traditions of cricket and therefore securing a future for the game.

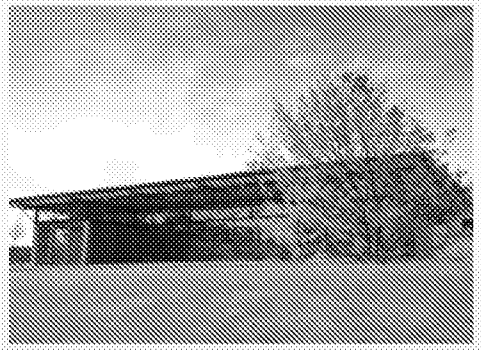
Although these examples of contemporary pavilions are not all cricket clubs, they could provide club accommodation in a similar plan layout to the traditional pavilions. Modern materials and efficient building forms and structures create robust, efficient and beautiful buildings. The plans provide the same accommodation as traditional pavilions but in a more modern way. The simple elevations and materials make very attractive, contemporary club facilities.



Stirling Cricket Club Pavilion by JM Architects
© Andrew Lee



Balornock Bowling Club by Studio KAP
© Keith Hunter



Broughton Hall Pavilion by Hopkins Architects
© Simon Miles

05.1 Accommodation

Block Diagrams

Careful planning of accommodation is essential to ensure a successful building.

One solution would be to arrange the changing rooms either side of the social space (all with views of the pitch) with other rooms towards the rear of the plan (as diagram 1).

The social space could be angled to open up and maximise views of the pitch (as diagram 2).

If the building is approached from the rear (not from the pitch side) then the social space could run from front to back giving clear views to the pitch from the entrance (as diagram 3).

Another solution would be to group the changing rooms to one side of the social space (as diagram 4).

Always consider possible future expansion at the outset, either for additional changing rooms and pitches or temporary accommodation for special events.

DIAGRAM 1

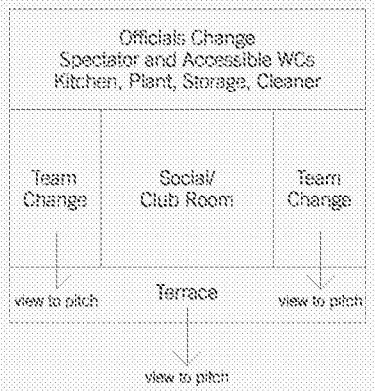


DIAGRAM 2

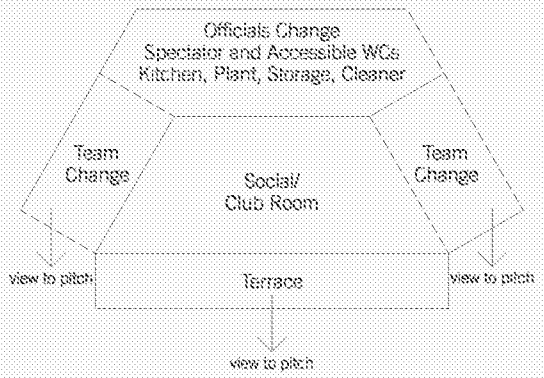


DIAGRAM 3

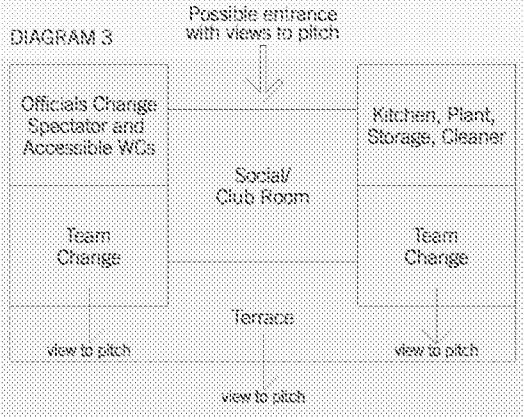
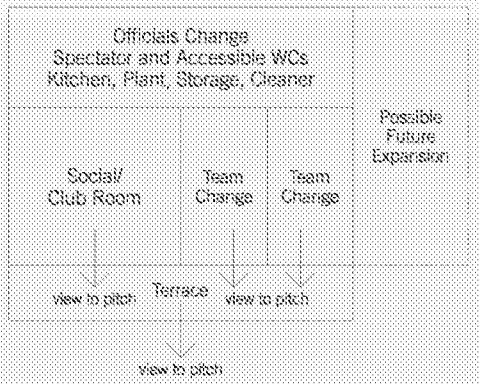
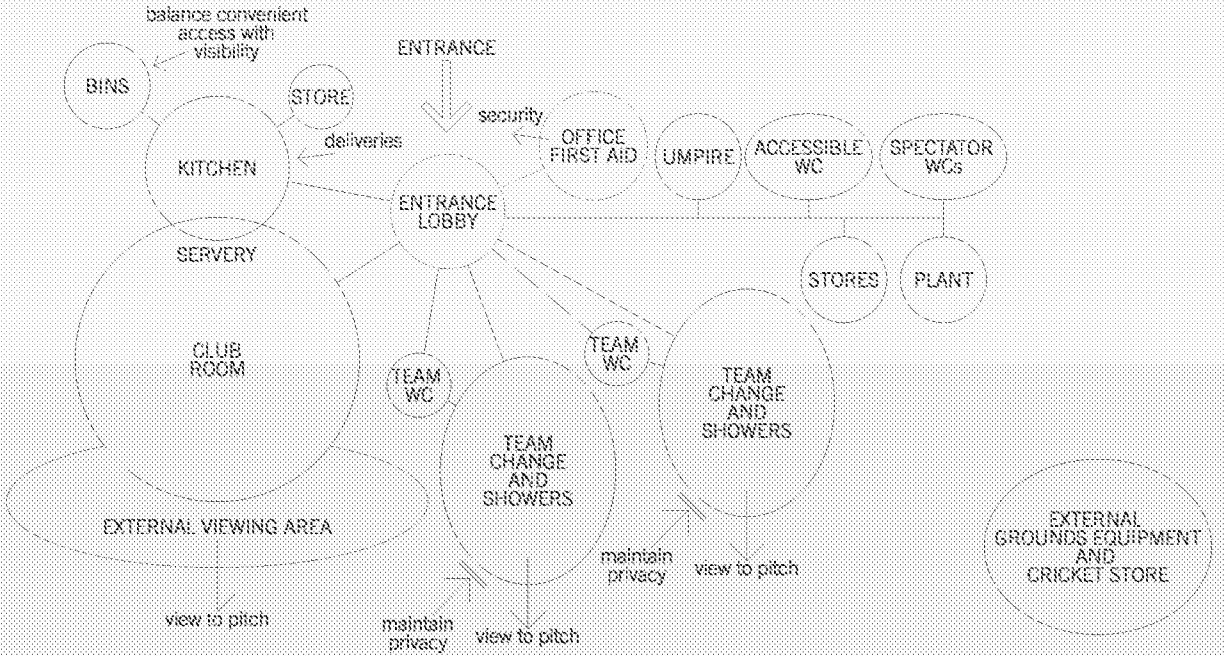


DIAGRAM 4



Adjacency

Whatever the basic block arrangement of social, changing and other spaces, the relationship of adjacent spaces should provide an efficient building and the desire for easy access and a view of the pitch must be balanced with maintaining privacy.



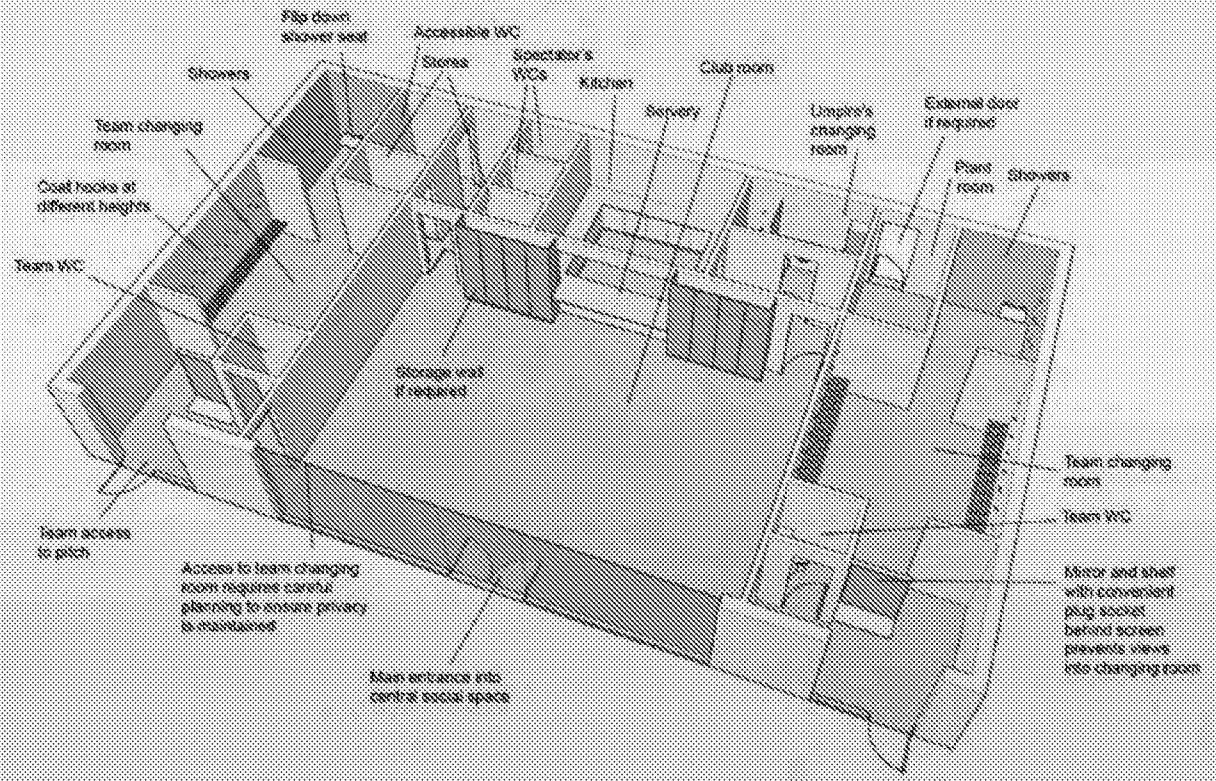
05.1

Two changing room cricket pavilion
This diagram shows a small, two changing room cricket pavilion with central social space as shown in block diagram 1 (see page 26).

This diagram only shows the essential spaces noted in the accommodation section and does not include desirable spaces such as a flexible changing room, bar, office and reception. Assume the grounds equipment store is provided elsewhere.

This follows a traditional pavilion plan with the main entrance directly into the social space and this is considered suitable for summer sports. Consider an entrance area for mixed sports clubs with winter use.

There are views from the changing room to the pitch from the padding-up bench which acts as a privacy screen to the main changing space behind.



Accommodation

The accommodation should meet the current and future needs of the club and can be considered in terms of what is essential or desirable:

Essential	Desirable
Entrance	Reception
Team changing room and showers	Office
Officials changing room and shower	Flexible changing room and shower
Toilets for players, officials and spectators	Additional umpire changing room and shower for multi sport facilities
Provision for first aid	Bar
Social and dining/ tea room	Meeting room
Club room	Secure storage for trophies
Kitchen and servery	External cricket equipment store
Storage	Refuse area
- food and beverages	
- consumables	
- cricket equipment	
- cleaner's equipment	
Plant room	
Grounds equipment store (this can be integral or external – see storage)	
Scoreboard	
Scorer's base	

Cricket club accommodation in England and Wales falls into planning use class D2 – assembly and leisure.

Clubs might encounter difficulty if the local planning authority is reluctant to grant permission for the social and administrative spaces in parks, open spaces or green belts.

There is positive support in current planning policy guidance PPG2 for green belts to provide opportunities for outdoor sport, but the construction of new buildings in green belts is considered inappropriate unless they are essential facilities – an example described in PPG2 is small changing rooms and unobtrusive spectator accommodation. The design and access statement (submitted with the planning application) should address the necessity for the social and administrative spaces and robustly demonstrate they are essential to the club, appropriately sized and sensitively designed for the context.

The right scale for the social and administrative spaces is influenced by site-specific factors as well as club needs. Club requirements and membership should be balanced with proposed hours of use of the social spaces and proximity to residential areas, planning restrictions, land ownership and covenants.

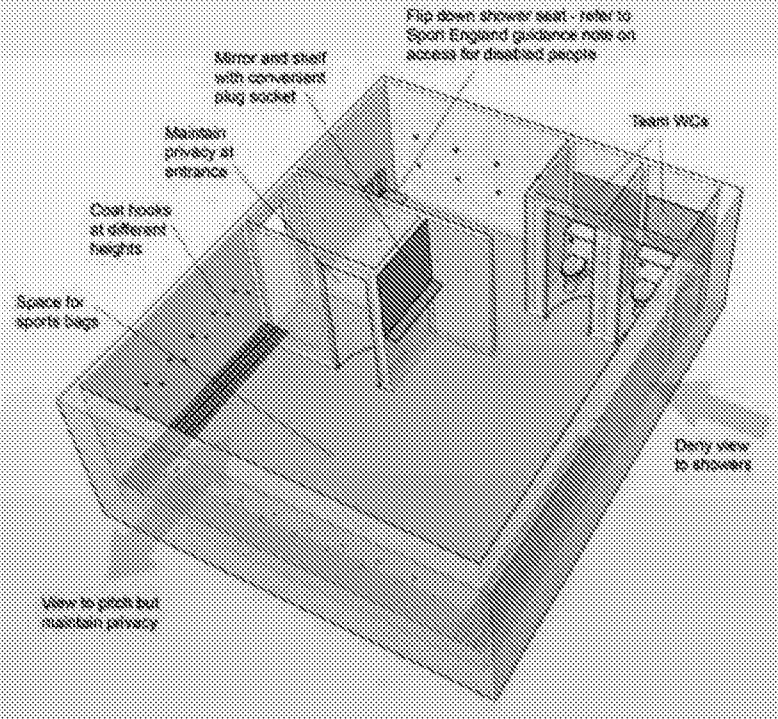
Early consultation with the ECB is vital as it can help towards a successful outcome.

05.1

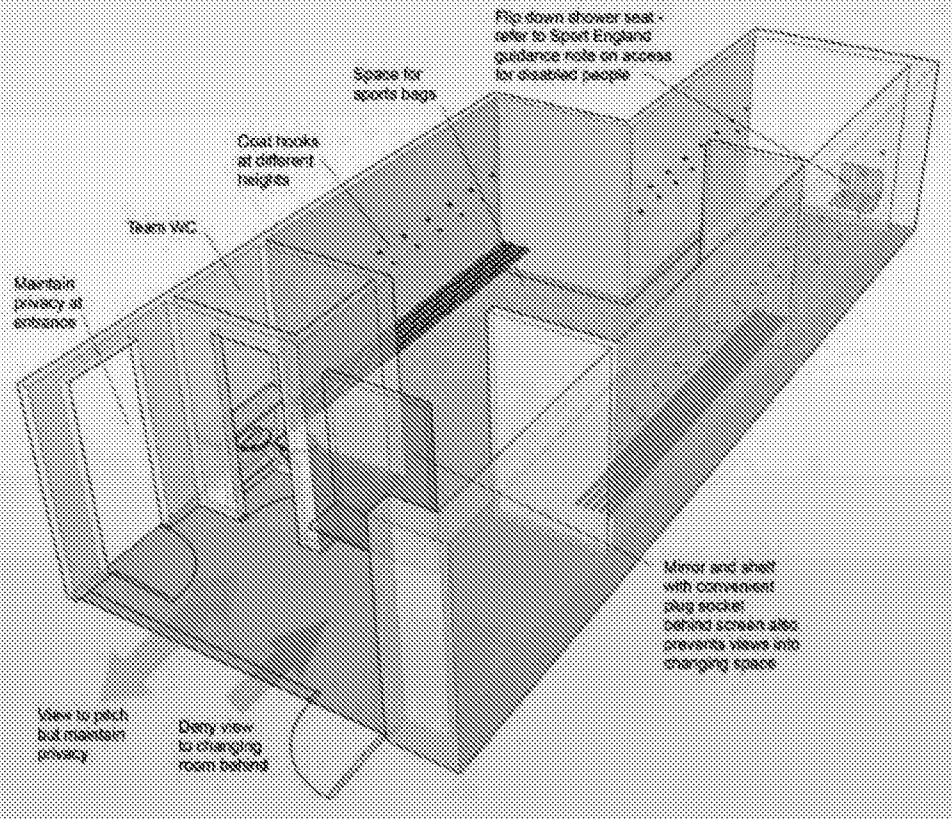
Changing for players

Team changing rooms need to accommodate the anticipated number of players, substitutes and coaching staff. The number of changing rooms provided will depend on the number of pitches in use at the same time. Communal changing rooms are a practical and cost effective way of providing facilities. Disabled players should always be accommodated within the team changing rooms. Careful arrangement of screens and doors should allow privacy for changing players while others enter or leave the room. Refer to Sport England design guidance note on access for disabled people.
http://www.sportengland.org/se_facilities_disabled.pdf
In some cases the solution can be changed to suit the culture or multi-culture of the club, or to adhere to child protection legislation and child safety.

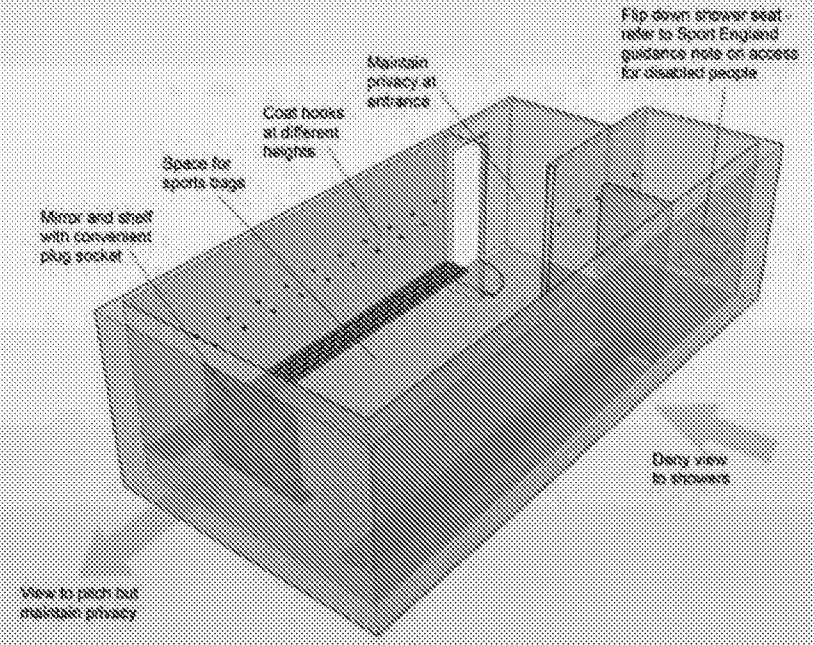
Most clubs find it sufficient to have lockable doors to the changing rooms in order to keep personal belongings and valuables safe. Lockers can be considered as an option depending on the size of the club but should be balanced against their projected use, cost and maintenance. If provided, lockers should be large enough to accommodate items likely to be stored in them – for example wallets and small items or clothes, bags and equipment.



Example of a team changing room with two team WCs



Example of a team changing room with one team WC



Example of a team changing room without integral WCs

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05.1

Changing rooms	Essential for each team changing room	Desirable
Bench seating	12 spaces at 500mm wide x 450mm deep x 450mm high	600mm wide
Kit bags	12 spaces at 1200mm long x 450mm deep x 400mm high. The changing room layout should account for each player having their own kit bag or box, which can be as long as 1200mm	450mm high
Changing	Two rooms each with 20sqm for changing space, benches and bag storage with 1.8m between the front face of opposite benches	2m between the front face of opposite benches
Showers	Three shower heads per changing room at 750mm centres with 450-600mm between showers fittings and the side walls. Showers on opposite walls should be at least 2.5m apart to allow circulation. A separate dry-off area should be provided.	Four shower heads. Always check the requirements of other sports governing bodies when designing mixed sports facilities. Consider privacy screens between showers or separate cubicles.
Toilets for players	Ideally provided with convenient access from the changing room: one WC and one wash-hand basin with mirrors above. In pavilions with four or more team changing rooms, toilets for players must be integrated in the changing room and for the exclusive use of each team. This is not essential in two-changing room pavilions.	Two WCs and wash hand basins. Note that providing urinals would make the changing rooms less flexible for female use.

Entrance
The pavilion should be welcoming and accessible with a well-defined entrance that is easy to find. Pavilions that face the pitch can cause confusion if they are approached from the rear. Consider the way people will approach the building and create a sense of arrival. The entrance is the first space that visitors encounter so it's easy to create a good impression by being simple to use.

A notice-board is essential. If the pavilion is large enough to warrant it, a reception desk and small office for management staff near the entrance will provide good surveillance. Consider automatic doors if the club caters for a significant amount of wheelchair sport. The entrance area should provide good access to the social areas and changing rooms. There should be suitable security and surveillance for the batting team's changing room as this is left unlocked. Always have suitable entrance matting by the external doors. Boot cleaning facilities such as brushes or scrapers can be a good idea but are more important for facilities with winter use.

Changing for umpires
Umpires must have separate changing and shower facilities to the players. A lockable room with bench seating, coat and towel hooks suitable for two umpires with one shower, wc and wash-hand basin would be suitable for small clubs. Larger clubs should calculate the number of officials and umpires required in relation to the number of pitches and fixtures. Secure storage for valuables should be provided, possibly in the form of a lockable cupboard. A view of the pitch is desirable.

Flexible changing
The pavilion should provide flexibility for different cultures, mixed gender teams and junior players. Although suitable changing facilities can usually be accommodated by carefully programmed use of the team and umpires changing rooms, an additional small changing room and shower (similar to the umpires changing room) would give greater flexibility.

Toilet facilities
Provide suitable toilet facilities for spectators in addition to the toilets located in the players and umpires changing rooms. Careful planning and interconnecting doors could allow changing rooms to be locked while still allowing toilets to be used for evening social functions.

05.1

First aid
Provision should be made for first aid treatment. It can be combined with another room as long as space is clearly identified. A physiotherapy room is desirable but not essential, especially in smaller clubs.

Social areas
The social spaces are the heart of the club, where players, officials and spectators gather to watch matches and enjoy refreshments during and after the game. Depending on the club size and circumstances, the following spaces are required:

- Social and dining/ tea room – dual purpose room for social functions and to accommodate players and umpires for lunch and tea breaks.
- Club room – for club members or for spectators and players when rain stops play.
- Bar area – many clubs raise funds through the sale of drinks. An appropriate license to sell alcohol is required and a view of the pitch is desirable.
- Meeting room – to conduct club meetings and affairs.
- Kitchen and servery with adjacent storage conveniently located for deliveries – the scale and operation of the kitchen facilities should be considered at the outset as a commercial kitchen has different space standards and equipment requirements to a domestic operation. Environmental health regulations require a separate wash-hand basin in food preparation areas.

Some of these spaces can be combined to form one or more flexible spaces and should at least accommodate two teams plus umpires, scorers and spectators with a view of the pitch and scoreboard.

The social space should flow out to an external viewing area, with a mixture of sunny and shaded areas. Extended roof eaves will provide a shelter from rain, as would retractable awnings while temporary gazebos and parasols could be used to provide shade and create a sense of occasion.

Notice-boards are essential. Many clubs display memorabilia and photos in the social areas. Secure storage for trophies and valuable items might be required.

Scoreboard and scorer
Electronic scoreboards can be computer controlled by a wireless connection from the pavilion removing the need for a detached scoring hut. In this case the scorer will need a private room or space to work where they aren't disturbed. The scorer will need a good, uninterrupted visual connection with the umpires and pitch.

Office
The need for a staff office depends on the size of the club. These could be combined as an office and coach's room. Consider having a suitable cupboard for storing club documents and equipment if a separate room isn't provided.

Corridors
Corridors should be at least 1.5m wide to accommodate passing players with large kit bags or a wheelchair turning circle. Aim for simple circulation for all users and good access to the playing areas. Players should have easy access to the pitch through areas with floor finishes suitable for spiked shoes.

Storage
Adequate storage should be carefully planned.
- Food and beverage stores: the size and location will depend on the scale of facilities.
- Adequate internal stores for consumables and cricket kit. This could be accommodated in a storage wall instead of a store room.
- Cleaners need a lockable cupboard with adequate space for a sink, cleaning equipment and products in line with control of substances hazardous to health (COSHH) requirements.
- External stores for cricket equipment and grounds equipment, machinery and supplies. These could be provided within the pavilion or as a detached hut or container concealed by a green screen, planting or fence. The relative costs of providing ground storage within the pavilion should be considered – a detached hut might be a more economical solution but it must also be secure – see security.

Plant room
The plant room should be appropriately sized and located to accommodate incoming utilities, plant equipment and boilers. Allow enough space for inspection and maintenance of the equipment. Ensure the maintenance staff are trained to operate the controls so the building and equipment runs efficiently.

Refuse area
The waste strategy should be considered at the design stage and suitable provision made for both general and recycled waste separation, storage and collection.

05.2 Furniture and Fittings

Furniture and fittings
Towel hooks are required in the shower areas along with coat hooks above changing room benches. Kit bags can be placed on the floor or a low table in the changing rooms, although care should be taken to avoid cluttering the circulation zones. Additional coat hooks and showers fixed at a lower height can be useful if junior players regularly use the facilities. Changing rooms should have a grooming or vanity area which could be as simple as a plug socket near a mirror and shelf so players can use their own hairdryer.

Suitable space for waste and recycling bins should be identified along with the requirement for vending machines, sanitary disposal bins and baby-changing facilities. Vending machines, if required, should not block corridors. Tables and chairs that can be stacked and are light enough to move around will give greater flexibility than heavy or fixed items. The choice of furniture will affect the look and feel of the clubhouse.

A sliding-folding partition could be used to open up two changing rooms or social spaces to provide flexibility.



05.3 Security

Security

Security is an important issue for cricket clubs as inevitably there will be periods when the building is unoccupied and potentially vulnerable to attack from arson, graffiti, vandalism and theft. Preventative measures include secure locks, building alarms, CCTV, security shutters, perimeter fences and also by careful design of the building, choice of materials or in some cases having a presence on site such as caretaker's accommodation. This problem is site-specific so whereas some clubs will encounter little or no trouble, others will need to give careful consideration to their security measures. It shouldn't be easy for intruders to climb onto the roof, but if they do, a solid underlay to the roof covering will make it more difficult to break-in. If there is a bar or your club routinely holds fundraising activities, you might want to consider installing a safe or lockable drawer. The police force has architectural liaison officers who will be able to comment on proposed clubhouses under their secured-by-design initiative.

The grounds equipment store could be provided within the pavilion or a separate building. However it must provide secure storage and be alarmed on the same system as the pavilion – grounds equipment and supplies are expensive and should be adequately protected.

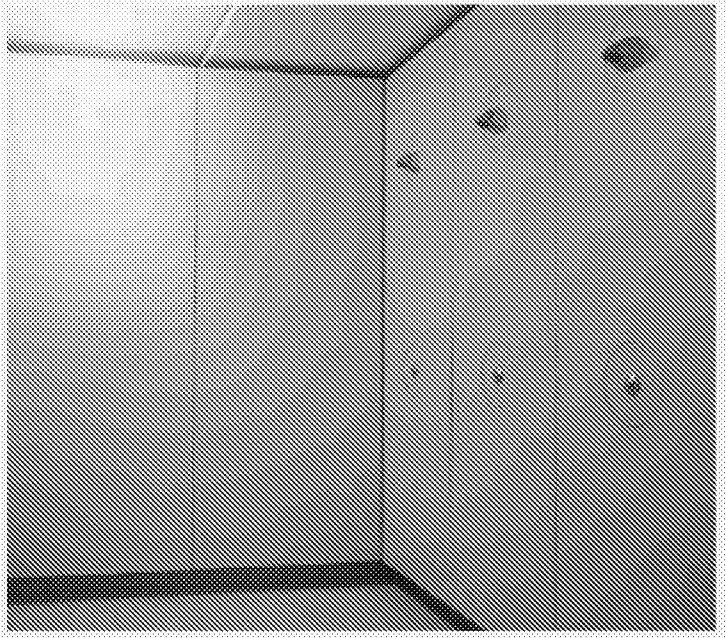


05.4 Materials and Finishes

Materials and finishes
The materials and finishes should be selected for their robustness, appearance, sustainability, cost and ease of maintenance and repair as this will affect how well the building is looked after and therefore how long it will last. The final choice will depend on the setting, design and possibly local authority planning constraints. Glazing should generally be clear and glazed in hardwood or pre-finished aluminium frames. The building envelope in range of the cricket pitch should be able to withstand the impact of a cricket ball or elements that could break should be easy to replace. Doors should be solid-core construction for robustness and acoustic properties and should be fitted with good quality ironmongery and kick plates. Floors where players are expected to walk should be suitable for spiked-shoes.



Lightweight furniture can give greater flexibility than heavy or fixed items.



Solid panels conceal pipe work and are easy to wipe down to keep clean.

Internal finishes for cricket only facilities

Area	Floor Finish	Wall Finish	Ceiling Finish	Skirting
Changing room	Spike resistant homogenous sheet or carpet. Ceramic tiles and laminate flooring are unsuitable.	Painted brick, block-work or plaster. Homogenous hygienic sheet. Plasterboard is unsuitable but a more robust board could be acceptable	Painted plaster. Suspended ceilings with modular tiles are not recommended for ceiling heights lower than 2.7m. If used, tiles must be humidity resistant.	Optional.
Shower and drying area	Sheet safety flooring with welded joints or non-slip floor tiles, laid to fall towards the floor drain.	Homogenous waterproof sheet or ceramic tiles.	Painted plaster. Suspended ceilings with modular tiles are not recommended for ceiling heights lower than 2.7m. If used, tiles must be humidity resistant.	Coved skirting forming a waterproof joint between floor and wall.
Toilets	Sheet safety flooring with welded joints, preferably spike resistant.	Minimum requirement is painted brick or block-work with tiled splash-back over washbasins and behind urinals. Preferred finish is if funds are available is homogenous waterproof sheet or ceramic tiles.	Painted plaster. Suspended ceilings with modular tiles are not recommended for ceiling heights lower than 2.7m. If used, tiles must be humidity resistant.	Coved skirting forming a waterproof joint between floor and wall. Concealed pipes and WC cisterns are preferred if funds are available.
Circulation	Spike resistant homogenous sheet or carpet in areas expected to be used by players. Ceramic tiles and laminate flooring are unsuitable.	Painted brick, block-work or plaster. Plasterboard is unsuitable but a more robust board could be acceptable	Painted plaster Suspended ceilings with modular tiles are not recommended for ceiling heights lower than 2.7m.	Optional.
Plant Room and cleaner's cupboard	Sheet safety flooring with welded joints or floor paint to screed or concrete slab.	Painted brick or block-work with splash-back behind sink.	Painted plaster	Optional.

06. Services

The key services required are water, heating, lighting, power and drainage. The services installation can amount to one-third of the construction costs so should be carefully designed and installed. Good services design will help provide comfortable facilities with adequate ventilation and prevent mould growth in shower areas.

Zoning
Efficient zoning and distribution of wiring, pipes and drainage can help reduce installation and running costs. All mechanical and electrical work must be carried out in accordance with building regulations and current institution of electrical engineers (IEE) regulations.

Utilities
Information on the proximity and availability of new services connections is vital as gas and electricity are not always readily available on remote sites. Alternatives such as renewable energy and bio-energy (refer to section 7 sustainability), or oil and liquefied petroleum gas (LPG) need to be investigated in conjunction with their life cycle costs, sustainability and the available space for storage and maintenance. Quotations should be sought from the relevant utility companies to establish if there is capacity for the new service connections, their costs and timescale.

Water and water saving devices
The use of low or dual-flush toilets, waterless urinals, aerating taps and showers is encouraged as they use less water without reducing performance. Taps and showers should also be thermostatically controlled. Consider having additional shower heads at a lower height if children regularly use the changing rooms. Routine observation and maintenance should be carried out to reduce wastage through leaks. Movement detectors can also be considered to shut off the water supply, preventing leaks when the building is not in use for long periods of time.

Heating
Frost protection is essential as a minimum provision, but central heating is preferred – either by radiators, ceiling panels or under-floor heating. The choice might be influenced by the heat source or boiler. Mechanical ventilation extraction is required for the showers, toilets and kitchens under the building regulations.

Lighting
Low energy lighting can reduce running costs as can proximity sensors (PIR) that will turn lights on automatically upon sensing movement and switch them off after a period of inactivity. Bear in mind external lighting will assist safe access from the pavilion to the boundary or across the car parks at night but the light fittings should be selected to reduce light pollution which can be a source of annoyance to neighbours.

Services for temporary accommodation
Consider identifying a location for a marquee or temporary accommodation to be erected on the site and consider installing appropriate external power and drainage connection points that could occasionally be used for large events.

Drainage and rainwater harvesting
The drainage design and proximity of suitable foul and surface water drains should be addressed early in the design stages. Rainwater can be discharged into the local surface-water drainage system but some clubs face large annual charges to do so. If the ground can't cope with the rainwater run-off, an alternative solution would be to have a soak-away or to collect the rainwater and use it for flushing toilets and watering the pitches and landscaping.

If there aren't sufficient falls across the site to sustain a gravity drainage system then a pump and chamber will be required together with a high pressure pumped drain to a discharge point. In the absence of a suitable discharge point a septic tank or sewage treatment plant will be required and must be sized to suit the proposed building occupancy.

The main principle of sustainable urban drainage systems (SUDS) is to deal with storm water on sites rather than discharging it into the drains or a watercourse to help prevent flooding. This can be done by infiltration or attenuation. An infiltration system (or soakaway) is when stones or water cells are wrapped in a geotextile sheet below ground - the rainwater collects there before slowly infiltrating into the surrounding soil. Attenuation is the temporary storage of rainwater below ground level. The stored water is gradually released in a controlled manner into a drainage system or watercourse. In both cases, a permeable surface is required to allow the rainwater to drain through.

07. Environmental Sustainability

The current focus on the environmental impact of buildings is not a new trend and has always been an inherent feature of good design. An approach that takes every opportunity to do more with less and to reduce construction and running costs has sustainability as a natural bi-product.

Sustainable development has been defined as meeting the needs of present generations without compromising the ability for future generations to meet their own needs. In practise, this means minimising the environmental impact of buildings by efficiency in the use of space, energy and materials, but it also applies to the wider environment such as the construction process, demolition, waste, water use, pollution, employment, transport, building use, flexibility and adaptability.

Climate change

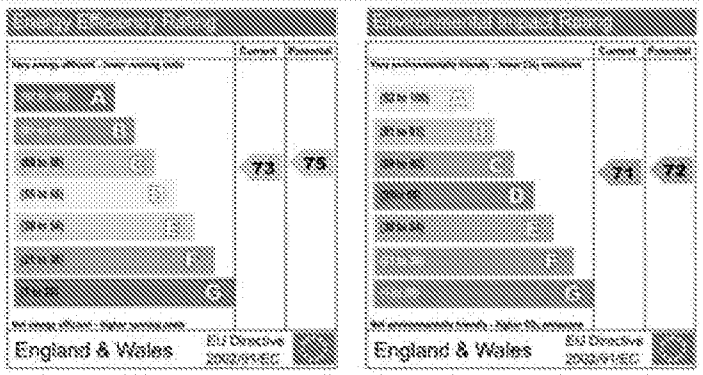
The climate is thought to have changed many times over millions of years but when people talk about climate change nowadays they are generally referring to the changes in temperature that have happened in the last hundred years. During this time the average temperature of the atmosphere near the earth's surface has risen by 0.74 degrees Celsius, the average sea level around the UK is about ten centimetres higher than it was in 1900 and ten of the hottest recorded summers have occurred since the early 1990s. In contrast, recent UK summers have enjoyed much less sunshine than average whereas rainfall and flooding have been more extreme.

What has the Government done?

The UK signed both the United Nations framework convention on climate change in 1992 and the Kyoto protocol in 1997 that set targets for reducing greenhouse gas emissions. The 2006 Stern report on the economic impact of climate change found that the costs of inaction far outweighed the costs of action. In 2007, the Government published the draft climate change bill which aims to set legally binding targets for reducing carbon dioxide emissions from a 1990 baseline by 20 per cent by 2010, 30 per cent by 2020 and 60 per cent by 2050. It has also set a timetable for carbon neutral development by proposed revisions to the Building Regulations in stages with a 25 per cent improvement in 2010, 44 per cent improvement in 2013, zero carbon for homes in 2016 and zero carbon for potentially all non-domestic buildings in 2019.

Energy performance certificates

Energy performance certificates (EPC) have been introduced to help improve awareness of the energy efficiency of buildings. From October 2008 all cricket pavilions will require one on construction, sale or rental.



Building Regulations Part L
– conservation of fuel and power

There are five key criteria for the conservation of fuel and power under the building regulations:

1. Achieving acceptable building carbon dioxide emissions
2. Limits on design flexibility such as U-values, air-permeability, heating controls, lighting efficiency and pipe-work insulation.
3. Limiting the effect of solar gain for example by shading and orientation
4. Quality of construction and commissioning, for example, continuity of insulation and correct settings of boilers to ensure efficiency
5. Providing information in the form of a building manual to help users understand the systems and carry out maintenance and monitoring of energy consumption.

07.

The Merton Rule

Some local authorities have a planning policy that requires a percentage of a proposed building's energy use to be provided by on-site renewable energy in order to reduce annual carbon dioxide emissions. This is known as the Merton rule because it was first implemented by the London Borough of Merton. Many other planning authorities have adopted similar policies or are considering their implementation. Refer to the Merton rule website for more information. www.themertonrule.org

It follows that a more energy efficient building will require less renewable technology (solar thermal panels/ ground source heat pumps) to meet the prescribed percentage of on-site renewable energy required.

How does this affect cricket pavilions and clubhouses?

The Government estimates that buildings are responsible for almost half of the UK's energy consumption and carbon emissions. The type of construction, building use, heating, cooling, ventilation, hot water systems and lighting are key factors affecting the energy performance of a building. The main way to help tackle climate change through building design is to reduce the amount energy consumed by using building materials and forms of construction that are efficient, sustainable and reduce waste.

It can be useful to describe the methods for doing this in terms of light green and dark green. At one end of the scale are passive light green measures (low-cost/ high-value) that needn't cost any more money and should be done, such as building form and orientation. At the other end of the scale, dark green measures have associated costs and need careful consideration of their financial viability, such as photo-voltaics.

Passive (or light green)

The first step is to use passive or light green measures to reduce the energy required to run the building, for example a highly insulated envelope, thermal stability, sunlight and daylight control and natural ventilation. Look at what is available from the site and the brief by exploiting placement, form and orientation to harness the free resources of sun and air, and to eliminate waste and unnecessary reshaping of the site. Pavilions and clubhouses are relatively small buildings so they can be naturally lit and ventilated by windows, louvers, roof-lights or sun-pipes. A well ventilated space will smell fresh while roof lights and high level windows let in daylight and can improve the stack-effect of natural ventilation. North facing windows will let in daylight but prevent too much solar gain. When buildings are lit during the day without using artificial lights, it can save energy, prevent heat gain from light fittings and make a more enjoyable space.

Passive methods tend to work well under most conditions but can struggle to cope with extreme cold snaps in winter and the peaks of summer. Thermal mass can be exploited by exposing concrete soffits or masonry walls – this will slow down the rate at which the building heats up and cools down, creating a more stable temperature and reducing the temperature peaks and lows.

Improving the performance of the building fabric will reduce the amount of energy required for heating or cooling. High levels of insulation will minimise heat loss and efficient appliances will also lower energy use and costs. The insulating performance of windows will also help prevent excessive heat loss.

Grouping services into efficient zones and using presence sensors can allow lights to be turned on and off when not required. Naturally ventilated buildings also avoid the high maintenance costs associated with air conditioning.

Other important steps are to use less water. Low or dual-flush toilets, waterless urinals, taps and shower aerators all use less water without reducing performance. If less water is used, then it follows that less water heating is needed which reduces running costs.

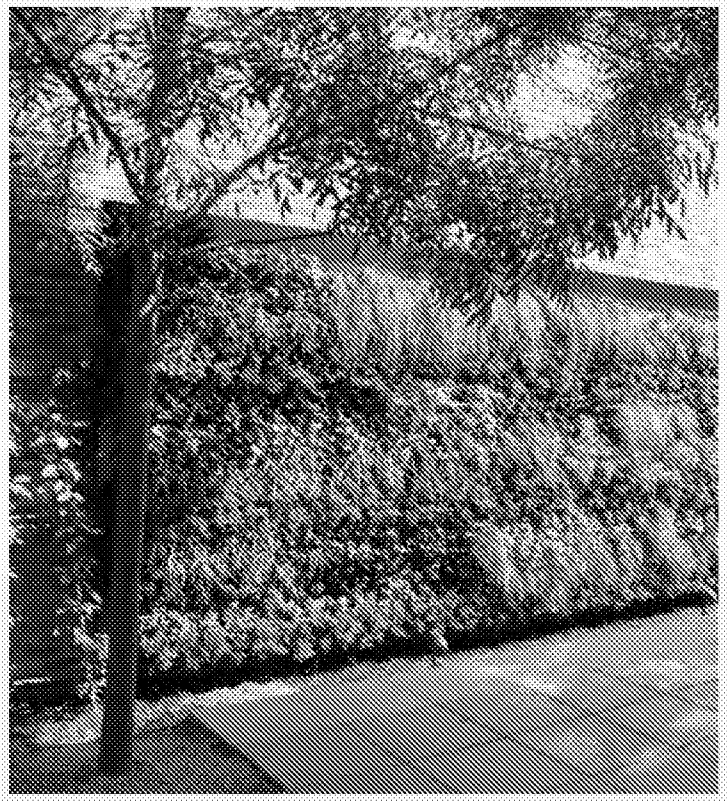
07.

Materials

The choice of building materials can affect the performance and environmental impact of the building. There is a huge variety of building materials available, new and recycled, traditional and innovative all with different properties, sustainability, performance and costs associated with the energy consumed in their production, delivery to site, installation and demolition.

For example, timber products act as a carbon sink throughout their life, have low energy consumption and low carbon dioxide emissions which make it a very attractive building material. The programme for the endorsement of forest certification (PEFC) and forest stewardship council (FSC) both have schemes that certify timber comes from a sustainable source by monitoring its chain of custody. Timber frame technology can allow walls and floors to be manufactured off-site which can reduce site waste. It can also be a rapid and efficient form of construction. However, careful design and specification is required to ensure robust details that prevent deterioration, especially in changing rooms.

Thermal insulation is also very important. Some forms of insulation (such a mineral wool) require a lot of energy in their manufacture but this is compensated by the energy saved when installed and it also performs well in fire. Other forms of insulation are considered better-than-zero-carbon, for example horncrete is made from hemp grown in the UK and mixed with a lime based binder to form a composite building material.



Green walls and roofs

Green walls and roofs might not be appropriate for all building types but could be suitable in some areas, possibly where there are sensitive planning issues. There are many benefits to using them on existing buildings or new developments:

- Reduced surge from storm water run-off and there is potential for harvesting rainwater
- Cooling: hard dry surfaces get hot in the sun whereas plants cool themselves every effectively.
- Reduced thermal load on the building fabric
- Air filtration from the plants by removing volatile organic compounds from the air
- Noise attenuation from the soft plant surface
- Encourages biodiversity and creates ecological microclimates
- Green walls provide an uplifting environment for building users and passers-by

The building must be designed to take the load of the plants and soil or growing material plus the water they hold. The watering and maintenance requirements must be carefully considered to ensure the green wall or roof thrives and prevent dying plants becoming an eyesore.

07.

Renewable energy (or dark green)
Once passive energy design measures have been incorporated to minimise the energy requirements, the need for generating renewable energy (micro-generation) on the site can be assessed. Buildings inevitably will require some energy in use and on-site renewable energy is the next step towards zero-carbon. A number of systems are available although the initial costs sometimes outweigh the savings in use so they should be considered carefully.

Solar thermal hot water
Solar thermal systems use energy from the sun to pre-heat water for hot water or space heating by using solar tubes or flat plates to collect sunlight. These can typically provide 60 per cent of the hot water heating requirement for homes over the year, performing better in summer than winter. This is one of the more appropriate systems for cricket clubs. Consider protection of the panels from damage by cricket balls or vandalism.

Inter-seasonal Heat Transfer
Inter-seasonal Heat Transfer (IHT) is a patented system that captures surplus summer heat from the ground and stores it to be used in winter. It is efficient because it captures and stores then releases heat as heat, avoiding losses through converting energy from one form to another. It is buried underground so doesn't have any visual impact and is not vulnerable to vandalism. It can also be reversed in summer to provide some cooling. This is one of the more appropriate systems for cricket clubs.

Ground source heat pumps
Similarly, ground source heat pumps take advantage of the relatively constant below-ground temperature to provide heating. A pipe full of water and anti-freeze is used to capture ground heat which is transferred to an under-floor heating system or radiators. This is one of the more appropriate systems for cricket clubs.

Wind turbines
Wind turbines use the wind to rotate blades that turn a rotor to generate electricity. Small-scale wind power can be suitable for remote locations but requires an annual average wind speed of at least six metres per second to be viable. The ideal site is a hill with a flat, clear exposure, free from strong turbulence and obstructions such as large trees or buildings, so it could be suitable for some cricket grounds. The visual impact and noise must also be considered.

Bio-energy
Bio-energy is when organic matter is burnt to generate heat. The carbon dioxide released when the fuel is burnt is balanced by the carbon dioxide absorbed during the fuel's production so is considered to be carbon neutral. As an efficient alternative to an open fire-place, small-scale biomass boilers typically burn wood pellets to provide heating and hot water, although they can also burn other fuels. It's important to have storage space for the fuel and a local supplier. This could be ideal for remote clubs that don't have gas supply.

Combined heat and power (CHP)
CHP or co-generation is when heat and electricity are produced at the same time from a single fuel. It saves energy by harnessing the heat produced when electricity is generated and is an efficient way of using fossil fuels as it avoids the transmission losses when electricity is provided from a remote power station. Micro-CHP is a miniature CHP unit designed to heat and power a building in place of a conventional boiler. The predicted heat and power requirements need to be checked carefully as CHP isn't suitable for all projects and the best sites are usually those where there is a year-round heat demand.

Solar photo-voltaics
Solar photo-voltaic (PV) systems use energy from the sun to generate electricity. PV requires daylight rather than direct sunlight and the power can be used straight away or linked back into the power grid. They can be expensive to install compared to the electricity they generate so the financial viability should be carefully reviewed. However, if the cost of electricity increases in the future and PV technology becomes more affordable it could be worth designing the building to allow for future installation. PVs are available in a wide variety of forms, shapes and colours.

08. Regulations and Guidelines

Building Regulations
Town and Country Planning act 1990
Construction (Design and Management) Regulations 2007 (CDM)
Disability Discrimination Act (DDA)
Child Protection
Sport England
Other relevant sports National Governing Bodies guidelines
Secured by Design
BS 8300 2001 Design of Buildings and their Approaches to Meet the Needs of Disabled People.
DCLG Fire Safety Risk Assessment: Small and Medium Places of Assembly 2006
BRE Digest 209: Site Layout Planning for Daylight and Sunlight' 1995
BS EN 12193:2007 Light and Lighting: Sports Lighting Publication 31 January 2008
CIBSE SLL Lighting Guide 4: LG04 Sports 2006
Licensing Act 2003

08.1 References and Bibliography

ECB publications
- TS[3] Facility briefs and guidance notes for indoor sports halls with cricket provision
- TS[5] Pavilions and clubhouses

Sport England publications
- Pavilions and clubhouses
- Access for disabled people
- Floor for indoor sports
- Changing rooms and lockers 2005
- FAQs Autumn 2007
- Car parking and landscape
- Environmental sustainability

Sport Scotland publications
- Sports pavilions and team changing accommodation

Football Foundation
- Facilities data sheet 1: Planning you facilities project
- Facilities data sheet 4: Changing rooms and clubhouses

Football Stadia Improvement Fund (FSIF)
- FSIF data sheet 1: Planning an improvement project

Rugby Football Foundation
- Community rugby facilities guidance note 5: Changing rooms and clubhouses

CABE publications
- Sure start every building matters
- Creating excellent buildings

HM Government
- Website www.direct.gov.uk/en

Environmentandgreenerliving/index.htm
- Energy performance certificates (EPC) and non dwellings: A guide for building owners, landlords and tenants
- Improving the energy efficiency of our homes and buildings: Act on CO2

Communities and Local Government
- Outdoor advertisements and signs – a guide for advertisers
- Sustainable designs
- Improving the energy efficiency of our buildings: A guide to EPC for the construction, sale and let of non-dwellings

Health and Safety Executive
- Website www.hse.gov.uk
- A short guide to managing asbestos in premises UK Green Building Council
- Website www.ukgbc.org
- Zero carbon task group report

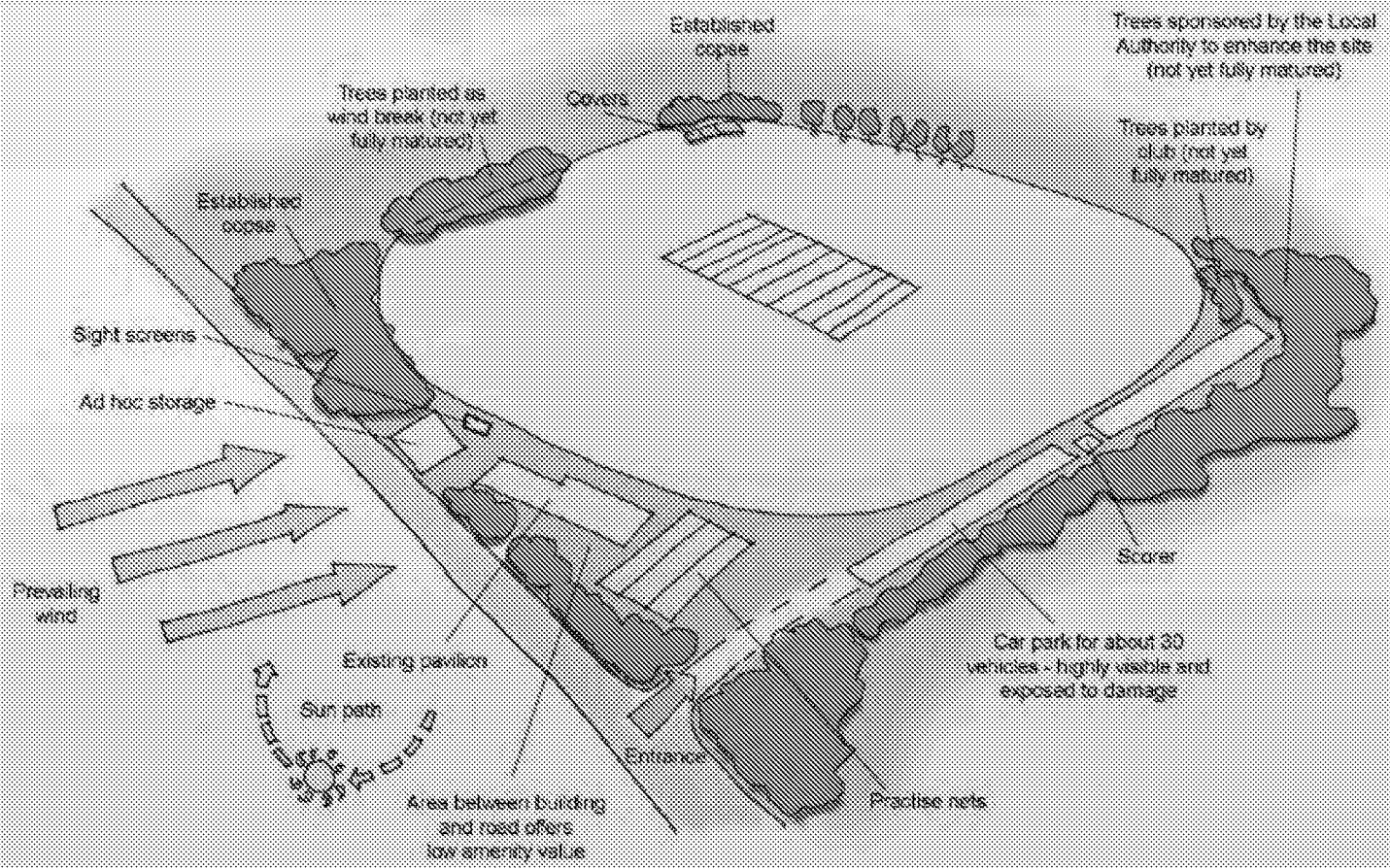
RIBA Publications
- Website www.architecture.com
- Commissioning Architecture leaflet
- Clients guide to engaging an architect
- Job Book
- Which Contract by Hugh Clamp, Stanley Cox and Sarah Lupton

09. Appendix A - Feasibility Study

In addition to the useful information to assemble listed in Section 2 preparation, items to include in the feasibility study are:

Site analysis
Existing plan and analysis
Photographs
Outline schedule of accommodation
Sketch options:
- Refurbishment and extension or new build
- Where the new building should go
- Buying or leasing new land

Outline costs and funding
Appraisal of options
Outline programme and key dates
Appraisal of sustainability and renewable energy options



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10. Appendix B - Consultants Glossary

Architect
Architects design new buildings and the spaces around them and alterations to existing buildings. They also advise on the restoration and conservation of old buildings, layouts for groups of buildings and most of what is referred to as the built environment. They liaise with current users, clients, and construction specialists and their designs take account of information about cost, safety and social factors from other specialists in the team. They advise clients on the practicality of building projects and seek permission and approval to see if the proposals can be put into practice. Once building starts they can co-ordinate and administer the building contract through to completion. Refer to RIBA Commissioning Architecture leaflet and website www.architecture.com/UseAnArchitect

Structural Engineer
Structural engineers design and calculate the building structure and foundations. They sometimes also design below ground drainage. Refer to www.istructe.org

Mechanical and Electrical Services Engineer
M+E services engineers design and coordinate the services of buildings including gas, electricity, heating, lighting, ventilation, water and renewable energy. They sometimes also design the drainage. They calculate the proposed energy use of the buildings. Refer to www.cibse.org

Quantity surveyor
Quantity surveyors measure, estimate and advise on the cost of the designs produced by architects, structural engineers and services engineers. www.RICS.org

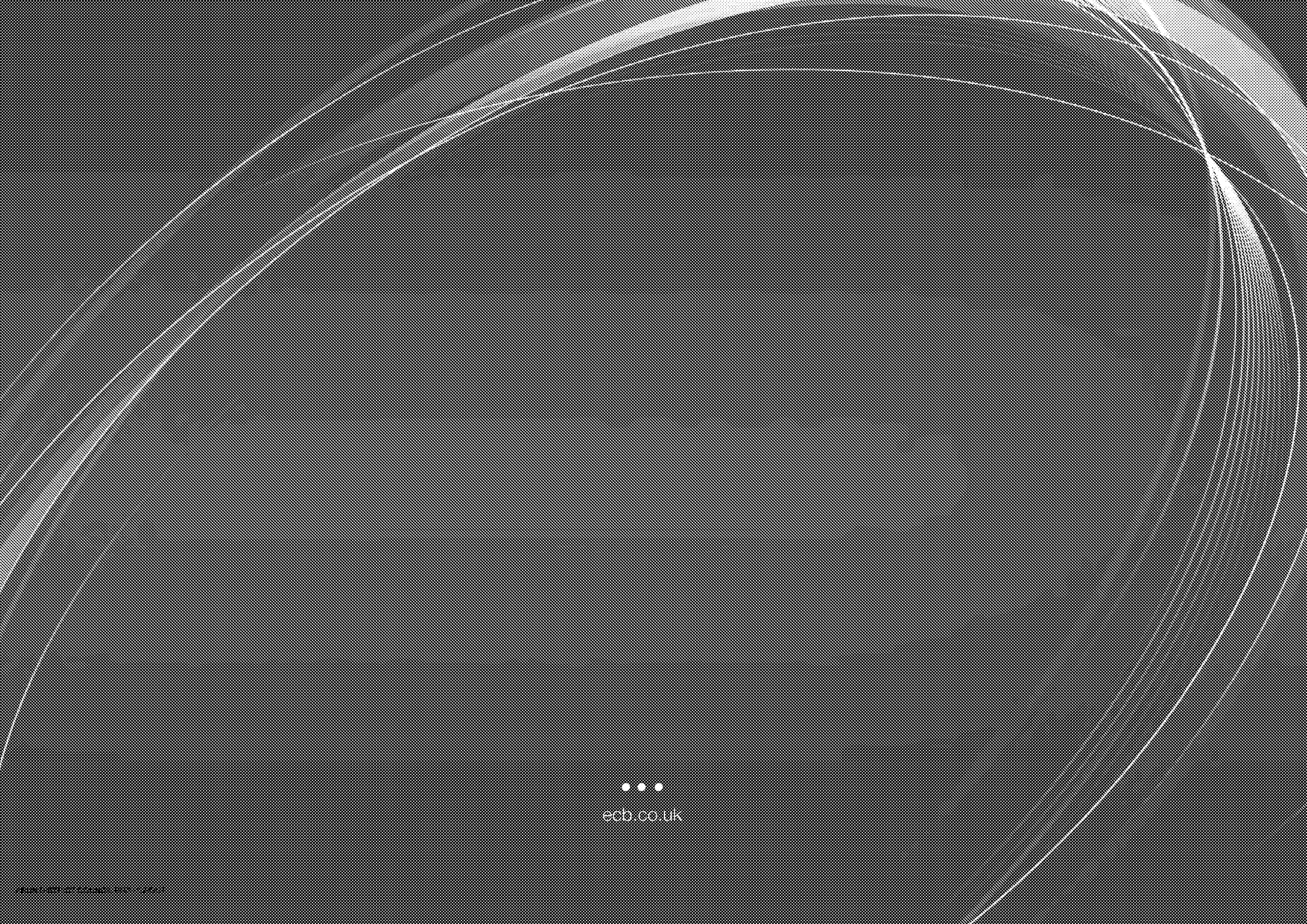
CDM Coordinator
CDM coordinators advise clients on health and safety issues, risks and the competency of the design team. They must be appointed by work stage C/ concept design.

Other specialists

Some projects might also require further specialist input during the design stage which will become apparent during the preparation stage:

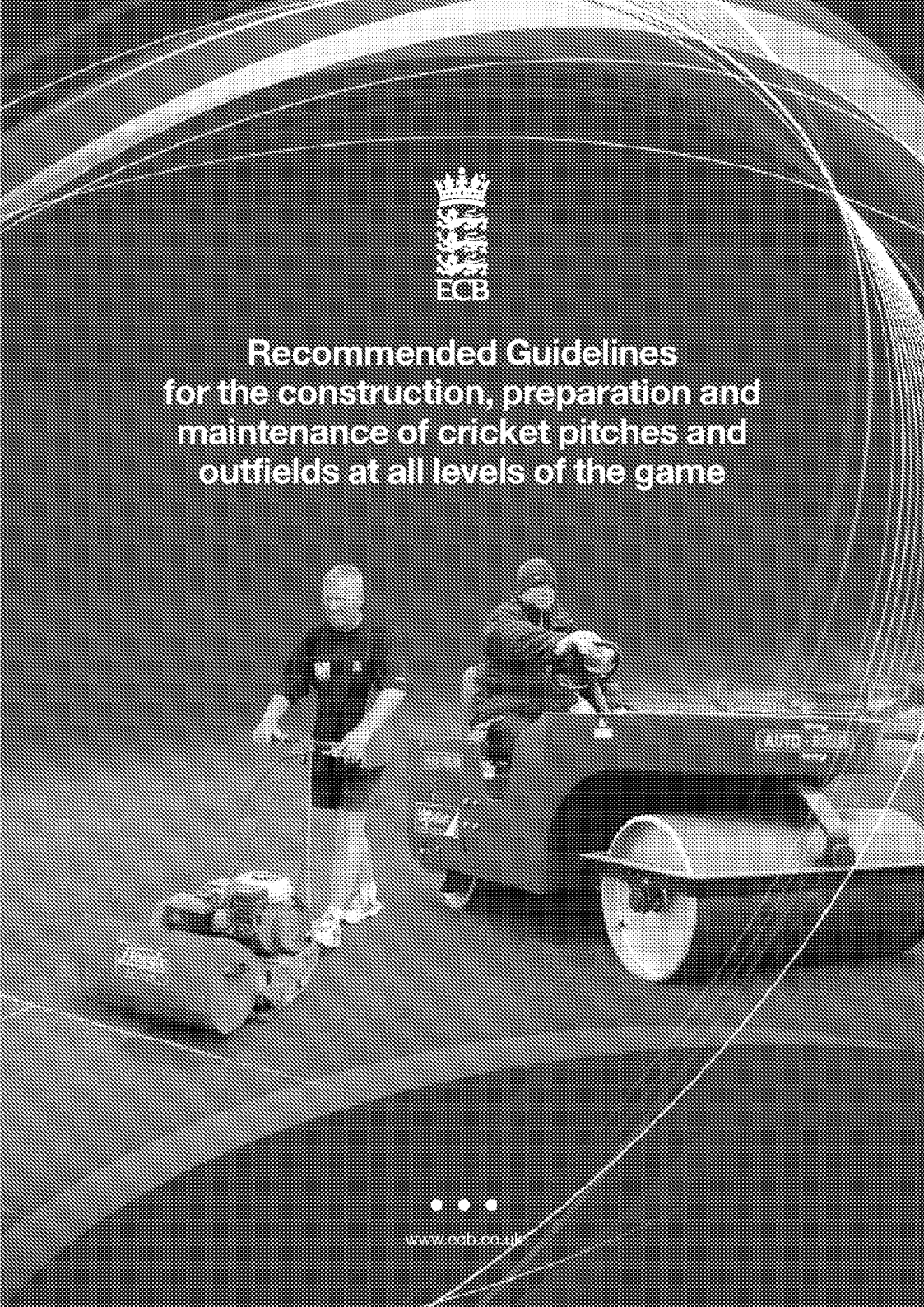
- Access consultants advise on designing inclusive buildings for people of all abilities
- Environmental consultants and ecologists advise on environmental issues which might be required if the site is a natural habitat for protected species
- Heritage and conservation specialists advise on preserving historic buildings and restoration
- Highways engineers design and advise on new roads or alterations to the public highways
- Landscape architects design the spaces and landscape around the buildings including details for hard and soft areas, trees and pitches.
- Planning consultants provide specialist advice when preparing planning submissions or appeals in areas with sensitive planning issues
- Project managers take responsibility for planning and facilitating a project. They can act on the client's behalf providing advice and be given responsibility for making key decisions.

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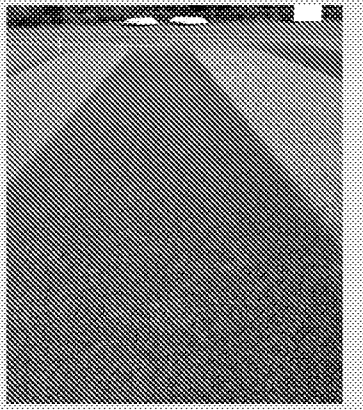
ecb.co.uk

Recommended Guidelines for the construction, preparation and maintenance of cricket pitches and outfields at all levels of the game



www.ecb.co.uk

Foreword

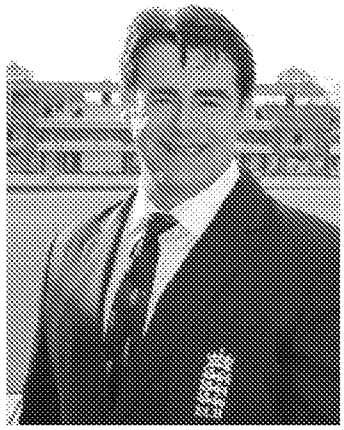


The England and Wales Cricket Board is committed to raising standards in all areas of the game and the provision of better pitches and outfields is central to that aim. No matter which level of cricket you play the desire is always to perform on the best possible pitches which offer both the batsmen and bowlers the chance to hone their skills and techniques.

We all recognise that the better techniques the players have, the better the standard of cricket they will deliver. For England – at every level in both the men's and women's games – to continue to prosper we need to produce players with outstanding technical ability. The first step to delivering those players is taken by the groundsmen and groundstaff, whose skills are so important to our game, as they strive to produce the best possible playing conditions.

ARUN DISTRICT COUNCIL BN/11/22/OUT

Foreword



Across the world, all forms of the game of cricket are evolving and developing with increasing popularity and the demand, from village green to Test Arena, requires safe, high quality surfaces in order that players can perform and improve their talents.

To meet these demands the knowledge and skills of the cricket groundsman have to develop alongside that of the game itself. Never before have today's generation of Turf Managers, of all codes of sport, been better supported by specific educational courses and qualifications and where ongoing scientific research and the development of innovative machinery facilitate the essential and traditional core methodology. Furthermore, the increased availability of funding through grant aid and interest free loan schemes have provided opportunities for the refurbishment or development of new facilities, resources and prospects for new career paths.

We are also living in a technological age of computers and communication networks where information can be swiftly gathered from all over the world. The same technology is used by the media to highlight sporting events and at the highest levels of the game, the work of our stadia groundstaff have come under the spotlight as never before. In return, it presents the opportunity to raise the profile of cricket groundsmanship as a universally recognised and highly skilled profession, from the enthusiastic volunteer of a village club to the grounds managers of the Test Match venues. I passionately believe that the persons who prepare the playing surfaces are as important as the finest players as neither can perform to the best of their abilities without each other.

I trust that this document encapsulates an awareness and understanding of contemporary procedures and methodology and provides the necessary guidelines for cricket groundsmanship at all levels, to assist in the preparation of the best possible surfaces their skills and available resources allow.

Chris Wood
ECB Pitches Consultant

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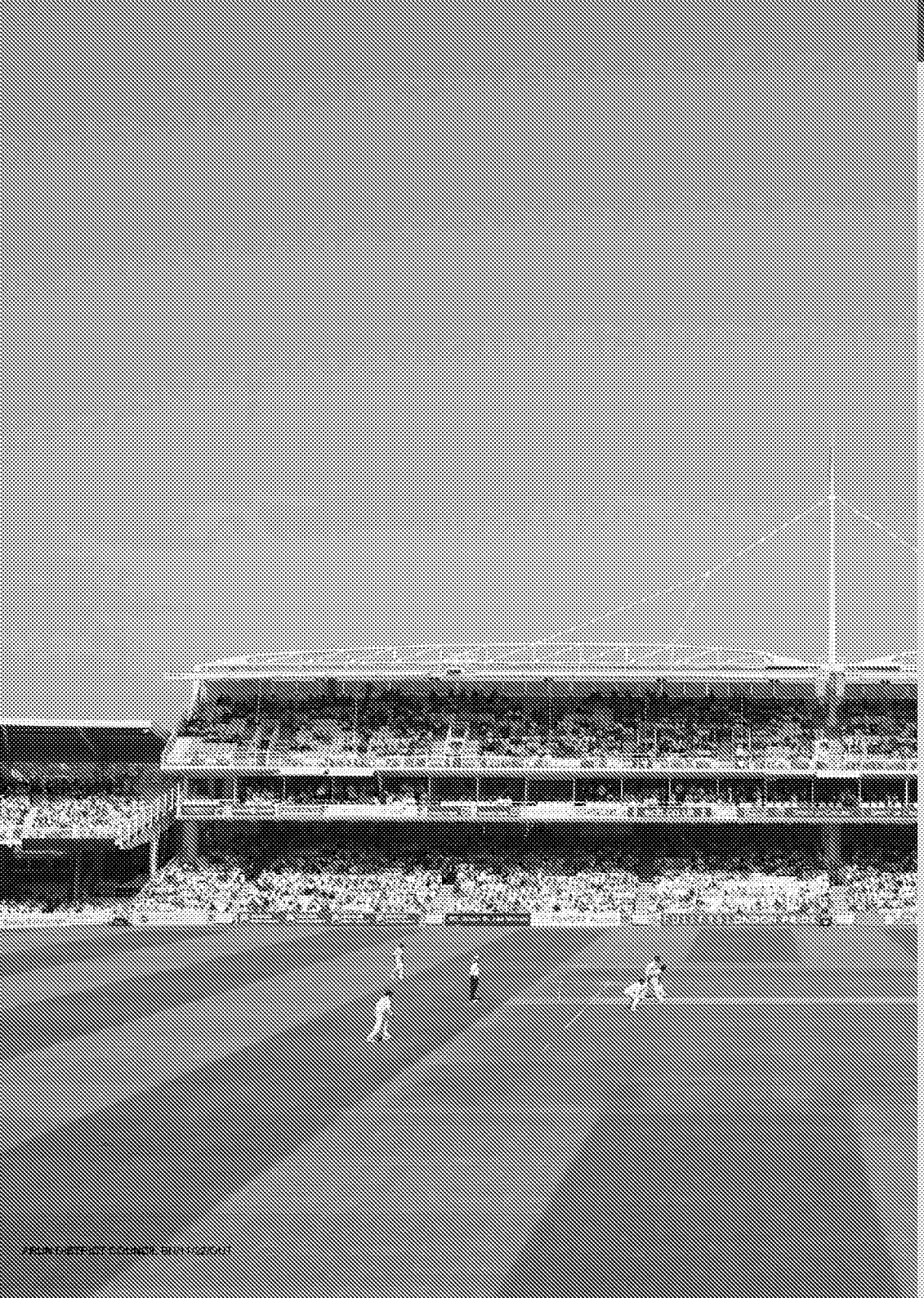
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ARUN DISTRICT COUNCIL BN/11/22/OUT



1 Introduction

The guidelines contained in this document are intended as a general guide to all aspects of construction, management, maintenance and pitch preparation of cricket grounds. It is accepted that with the groundsman's knowledge of the local conditions, he may find it necessary to vary the recommended treatment to suit a particular site. Likewise, due to varying weather conditions, the judgement of the groundsman is necessary to determine exactly when each operation should be carried out.

Preparation and maintenance of pitches suitable for first and non-first class matches, premier leagues, clubs and schools

Aim

To achieve the best possible playing surface at all levels of the game – at the top level a minimum of a two day game.

Objective

First class and matches of three days or more
At the commencement of the match the whole surface should be completely dry, firm and true, providing even bounce. The surface of the pitch should ideally wear sufficiently to give spinners some assistance later in the game.

Limited over one-day matches
For the duration of the match, the whole surface of the pitch should be completely dry, firm and true providing good carry and even bounce throughout. There should be little or no turn and little or no seam movement.

At the club/school level of the game, the pitch should give a consistent and safe bounce.

Guideline Maintenance Schedules

1. SPRING/PRE-SEASON & SUMMER

Pre-season rolling is absolutely crucial to the production of fast pitches, as the cricket square requires a firm, even surface and rolling should commence as soon as conditions permit. The groundsman is the only person who can decide when conditions are suitable.

The use of rollers to firm the surface over a period of several weeks will slowly consolidate the square. Use a light roller at the earliest opportunity in the spring, possibly at the end of February or the beginning of March, gradually increasing the weight, if possible, up to a 2028kg (2 ton) heavy roller.

Rolling Weights
Light Roller: up to 254kg (5cwt)
Medium Roller: up to 508kg (10cwt)
Heavy Roller: 1014kg (1 ton) or more

The pitch should be rolled in all directions, but with the emphasis on cross rolling in the early stages, but finish on the line of the pitches. The aim is to consolidate the square to a depth of 100mm (4 inches) before the commencement of the season. Light scarification may be necessary in the early spring, but this should only be done in moderation with great care being taken not to destroy grasses sown in the previous autumn. Heavy mechanised scarification/verticutting that would cut into the surface may well lead to cracking of pitches later in the season, however a scarifying unit with brush attachment is recommended.

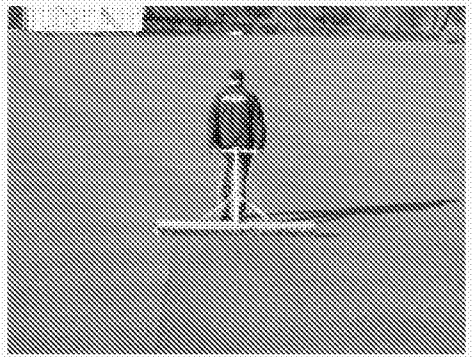
Spring fertilisers may be used at the discretion of the groundsman (according to manufacturer's instructions). Nutritional analysis of the soil is a must and will assist decision making.

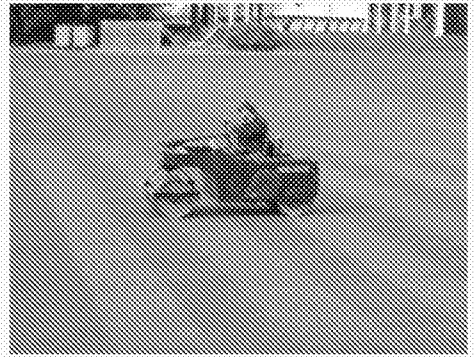
A summer-based fertiliser contains more nitrogen, which encourages top growth increasing the need for mowing more often.

Brush or drag mat the square regularly, especially when dew is on the ground, as this will remove moisture from the leaves and discourage disease. Maintain observation of infestation of weeds and worm casts. Take control measures using the appropriate products assuring all legislation compliance.

Mowing

Gradually reduce the height of cut on the square approaching the start the season to a height of 12mm (½ inch). This height should be maintained all season over the square, with it being cut at least once a week if not twice during growing conditions. Always ensure blades are kept sharp and set correctly to ensure a good clean cut with no "ribbing" or tearing.





11. PITCH PREPARATION & POST-MATCH RENOVATION

When the fixture list is available it is possible to establish a plan to programme pitch allocation for the whole season. You should aim to produce equal usage of each pitch. It will be necessary to place the more important fixtures towards the centre of the square and then work out accordingly.

Consecutive matches should not follow on adjacent pitches as this could mean using a strip which may be damaged from the bowlers run-off from a previous match. The two outside pitches are often reserved for junior games or practice/artificial pitches.

To facilitate this, the table should be "squared off" prior to the playing season, using the "3-4-5 triangle" method to establish the corners, stump lines and individual pitches set out with white "T" markings. *(See Fig 1.1).*

Pitch Preparation Prior to a Match

- For first class pitches, this should ideally commence at least 14-10 days prior to the match, or in the case of clubs, schools etc, a minimum of 5 days before the match.

- Select the pitch to be used, outlined by "T" marks to a width of 3.05m (10ft) and preferably using strings and mow, ideally using a mower with a thin bottom blade and having at least an 8-bladed cylinder set to a height just lower than the rest of the square (eg.6mm or ¼ inch) Cut along the line of the pitch and return on the same line you have just cut.

- Work your way across the pitch to complete the full width. Dependant on how much grass is present on the surface it may be necessary to repeat this operation.

- Scarification should be carried out between the popping creases, to reduce the density of grass using pedestrian or mechanical brush/rake machinery (not thatch removal or similar type tines), hand rake or a strong broom, care being taken not to disturb the soil surface. The bowling ends should not be scarified as this will assist in reducing the wear and tear, and aid recovery from the damage caused by players.

  Scarification should continue until the grass sward has been sufficiently reduced in density. There should be no mat of grass and the surface soil should be visible between the blades of grass.

- Check for small scars or depressions, particularly on a length and repair where necessary. (Carefully lever up depressions. Do not simply fill hollows with loose soil as such would only disintegrate if struck by the ball)

- If the surface is dry, it is generally considered that water, either by rain or applied by irrigation, is essential in the preparation of a pitch in order to give it a firmer, solid surface for match play. Water copiously if necessary with the aim to soak the profile to a depth of 75-100mm (3-4 inches).There is no fixed period for the watering of a pitch, but this should be done well in advance of a match in order to ensure that the pitch is completely dry at the start of play. Ideally this should start no less than 10 days prior to the match. The rolling of the pitch should commence with a light roller when all surface water has disappeared. As the pitch dries, the weight of the roller should increase. The groundsman should use the heavy roller at every suitable opportunity prior to a match whilst any moisture content remains. The heavy roller should not be used once all the moisture has gone from the pitch. In prevailing hot, dry weather conditions it may be necessary for further light irrigation or "flashing" nearer the match day although such a decision would rely on the experience and expertise of the Ground Authority as is the deployment of covers where provided to prevent unwanted wetting of the surface or control the rate of drying during the course of preparation.

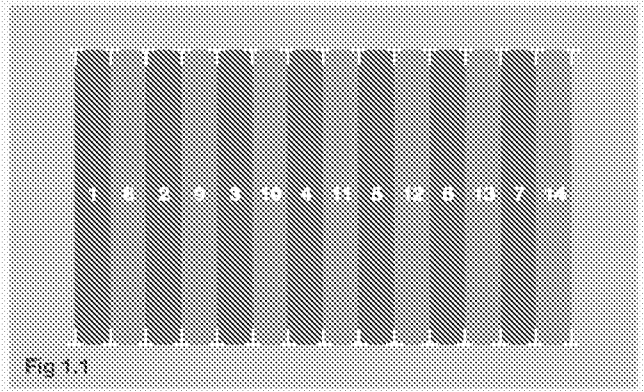
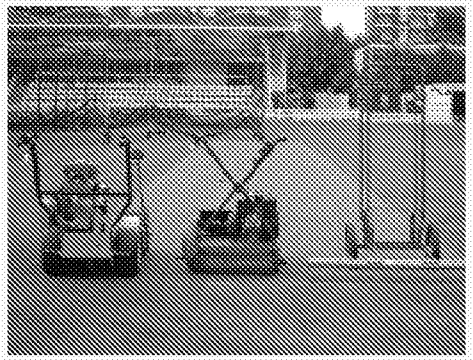


Fig 1.1

2 Cricket Ground Maintenance & Pitch Preparation





If the square has been consolidated before the season, pitch preparation is greatly assisted and possible rolling times reduced.

- For the remaining pre-match days during the course of preparation, mow every day or at least every other day between the popping creases and in combination with light scarification/brushing, progressively lowering the cylinder to the desired height of cut (typically between 3-5mm, (⅛ – 3/16 inches) or as low as possible, without scalping and the surface is not scarred or disturbed in any way.

- On the morning of the match, start early and brush, close mow and roll (Typically for around 15-20 minutes). Finally, if not done the previous day, Mark out the creases on the pitch, clearly, accurately and neatly with lines not more than 25mm (1 inch) wide nor less than 12mm (½ inch) using string lines or a marking frame if available. (see the paragraphs on marking out for details). Use a proprietary marking compound or whiting powder or combination of both. Finally set the stumps in the correct positions on the crease with a little water placed in the stump holes prior. This will ensure that the stumps remain firmly in place during the duration of the game.

At the start of the match the pitch should not be excessively green in colour to favour sideways, seam movement and be completely dry. This applies not only to the top surface but also progressively to a depth of 75-100mm (3 - 4 inches). Weather conditions may make this difficult, but, if the weather is fine or with the correct use of covers, it should usually be possible to obtain complete dryness. A pitch which is completely dry at the start of a game is more likely to assist spin bowlers later in a game.

A pitch prepared in the above manner should, given good ground and weather conditions, be expected to last for 3-5 days of first class or 3-4 games of average club standard.

Surface Stabilisation Agents (SSA)

At the commencement of the 2006 season, the ECB sanctioned the application of a surface stabilising agent, in particular PVA (Poly Vinyl Acetate) adhesive solely for county one day matches. The application of Surface Stabilisation Agents during the preparation of pitches for first class matches is not permitted. Any pitch that has had the agent applied at any stage during the season in question (eg for use in other matches) may not be used for first class matches. This is because first class pitches should naturally deteriorate as the game progresses and the use of an SSA would work against this process. The ICC also gave permission for international one day usage where deemed appropriate and always with the agreement of all interested parties involved.

The material works by binding the surface to prevent excessive deterioration and assist a degree of uniform pitch performance. It has proved to be successful on smaller squares where already worn pitches have to be re-used in order to accommodate a heavy schedule of matches and will also add longevity to outdoor grass net practice facilities. It can also be useful for the recreational game to retain a safe playing surface in times of drought and subsequent watering restrictions. It should never be applied with the notion of turning a pitch with poor playing characteristics into a good one, nor a substitute for a correct maintenance regime.

It should be noted that if there is evidence of moisture in the surface of the pitch then it will effectively be sealed in with the resultant likely consequence of excessive seam movement.

Although occasionally used in New Zealand since 1996-97, this is a relatively new concept in England and Wales and there has been no evidence to date of deterioration of growth or soil conditions by residual build-up although more research over time will allow for re-evaluation. However, with the contemporary restorative machinery available today, this should not be an issue.

Application Guidelines

The best way to apply the mixture is through a knapsack or a "walk-over sprayer". It takes between 10-15 litres to do a strip.

The rates of glue can vary from anywhere between 5-10 litres of glue per pitch but generally 5 litres of adhesive to 5-10 litres of water are the favoured norm as long as the glue is mixed well with water before putting in the knapsack and it goes through the nozzles.

Apply the contents of the knapsack/sprayer evenly over the entire surface of the pitch or practice area. Do not stop or the mixture will quickly coagulate in the lines. It will look white when first applied, but it will dry clear. The spray container must be well washed out immediately after use.

The optimum time to apply is when all pitch preparation is complete ie the evening before match day. Allow approx. 45-60 minutes to cure & dry before putting the covers on for the night. On the morning of the match, a quick cut if necessary and light roll will suffice.

Whether or not any grass remains on the surface, once sprayed, then it is possible to re-use the pitches again after the game easily enough. Treat the pitch as normal ie water up, re-roll, mow etc, the glue should not alter anything in that respect. More can be applied if needed. This procedure can prolong the lifespan of grass practice facilities especially where confined or restricted by available space.

When no longer in use, the pitches are easily re-instated and renovated by simply vigorous brushing of the surface, thorough watering and overseeding under normal procedures.

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2 Cricket Ground Maintenance & Pitch Preparation

After Match Pitch Repairs and Renovation

It is essential to proceed with repairs and renovations as soon as the pitch becomes available after play and not wait, as the whole square will soon be looking very sparse. Un-repaired ends on used/worn pitches can be dangerous and are not conducive to a good game of cricket. The selection and rotation of fresh pitches, of a good standard, will become increasingly difficult if the ends are not repaired promptly and correctly.

Maintenance and Repairs to Foot Holes

The umpires shall see that wherever possible and whenever it is considered necessary, action is taken during all intervals on play (including designated drinks intervals) to do whatever is practicable to improve the bowlers' foot holes.

In matches of two days or more, as soon as is possible after the conclusion of each day's play, bowlers' foot holes will be repaired.

If the pitch is to be used the following day they will need to be filled in using the following method:

a. Use a cricket clay loam that has been prepared a day in advance of a game. Make this up in a wheelbarrow. Screen two shovelfuls of soil into a wheelbarrow and sprinkle with water until there is sufficient moisture to have a light covering. Repeat this operation until the barrow is full. Keep under cover until required.

b. Brush with a besom or a yard broom within the creases and slightly up the pitch (no further than the protected areas) cleaning out any loose material.

c. The footholds need to be thoroughly drenched. Then using hands, remove all excess water. This dampening has the effect of creating a bond for the new soil to adhere to. By the addition of mixing some grass seed with the soil there will often be no need to remove the repair once the match has finished.



d. When infilling a depression ensure that it is done in one mass, if applied in layers, the soil will not bind sufficiently.

e. Start to consolidate from the outside of the foot hole and tread down with the foot, or with a heavy panner/thumper/'elephants foot', preferably one made of metal.

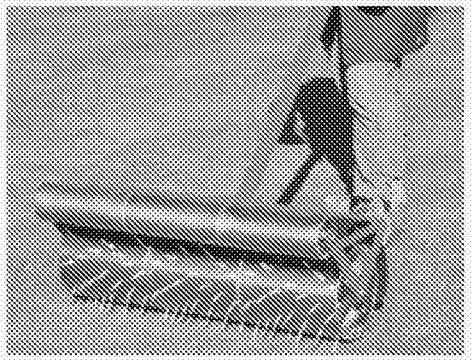
f. Ensure that the finished filled area is no higher than the rest of the surrounding surface within the crease by means of a suitable straight edge. This will help to prevent raised ends or 'saddles' from gradually forming.

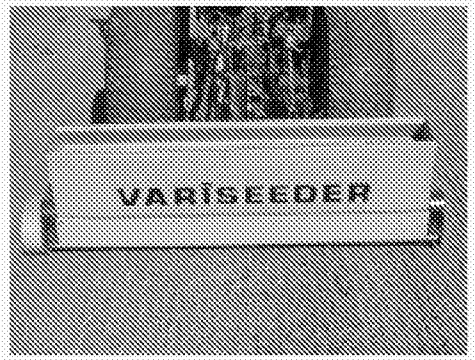
g. Brush some dry soil/dust over the repaired area and mark out afresh.

Renovation and Reinstatement of Used Pitches

As soon as possible after the game is over, start reinstatement of the whole pitch.

First vigorously brush the pitch with a besom or yard broom to remove any loose soil and debris. Check that no foreign objects such as studs have been left on the playing surface, if they are not picked up they could seriously damage the mower. Worn bowler's footholds need particular care and attention.





Flood the pitch three or four times depending on how much water it will take to become soft enough to take a Sarel spiked roller or studded type overseeding device, which will produce a good seed bed of many small holes.

It is a waste of time and money to merely scatter seed on an unprepared surface. In order to give the seed a better chance of germinating it is important that it is well embedded in the soil. The making of a seed bed is essential and the seed worked/brushed well into the holes produced by the overseeder.

Pay particular attention to the bowling ends and run through areas where most of the wear and tear has taken place. Do this by raking lightly to form grooves, or use a border fork, or dibber to loosen the base. Evenly sprinkle the grass seed into the repaired footholds and cover with a light coating of loam. Always use a straight edge to level off with the surrounding area to prevent raised bowling ends and a saucer shaped square!

Any deep ball or heel marks should be attended to by raising with a screwdriver and plugging with moulded loam, level to the surface, and consolidated.

Finally, overseed the rest of the pitch brushing the seed into the holes made by the overseeding equipment. Apply an autumn fertiliser at a rate recommended by the manufacturer. If needed give a light dressing of loam, work in and lightly water with a sprinkler.

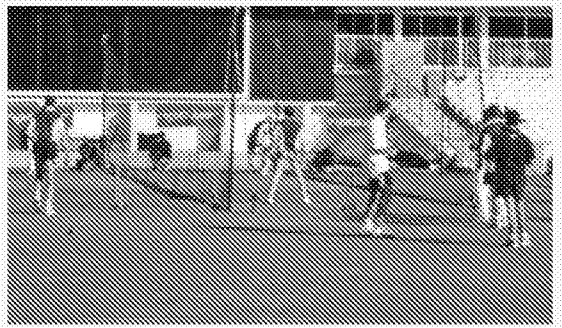
In normal British summer conditions, grass seed will germinate with the pitch ready for use in four to five weeks. Use of plastic or mesh sheets (germination sheets) will speed up the germination process.

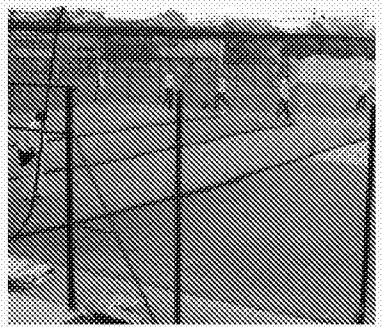
Grass Net Practice Facilities

Where grass net areas are provided it is imperative that they are constructed and maintained to exactly the same criteria as the square, with true and predictable bounce enabling players to practise and perfect their skills, a very important aspect of today's modern game.

Ideally these facilities should be allocated off the playing area so that practise can take place during match days. However, if not possible, consideration can be given to a suitable area on the outfield or provision made for use at the edge of the square. Such an area should allow for a minimum of 3.66m (12ft) or maximum 4.75m (15ft) wide bay or multiples of, with an adequate allowance as possible for a full safe bowlers run up. A batting end of a minimum of 10.67m (36ft) length would suffice providing the run-ups are on a similar level surface. However, an audit survey of international and first class practice facilities, undertaken in 2001, found that players prefer full cut net pitches with firm bowler's footholds and no discernible line across the middle that detracts from the judgement of line and length for bowlers and batsmen alike.

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The net system deployed can have a direct bearing on the lasting quality of the surface in that where a permanent cage is in situ, the practice lanes have to be used and renovated in rotation as they wear, whereas a moveable system like a simple Brodie pole/guide rope assembly can utilise the entire space of a designated "block" and allow easy access for managerial procedures like cross rolling and swift covering with a flat-sheet. For clubs with a healthy financial income, more complex and costly systems have been developed for designated areas. One has poles set into sockets. The batting end poles have fitted boxes containing the side netting that pull out to form the separate lanes whereas the most advanced has permanent pylon stanchions to the side supporting wires that carry a number of net bays that can be situated anywhere on the practice pitch area and winched up quickly to leave a completely clear zone for maintenance and even mini-cricket practice. One of the many benefits of this system is that there are no metal pole supports that the ball can rebound off, a much safer aspect as is full length side nets that prevent a strongly hit ball from the path of a bowler or persons in an adjoining net bay.

Mobile net cages can allow for many recreational clubs, cost effective and instant use of a pitch on the square or set aside area, and stored away afterwards thus limiting unauthorised usage and unnecessary wear.

Because the upkeep of grass net facilities is as high maintenance as the square, it can be a luxury that many clubs cannot afford and if considered for development, sustainability must be taken into account as there is nothing so worse for a player's skill progress than a badly maintained net surface especially where a high intake of youth and junior cricket is to be supported.

In this scenario Non Turf Pitch (NTP) outdoor practice facilities offer the best option in terms of low maintenance, readily available in most weather conditions and safe playing performance rating.

Outfield Areas

The outfield should provide a fast and true surface for the ball to run without deviation and should be firm enough to provide a good and safe foot hold for the fielder.

Some outfields perform a dual role and will be utilised for football or other winter sports after the cricket season. In these circumstances there is a greater opportunity for the provision of a wider range of machinery and equipment for the outfield. Many village/community grounds will have an outfield that does not display satisfactory levels and may contain many humps and hollows that may radically prevent a good maintenance programme being implemented. To bring a poor surface to a good standard may incur huge expense and is not always affordable by small clubs/schools without financial assistance.

Drainage is another major problem on the outfield and the installation of a pipe drainage system may be required.

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The outfield should ideally be made up of a good free draining loam with suitable grasses and weed free. It must be cleared of any objects that could cause injury to players or damage to machinery.

The majority of first class county grounds have made commitments towards enhancing and improving the quality of their outfields, improving drainage to ensure that playing time/television coverage is maximised after cessation of heavy rainfall. Some counties have installed pop-up irrigation that is computer controlled to precise and optimum measures and is often deployed overnight as we become increasingly mindful of water conservation and the necessity to maintain a uniform visual presentation and safe playing performance rating.

Perimeter Ball Stop Safety Netting

There are many grounds in the UK historically sited or newly constructed within residential areas with adjacent housing or railway lines or public highways in close proximity to the boundary extremities. Over the years there have been reported incidences of damage to property and persons with insurance company indemnity policies becoming costlier and increasingly reluctant to cover without the consideration on safety grounds, of installing protective ball stop netting situated reasonably high enough to prevent the trajectory of a hit cricket ball encroaching outside the ground perimeters. Where installation is contemplated, local planning permission should be sought although there is on the market a temporary system that can be erected and dismantled as required, without the need for planning approval.

Maintenance and Presentation

Mowing is the main operation carried out on the cricket field, the standard and quality of the facility will determine the height of cut. A good outfield should play true if maintained on a regular basis at 10-12mm (⅜-½ inch). Any unevenness in the surface would prevent close mowing and a cutting height of up to 25mm (1 inch) will be required.

For all first class and international competitions, the outfield shall be mown daily before play begins, upon cessation of the days play or whenever weather permits. (Law 10.3(d)).

Every opportunity should be taken to enhance the presentation of the ground, for both spectators and players. This can be achieved easily by the sensible use of the mower (or trailed equipment, such as the brush or harrow).

For the best results the outfield should be cut with a 36 inches (90cm) box cylinder mower. The use of a roller mounted trailed seat with the mower will assist the smoothness of the surface. A Triplex type ride-on mowing unit will also produce a similar quality boxed finish, without effecting surface consolidation, whilst allowing increased time efficiency. Where the grass clippings are removed on a regular basis, there will unfortunately be a greater demand on the nutrients and additional fertiliser applications may be required.

Many village/community clubs will have the outfield cut by gang mowers towed behind a tractor or other vehicle. These will reduce the cutting time and return the clippings to the surface. The lack of rolling from the gang mowers will reduce the need to aerate the outfield with spiking equipment.

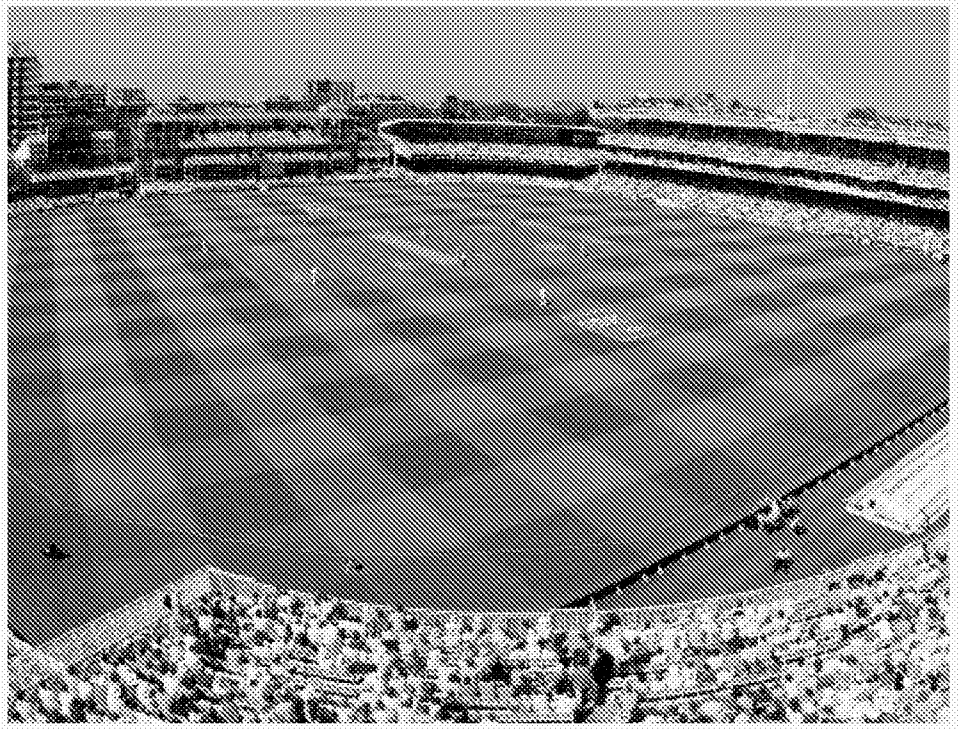
A light rolling prior to the commencement of the playing season will resolve soil disturbance and firm the sward. A larger mower, with the cutting cylinder disengaged, will prove ideal for the purpose and may also be used during the playing season to firm the outfield should the need arise. This latter difficulty often arises when gang units are used as the sole means of cutting the outfield.

Although fertiliser on the outfield is not as important as on the square, one dressing a year, usually in spring is sufficient for most grounds. However a supplement at the end of the season to enhance growth for winter sports may be useful.

Other maintenance operations could include the control of weeds, pests and diseases as required.

Where provision is allowed for the irrigation of the outfield areas, either by self-traveling or pop up systems, these should be used at the discretion of the groundsman.





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III. AUTUMN/POST SEASON AND WINTER

End of Season Renovation

It has long been recognised that post season cricket square renovation, undertaken in a correct and professional manner, forms the foundation for quality pitches throughout the forthcoming season. For many clubs this work can often be unsubstantial due to lack of resources either in funding or lack of machinery/materials or plain absence of knowledgeable trained manpower.

All materials required should be ordered and delivered to site well in advance to ensure that all workings are commenced and completed at the earliest opportunity as soon as the playing season is over whilst climatic conditions facilitate germination and early growth. There is never a guarantee that completion of programmes of recommended operations will result in distinct improvements in quality playing standards if the correct after care and resources of the ground authority are insufficient to maintain facilities.

Type of Soil and Top Dressing

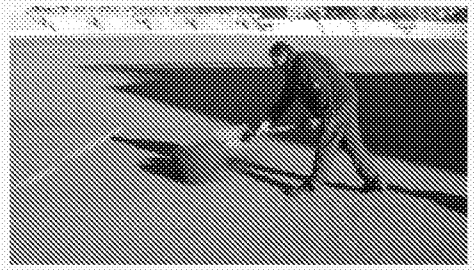
The use of the right soil is most important for the production of pitches of optimum playing performance. The soil must have strong binding qualities and this is dependant on the percentage of clay content in conjunction with the other constituents of the soil structure.

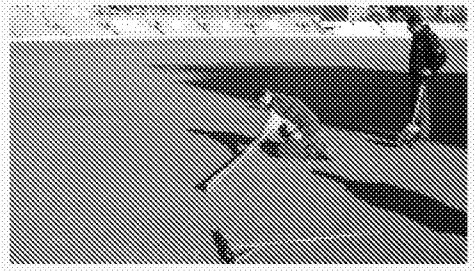
The soil selection is dictated by the standard of pitch required:

First Class and Premier Leagues:
Minimum of 28-35% of clay
Club standard: Minimum of 25-30% of clay
School: Minimum of 25-28% of clay

If there is any doubt regarding the quality of topsoil loam, then samples should be sent to an ECB recommended organisation for analysis and report using the appropriate methodology (Sedimentation/ Pipette method). There may be a cost for this service.

A light sandy soil should never be used as a top dressing.

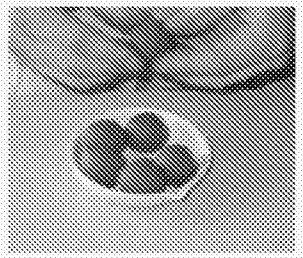




Under 45kg (100lb) = poor soil
55-65kg (120-145lb) = good for club cricket
65-90kg (145-200lb) = good for county cricket
Above 91kg (200lb) = difficult to manage

Soil Strength (ASSB Test)

The results of the soil strength tests indicate the ability of the soil to bind together when prepared as a pitch by rolling.



Soils that have a breaking strength of less than 35kg will not hold together when dry under the impact of the ball and therefore such soils should never be allowed to dry out. Soils that break between 45kg and 55kg can be allowed to dry out but preparation must be very good. Soils with a breaking strength of 55- 75kg are ideal for club cricket and provided they are prepared well can be allowed to dry out.

Core Sample Testing

This test will determine how good the soil is in your square. This analysis must be for both the soil texture on the square and the loam being supplied.

The aim of top dressing is to restore the levels of the pitch to produce a consistent surface while also maintaining the quality of the playing surface.

The use of top dressings on a cricket square must follow two fundamental principles;

1. Must be compatible with the existing soil in terms of particle size distribution.
2. Must be compatible with the existing soil in relation to swell/shrinkage characteristics.

Top dressing involves the application of sieved/screened clay loam to the surface of the square to improve the surface and ameliorate the underlying soil.

The top dressing should be a heavy clay loam with a binding strength of between 55-90kg (120-200lbs) and approximately 25-35% clay, with a sand and silt fraction ranging between 25%-50%. The organic matter content should be between 2-6% with the pH above 5.5 and the soil screened through 4mm (3/16 inches) Mesh.

As a working estimate the depth of clay loam applied as a top dressing should be 2-3kg/m (4-6lb/yd).

A "Motty" (ASSB) test should be carried out to ascertain the soil strength and binding quality. To make motties take approximately 150 – 170g (5-6oz) of air dried soil passed between a 5mm screen (assuring any organic debris is removed), moisten slowly and mould the mixture into a plastic state. Then roll into a cylindrical shape of approximately 20mm (¾ inch) diameter. Cut into 25mm (1inch) lengths and roll carefully into smooth spherical balls of approximately 25mm diameter. Retain 6 of the most evenly shaped and allow to dry at room temperature (not in direct sunlight) for a period of 4 days.

When dry and using suitable bathroom scales, place the motty between 2 firm, flat surfaces and press down to determine the weight required to break the ball.

The clay percentage & soil strength guidance scales provide the required information.

The clay percentage scale gives the answers.

Types of Grasses

Pace and evenness of bounce can be influenced by the growth habit and performance of the turfgrass cultivar(s) and/or specie(s) used.

Leading turfgrass research centres are continuously striving to breed new varieties that meet the unique nature and demand of cricket pitches, for example, speed of germination, fineness of leaf, tolerance of close mowing, strong re-growth and regeneration, drought and wind-chill resistance, deep and vigorous rooting, disease resistance, and in the case of Perennial Ryegrass (Lolium Perenne), less tendency to "browning".

Today all first class county squares use a 100% Perennial Ryegrass blend although some squares in community/ recreational cricket still include a few traditional species such as Chewings Fescue (Festuca rubra commuNtaTa) and Brown Top Bent (Agrostis capillaris).

Some cultivars perform better than others according to location, topography, and prevailing climatic conditions. The turf manager should decide on the best grass cultivar/blend/mixture for his/her purpose, dependant upon the demands of the pitch, club fixtures, and management regime. Further information and site-specific guidance is available from a reputable seed supplier.

Only those cultivars on the National and EU Common Catalogue List can be legally sold, supplied and seeded in the UK. All seed produced, in accordance with the above, must conform to D.E.F.R.A regulations for seed purity, germination, and non-crop species.

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Turfgrass cultivar characteristics, scores, and rankings can be found in the current edition of Turfgrass Seed published each year by the Sports Turf Research Institute (STRI) in association with the British Society of Plant Breeders Ltd (BSPB)

Typical seed mixtures for the square and renovation are;

A) 40% Perennial Ryegrass
40% Perennial Ryegrass
30% Chewings Fescue

B) 65% Perennial Ryegrass
20% Perennial Ryegrass
5% Browntop Bent

The Turfing of pitch or square is strongly discouraged!

Guideline Renovation Procedures

The recommended procedures are an example of a square comprising of 10 strips or pitches. Each pitch measuring 22.67m x 3.05m (75 x 10ft) a total of 69.6^{2}m (83.3^{2}m) with the area of the square 696^{2}m (833 sq.yd) as follows:

Upon cessation of the playing season any remaining worn bowling ends to be filled and consolidated level to the surface and seeded.

The entire square to be in a condition that is immediately receptive of a renovation programme by shaving down to a cutting height of 3mm (⅛ inches), match height, or as low as possible without scalping the surface. Use a well set cylinder mower with a low height of cut to provide a clean surface, this may take two or three cuts.

If rainfall is absent and prior to further operations, soften the surface sufficiently by artificial watering. It is imperative that imminent weather conditions are taken into consideration before commencement where possible. (This is important for optimum effect of scarification/ verticut operations unless grooves/linear aerators are implemented)

(Both the above measures can be implemented by the home authorities before arrival of contractors to ensure optimum results).

The entire square to be heavily verticut in preferably 2 or 3 directions (diagonally & in line with play) according to density of surface vegetation or organic matter, by an approved machine capable of penetrating the surface without labouring the engine. The new generation of grooving/linear aerator machines are capable of achieving this to a depth of 6-12mm (¼–½ inch) under dry conditions, without resultant sealing of grooves by foot or tyre traffic. All resultant arisings must be removed from the surface by sweeper, blower or equally efficient device. In the main many clubs do not possess such a heavy-duty machine so should hire. Costs can vary per day according to type and whether pedestrian or tractor mounted and with or without operator. (Possible implications with Health and Safety competence in operation of machinery)

The linear grooves created by the verticut facilitate a receptive surface for overseeding and keying in loam top-dressings although an overseeding implement such as a Sarel type spike roller or studded variseeder would maximise application of recommended grass seed at a minimum of 50grm per^{2}m (1 ¾oz per^{2}yard) for the square and brushed into the surface. The majority of cricket squares these days are sown using a total perennial ryegrass blend using 2 or 3 cultivars tabled under the name of the respective seedhouses in the annual performance listings provided by the Sports Turf Research Institute. Where specified or requested to match an indigenous sward of finer grasses such as fescues, bents or smooth-stalked meadow, consideration should be given to their slower to establish properties or whether survival rates diminish on account of wear and relative pH values.

An application of a suitable pre-seeding or autumn/winter low nitrogen fertiliser to encourage an aggressive primary root growth and hardy plant health. Some groundmen prefer to apply a week or so prior to commencement of renovations and follow up with another application later on when the grasses are fully established. Also there are

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now forms of root-enhancement products available to consider.

A nutritional analysis beforehand is always advisable to determine the specific requirements of the square.

Applied top-dressing of a suitable proprietary recommended loam ideally in continuity of that already established in use or as close a match to the shrinkage values of the indigenous loam. This should be spread by hand or machine and thoroughly luted and keyed into the surface by use of an implement such as a wide tru-lute or straight-edge to approx. 6 x 25kg per pitch (2.95kg per^{2}m or 5.5lb per^{2}yds) unless pronounced saddled ends are evident and dressings should then be applied only to where levels meet the rise. Any small deviation in the levels should be corrected at this stage.

It is important to maintain the same consistency of top dressing and it is often advisable to order a small surplus to store for seasonal repairs.

Irrigate the square if necessary during prolonged dry spells and lightly top-off the grass sward when the seed has germinated and the square is dry enough to take the mower.

Linear Aeration (Surface Grooving) for Cricket Squares

One of the most important operations of the calendar year towards the production of high standard cricket squares, has been heavy scarification at the end of the season to reduce the build-up of surface organic material, lift and sever procumbent growth, reduce the percentage content of thatch producing Poa Annua and assist incorporating heavy cricket clay loam top dressings.
Until the concept of motorised verti-cutting machines, much of this had to be accomplished by pedestrian operated rakes, a laborious task that still allowed some organic content to be buried under top-dressing that sat as a "skin" on the surface. Even the arrival of the motorised scarifier was extremely limited in the removal of accumulated thatch that lay beneath the surface because the blades were unable to effectively penetrate the immediate surface without labouring the engine or causing severe wearing of the blades.

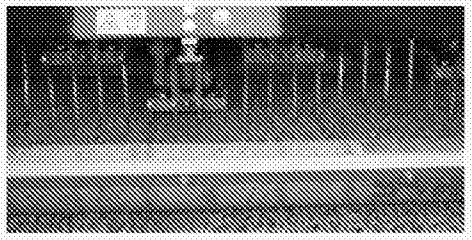


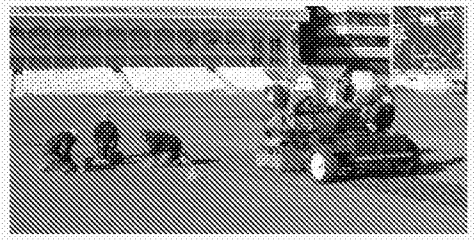
Softening of the surface by application of water/rainfall assisted the operation but the resultant grooves closed up under pressure from foot and wheeled traffic and mud frequently sticking to the front rollers, if not cleaned regularly, meant that the height adjustment was affected. The surface then had to dry out before top-dressing could be applied.

Throughout the UK, core sampling of the profile of many squares reveals how the ineffectiveness of this operation has resulted in bands of buried organic layers causing breaks and air pockets caused by the yearly applications of top-dressings not being able to be keyed into the underlying surface.

The gradual results are squares underperforming, with possible uneven bounce and a drastic reduction in pace because the impact of the ball is diffused and cushioned.

In 2000, an Australian engineer introduced into the UK a heavy-duty scarifier powerful enough to penetrate uncompacted sports turf down to 45mm thus removing bigger quantities of buried and surface fibre than previous hollow-tining methods. This has become known as Linear Aeration. However, for the far harder and consolidated surfaces required for cricket and especially the high clay bulks of Australian pitches, the tungsten-tipped blades proved ideal for surface grooving producing a superior environment under much dryer conditions that facilitate removal of fibrous matter, a seedbed with a higher percentage of germination and most importantly, integration of the top-dressing.





It is recommended that a depth of no more than 12mm (½ inch) is set to lessen the risk of linear cracking during seasonal pitch preparation. If surface thatch or buried fibre deeper than 12mm (½ inch) is evident then removal by Fraise Mowing/Topping is far more effective followed by surface grooving as a tilth medium.

Aeration and the Soil Profile

Aeration has always been considered as one of the most essential requirements of managing a healthy soil profile in particular relieving the dense consolidation, a natural feature of all cricket squares, that impedes the pore size and air spaces between soil aggregates and severely limits the depth and health of the root system. Traditionally, this operation was done before top-dressing but rarely sufficient depth of penetration was achieved due to the density of the sub-surface in late autumn. It is now recognised that roller drum type of spikers with a consistent depth of tine can be detrimental to any square with underlying layering and rootbreaks due to its pulling action.

It is recommended is to use a cam or vertical punch type of aerator fitted with a solid "pencil" tine to minimise side wall compaction at a minimum depth of 100mm (4 inches) at 50-100mm (2-4 inches) centres avoiding any form of "heave" by the addition of finger bars between the tines. Therefore the tendency of timing of the operation is later in for example, mid-November when the soil profile is more likely to be moist and in a more receptive condition after early re-establishment of the grasses whilst the soil temperatures are favourable and top dressing has been weathered in.

Taking a profile reading from a core sample is essential towards making informed decisions on aeration such using the right type of machine in optimum conditions at the right time. Surface thatch and layering lend towards shrinkage discontinuities between layers that cause rootbreaks thus inhibiting the development of healthy rooting and differences in density values. Water penetration can be impeded also to the detriment of grass health and pitch performance. Even in late autumn the top 50mm (2 inches) can appear malleable but beneath be dry and crumbly lending towards underestimating the effectiveness of a spiking operation and subsequently exacerbating the problem by the chosen machine's inability to achieve a full depth of penetration and pulling the top layer away. The plant will choose the favourable option of horizontal rooting instead of vertical.

The paradox is that in a layered profile, deep aeration is paramount towards development of a root system to bind the layers together and although the many advances in machinery and tine development have produced equipment to achieve this, it is often put beyond the purchase budget of many clubs, although for some the initial outlay could be offset by cluster sharing with neighbouring clubs.

For many grounds, consideration for hiring in may prove more favourable, rather than have a capital item sitting in the workshop for the best part of the working year.

One of the most effective aeration equipment available today for cricket squares in particular is the deep-drill. It is costly to hire but can achieve penetration depths up to 250mm (10 inches) without sidewall

2 Cricket Ground Maintenance & Pitch Preparation

smearing/compaction and absence of any heave or pull. Follow-up regular operations with standard pedestrian machines
have subsequently proved to be more efficient.

Using large drill bits (20mm diameter or ¾ inch), back filling and consolidating with the appropriate cricket loam down the tine holes by hand (only on cricket squares) has proved to be successful in "nailing" a layered profile together and has become known as "Drill & Fill".

Similar deep aeration success has been monitored by deployment of Verti-Drain type of aerators, especially the modern high-speed cam action versions. However it is recommended that a recognised professional adviser should oversee the operation with an experienced operator to ensure that no heave is evident or severe damage to the square could result.

The use of soil exchange or hollow core aeration tines pre top-dressing has been traditionally used to remove plugs of layered and buried fibre and replace with fresh loam or as a means to introduce a different loam into the profile. There is some debate on the effectiveness as the operation is seldom achieved efficiently as it is quite impossible to fill the void of the tine hole with a sufficient volume of loam. It would now be considered more practical to undertake some form of removal of the offending profile by use of modern innovative procedures such as fraise topping restoration which to date has been monitored to great success at affordable costs, *where they met the right criteria.*

Winter Work

Further operations may include supplementary aeration during the winter months. *It is generally recognised that all aeration operations should cease by mid-January.*
Maintain ongoing regular inspection and brushing/drag matting to minimise the opportunity of any disease developing and ensure the dispersal of worm casts, if present.

The occasional surveillance of the square will provide the opportunity of investigating any outbreak of fungal disease, treating with fungicide when the first signs appear (following any legal requirements) and also enable the detection of any excessive grass growth. In any mild spells it may be necessary to top the grass to ensure that the sward growth is not too retarded in the Spring by removing too much growth in a short period of time. Any growth over 25mm (1 inch) should be lowered to 18-20mm (approx ¾ inch).

It may be necessary for additional nutrient applications, especially during mild winters but it is recommended to be guided by professional analysis.

If the presence of moss/algae is detected, they should be treated with a suitable proprietary product at the first opportunity and the possible cause investigated

When the surface conditions allow, regularly walk the square to remove any debris that may have accumulated to ensure that no damage will be caused to equipment and to keep a watchful eye for damage caused by animal activity.

During prolonged wet spells, heavy frost or under a blanket of snow it is advisable to stay off the area completely.

Mid-winter is a good time to assess the condition of equipment and preparing a budget for approval for the forthcoming year. Orders for the forthcoming season can be prepared and submitted well in advance.

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1. FUNDING COMPLIANCE, CONTRACTS & PROJECT MANAGEMENT

Project Development

Developments in technological understanding of sports surfaces, machinery and equipment and provision of considerable funding sources via central government, charitable foundations and sponsored organisations assisted and distributed by sporting governing bodies like the ECB.

Programmes such as the ECB interest free loan scheme and the ECB Grant Aid Programme, have provided grant/loan opportunities for refurbishment and improvement of existing facilities or for new sites to be developed. They are often linked to land acquisition for urbanisation, increased demand for new housing and re-instatement of land-fill sites. Multi or dual sport areas are considered especially for local community and junior usage.

Where once the sole domain of only the wealthy and professional clubs, funding availability has also provided opportunities for many recreational clubs and schools to reconstruct or restore old and underperforming pitches and squares in order to meet the demands for ever increasing safe standards of player performance and general physical health of future generations.

Funding Compliance Points

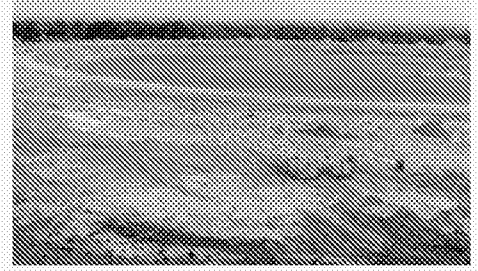
The following guidelines can be used for clubs seeking advice for developing and submitting a quality bid for funding.

- Provide details of all parties who have prepared technical, financial and programme advice and scheduling
- Provide details of the person who will be responsible for coordinating and managing the on site works
- Provide details of the in-kind contributions the club has received or will receive
- Provide evidence of tenure

Drawn information

- Identify the current amount of drawn information
- If not available agree the appropriate level of information to be obtained
- Identify the specification of materials as appropriate
- Ascertain compliance with ECB/Sport England guidelines
- Identify the result of any site investigations or exploratory work





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3 Cricket Ground Construction and Restoration of Squares

Third party approvals

- Provide the status of planning permission and details of the submission (unless none required)
- Obtain Building Control Approval (unless none required)
- Provide copies of the approvals received
- Submit a detailed breakdown of costs
- Submit a full tender analysis (2 or 3 quotes required depending on value)
- Identify what level of contingency funding is required and the basis of this calculation
- Submit written confirmation of all partnership funding including in kind contributions
- Provide details of asbestos survey (unless none required)
- Provide information on existing services
- Identify risk assessments arising from the design
- Provide information on access and egress points on site
- Identify procedures of welfare facilities for the workforce
- Identify site mobilisation and access
- Provide information on the security of the site
- Provide information with regard to assessing the competency of any party directly involved with designing, coordinating, managing and constructing the project

Design Consultation & Project Planning

The range of services available to clubs to design and manage works is increasing dramatically and as such clubs should not naturally assume a design and build approach to be the most appropriate. Clubs should consider carefully the roles of designers, project managers and contractors to create the best team to deliver the project. Clearly an independent signoff of works and a detailed after care package assembled by the designer is recommended.

Therefore, it is essential that before undertaking any new cricket ground project, professional consultation should be sought to ensure that every possible aspect and suitability of the site is taken into account before a specification is drawn up and contractors invited to tender. These factors should include:

(1) General proposed layout plan and local survey maps of site relative to size of area and facilities required.
(2) Identify any known planning restrictions, ie existing tree preservation orders machinery storage buildings etc.
(3) Local topography, waterways and levels relative to likely implications of drainage requirements.
(4) Availability of services to the site (water, gas, electricity, sewerage).
(5) Site access and local road restrictions.
(6) Analysis of site top and sub soil.

The Contract

Once the above measures have been enacted on, the design consultant can draw up a detailed, carefully worded and cost effective specification, inclusive of detailed drawings showing the layout, levels and drainage etc. Based on a common design, tenders can then be put out to invite specialist contractors to price up on with the winning company entering into a contracted agreement with the client.

Fine turf works are subject to a higher risk of inclement climatic conditions the further into the autumn works are scheduled. To alleviate some of this risk planning and contractual arrangements for projects should be completed by April of each year.

Project Management

Even the most comprehensive specification does not guarantee a satisfactory outcome on completion unless the various stages of the project are carefully supervised by the consultant or an appointed project manager acting on behalf of the client.

This is to ensure that the details in the specification are adhered to, correct materials provided and the progress of each stage of the operation is monitored, approved and signed off. Also in the event of unforeseen circumstances occurring, any variations in the contract, can be approved and acted upon swiftly to avoid costly delays.

Liaison with the client's ground authority where employed, is important both during construction, timing of the works and dovetailing into the post-construction and maintenance period.

Schedule of Works

An agreed programmed schedule of works will outline the projected timescale of each stage of the contract. It is always subject to the vagaries of the weather and allowances should be made accordingly so that planning, temperatures, ground conditions etc, can fall in line with the various stages of the construction period.

Employers Requirements (an example)

This criteria can be used as an example for guidelines to ensure that strict supervision can be maintained when employing contractors to complete construction work. There are a number of general points to any specification, which can be set out in the form of a preamble known as the Employers Requirements.

Form of Contract

The contractor shall include in his tender for entering into a formal contract with the client in accordance with the Article of Agreement and Conditions of Contract drawn up by the designer.

Where additional unforeseen works are required, the contractor shall submit to the client/client's representative a written price for the additional works. If these works are deemed necessary, the client/client's representative will raise a variation order or a written instruction for the contractor to proceed.

Drawings and Specifications

The accompanying drawings and specifications are intended to convey an accurate description of the nature, extent and standard of work to be performed by the contractor. The contractor must visit the site, and be fully acquainted with what is required and quote accordingly. Should the contractor be in any doubt regarding the true meaning and intent of any clauses in the conditions of contract, specifications or details shown in the drawings, is to be invited to have these fully resolved before submitting his tender, as no extras will be allowed for, nor any loss or expense involved through any misunderstanding arising from his failure to comply with this requirement.

The tender must include for carrying out the work strictly in accordance with the true intent and meaning of the drawings and specifications. Minor works not specifically mentioned but obviously necessary and customary in the trade will be deemed to be allowed for in the contractor's price.

Sub-contracting

The contractor shall not sub-let any part of the works without the written consent of the client's representative. Any intention to sub-contract any part of the works shall be notified at the time of tendering.

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to the client's representative when the tender is submitted and full details of the sub-contractor/s shall be provided, eg name and address and the phase/s of the work they are to complete.

Supervision

The contractor shall ensure adequate managerial supervision of the site and shall provide in his tender for a competent foreman to be continuously employed on the site while work is in progress and for him, as the contractor's representative, to receive and carry out any instructions given him by the client's representative.

Documents

The contractor shall keep at the site of the works copies of the contract drawings and specification; these to be available at all times to his foreman and the client's representative.

Handwork

The contractor shall allow in his pricing for the hand working on parts and conditions where the use of machinery will not produce results to the satisfaction of the client's representative even though specific reference is not made to such in the body of this specification.

Procedure

No variation from the sequence and nature of the works detailed in this specification will be permitted except with the prior written consent of the client's representative.

Site Meetings

The contractor will attend periodic meetings on site as required.

Labour, plant etc.

The contractor shall supply all labour, approved tools, plant and equipment fitted with turf/low ground pressure tyre/track, necessary to the efficient execution of the work. He shall comply with all statutory regulations and shall provide such storage sheds, canteens, latrines and shelters as may be required, maintaining same during the contract in a thoroughly sanitary and hygienic manner and clear away on completion to the satisfaction of the client's representative.

Machinery

All traffic shall be confined to approved routes within the site. The use or passage of heavy earth moving equipment will not be allowed on site following the return of the top-soil. Only recognised construction machinery of an approved type shall then be used to complete the specified works unless otherwise agreed by the client's representative.

Provision of Materials

As soon after the contract has been awarded, the contractor shall submit to the client's representative a list of suppliers from whom he wishes to purchase the materials necessary for the execution of the work.

Storage of Equipment and Materials

All equipment and materials shall be approved and stored on areas as shown on the drawings or otherwise as agreed. The Contractor shall be responsible for reinstating any such areas at his cost unless otherwise allowed for in the Bill of Quantities.

Health and Safety

The contractor shall ensure that all CDM Legislation conditions on site are met and adhered to.

Insurance

The tender and rates shown in the Bill of Quantities shall be deemed to cover all insurance, in particular the following:

- Employer's Liability
- Fatal Accidents
- National Insurance
- Third Party Risks

and to indemnify the client against all claims and losses. The contractor will not be allowed to take possession of the site until the insurance policies required under the General Specification have been examined and approved. The contractor is to forward the insurance policies suitably endorsed to the client as soon as possible after the acceptance of the tender and before entering the site.

Water for Working

The contractor shall be permitted to use the client's water supply free of charge for the purpose of the works but must supply the necessary hose or temporary piping, etc and exercise due care in the use thereof to avoid waste.

Private and Publicly Owned Services

The information in the contract as to the whereabouts of existing services and mains is believed to be correct but it shall be the responsibility of the contractor to verify the completeness and accuracy of the information prior to the commencement of any works.

Any services affected by the works must be temporarily supported or protected by the Contractor who must take all measures required by the various bodies to protect their services and property during the progress of the works.

Standard of Work

The standard of work is to be completed to the satisfaction of the client's representative. Drainage works should be carried out to current Land Drainage Contractors Association (LDCA) guidelines.

Approval of Work

No work shall be proceeded with until any previous operations thereby likely to be concealed have been inspected and approved

Inclement Weather

The works or any part thereof shall be suspended temporarily by the client's representative when, in his opinion, working conditions are unsuitable due to inclement weather. Work must cease when conditions are such that puddling and/or deep rutting of the soil, or any other detriment could result.

Defects Liability Period

The contractor shall be responsible for correcting any faults arising from poor work or faulty materials for 12 months after the completion date.

Maintenance of Public Roads Etc.

The Contractor shall be responsible for keeping clean all public roads, pavements, verges and other areas and for making good at his own expense any damage thereto when carrying out the works.

Contingencies

In the event of unforeseen difficulties occurring during the contract period, a percentage of the total cost of the specified work providing for such items, to be suitably worded and shown within the Bill of Quantities.

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Payments

Payments can be made at valuation points to the extent of 90% of the estimated value of the work completed to date. The balance is to be paid 5% on certified completion of the work and the remaining 5% at the end of the defects liability period provided all the conditions in respect of rectification of defects have been complied with.

In valuation for interim certificates 80% of the value of any materials delivered on site but not used may be taken into account.

Interim certificates will not normally be issued where the total value of the amount of any payment would be less than £20k.

The contractor shall pay sub-contractors for works completed by them within 21 days following payment to the contractor of interim certificates. The client's representative must receive a receipt from the sub-contractors verifying that payment has been made to them before further interim payments can be made.

Tidiness and clearance

At all times the site shall be kept in a tidy condition, all surplus earth and rubbish being cleared as work proceeds. The contractor shall clear away all surplus materials on completion and leave the site in a clean and tidy condition right to contract boundaries to the satisfaction of the client's representative.

Spec Item	Item Description	Quantity	Unit	Cost
	SECTION ONE – OUTFIELD			
	Earthmoving and Grading proposals Clearing of site Removal of all vegetation and debris Strip off top soil from site. Cut and fill sub soil and laser assisted final grading of area. Return top-soil to site		 m² m² m² m²	
	Sub-soil cultivations Use of sub-soiler to break sub surface compaction.		m²	
	Water supply Allow a sum for the provision of a water supply to the cricket square and net area. Hydrant boxes with 22 mm fittings m. of 32 mm pipe		 item m²	
	Primary Drainage Excavate trench to an average depth of 600 mm deep to pre-determined gradient. Supply and lay 110 mm diameter pipe. Backfill trench using 6-10mm gravel to within 150mm of the finished surface level, followed by a 50mm layer of binding sand and then a sandy free-draining top soil or imported rootzone to the surface As above, but supply and lay 80 mm diameter laterals at 5 / 10 m centres, average of 500 mm deep. Supply and install purpose-made junctions. @ Supply and install pre-cast concrete silt traps. x 2.5 m deep @ Supply and install pre-cast concrete manholes. x 2.5 m deep @ x 1.3 m deep @		 m m item item item item	

Spec Item	Item Description	Quantity	Unit	Cost
	SECTION ONE – OUTFIELD (continued)			
	Initial cultivations Cultivate site using, plough, harrows or cultivator. Blade grade the whole site as many times as necessary using laser controlled equipment. Where possible, use a stone burying machine so that no stones above 30 mm are visible on the surface.			
	Seed bed preparation Produce a satisfactory seed bed using harrows and roller to form a fine tilth. Just before seeding a pre-seeding fertiliser should be applied to the whole site excluding the cricket square. Lightly harrow fertiliser into the immediate surface.			
	Seeding Supply and sow the area with grass seed at a rate of 250 kg / ha.		25kg	
	Maintenance Allow a sum for the first cut of the outfield.		m²	

Spec Item	Item Description	Quantity	Unit	Cost
	SECTION TWO – CRICKET SQUARE			
	Excavation Excavate original soil down to a depth of 325 mm formation level.		m²	
	Weed control Apply suitable herbicide to formation level to prevent weed growth.		m²	
	Drainage Excavate trench and provide perimeter drain around the square using 100 mm diameter pipe. Use 3-10 mm of angular stone to backfill the trench and provide 100 mm of 3-10 mm angular stone drainage raft. Supply and lay 50 mm course sand blinding layer		 m m² m²	
	Rootzone Return 75 mm of free draining soil and topped with 125 mm of cricket loam		m² m²	
	Seed bed preparation Using powered or hand rakes prepare a suitable tilth and firm seed bed. Before final raking apply a pre-seeding fertiliser to the square.		 m²	
	Seeding Sow grass seed over the square and rake in.		kg m²	
	Management & Maintenance To achieve desired standard		item	
	TOTAL COST			

II. OUTFIELD AREAS & DRAINAGE

The quality playing capability of any newly constructed facility and the associated financial income and expenditure is substantially governed by the ability of ensuring maximum playability and maintenance conditions within as short a time as possible after the cessation of rainfall and to restrict the effects of localised flooding and high water tables especially where situated on a flood plane. This is especially important where winter sports are designated on the site plan.

To achieve this it is advisable to acquire the services of an independent drainage expert to survey and design on a scientific basis, an optimum scheme that would determine, the materials required and the most cost effective process relative to the site, usually on calculation of the amount of water to be removed within a defined period. Major grading of heavily sloped sites can interfere with the passage of natural underground water movements and some indigenous soils may prove water retentive and impair surface drainage without the addition of importing free-draining materials.

Therefore, the financial outlay of an independent survey could ultimately save a considerable amount of money on an unnecessary and over-elaborate or under achieving scheme.

Gradients

Final gradient levels can facilitate drainage but may be determined by the local topography of the site. It is an advantage to have a slight slope, ideally running away from the centre of the square where appropriate but in all cases not exceeding 1:50.

Irrigation and Water Management

Liaison between a drainage expert and the consultant designer would facilitate meeting the future requirements for irrigation mindful of increasing demands for water and possible re-cycling of rainwater for sports turf. Creating holding reservoir areas on site at drain outlets, can allow for carefully controlled water management although legislation for monitoring fertiliser leaching and other undesirable chemical infiltration, possibility by incorporated filter units would have to be investigated along with intended machine wash down areas at the pre-planning stage as would be the Water authority regulations for the irrigation supply to the cricket squares and any holding tanks. Increasingly where afforded, pop-up sprinkling systems are being considered at the construction stage to ensure optimum and effective irrigation of outfield areas.



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3 Cricket Ground Construction and Restoration of Squares

Grasses

(1) Seed

The choice of sward is often determined by the demands required. If no winter sports are planned a fine quality surface might be desirable where a typical blend might be:

45% Creeping Red Fescue (Festuca Rubra)

25% Chewings Fescue (Festuca Rubra Commutata)

25% Smooth-Stalked Meadow Grass (Poa Pratensis)

10% Browntop Bent (Agrostis)

If the outfield is intended for winter sports, a harder wearing blend would include a 40-50% of a suitable high performing cultivar of Perennial Ryegrass (Lolium Perenne) or even a total blend of 3-5 Perennial Ryegrass cultivars, eg:

40% Perennial Ryegrass	or: 25%	
20% Creeping Red Fescue	25%	Perennial Ryegrass
20% Smooth-stalked Meadow Grass	20%	- (Lolium Perenne)
15% Chewing Fescue	15%	
5% Browntop Bent	15%	

(2) Turf

Turfing of large areas as cricket outfields is a very expensive outlay and would normally only be considered if it is absolutely imperative that play would commence at the earliest opportunity. It is recommended that the turf should be of high quality and has been cultivated by specialist companies in a suitably compatible root zone specifically for the purpose and laid accordingly with no disparity of surface levels between the joints.



3 Cricket Ground Construction and Restoration of Squares

Guideline specification of work for construction of outfield areas

The outline specifications are intended for general guidance only. They must be interpreted and the wording adjusted to suit the job in hand and not applied regardless of local conditions and requirements. Generally, however the type of works and sequence should be maintained

Scope of work

To prepare and establish the cricket ground outlined on provided drawings. The work involves site clearance, herbicide application, minor grading, major grading, sub-soil cultivation, drainage, general cultivation, blade grading, seed bed preparation, seeding.

Clearing site

a. In this work and throughout preserve carefully all trees marked on the plan for retention.

b. Grub out any roots of all trees, shrubs and hedges shown on the drawings for removal, all rubbish to be removed off site at contractors expense.

c. Remove all vegetation by the use of translocated herbicide.

d. Break up any foundations, roadways and similar obstructions and clear site of all tins, rubbish, large stones or any material detrimental to the establishment of a good turf sward and its use thereafter. Cart away to contractor's tip.

Grading

Three categories of grading can be identified:
a. Where surface levels are acceptable after small adjustments
b. Where minor grading is required
c. Where major grading is required

Type a

Plough to top-soil depth

Cultivate by approved implements to break down plough furrows.

Regulate the entire surface by transference of top-soil as agreed, using a box grader to produce a surface with smoothly running contours free from marked mounds or depressions. Special care should be taken to produce a true boned level for the cricket square and to marry this in smoothly with the surrounding land.

Blade grade with an approved laser guided type blade grader to produce a smooth surface with running falls to existing main contours. An absolute minimum depth of 100mm (4 inches) final firmed true top-soil should be left throughout on completion.

Type b

Strip top-soil from areas indicated on the plan and stack in approved position convenient for re-use.

Adjust levels in sub-soil to smooth out irregularities to produce a final surface marrying in with adjacent land.

Cultivate and trim sub-soil surface.

Replace top-soil carefully using only approved equipment, being the lightest convenient to the size of the project. Top-soil should be replaced to the original depth subject to an absolute minimum of 100mm (4 inches) consolidated.

Sub-soil cultivate the whole area in the direction of maximum fall by means of approved sub-soiler to a minimum depth of 450mm (1ft 6 inches) and no more than 600mm (2ft) centres.

Plough whole site to top-soil depth.

Type c

Scrape off all true top-soil to a nominal depth of *mm and mound conveniently for re-spreading. Sub-soil shall be avoided. Top-soil heaps shall be made as small as reasonably convenient and kept mounded for as short a time as possible.

The contractor must carefully select the site of his soil dumps so as not to interfere with the sequence of operations and agree them with the client's representative. Any double handling necessary through lack of foresight in this respect will not be recognised as an extra.

Adjust the sub-soil levels to produce a smooth surface with regular gradients as indicated on the drawing (including cricket square area). The sub-soil to be excavated, transported average *metres and filled on the cut and fill principle, filling to be consolidated in consecutive layers of not more than 225mm (10 inches) deep. Trim to uniform true surface leaving it free of noticeable ruts and depressions.

Sub-soil cultivate and trim the whole area.

On the smoothed out surface spread all top-soil to form a uniform surface layer which at no point is less than 100 mm (4 inches) firmed depth. Where soiled areas are next to kerbs or similar the finished level to be 25mm (1 inch) above kerbing level. The replacement and spreading of the top-soil shall be reduced to an absolute minimum by using the lightest equipment possible and so arranging the operations that heavy loads do not have to be taken across areas on which top-soil has already been restored.

Sub-soil cultivation

Sub-soil cultivate the whole area, using a low ground pressure tyre tractor-mounted type of sub-soiler fitted with a sub-soil shoe, or other approved sub-soiler implement. The operation shall be carried out in the direction of the maximum depth of 450mm (18 inches) Care must be taken not to bring sub-soil to surface.

Water supply to cricket square

Before draining the contractor shall lay a water supply to the cricket square consisting of 32mm (1¼ inches) heavy gauge polythene or rigid PVC pipe complete with all necessary fittings and hydrant boxes and connected to the water system at the point indicated by the client's representative. The pipes shall be laid at a depth of 750mm (2ft 6 inches) below ground level. All hydrant boxes to be fitted with screw connectors for a 25 mm (1 inch) diameter hose pipe.

The hydrant box shall be 300mm (12 inch) inside measurements and be constructed of 100mm (4 inch) thick brick walls. The base to be constructed of concrete, using 40mm (1½ inches) aggregate. Allowance should be made for an inlet to except the polythene pipework. As an alternative, preformed pvc can be installed.

The box should be covered with a timber top of 50mm (2 inches) timber treated with an approved wood preservative and wrapped with an appropriate artificial turf carpet with a means of lifting the cover ie a bore hole. The timber top should be finished slightly lower than the surface surrounds so as not to cause damage to equipment and a trip hazard for players.

A stop valve shall be fitted at the point where the polythene tubing is connected to the mains water system so that the water supply may be turned off. A stop non-return valve to the same specification as the hydrant box shall be constructed. Provision shall be made for emptying the system before frosty weather.

Surplus sub-soil shall be disposed of as specified for drainage and care should be taken to preserve the top-soil.

The contractor shall pay all fees necessary for connection to public mains and for the installation of meter.

Insert amount/item as required

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3 Cricket Ground Construction and Restoration of Squares

Drainage

Working from the outlet, a piped drainage system shall be installed as shown in the design drawings. The drainage system shall be laid in a * with lateral drains of 80 mm at intervals of * metres and at an angle of flow to the main drain (110 mm) of 450 or 600. PVC drain pipes and appropriate angle junctions shall be to BS 4962:1989.

Introduce pipe drains around the perimeter of the square, allowing an extra 3m at either end of the square. Perforated plastic drain pipes with a diameter of 80mm diameter to be used. All joints in the line of drains shall be made with purpose made connectors by slotting or by other approved method according to type of pipe. End stops shall be provided to seal open ends and all connections shall be formed with purpose made junctions of appropriate sizes.

All drains shall be laid to true lines on a firm foundation at a depth of 600mm (2ft) at invert level and with steady falls of not less than 1:200.

Catchwater drains shall be constructed at the top and bottom of any banks as shown on the drawings.

Any existing drains that are cut through or damaged at any time should be pointed out to the client's representative. They may be connected to the new drainage system at an opportune time to the satisfaction of the client's representative or treated as directed.

Excavate soil to required depth, load via conveyor belt and cart away as work proceeds. Trenches shall be kept as narrow as practicable. Any surplus sub-soil from trench excavation which cannot be used in the general grading of the site shall be carted from the site to a tip provided by the contractor at his own expense. On no account may sub-soil be spread on the surface between the drains or be deposited on or mixed with the top-soil that is to be used for seeding.

Lay plastic piping to correct falls, the upper end of each drain being effectively sealed by plugging.

Approved junctions shall be carefully laid to form perfect connections so that the free flow of water is not way impeded.

Test all drain runs for line and gradient before filling in. Backfilling shall not commence until the client's representative has inspected the drains to satisfaction.

Backfill drainage trenches using 6-10mm gravel to within 150mm (6 inches) of the finished surface level, followed by a 50mm layer of blinding sand and then a sandy, free draining top-soil or imported rootzone to the surface.

All backfill shall be carried out carefully to avoid displacement of or damage to pipes or the inclusion of sub-soil. Backfilling to be carefully shovelled in or introduced with an approved mechanical trench filler.

Catchwater drains should be filled to within 50mm (2 inches) of the finished surface with approved permeable filling and topped with a fine grit or other suitable material.

Samples of materials thought suitable for use in backfilling drain trenches shall be submitted for approval before bulk purchase is made. Any material used that does not compare favourably with the approved sample will be rejected.

Excavate and build silt pits shown on drawing with inside measurements of 900x600 mm (3ft x 2ft) and depth of 300mm (1ft) below the outlet pipe. The silt pits shall be constructed with 225mm (9 inches) thick brick walls with 150 mm (6 inches) thick concrete using 40mm (1½ inches) aggregate bottoms and with 100mm (4 inches) thick reinforced concrete tops mixed with 20mm (¾-inch) aggregate in four sections with rebated joints and countersunk lifting rings to each section set 150mm (6 inches) below ground surface. Allowance must be made for forming inlet and outlet pipes in salt glazed pipes.

Purpose made precast concrete units are acceptable as an alternative to the traditional brick chambers. Where silt pits etc are brought to the surface, heavy duty metal covers (BS 497) Grade A galvanised) may be used as a convenient alternative to concrete.

Similarly, excavate for and build inspection chambers as specified for silt traps except that the inside measurements shall be 600mm x 600mm (2ft x 2ft) with 225mm (9 inches) thick brick walls. The bottom shall be the same depth as the outlet pipe and channelled. Tops shall be 75 mm (3 inches) thick reinforced concrete in two sections and shall be finished 150mm (6 inches) below ground level.

Excavate for and construct 100mm (4 inch) concrete using 40mm (1½ inches) aggregate head wall and aprons, as shown on the drawings, in stream, each consisting of head wall 750mm (2ft 6 inches) wide x 1.07m (3ft 6 inches) high with angled apron walls 900mm (3ft) long on 100mm (4 inches) hardcore bed. Cut and pin in end of drain (the last pipe being salt glazed) and provide and fix 450mm x 600mm (18 x 24 inches) galvanised mild steel grating. Allow for all necessary damming and pumping, form work, planking and strutting, backfilling and carting away of surplus materials to contractor's tip.

All existing ditches to be cleaned out and properly trimmed to the maximum uniform gradients permitted by the general configuration of the ground, or to the definite levels indicated. These ditches are to be piped to the dimensions indicated on the drawings.



Cultivations

Plough the site to the depth of top-soil. Cultivate the site using tine cultivators or heavy disc harrows to break down the furrows. At least four passes shall be made in transverse directions.

When a sufficiently fine tilth has been produced blade grade the whole site using an approved laser guided blade grader as many times as required to produce even falls. At no point must the site finish with less than 100mm (4 inches) true top-soil on completion.

Before completing the cultivations, sub-soil cultivate the site with an approved sub-soiler. The operation will be carried out in the direction of the maximum fall. It shall be carried out no more than 600mm (2 ft) centres at a constant depth of 380mm (15 inches).

Blade grade the whole site using an approved laser guided blade grader to provide an even surface.

Seed bed preparation

Produce a satisfactory seed bed using approved harrows and roller or purpose made seeding implement as necessary to form a fine tilth for grass seeding. The seed bed shall be fine, smooth and evenly firm but not compacted.

Shortly before seeding apply evenly to the outfield (except the square) a fertiliser to be specified. The fertiliser to be of ratio 10N:15P:10K or approved alternative applied at 250-300kg/hectare.
The fertiliser for the cricket square shall be reserved for the appropriate time.

Lightly harrow fertiliser into the immediate surface.

During the above operations all surplus vegetation, debris and all stones having one dimension of over 38mm (1½ inches) should be removed from the outfield area.

* *Insert amount/item as required*

Seeding

Provide a seed mixture composed of (typically):
25% Smooth stalked meadow grass
25% Strong creeping red fescue
20% Slender creeping red fescue
20% Chewings fescue
10% Brown top bent

Sown at 350kg/Ha. The contractor will provide a certificate of composition, purity, germination, year of harvest and country of origin for the above.

Seeding should be carried out during suitable weather conditions. The total quantity of seed required should be divided into half and each half sown in transverse directions.

Lightly chain harrow seed into immediate surface, care to be taken not to ridge the surface.

Maintenance

When the grass reaches a height of 50mm (2 inches) it should be tipped using a rotary or appropriate mowing machine, not more than ⅓ of the leaf should be removed in any one cutting operation.

After the first cut the maintenance will be the responsibility of the client. This does not absolve the contractor from his liability to make good all defects due to faulty materials and/or workmanship for twelve months from the certified date of completion.

III. CRICKET SQUARES & PITCHES

These guidelines have been produced to assist clubs contemplating square or pitch construction. Outlined below are the planning and resource considerations along with example specifications, which will assist when assessing contractors or consultant reports.

Initial Planning

Identify the level of cricket to be played and therefore the standard of the pitches required. Plan on the square having an unspecified life span, dependant on maintenance standards and financial/human resources available.

It is unwise to standardise on a type of construction for a cricket square as a number of factors are involved and the cost of such provision may be unnecessary bearing in mind the condition of the site and what materials are available.

Existing material on site may be suitable and all that is needed is to grade out an area to the required gradients followed by cultivations and seeding. On the other hand a total excavation may be required. As a general rule squares are made up of:

a. A clay-loam surfacing zone laid on an
b. Intermediary zone, which supports the clay loam,
c. Supported by a free drainage zone, which may or may not require a blinding layer to prevent particles migrating into the free draining layer.
d. Around the perimeter an interception drain may be desirable.

The depth of each zone shall be consistent but will vary depending on the ground conditions, the top soil and subsoil profile in the location where the square is to be laid, prevailing climatic conditions, and the grade of cricket to be catered for.

At club level the clay loam shall have an ASSB soil binding strength of no less than 45kg where as at higher levels a binding strength of no less than 60kg is more desirable.

Typical consistent depth of each zone shall be with in the range as indicated below:

Clay loam zone: 50mm to 150mm

Intermediary Zone: 100mm to 150mm

Drainage Zone: 100mm to 200mm

Instead of specifying a construction it is advantageous to specify a performance quality requirement to which the facility must conform and use a "design and build approach" to procuring the square.

A competent Cricket Facility Adviser, professional consultant or expert should be approached with a view to designing the square or producing a performance specification.

The ECB Development (Facilities) Department (facilities@ecb.co.uk) or the Institute of Groundsmanship will be able to advise or make recommendations.

Initial Site Investigation

One pitch area is 75ft x 10ft (22.87m x 3.05m) therefore the size of the square will depend on the likely fixture list (suggested maximum of five matches per pitch during the season). The number of teams that will use the facility (consideration for future club expansion and development should be taken into account), boundary restrictions and time allowance to groundstaff to maintain and prepare pitches. Once the size of the square has been determined, the pitch orientation must be taken into account when considering the overall layout. A north/south orientation is preferable to minimise the effects of the sun on the bowlers and batsman, though a possible east/west variation of 55° from the point of north is acceptable.

The boundary must be considered when planning the site; the boundary should be a minimum of 45.72m (50 yards) from the centre of the pitch in use although the ideal planning size should be a minimum of 50 yards from the centre stump of any designated pitch to be used on each side of the square to allow for League and Premier legislation ruling.

The local indigenous soil must be identified for its texture and compatibility characteristics before any construction is undertaken. It is recommended that when soil analysis be carried out, a minimum of six locations in a W formation, on the site are used and a professional report gained. Both topsoil and subsoil should be analysed.

Drainage

Identify the natural run off and any drainage lines if present. If the site has been previously used, any drainage plans must be obtained. If a survey has determined the necessity of a ring-drain around the square then sufficient distance from the edges should be regarded to allow for future club development considerations for extending the square and to minimise the risk of removal and alterations.

Drains should not be located below the surface area of the square or laid at a fall of less than 1:200.

Site Access

When considering a site, confirm reasonable access for construction vehicles and consider what protection will be required for the outfield during construction. Heavy laden vehicles if allowed to drive to the square, will damage the outfield.

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Result of initial site investigation

This must provide:

- Size of the square
- The depth to excavate for square construction
- Drainage requirements (when planning, allow for future increase of size).

Decision on suitable materials

Selection of the wrong sort of materials (or taking the cheaper option) could be the cause of future problems. All materials should be obtained from recommended suppliers. A consultant or professional Advisor would possess knowledge of the appropriate selection of materials, in particular the choice of loams within the profile and the grass cultivars.

Cricket Loam

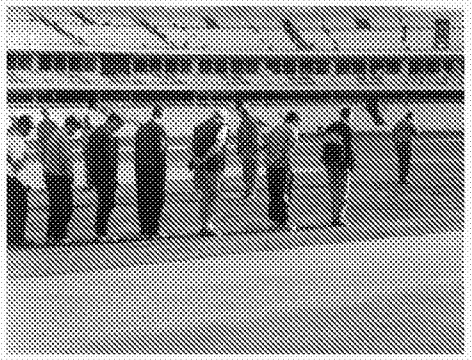
Choice will be dictated by the standard of pitch required.

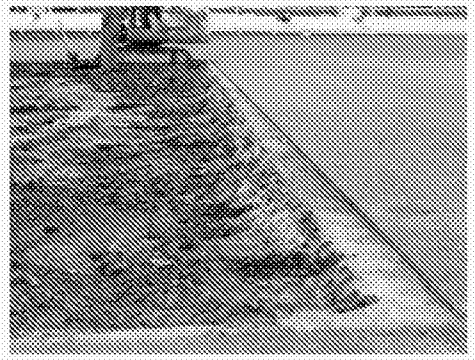
- First Class and county standard: minimum of 28-35% of clay
- Club standard: minimum of 25-30% of clay
- School: minimum of 25-28% of clay
- Should be compatible with the local indigenous soil
- Initial planning will indicate depth and therefore quantities
- The use of marl is not recommended

Useful Quantity Guide

(Per Pitch area of 75x10ft (22.87x3.05m) and inclusive of allowances for consolidation & element of wastage)

Depth mm (inches)	Exact Quantity (Cubic metres)	Suggested Delivered Quantity (Cubic metres)
25 (1)	2.2	2.5
50 (2)	4.4	4.5
75 (3)	6.6	7.0
100 (4)	8.8	9.0
125 (5)	11.0	11.0
150 (6	13.3	14.0





Grasses

There are a number of cultivar blends on the market, notably Perennial Ryegrass (Lolium Perenne) and advice should be sought for those recommended specifically for cricket purposes and considerations for the level of play and maintenance resources.

Individual cultivars of different species can be evaluated from the yearly edition of "Turfgrass Seed" published by the Sports Turf Research Institute (STRI)

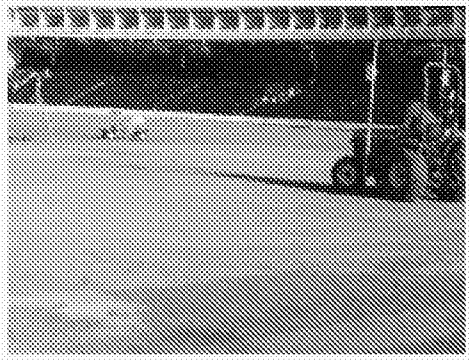
The Turfing of a square is strongly discouraged!

Construction Methodology

1. **Excavation** and removal of topsoil/subsoil to an agreed depth and to uniform, graded level.

2. **Drainage** laid as planned and inclusive of stone layer and course sand blinding layer if site survey indicates the necessity.

3. **Sub-Base**. If the depth excavated exceeds 100mm (4 inches) then a loam can be used as a sub-base – this should be as compatible possible with the shrinkage values of the topsoil and thoroughly keyed in during construction.



4. **Consolidation** This is the most important element of construction – Uniform consolidation should be undertaken approximately every 50 mm (2 inches) by using an appropriate method. The best and time-honoured process is by "heeling" but is very time consuming and labour intensive to be cost effective for most contractors who prefer usage of appropriate machinery such as the caterpillar tracks or tractor tyres or "sheeps foot" rollers. Whatever method is used care must be taken to ensure uniformity with no air pockets remaining and each layer to be keyed in. The projected optimum playing performance rating will only be achieved if this process is completed correctly. The final surface levelling should not be done by a heavy roller as it may leave isolated and uneven pockets

5. **Levelling** can be accomplished by using basic strings and pegs or rails/shuttering. The most modern method used by many contractors is by laser guided grading technology and equipment that has proved to be precise and rapid thus minimising the chance of inclement weather interfering with the construction schedule. The final surface should be level along the direction of play although a fall of 1:100 is acceptable with a cross fall of 1:60-1:80. In all cases the square should blend smoothly into the outfield and be finished proud of the surrounds by 25mm (1 inch) to allow for water run-off and prevent standing winter rainfall to the detriment of grass health and build up of associated algae or "squidge".

6. **Seeding** can be achieved by raking the surface by powered or hand rake or by using seeding equipment specially made for the purpose, preferably leaving a "slotted" or "dimple" type finish, sowing at a rate of 50gm^2/m (1½ oz per ^{2}yard). Lightly rake the seed into the surface and finish with a light hand roller. A pre-seeding fertiliser can be applied before seeding or after establishment if considered necessary.

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7. **Irrigate** when necessary to encourage germination and establishment. Germination sheets can be considered to facilitate and prevent the occurrence of damage from wash-off cause by severe rain storms.

8. **After-care.** Erect a form of protective fencing around the area of the square to prevent unwanted encroachments and follow the appropriate after care maintenance measures.

ALLOW 18 MONTHS TO 2 YEARS BEFORE THE SQUARE IS READY FOR USE.

Example Specification for the Construction of a New Cricket Square.

Schedule of Works

This specification provides a summary of information for a comprehensive construction of a cricket square to be constructed for a cricket club. The area being approximately 46m x 24m to a total depth of 325 mm. The work involves excavation, drainage, construction, seed bed preparation and seeding.

General

The new cricket square shall be located on the outfield at the position shown on Drawing No* and in agreement with the client's representative

Excavations

Excavations should be carried out when there are suitable ground conditions so that minimal damage is caused to the surrounding area. Top soil should be removed from the area of cricket square, if it is to be re-used it should be stored in an approved place on the outfield. No sub soil should be scraped off with the top soil. Any surplus top soil should be disposed of as agreed by the client's representative. The exposed sub soil can then be excavated to a depth of 325mm (13 inches) from the original surface level, All sub-soil to be disposed of off site at contractor's tip. The sub-soil should then be accurately graded to allow for build up of the drainage layer, blinding layer and cricket loam for the square as shown in the cross section. The formation level should be of even consolidation and a tolerance of +/- 19 mm (¾ inches). Any surplus sub soil should be disposed of as agreed by the supervising officer.

Weed control

If necessary and in agreement with the client's representitive, apply approved total herbicide to the formation level of the square in the manner recommended by the manufacturer.

Drainage

On completion of the previous items a perimeter drainage system is to be introduced. The drainage system shall run along the four edges of the square and link to an existing drain on the outfield. Trenches excavated to a width of 100–150 mm with all arising carted off site to approved tip. All drainage pipes to be 100mm of polymer perforated corrugated pipes, laid to a minimum depth of 600 mm-minimum gradient of 1:100, and level checked before backfilling. Backfill all drains with 3-10mm of angular stone to the top of the formation.

Stone Drainage Layer

A drainage layer of a similar filling to the trenches to be laid to a consolidated thickness of 100mm (4 inches) over the entire construction area.

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3 Cricket Ground Construction and Restoration of Squares

Blinding Layer

A 50mm (2 inches) layer of coarse sand laid to form a blinding layer and ensuring that the correct level is formed ready for the clay loam. Rake the blinding layer to form a key for the loam.

Rootzone Profile

Lay and grade to level a 75mm (3 inches) depth of recommended base loam and consolidate as required. Rake surface to create key for next layer.

Lay and grade to level a 62mm (2 inches) layer of recommended cricket loam and consolidate as required. Rake surface to create key for next layer.

Lay and grade to level a final 62mm (2 inches) layer of recommended cricket loam and consolidate as required. The final level to be 25mm proud of and trimmed into the surrounding area.

Surface and Seed Bed Preparation

Carry out final grade to a tolerance is +/- 3 mm (⅛ inch). Apply evenly to the whole area an approved pre-seeding fertiliser and power/hand rake surface to prepare for seeding.

Seeding

An approved grass seed blend to be sown in two directions by seeding device at 50gm per ²m. Hand rake in to surface.

Establishment

Attend site as and irrigate area to aid establishment for up to *visits if required.

Maintenance

Carry out initial mowing operations when the sward is established to a height of 50mm (2 inches) primary with a rotary type machine then by a cylinder mower (preferably 10 bladed) allowing for up to *cutting operations.

Further Maintenance Operations

As agreed by client's representative.



Insert amount/item as required

3 Cricket Ground Construction and Restoration of Squares

IV. RESTORATION
(Fraise Topping –Fraise Mowing)

In the UK, in almost every town and village can be found a cricket ground, many having been established over the course of a century as they have on the playing fields at some of the oldest public schools.

Small wonder then that players complain that they find many pitch playing characteristics notoriously low and slow. This can be observed by examination of the makeup of the soil profile. Years of applications of top-dressings can be seen forming layers often with differing loams that became incompatible or separated by bands of buried fibrous organic matter. Many performance ratings are also exacerbated by depths of surface thatch acting as a cushion and preventing water and air from promoting a healthy sward and vital root establishment. Top-dressings of heavy cricket loam applied to "stiffen" the surface just sit on top of the fibrous organic material without truly being incorporated into the soil below, at best diluting the fibrous content but susceptible to the ball impact causing the familiar expression, "going through the top" and associated unpredictable, even dangerous bounce. When they occur the square is considered "tired out". Strictly speaking they are the results of incorrect management procedures over many years that were unwittingly passed down as standard practice although of course there were not the resources of equipment available today. In the majority of cases the original level of the square underneath the build-up of years of top-dressings, show that the soil is firm and consolidated without prohibitive layers or breaks present.

Effecting a cure in the past necessitated excavating the offending profile and replacing with a new approved cricket loam. Indeed throughout the mid 1970s up to the present day, many of the top Test and County grounds were systematically having individual pitches relayed, some to depths of 300-400mm (12-16 inches).

This is of course an expensive exercise implemented over a number of years to complete the whole square with consideration towards continuity of materials and sound, consistent construction techniques, each pitch taking up to 5 years to fulfil maturity and optimum playing performance ratings. Improving the levels of the square, especially where slight "saddles" were present were limited due to using adjacent pitches as a level profile "template" and the associated dangers of leaving an undesirable "step" especially at the professional first class level of the game.

For the recreational game few clubs could even contemplate such a cost prohibitive initiative with the associated high level of management skills required to nurture the young pitches to maturity. Not so much a cure but more of a remedial measure, the only cost effective operation was to aerate using hollow tines to remove plugs of at most 75-100mm of the top profile and work fresh loam into the holes. If done proficiently this operation did improve some poorly rated squares but it was more the exception to the rule with no real estimation of a realistic time span to really enhance and improve the playing characteristics.

A recent innovation invented in Holland has been introduced into the UK. Originally intended for general winter Sports Turf like soccer pitches, its use has been monitored carefully since 2001 for restoring cricket squares very cost effectively and swiftly (in most cases 1-2 days given favourable weather conditions) generally without compromising the club's fixtures the following season yet drastically changing the levels, quality of grass content and overall playing performance characteristics *but only where the correct conditions of the profile have been identified by qualified advisors as being suitable.*

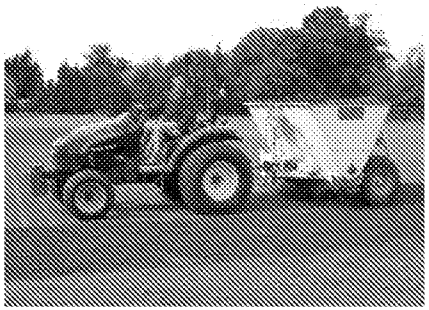
Restoration of Cricket Squares System



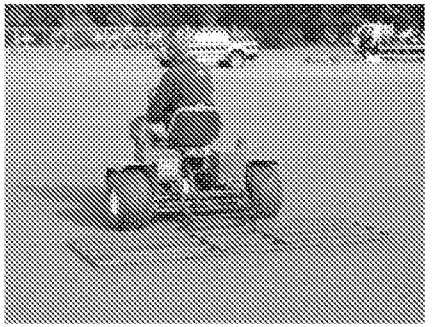
1. Planing off the surface to establish a primary level



2. Creating a uniform tilth



3. Spreading and integrating cricket loam



4. Grading to level



5. Overseeding the final surface



6. Six weeks after completion

The machinery is basically a tractor mounted, surface planing device similar to a flail mower that can remove the top surface down to a maximum depth adjustment of 40mm (1½ inches) in one pass with all arisings deposited on a conveyor belt straight into an accompanying trailer. An average ten pitch square (100 x 75 feet or 30.48 x 22.86 meters) can be stripped of years of history in a couple of hours.

Experience has guided experts and contractors who understand the unique dynamics demanded of cricket squares into 3 types of restoration operations according to soil profile make-ups and adviser's recommendations.

These are:

1. Fraise Topping

2. Fraise Topping & Cultivation

3. Fraise Mowing

The basic principles of each are outlined as follows.

Fraise Topping

This is the most popular method of swift restoration whereby the device removes the grass surface and underlying soil. Experience has shown that with a succession of passes with a shallow setting at apposing angles, gradually shaving off offending layers with special attention given to raised bowling ends, a basic primary level can be satisfactorily established.

The next step is to form a shallow tilth of no more than 25mm in order to incorporate an approved Cricket loam displaying as near compatibility features to the indigenous soil. This is graded out with a levelling device before a final top soil is added, graded, fertilised and overseeded with an approved cultivar blend. It is essential that the smooth, final levels should remain proud of the surrounding outfield to allow for rainfall run-off and prevent formation of algae/moss.

Occasionally, some of the arisings, once devoid of organic content, are removed so cleanly and fine that it can be re-cycled and blended with the new loam to save costs but again this must be determined by expert advice beforehand.

Inexpensive germination sheets will assist maximising grass uptake and preventing drying out or wash-off in the event of extremely heavy rainfall. The result of most operations if not completed too late in the year display excellent grass coverage within 3-4 weeks as the seedlings are in direct contact with the soil and not inhibited by thatch. Initial rooting is normally very aggressive so in the majority of cases there is no need for aeration until the following autumn. A worm suppressant is useful early on to prevent castings from spoiling the smooth new levels during late winter and early spring.

Careful aftercare should ensure that cricket will commence as normal in the new season, the principle being that as the square has not been re-laid it does not need to settle and the firmness of the surface will be immediately felt underfoot.

However, if the final surface is level or below that of the surrounding outfield, an added determined depth of loam may be considered necessary in order to ensure surface water run-off. Under these circumstances, the aftercare management would be similar to that of a re-laid square.

Many clubs have benefited by the addition of extra pitches on the edges of the square, for youth matches and practice sessions. These being created by a single pass at maximum depth with the replacement loam incorporated with ongoing grading operations on the rest of the table.

Fraise Topping & Cultivation

Where the soil profile of the square displays certain traits such as deep underlying roothreaks, a bed soil that is unsuitably too light to sustain a solid foundation or levels that dip below that of the surrounding outfield then this method in often recommended and deployed.

The top surface is removed with the planing device almost acting as a turf cutter and a suitable implement is used to cultivate the layers and indigenous soil into a fine tilth. This is essential as air pockets trapped between larger aggregates will inhibit bounce and may cause subsequent localised fluctuations in surface levels over time.

An approved quantity of cricket loam is blended in and graded to level whilst consolidating the tilthed profile until the final finish is established as already outlined in the previous Topping method.

Again grass uptake is very quick to establish but aftercare is quite different and more intense as this method effectively will act as a newly constructed square does in its first season with possibilities of cracking and "rippling" during settlement.

Experience has shown that the performance ratings in the first season are generally low slow with pace and bounce not picking up until the following year. There remains a possibility that some fixtures might be compromised during the first year of establishment. The costs of this operation are generally higher due to more labour intensive work and the price of the extra loam required. However it remains far cheaper than conventional methods of reconstruction.

Fraise Mowing

This operation is simply the machine being set at an adjustment height to remove only the herbage whereby the surface is cleaned out of shallow rooting Poa Annua and any thatch accumulations. Deeper rooting Rye grass is also removed including old "woody" stems & crowns but the body of the plant remains intact allowing for regeneration to take place. With all arisings removed immediately this effectively far outweighs the benefits of traditional scarification.

Usually two passes at right angles are sufficient and also assist in maintaining smooth levels, leaving the area ready for surface grooving or a dimpled finish for the purpose of overseeding and incorporating top-dressing.

It is envisaged that this can be undertaken every 3 years and therefore build-up of top-dressings, saddles and layering will become a feature of the past to the benefit of quality pitches and players' performance standards in the UK. County grounds have now had the confidence to embrace this technology with positive results and considerable improvements.

V. AFTER CARE

A most important aspect towards facilitating early settlement, maturity and maximising the performance ratings of newly laid or restored squares and pitches, is the correct deployment of after care procedures. Many first-rate contractors' specifications on completion have been seriously compromised by an absence or lack of post-work measures to ensure a successful outcome.

A contractor will normally agree to undertake the first cut and re-check surface levels after completion. This can be advantageous to the client as it encompasses the contractor's desire to advise and ensure that the maximum germination of seed is obtained by irrigation if necessary during very dry spells and re-establish if wash-off from severe rain storms are experienced. Cheap germination sheets that cover the entire area are an extra expense but well worth considering to avoid wash-off and retain moisture to prevent seed failure. At their discretion, some contractors have adopted the practice of lightly rolling the surface (no more than the weight of a 20 inch (50.8cm) fine turf mower approx 110kg/ 2.16cwt) when the grasses are just coming through. This action appears to encourage tillering and conserve moisture in the surface.

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A surround fence will assist to deter wildlife from damaging the completed project and indicate a restricted area to unauthorised personnel.

For those that undertake these tasks themselves, the first cut can be with the usage of an airborne (Hover) or rotary mower ensuring sharpened blades to avoid tearing or pulling at the delicate new grasses. This should occur about four weeks after germination depending on climatic conditions and growth rate or at least when the sward is around 50-75mm (2-3 inches). It is detrimental to allow the sward to become long and lanky as the soft top growth will obscure worm casting and lend towards a thin open surface when eventually cut back. The aim is to cut no more than a third of the grass leaf at a time until a maintenance height of cut is achieved (Approx. 20-25mm, ¾-1 inches in winter, 20-15mm in summer).

If the surface is too soft to walk on or take machine traffic, then a hover type mower can be deployed by using two people and pull ropes. (Ensuring that relevant risk assessment and health & safety measures are adhered to).

Weed infestation can be quite alarming even to professional groundsmen but indicates that the loam is not inert. The broader leaved species normally succumb to closer mowing regimes and once the sward is strong enough, an application of selective weed control will account for the remaining weed content.

Cricket loam companies will not normally supply sterilised loam unless specifically requested and this is usually at a higher cost.

There are around 25 species of earthworm occurring in the UK although only three are responsible for the majority of worm casting activity, if allowed to go unchecked can ruin the smooth surface levels with resultant unsafe playing conditions and create bare areas ideal for weed establishment. There are no chemical worm eradication products available but there remain for an uncertain period of time products classified as worm control.

These should be applied by a competent and certified operator whenever worm activity is present.

All chemical control measures should not be undertaken until the grass plant has matured to the three leafed stage of growth.

Regular brushing or drag-matting of the square will assist to disperse casts when friable. Nutrient levels are generally in more demand in a new construction so these need to be attended to when necessary. It is advisable to seek a nutritional analysis at intervals to ensure the correct nutrient and Ph levels are maintained for optimum grass health.

Initial rolling procedures are one of the most important yet less understood operations that are essential towards achieving the deep seated consolidation required of a square/pitches. This is an essential element towards the requirements of the game of cricket, good pace, carry and consistency of even bounce. The timing is not an exact science but recent rolling trials indicate that the condition of the soil profile and optimum moisture content is the key. A 36 inch motor mower weighs around 254kg (5cwt) and is ideal for initial settlement, especially during winter months when the soil is in a "plasticine" condition. The cutters can be engaged during mild spells to tidy up the sward but again ensuring that the blades are sharpened.

Sooner or later the decision will have to be made to introduce the heavy roller and this will solely depend on the moisture content of the new square. Neither too wet nor too dry, it is advisable though to err on the side of caution for the initial rolling so as not to cause pushing the surface in a "bow-wave" fashion and capping the surface or induce "rippling" that can lead to very unsafe playing conditions. The operation should not be excessive in the first year and priority to cross and diagonal passes with speeds progressively slower as even consolidation is achieved.

3 Cricket Ground Construction and Restoration of Squares

A feature of newly laid squares or pitches are that during the process of maturing a certain amount of settlement can occur, the severity of which usually depends on how well accomplished the construction methods were applied, specifically the condition and quality of rootzone materials and consolidation. This may appear as overall slight or deeper sinkage, excessive cracking and associated movement of "plates", during the formative years.

To counteract this primary settlement and expedite maturity, wide cracks should be methodically filled with finely screened loam and firmed using an implement such as a builder's wide cold chisel and seeding in order to knit the cracks together. Just rubbing in top dressing will not facilitate the procedure. Deep tine aeration to break large plates into smaller cracking patterns is known to improve irregular bounce characteristics but should only be undertaken under expert supervision.

The fine cracks that appear during normal pitch preparation are an accepted feature that can often be limited by use of covers to prevent the surface from drying too rapidly.

By use of a 12 foot straight edge or similar device, routine checks on surface levels should be made especially if "rippling" has occurred, so that, where considered necessary, carefully applied top dressing can be administered to correct levels. It is important though to thoroughly key the dressing in and not trap organic matter in low spots as it would lend towards a root-break discontinuity in the profile years later after many seasons of applied clay loam top dressings.

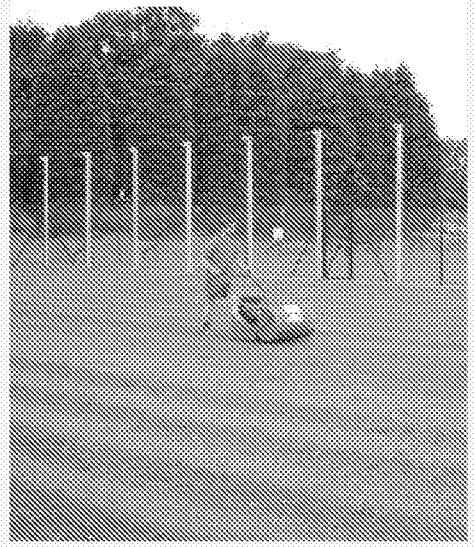
Aeration (spiking) is generally not necessary within the first year of use for newly laid squares. It may however be extremely beneficial for some restored squares but in all cases observation and management of the profile should be undertaken before considering the type of machine and timing of the operation.

Outfield Areas

Standard Turf Culture maintenance practices will apply to outfield areas during the post - construction stages ie observation of any stones remaining on the surface and picking if necessary, initial topping of the grasses to encourage tilling and subsequent mowing operations, light rolling, fertiliser applications when required, control of worm and weed activity, regular brushing/drag-matting etc.

Frequently a feature of newly constructed outfields in the first year of usage, is that they can become very firm, prohibiting player safety and preventing water percolation in the event of prolonged periods of rainfall. Some form of de-compaction may be required by deep aeration methodology.

Some ground authorities deliberately allow thatch to develop to cushion the surface hardness but could lend towards compromising the future health of the sward, especially during periods of drought and associated problems.



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Non-turf pitches and facilities are best described as facilities that do not support grass or vegetation. They are designed to perform without any form of vegetation.

1. TYPES OF PITCHES AND CLASSIFICATION

There two types of structures as indicated below:-

1. **Bound:** like concrete or bitmac supporting one or more surfaces.
2. **Unbound:** like water bound or interlocking minerals supporting one or more surfaces.

The pitch systems can be classified into four groups based on the way pitches perform. The determining factor is the effect of water on the way pitches play.

The playing performance of pitches affected by water are described as Dynamic and those that are not significantly affected, as Static.

ECB Performance Standard

All pitches shall perform within the limits as specified in the ECB performance standard specification which indicates the range of performance criteria within which all pitches shall perform in order to emulate a good natural grass pitch.

Parameters are set for vertical ball bounce, friction, hardness, traction, surface evenness, (smoothness), gradients plus other performance criteria applicable to the material component used within the structural design of the pitch.

Classification

Practical research during the past 25 years has shown the top 100mm of a non-turf pitch influence the playing performance. The ability of this zone to absorb moisture is a major factor in determining how a pitch plays.

The number and depth of moisture absorbing components in the zone affect the extent to which a pitch performs thereby providing the nearest comparison to a grass pitch. It is the combination of components and the extent to which they are affected by moisture that determine "the changeability" in a pitch in the same way a grass pitch is affected.

Based on the ability of the structure to absorb moisture and its affect on playing performance pitches are classified as.

Totally Dynamic
All the components to a depth of 100mm (4 inches) absorb moisture and therefore provide the nearest performance to a grass pitch.

Semi Dynamic
Where one or more components absorb moisture and others don't, thereby controlling the playing performance within defined limits.

Totally Static
None of the components absorb or are affected by moisture and therefore the pitch plays the same at all times.

Semi Static
When one component is affected by moisture and the remainder don't, providing a little variation in the performance.

(Note: No totally static or semi static pitches are approved within the ECB approval scheme at the time of publication of this document).

Further information on Non-Turf Pitches can be obtained from the ECB, NTP Guidance Notes and the Codes of Practice and Technical Requirements for the Design and Installation of NTP's.

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4 Non-Turf Pitches (NTP)

11. MAINTENANCE

All non-turf pitches require maintenance and need managing if they are to last and fulfil their role providing an essential facility to clubs at an affordable cost.

Like grass, NTPs must be maintained or they deteriorate. All types need some maintenance on a regular basis as indicated below:

Static systems

Weekly:	Inspection and keeping free of debris Perhaps marking out Cutting the grass around the perimeter of the pitch
Monthly:	As above and any repairs
Twice a year:	Weed, moss, algae control Repairs to the ends

Dynamic systems

Weekly:	Inspection and keeping free of debris Perhaps marking out Cutting the grass around the perimeter of the pitch Perhaps rolling
Monthly:	As above and any repairs
Twice a year:	Weed, moss, algae control Repairs to the ends

Some dynamic systems require the surface components to be lifted and the unbound base renovated once a year or every other year.

Detailed information on the maintenance should be obtained from the system supplier.

Managing the facility will include:

1. They way the pitch is used and by whom.
2. Planning material requirements to ensure it is maintained in a satisfactory condition.
3. Planning labour requirements, who does what, players, the groundsman, contractor etc. Are the personnel adequately trained?

Maintaining a typical Non-Turf Pitch

Remark the crease areas on a weekly basis, particularly during early days of settlement.

Remove any debris from the surface of the pitch by brushing, particularly the bowling ends and popping crease. This needs to be carried out regularly, twice a week if possible.

On unbound pitches occasionally roll, perhaps once or twice a week for the first few weeks. Use a 5-6 cwt (254-305 kg) roller in order to settle the base formation. During such work, wrinkles may appear in the surface at each end of the pitch as a result of rolling. The nails at the end of the mat should be removed and the wrinkles pulled out followed by re-fixing with nails.





The stump holes will need weekly repair by watering and firming with clay loam if required.

The pitch surrounds should be mown weekly to blend in with the rest of the square.

Occasionally it may be necessary to apply a weed/moss control to pitch exercising great care and being mindful not to leach the materials into the surrounding ground, killing vegetation, therefore 'contact herbicide' are recommended. Calcined sulphate of iron is effective on moss on synthetic pitches.

No vehicles should be allowed on to the surface especially when newly laid.

On some pitches it may be necessary to refill the bowlers delivery area with particulate material, this taking place on a regular basis.

Out of season maintenance

During the autumn, following the cleaning of the ends, on some pitches, a top dressing should be applied and worked in to the bowler's delivery area. After the pitch has settled down and been used for a season, it may be necessary to carry out remedial work to the base formation undertaken as follows:

- Remove the surface matting.
- Remove the underlay if one is used.
- Break up the unbound mineral base by lightly pricking with a fork, particularly in areas with depressions.
- Incorporate new material in to the disturbed unbound mineral base.
- Level the base with a straight edge and appropriate equipment.
- The underlay should then be relaid and tensioned.
- Relay the surface and tension, followed by filling the stump holes with new clay loam.

Where major depressions have formed, it is important to fork to a greater depth, working in sufficient new material in to the holes to build up levels. This is then followed by pricking the remainder of the unbound mineral material, top dressing with new material and working in after which the area is screened and consolidated. Consolidation can either be with a roller or preferably, a vibrator plate. The underlay, if used, and the surface mat carpet is then re-laid.

Potential hours of use per week: 30 plus

Maintenance inputs, time allocation.

- When first laid: 1-2 hours per week
- After first 3 months: 1hour per week
- Autumn work: 8 to 10 hours
- Spring work: 3 to 4 hours

The allocation of time and the input of maintenance will ensure the pitch lasts for years. In order to obtain value for money it is essential Non-Turf cricket pitches are regularly maintained and used intelligently otherwise they will soon deteriorate and cease to be suitable for the game.

Further comprehensive guidance can be obtained from the ECB TS6 document on Artificial Surfaces, from the system suppliers or the Institute of Groundsmanship, Specialist consultant and advisors on NTP's obtainable from the ECB.

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ECB Approved NTP System Suppliers

Notts Sport Ltd
Premier House
18 Mandervell Road
Oadby
Leicester LE2 5LQ
Tel 0116 272 0222

Approved pitch systems:
1. The Nottsbase "D" System
2. The Envelope System
3. The 3 D System

Exclusive Leisure Ltd
28 Cannock Street
Leicester LE4 9HR
Tel 0116 233 2255

Approved pitch systems:
1. The Cricketweave System
2. The "T" based System

Clubturf Cricket Ltd
Lea House
5 Middlewich Road
Sandbach
Cheshire CW11 1XR
Tel 01270 753344

Approved pitch systems:
1. The Clubturf Natural Pitch System
2. The Clubturf International System

Verde Sports (Cricket) Ltd
Gabbotts Farm Barn
Bury Lane
Withnell
Chorley
Lancs PR6 8SW
Tel 01254 831666

Approved pitch systems:
1. The Test Match System
2. The Premier System

Total Turf Solutions Ltd
PO BOX 250
Northampton NN5 5WZ
Tel 01604 750555
Fax 01604 750780
Email enquiry@totalturfsolutions.co.uk

Approved pitch system :
1. The Total Play System

I. INTRODUCTION TO PQS

Performance Quality Standards provides a means of determining the quality of a square or pitch at a given time. They are best described as 'a tool' in the management process and can be used for a range of applications as well as providing a series of 'Benchmarks' against which judgements can be made following the assessment/measurement of a square or pitch.

Each Performance Standard has a stated method of test of which the majority recommended are British Standards.

Within the PQS there are three categories of measurement that relate to the overall quality of a facility. These are:

1. **The physical structure** – The profile make-up
2. **The presentation quality** – The visual aspect
3. **The playing quality** – The performance Ratings

Performance Quality Assessment Parameters and Test Method Measurements are used to determine the current quality and the information obtained can then be used to:

- Determine the current quality of the square/pitches
- Compare test results to identify deterioration of the square/pitches
- Improve the playing quality of the pitches
- Determine the purchase of materials and equipment
- Set management objectives
- Prepare short and long term plans of a realistic standard expectation including future development
- Introduce a monitoring system including: testing, assessment, recording and review.

II. MONITORING

An essential part of managing and maintaining cricket facilities is to monitor the condition of the square, pitches and the outfield throughout the year particularly during the playing season. Using performance quality standards monitoring forms provides a means of monitoring quality which can be used to help in the management and maintenance programme, allocation of resources, finance, planning etc.

Forms for the cricket square and the outfield can be modified and the properties adjusted or reduced depending on the clubs needs and the extent to which the information will be used, ie renovation work, construction etc and provide an indication as to the quality of the facility provided.

It is suggested that the properties indicated in each table on the forms are the minimum required in "building a picture" of the way the facility is developing and highlighting areas where action is required.

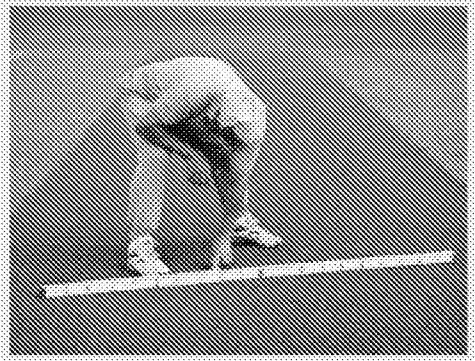
The intervals between assessments can also be adjusted to suit the needs of the club. For instance, it may be desirable to monitor the Square four times a year but individual pitches say three times during the period a pitch is in existence in which case one form for each pitch would be used monitoring during each stage of preparation, during use and when under repair.

It is also helpful if clubs develop a programme for the activities required to manage and maintain the square, pitches and outfield.

This would include grass cutting, fertilising, rolling, repairs, and all activities required throughout the year. This can be used to quantify the resources required and the estimated cost.

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NTP Quality Performance Standards

For Non Turf Cricket Pitches the following classifications for grading are:

1. First Class and Centres of Excellence

2. Club/Recreational

3. Junior (under 12)

III. COUNTY PITCH ADVISERS

Between 2001-03, the ECB with the support of Sport England, instigated the Pitch Adviser Scheme to improve the standard of recreational pitches across the UK, in line with the requirements and objectives of the National Facilities Strategy.

The project involved each of the County Cricket Boards nominating a candidate recognised to have had a minimum of:

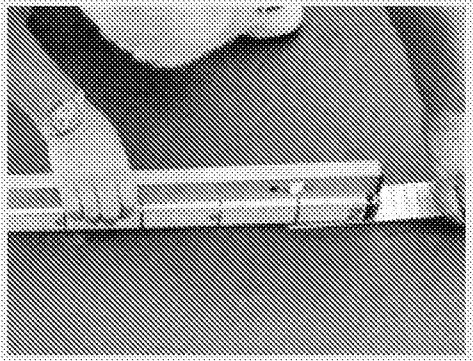
- 10 years of full time practical experience in cricket groundsmanship of a good quality standard facility.
- Attained an ECB/IOG level 2 certificate or other nationally recognised qualifications.
- Possession of good communication skills (Especially report writing).

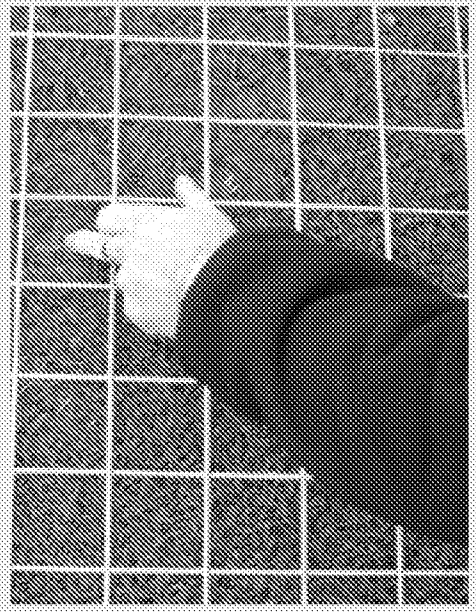
A total of 45 appointed pitch advisors attended comprehensive residential training courses in order to attain standardised assessment and advisory skills and deployed to fulfil the following roles:

- Prioritised detailed assessment and recommendations that may include grant aid schemes, using Performance Quality Standard methodology.
- Create a response system for basic assessment duties that may include local League criteria.
- Monitoring the development of facilities where recommendations have been implemented.
- Assist in establishing effective County groundsmen's Associations.

IV. BASIC METHODS

The pitch advisor will use a group of five basic items of equipment to make measured assessments on a square or prepared pitch. Once trained, any competent turf manager can purchase or make their own and use them to monitor their own facilities. There are other forms of equipment that can be used for more serious problems but are costly and perhaps preferably hired in or a qualified operative employed.





The five main items are:

1 **Soil profile sampler & measure…**
To assess the profile make-up & depth of rootzone.

2 **3m straight edge, spirit level, graduated wedge or measure…**
For determining the evenness of the surface & localised gradients.

3 **Square quadrant frame, divided into 100 equal squares…**
For identifying percentage values of ground cover composition, pests & diseases.

4 **Ball drop device, measuring post and good quality cricket ball…**
For testing vertical ball bounce on a pitch.*

5 **Bathroom scales, 2 boards, dishes, knife…**
For ASSB (Motty) Test (not pictured).

*This test is only carried out on prepared pitches, pre or post match and indicates the consistency of bounce (when a ball is dropped vertically) and when the ball bounce results are combined with friction measurements the true pace of a pitch can be calculated.



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The bounce test results have been used for over 30 years to determine the binding qualities (ie clay content) of a pitch and its potential pace, which is expressed in percentage terms, as a guideline:

Less than 8%	very slow pitches
8% to 11%	slow
12% to 16%	easy paced
17% to 21%	fast
22% to 24%	very fast

Pitch Advisers can be contacted through the relevant ECB County Board

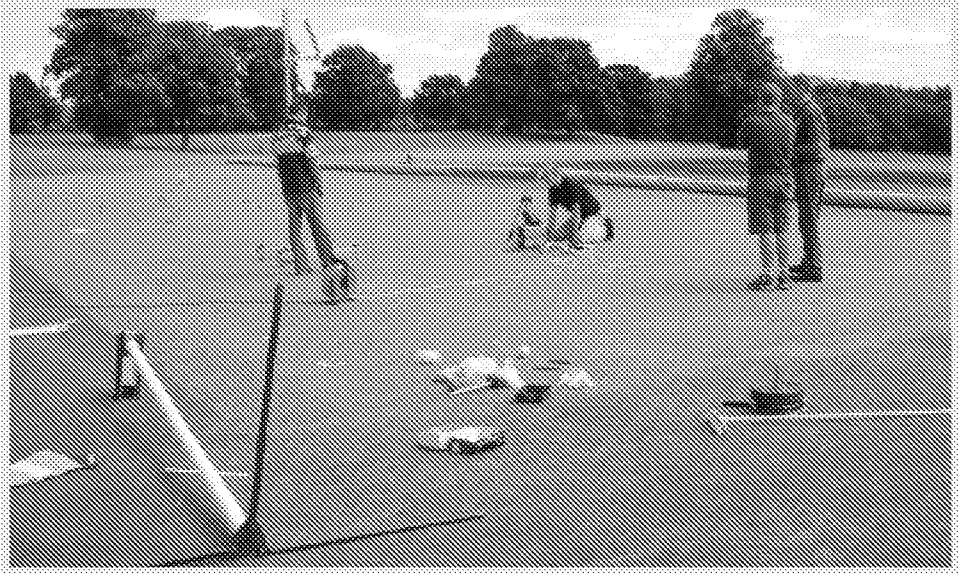
V. PITCH RESEARCH

In 1996 the ECB formed the Pitches Research Group and invited and commissioned experts, test houses and representatives to participate in the group. The work of the group has been enormous value to the game of cricket dispelling long beheld beliefs about pitches, substantiating others and introducing scientific evidence which will be of major importance to the game in the future.

A great deal of documentation has been produced and is encapsulated in a document under the title "Pitch Properties and Performance" which is obtainable from the ECB. Some of the work can be used within the performance quality standards at the senior levels of the game Premier league and above. It has a great deal to commend it as a source of information for all levels of the game including the providers of cricket facilities. It is not only beneficial for grass provision it provides information which can be used in NTP provision particularly by the developers of facilities.

For more comprehensive information on Performance Quality Standards, the Institute of Groundsmanship publish a document for a range of cricket applications.

For further information please contact the Institute of Groundsmanship (Tel. 01908 312511)
Email iog@iog.org



Example Basic PQS Form

Performance Standard	Cricket Club	Quality Standard		
		High	**Standard**	**Basic**
A. Herbage				
i) Length of herbage: (a) during the growing season (b) during the non-growing season		(a) 6 to 10mm (b) 8 to 13mm	(a) 8 to 12mm (b) 13 to 18mm	(a) 8 to 14mm (b) 16 to 25mm
ii) Bare area				
(a) total area		(a) Max. 5%	(a) Max. 10%	(a) Max. 20%
(b) diameter of any individual bare area		(b) Max. 25mm	(b) Max. 25mm	(b) Max. 40mm
iii) Total ground cover		Min. 95%	Min. 90%	Min. 80%
iv) Desirable grass species		Min. 90%	Min. 80%	Min. 60%
v) Poa annua		Max. 10%	Max. 15%	Max. 30%
vi) Other undesirable grass species		Nil	Nil	Max. 10%
vii) Weeds - Large-leaved		Nil	Nil	Nil
viii) Weeds - Small-leaved		Nil	Max. 2%	Max. 5%
ix) Moss		Nil	Nil	Nil
x) Algae and Lichen		Nil	Nil	Nil
B. Pests and Diseases				
i) Diseases		Nil	Nil	Nil
ii) Earthworms		Nil	Max. 2%	Max. 6%
iii) Pests		Nil	Nil	Nil
C. Profile				
i) Root depth		Min. 150mm	Min. 100mm	Min. 75mm
ii) Thatch depth		Nil	Nil	Max. 2mm
iii) Rootzone medium (of appropriate clay loam)		Min. 150mm	Min. 100mm	Min. 75mm
vi) Evenness: 2m straight edge, or 0.5m straight edge		Max. variation 4mm 3mm	Max. variation 8mm 4mm	Max. variation 10mm 6mm
xi) Gradient: (a)Length ways (b) Across the pitch		1:100+ 1:70 - 1:90	1:100+ 1:70 - 1:90	1:90+ 1:60 - 1:80

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Pitch Measurements (Law 8)			
	Pitch	Stumps	Bails (length)
Adult	20.12m (22 yards)	71.1 x 22.86cm (28 x 9 inches)	10.95cm (4 ⅜ inches)
Junior (under 13)	19.20m (21 yards)	55.88 x 20.32cm (22 x 8 inches)	9.53cm (3 ¾ inches)
Junior (Under 11)	18.29m (20 yards)	55.88 x 20.32cm (22 x 8 inches)	9.53cm (3 ¾ inches)
Junior (Under 9)	16.46m (18 yards)	55.88 x 20.32cm (22 x 8 inches)	9.53cm (3 ¾ inches)

ECB Recommendations for Junior Cricket			
	Pitch	Stumps	Bails (length)
Under 15	20.12m (22 yards)	65.00 x 22.86cm (27 x 9 inches)	10.95cm (4 ⅜ inches)
Under 14	20.12m (22 yards)	65.00 x 22.86cm (27 x 9 inches)	10.95cm (4 inches)
Under 13	19.20m (21 yards)	65.00 x 20.32cm (27 x 8 inches)	9.53cm (3 ¾ inches)
Under 12	19.20m (21 yards)	65.00 x 20.32cm (27 x 8 inches)	9.53cm (3 ¾ inches)
Under 11	18.29m (20 yards)	65.00 x 20.32cm (27 x 8 inches)	9.53cm (3 ¾ inches)
Under 10	17.37m (19 yards)	65.00 x 20.32cm (27 x 8 inches)	9.53cm (3 ¾ inches)
Under 9	16.46m (18 yards)	65.00 x 20.32cm (27 x 8 inches)	9.53cm (3 ¾ inches)

Area of Pitch (Law 7.1)

The pitch is a rectangular area 20.12m (22 yards) in length and 3.05m (10 feet) in width. It is bounded at either end by the bowling creases, which shall measure 1.52m (5 feet) in width on either side of a line joining the two middle stumps of the wickets, each parallel to it. (Law 7).

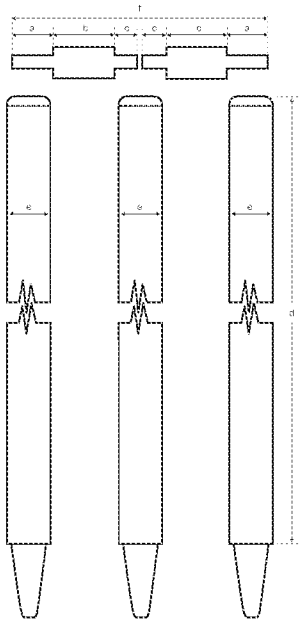
Width and Pitching (Law 8.1)

Two sets of wickets, each 22.86cm (9 inches) wide, (junior cricket is 20.32 cm (8 inches) and consisting of three wooden stumps with two wooden bails upon the top shall be pitched opposite and parallel to each other and at a distance of 20.12m (22 yards), (junior cricket 19.2m (21yards) between the centres of the two middle stumps.

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Stumps (Law 8.2)

Stumps shall be of equal and sufficient size to prevent the ball from passing between them. Their tops shall be 71.1cm (28 inches) above the ground, junior cricket 68.58cm (27 inches). The portion of a stump above the playing surface shall be cylindrical, apart from the domed top, with circular section of a diameter not less than 3.49cm (1 3/8 inches) nor more than 3.81cm (1 1/2 inches) (Law 8).



Stumps shall conform to the following specifications:

	Senior	Junior
Height (d)	71.1cm (28 inches)	68.58cm (27 inches)
Width (e) max	3.81cm (1 1/2 inches)	3.49cm (1 3/8 inches)
Width (e) min	3.49cm (1 3/8 inches)	3.18cm (1 1/4 inches)
Overall width of Wicket (f)	22.86cm (9 inches)	20.32cm (8 inches)

Bails

The bails, when in position on top of the stumps

(i) shall not project more than 1.27cm (1/2 inch) above them

(ii) shall fit between the stumps without forcing them out of the vertical.

Bails shall conform to the following specifications:

	Senior	Junior
Overall (a+b+c)	10.95cm (4 5/16 inches)	9.68cm (3 13/16 inches)
Longer Spigot (a)	3.49cm (1 3/8 inches)	3.18cm (1 1/4 inches)
Length of Barrel (b)	5.40 cm (2 1/8 inches)	4.60cm (1 13/16 inches)
Shorter Spigot ©	2.06cm (13/16 inches)	1.91cm (3/4 inches)

The bowling crease (Law 9.1)

This is the back edge of the crease marking, shall be marked in line with the stumps at each end and shall be 2.64m (8 feet 8 inches) in length with the stumps in the centre.

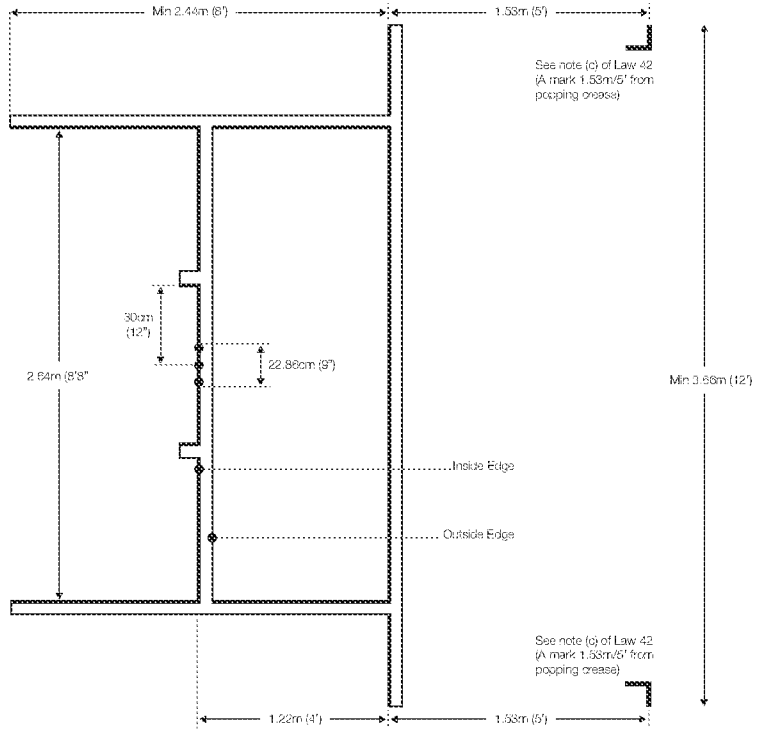
The popping crease (Law 9.2)

This is the back edge of the crease marking, shall be in front of, and parallel with, the bowling crease. It shall have the back edge of the crease marking 1.22m (4 feet) from the centre of the stumps and shall extend to a minimum of 1.83m (6 feet) on either side of the line of the wicket. For Test and International Competitions, the 6 feet minimum will be replaced by a minimum of 15 yards. The popping crease shall be considered to unlimited in length.

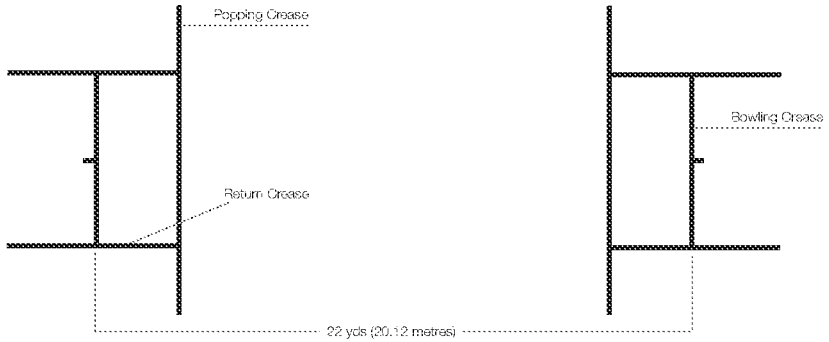
The return creases (Law 9.3)

These are the inside edges of the crease markings, shall be at right angles to the popping crease at a distance of 1.32m (4 feet 4 inches) to either side of the line joining the centres of the two centre stumps. Each return crease shall be marked to a

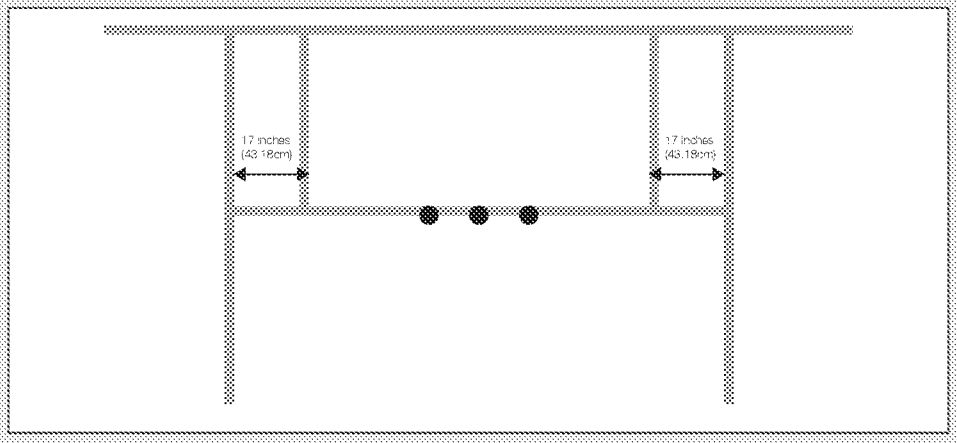
Appendix B: Law 7 (The Pitch) and 9 (The Bowling, Popping and Return Creases)



Pitch Markings



ICC One Day International Wides Crease Markings



minimum of 2.44m (8 feet) behind the popping crease and shall be considered to be unlimited in length. Wherever possible the creases shall be remarked during the game. The width of all lines shall be under 25mm (1 inch) and as near to 12.5mm (½") as possible.

Preparation and Maintenance of the Playing Area (Law 10)

1. Rolling
The pitch shall not be rolled during the match except as permitted in a) and (b) below.

(a) Frequency and duration of rolling
During the match the pitch may be rolled at the request of the captain of the batting side, for a period of not more than 7 minutes, before the start of each innings, other than the first innings of the match, and before the start of each day's play.

(b) Rolling after a delayed start
In addition to the rolling permitted above, if, after the toss and before the first innings of the match, the start is delayed, the captain of the batting side may request to have the pitch rolled for not more than 7 minutes. However, if the umpires together agree that the delay has had no significant effect on the state of the pitch, they shall refuse the request for the rolling pitch.

(c) Choice of Rollers
If there is more than one roller available the captain of the batting side shall have the choice.

(d) Timing of permitted rolling
The rolling permitted (maximum 7 minutes) before play begins on any day shall be started not more than 30 minutes before the start of play. The captain of the batting side may, however, delay the start of such rolling until not less than 10 minutes before the time scheduled or rescheduled for play to begin, should he so desire.

(e) Insufficient time to complete rolling
If a captain declares an innings closed, or forfeits an innings, or enforces the follow-on, and the other captain is prevented thereby from exercising his option of the rolling permitted (maximum 7 minutes), or if he is so prevented for any other reason, the extra time required to complete the rolling shall be taken out of the normal playing time.

2. Sweeping
(a) If rolling is to take place the pitch shall first be swept to avoid any possible damage by rolling in debris. This sweeping shall be done so that the 7 minutes allowed for rolling is not affected.

(b) If no rolling is to take place the pitch shall be cleared of any debris before the start of each day's play, between innings and at all intervals for meals. See Law 15.1 (An interval)

(c) Notwithstanding the provisions of (a) and (b) above, the umpires shall not allow sweeping to take place where they consider it may be detrimental to the surface of the pitch. (It is considered normal practice to sweep back to behind the stumps from the 6ft mark and avoiding the protected area other than manually removing larger debris)

3. Mowing
(a) Initial Mowing
All mowings which are carried out before the toss shall be the responsibility of the Ground Authority. The pitch shall be mown before play begins on the day the match is scheduled to start or, in the case of a delayed start, on the day the match is expected to start.

(b) Subsequent mowings in a match of more than one day's duration. All subsequent mowings shall be carried out under the supervision of the umpires. The pitch shall be mown daily. Mowing shall be completed at least 30 minutes before the time scheduled or rescheduled for play to begin. Should it not be possible to mow the pitch in any day because of weather conditions, rest days or other reasons, the pitch shall be mown on the first day on which the match is due to be resumed.

(c) Mowing of the outfield in a match of more than one day's duration. In order to ensure that conditions are as similar as possible for both sides, the outfield shall be mown before the commencement of play on each day of the match, if ground and weather conditions allow. If for reasons other than ground and weather conditions complete mowing of the outfield is not possible, the Ground Authority shall notify the captains and umpires of the procedure to be adopted for such mowing during the match.

4. Watering
The pitch shall not be watered during the match.

5. Re-marking creases
The creases shall be re-marked whenever either umpire considers it necessary.

6. Maintenance of footholes
The umpires shall ensure that the holes made by the bowlers and batsmen are cleaned out and dried whenever necessary to facilitate play. In matches of more than one day's duration, the umpires shall allow, if necessary, the re-turfing of footholes made by the bowler in his delivery stride, or the use of quick-setting fillings for the same purpose.

7. Securing of footholds and maintenance of pitch.
During play, the umpires shall allow the players to secure their footholds by the use of sawdust provided that no damage to the pitch is caused and that Law 42 (Fair and unfair play) is not contravened.

8. Non-turf pitches
Wherever appropriate, the provisions set out in 1 to 7 above shall apply.

Covering the Pitch Before, During and After a Match (Law 11)

Test and international competitions
The pitch shall be entirely protected against rain up to the commencement of play and for the duration of the period of the match. It shall be wholly covered at the termination of each day's play, or provided the weather is fine, within a period of two hours thereafter.

The covers shall be removed no earlier than 06.00am and no later than 07.00am on each morning of the match (including the rest day) provided it is not raining at the time, but they will be replaced if it rains prior to the commencement of play.

ARUN DISTRICT COUNCIL BN/11/22/OUT

The following areas shall also be covered unless the umpires decide otherwise:

- The covers must totally protect the pitch.
- The pitch surroundings, a minimum of 5 metres either side of the pitch.
- The bowler's run-ups to a distance of at least 10x10 metres.
- Any other soft or worn areas in the outfield.

Championship and other First Class matches:
In addition or instead of the above:

- The whole pitch shall be covered the night before the match and if necessary, until the first ball is bowled; and whenever necessary and possible at any time prior to that during the preparation of the pitch.
- On each night of the match and if necessary, throughout any rest days.
- In the event of play being suspended on account of bad light or rain during the specified hours of play, and at lunch, tea and between innings on account of rain.

The covers shall be removed before 8.00am on each morning of the match (including the first day and rest days) providing it is not raining at the time, but they will be replaced if rain falls prior to the commencement of play.
For one-day matches there is no time stipulated for the removal of covers prior to play. This is at the groundsman's discretion.

The following other areas shall also be covered unless the umpires decide otherwise:

- The bowler's "run up" to a distance of at least 10 yards, with a width of 4 yards.
- At least 20 feet either side of the length of the pitch.
- In addition to the above, further areas and in particular worn patches should, if possible and practicable, also be covered.

If flat sheet covers are to be used on championship pitches from 48 hours before the start through to the end of matches, a dry coir mat or equivalent must be placed under the sheet.

When play is interrupted on account of the weather and/or bad light, and raised covers have been the normal method of covering the pitch, a flat sheet cover can be used as a temporary measure to cover the pitch if so desired, instead of the wheeled covers having to be brought on immediately. The flat sheet can remain on the pitch for a maximum of 30 minutes, after which time raised wheeled covers must be put on and the sheet removed. This should be done earlier if the weather appears likely to worsen, or if the interruption looks as though it will last longer than 30 minutes. In exceptional weather the flat sheet can remain longer than 30 minutes at the umpires' discretion.

In order to make play possible, the Umpires may decide, following consultation with the Captains, to have particularly wet or muddy areas covered by mats or blankets whilst play is in progress.

A pitch being prepared for a future match may be protected by a porous mat in order to avoid unnecessary damage. A second porous mat may be put down if an additional pitch which is intended to be used for a future Test match, One Day International or an ECB Cup/Trophy Final requires protection.

Premier Leagues
The covers must protect an area of at least 80 feet by 12 feet and clubs are encouraged to protect a larger area, including the bowlers' run-ups, whenever possible.

Clubs and Schools
If covers are possessed then Law 11 may apply.

Drying of Pitch and Ground
Test & International matches
Groundsmen may use any equipment available, including any roller, for the purpose of drying the pitch and making it fit for play.

Note: An absorbent roller may be used to remove water from the covers, including the cover on the match pitch (when flat sheet covers are used an absorbent hessian type underlay matting should also be used on the match pitch).

Boundaries: (Law 19)

The boundary is the perimeter of the field of play. For senior matches the Ground Authority shall aim to provide the largest playing area, subject to no boundary exceeding a distance of 90 yards or less than a minimum of 60 yards (45.72m). For Test and international matches, the playing area shall be a minimum of 140 yards (128.01m) from boundary to boundary square of the pitch. The pitch shall be a minimum of 60 yards (54.86m) from one boundary square of the pitch. When this minimum distance is used, the pitch has to be a minimum of 80 yards (73.15m) from the opposite square boundary. The straight boundary at both ends of the pitch will be a minimum of 60 yards. Distances shall be measured from the centre of the pitch to be used. For Women's International matches, the boundary shall be a minimum of 60 metres and a maximum of 65 metres. Distances shall be measured from the middle stump at each end of the pitch forming two semi-circles which shall then be joined by a straight line to form the complete boundary.

Defining the Boundary
On grounds where the boundary is not clearly defined by a perimeter fence or edge of grass area, it must be marked by a rope. For Test and international matches, all boundaries must be designated by a rope or similar object of a minimum standard as authorised by the ICC from time to time. Where appropriate the rope should be a required distance (3 yards / 2.74m minimum) inside the perimeter fencing or advertising signs. For grounds with a large playing area the maximum length of boundary should be used before applying the minimum 3 yards (2.74m) between the boundary and the fence.

Protected Area*
The protected area on a pitch is the area contained by an imaginary line 1.22m (5 feet) from the Popping Crease and parallel to it and within two imaginary lines drawn down the pitch from points on that line 30.48cm (1 ft) on either side of the middle stump. (Law 42).

Selection and Preparation
Before the toss for innings the groundsman and Grounds Authority shall be responsible for the selection and preparation of the pitch. Thereafter, the Umpires shall control its use and maintenance.

Fitness of the Pitch for Play
The umpires shall be the final judges of the fitness of the pitch for play.
The pitch – ICC rulings.
Covering the pitch – ECB Pitches Reference Document.

Changing the Pitch
The pitch shall not be changed during the match unless the Umpires decided that it is dangerous for play to continue on it and then only with the consent of the two Captains.

Non-Turf Pitches
In the event of a non-turf pitch being used, the artificial surface shall conform to the following measurement (Law 10.8):

Length: a minimum of 17.68m (58 feet)
Width: a minimum of 1.83m (6 feet)

ICC/ECB Restrictions on the Placement of Fielders

Applies to competitions where regulations require restriction on the placement of fielders. This may vary subject to the playing regulations of the competition authority.

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Markings

27.5m (30 yards) Outer Circle
Two semicircles shall be drawn on the field of play.

The semi-circles have as their centre the middle stump at either end of the pitch. The radius of each of the semicircles is 27.5m (30 yards). The ends of each semicircle are joined to each other by a straight line drawn on the field on the same side of the pitch.

The field restriction area should be marked by a continuous painted white line or 'dots' at 4.5m (5 yards) intervals, each 'dot' to be covered by a white plastic or rubber (not metal) disc measuring 18cm (7 inches) in diameter.

At the instant of delivery, there may not be more than five fielders on the leg side.

For the first 15 overs only two fielders are permitted to be outside the field restriction marking at the instant of delivery. For the remaining overs only five fielders are permitted to be outside the field restriction at the instant of delivery.

13.72m (15 yards) Inner Circles
Two inner circles shall be drawn on the field of play.

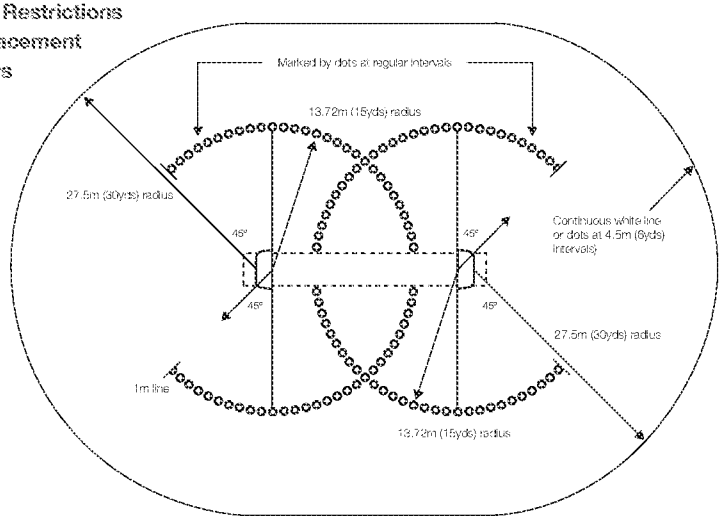
The circles have as their centres the centre point of the popping crease at either end of the pitch. The radius of each of the circles is 13.72m (15 yards). The field restriction area should be marked by 'dots'. The segment of the circles reserved for the slip positions shall not be demarcated (See marking plan).

In the first 15 overs there must be a minimum of two stationary fielders within the 15 yards field restriction of the striker at the point of delivery. The two stationary fielders may be permitted to stand deeper than 15 yards (in the demarcated area) provided only that they are standing in the slip, leg slip and gully positions.

Where play is delayed or interrupted affecting the innings of the team batting first, and the total number of overs available is reduced, the number of overs in regards to field restrictions shall be reduced proportionately. Fractions are to be ignored.

In the event of an infringement, the square leg umpire shall call and signal a no ball.

ICC/ECB Restrictions on the Placement of Fielders



Relevant to Groundsmanship

These guidelines describe the standards of facilities required by Premier League Clubs. Umpires will be asked to mark the playing facilities after each game and to comment on any deficiencies.

1. Pitch & Square

The square should be well maintained and in good condition with the whole of it being cut within 2 days of the start of each match. The pitch should be clearly distinguishable from the remainder of the square and shall be marked and rolled before play. The pitch should be appropriate for matches of at least 100 overs duration. The bounce of the pitch should be true and predictable throughout the match, and should not produce excessive spin or movement off the seam. Any holes or ruts on the square caused by previous matches must have been levelled, filled and firmed. It shall not have been artificially watered within forty-eight hours of the match. The popping crease shall be marked for a minimum of twelve feet to conform with Law 9 and the restricted area for the bowlers' follow-through (Law 42 Note C) shall be indicated with markings off the playing surface five feet in front of the popping crease and also on the bowling crease one foot on either side of the middle stump.

Stumps, which should be properly matched sets in good condition and with matching balls, shall be pitched by the groundsman with holes adequately watered to allow easy resetting by the umpires. The pitch shall be brushed and re-marked (rolled if required) during the interval between innings. At least one roller must be available for use during the match.

2. Outfield

The outfield should be well maintained and adequately drained. It should be closely mown with no noticeable grass cuttings. Balls should be able to run true and the outfield should be free of holes, ruts or other obstructions that might pose a hazard to fielders.

3. Boundary

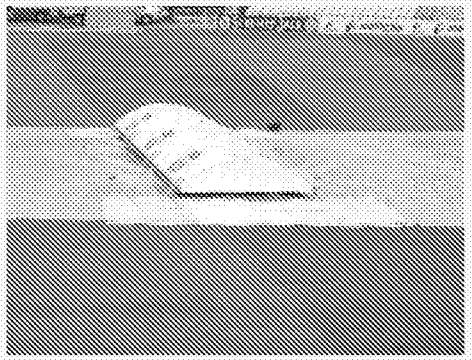
The boundary should be clearly marked by rope or a white line with markers approximately 20 yards apart. Alternatively where a gutter is used the edge shall be clearly cut; if a picket fence or advertising boards form part of the boundary they shall be secure and in good conditions. No boundary shall be less that 50 yards or more than 90 yards from the nearer middle stump on the match pitch unless explicit dispensation is given by the League Management Committee.

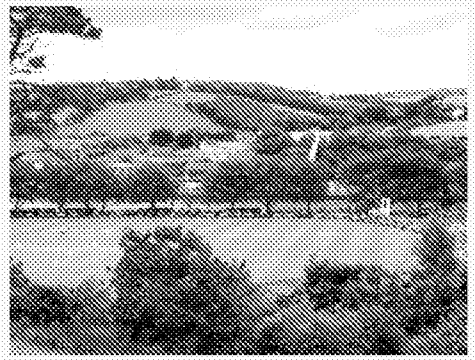
4. Sight scenes

The structure and non-reflective paintwork of the sight screens should be in good condition. They should be of an adequate and appropriate size for the ground and should be completely outside the playing area whenever possible. Screens should be properly positioned before the commencement of play. Screens are to be provided at both ends unless explicit dispensation is given by the League Management Committee. A rope or boards should be provided to define the boundary if the sight screen (s) stand within the playing area, and the roped/boarded area must be of sufficient size to allow screens to be moved from side to side without adjusting the ropes/boards.

5. Covers

Covers must be available to protect the pitch and the bowler's run-ups from rain both during the match and in the preceding days as appropriate. Arrangements should be made for the groundstaff, players or other helpers to put the covers in place as quickly as possible. Wheeled covers are recommended, although plastic sheets/tarpaulins can be used provided that they are well maintained and are laid over a hessian underlay or coconut matting which covers the pitch area. The covers must protect an area of at least 80 feet by 12 feet and clubs are encourage to protect a larger area, including the bowler's run-ups, whenever possible.





Clubs will be required to show that their covering arrangements are adequate to protect the pitch, taking into account the contours and draining characteristics of the ground.

6. Drying Equipment

An adequate supply of sawdust and cloths should be available to minimise lost playing time due to wet ground conditions. Additional covering for areas likely to cause a delay in play (eg the ends of previously used pitches) should be provided whenever possible. Coconut matting can be used to protect pitches under preparation. Other drying facilities, including brushes, forks, squeegee, absorbent rollers etc. can also be useful.

7. Rollers

Light (5-10cwt, 254-508 kg) and heavy (minimum 30cwt, 1524 kg) rollers should be available for use on the pitch. At least one roller must be available for use during the match.

8. Ground Surrounds

The surrounds should be maintained by regular cutting. Fences and walls should be well maintained. The entrance(s) to the ground should be clearly signed, showing the name of the club. Seating for spectators should be in good condition. Suitable measures should be taken to ensure that lost balls do not delay play.

9. Practice Facilities

Club should ensure that they have access to good quality practice facilities for mid-week practise for senior players and either mid-week or weekend practise for juniors. Net practise facilities should be available for use by both sides (ideally a minimum of two nets) before matches whenever possible. Any grass nets must be in good condition with true and predictable bounce. Artificial net pitches should be regularly maintained and rolled where appropriate to ensure true and predictable bounce.

10. Umpires

The Umpires will assume responsibility for the pitch and ground 30 minutes before the scheduled start of play on each day. Their responsibility will end at the close of play on each day or when play has been abandoned for the day. The home ground authority is responsible at all other times.

1. CLUB CRICKET

The equipment listed below is the minimum recommended items required to maintain a cricket pitch to a safe and consistent condition. Some items may be hired/borrowed at the optimum operation time as opposed to owned.

1. Mowers

a. Pitch Mower
Cylinder mower (with no less than 8 blades, capable of a minimum of 130 cuts per metre, no wider than 600mm, variable speed and collection box), suitable for pitch / square preparation, with adjustment tools. (minimum of 1 machine per square)

b. Outfield Mower
- Either, trailed or mounted gangs, width 1.8-2.1m or,
- ride-on, width 1.2-1.8m

2. Rollers

a. Hand Roller
- Weight 750-250 kg (light)
- Width 0.6-1.0m

b. Motor Roller
- Self propelled
- Medium up to 500kg, heavy 1,016kg or more
- Width 1.2m

3. Scarifiers

a. Hand Width 68cm
b. Self propelled
- Width 35-50cm (operating)
- Engine 5hp (3.7 kW)
- Tines; thatch control, thatch prevention, brush attachment

4. Aerators

a. Sarrel Roller
- Width 900mm-1.2m
- Solid tines 37-50mm deep, set spirally along the drum

b. Pedestrian/self propelled-hydraulic ram
- Width 1.0-1.2m
- Tine depth 75-100mm
- Tine spacing 50-100mm
- 75-100 holes per sq metre

c. Tractor mounted
- Width 1.2-2.5m
- Tine depth 230mm
- Tine Spacing 100mm

5. Fertiliser distributors

a. Belt 61-92cm
b. Cyclone/disc 1.2-2.4 distribution pattern

6. Pesticide Applicator

- Knapsack/walk over sprayer (groundsperson must be qualified)

7. Setting out Equipment

a. Tape measures 2x30m, 1x50m, 1x100m
b. Lines (Non stretch) 2x50m
c. Pegs 12x150mm (minimum)

8. Marking Out Equipment

a. straight edge 1x3.6m
b. marking frame/template
c. paint brushes/line marking material
d. Boundary marking equipment/material

9. Irrigation Equipment

- system to get water to the square in sufficient quantities

10. Hand Tools

a. Springbok rake
b. Wheel barrow
c. Switch/whale bone brush
d. True lute
e. Drag mat/drag brush
f. Besom broom/stiff brush
g. Stump hole marker
h. Hammer
i. Wooden mallet
j. Setting bar
k. Shovel
l. Fork
m. Tool kit
n. Bucket
o. Thumper/heavy panner
p. Straight edge

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II. CENTRES OF EXCELLENCE

The equipment listed below is the minimum recommended items required to maintain a cricket pitch to a safe and consistent condition.

1. Tractor

Tractor unit, 25hp (or equivalent), low pressure tyres.

2. Mowers

a. Pitch Mower
Cylinder mower (with no less than 3 blades, capable of a minimum of 130 cuts per metre, no wider than 600mm, variable speed and collection box), suitable for pitch/square preparation, with adjustment tools (minimum of 1 per square).

b. Outfield Mower
- 36 in cylinder mower, suitable for outfield preparation (ideally 2 required)
- Either triplex ride-on, width 1.2-1.8m or,
- Trailed / Mounted gangs, width 1.8-2.1m

3. Rollers

a. Hand roller (x 2)
- Weight 75-250 kg (light)
- Width 0.6-1.0m

b. Motor roller (x2)
- Self propelled
- Weight up to 500kg (medium), Weight 1,524kg or more (heavy)
- Width 1.2m

4. Scarifiers

a. Hand Width 66cm
b. Self propelled
- Width 36-50cm (operating)
- Engine 5hp (3.7kW)
- Reels; thatch control/thatch prevention/ brush

c. Outfield Tractor drawn (Single or multiple unit)

5. Aerators

a. Sarel Roller
- Width 900mm-1.2m
- Solid Tines 37-50mm deep, set spirally along the drum

c. Pedestrian / self propelled
- Hydraulic ram
- Width 1.0-1.2m
- Tine depth 75-100mm
- Tine spacing 50-100mm
- 75 to 100 holes per sq metre.

d. Tractor mounted
- Width 1.2-2.5m
- Tine depth 230mm
- Tine Spacing 100mm

6. Fertiliser distributors

a. Belt 61-92cm
b. Cyclone/disc 1.2-2.4 distribution pattern
c. Tractor mounted Distributor (also used as top dresser)

7. Pesticide distributors

- Knapsack/walk-over sprayer (groundsman must be qualified)
- Tractor mounted (used within regulations)

8. Setting Out Equipment

a. Tape measures 2x30m, 1x50m, 1x100m
b. Lines (non-stretch) 2x50m
c. Pegs 12x150mm (minimum)

9. Marking Out Equipment

a. Straight edge 1x3.6m
b. Marking frame/template
c. Paint brushes/line marking material
d. Boundary marking equipment/material (wheeled marker, whitening, paint, rope etc.)

10. Irrigation Equipment

- System to irrigate the square in sufficient quantities
- Underground system (Pop-up), Self-travelling system to cover square, outfield & practise areas, with sufficient pressure. Standpipe of a minimum of 25mm bore.

11. Tractor attachments

- Drag brush/Mat/Harrow
- Overseeder
- Trailer
- Leaf sweeper
- Top dresser distributor
- Pesticide Applicator (qualified operators only

12. Hand Tools

a. Springbok rakes
b. Wheel barrow
c. Switch/whale bone brushes
d. True lutes
e. Drag mat / drag brushes
f. Besom broom / brushes
g. Stump hole markers
h. Hammers
i. Wooden mallets
j. Setting bars
k. Shovels & Forks
l. Watering cans
m. Tool Kit
n. Buckets
o. Thumper / heavy panner
p. Straight Edge

13. Covers / Pitch Protection

- Mobile wheel-on or flat sheet covers
- Sponge water absorbent rollers (ride on/pedestrian) drying equipment
- Coconut matting

14. Miscellaneous

- Airline/Power washer



Consideration for the surrounding environment and welfare/safety of players, spectators and the general public is an important issue that is often neglected or ignored. Health and safety is a misunderstood and feared issue that is designed to protect individuals, damage to property and appoint responsibility.

Health and safety law is made under Acts of Parliament, the enforcement of being the responsibility of the Health and Safety Executive (HSE).Therefore any proven contravention can be enforceable by fine or imprisonment so apart from the legal requirements to follow regulations, there is a duty of care for all Sports Turf managers and users of grounds to protect the environment and surrounds. Pesticides and fertilisers are the most obvious threats but polluting machinery and destruction of habitats & waterways also need to be considered and possible cultural method investigated in their place.

All employers have a general duty of care to ensure the welfare of all their employees that may be affected by the activities of their business just as all employees, whilst at work must take care of themselves and others who may be affected by their actions.

Risk Assessments

To identify significant work place hazards so that all employees are aware of risks the employers have a duty to ensure that the two formats of assessment of risk (Generic & Local) are carried out by an appointed competent person, evaluated and logged to the various categories and levels.

Policy documents

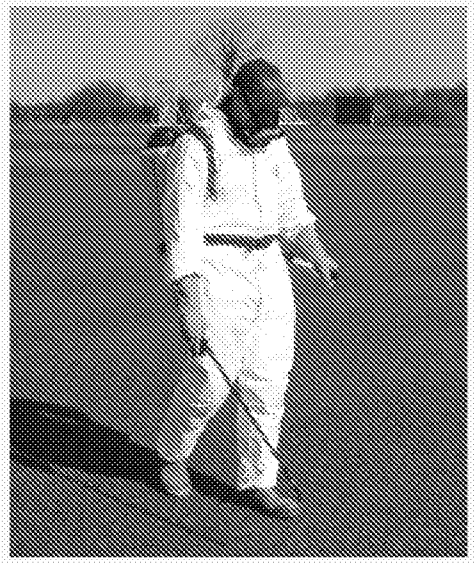
An organisation must have a written copy of a Health and Safety policy document readily available and to the attention of all employees unless five or less are employed.

Regulations

These are some of the main regulations under the The Health and Safety at Work Act 1974 that involve general Groundmanship duties

- The Provision and Use of Work Equipment Regs. 1998
- The Control of Substances Hazardous to Health Reg. 2002 (COSHH)
- The Management of Health and Safety at Work Regs. 1999
- The Provision and Use of Work Equipment Regs 1998
- The Personal Protective Equipment Regs. 1992
- The Manual Handling Regs. 1998
- The Noise at Work Regs. 1989
- The Supply of Machinery (Safety) Regs. 1992 (Includes CE Marking)

For more comprehensive information contact The Institute of Groundsmanship who publish a document "Health and Safety Guidance for Sports Ground Managers, or the Environment and relevant Government Agencies.



The England and Wales Cricket Board in association with The Institute of Groundsmanship have developed a structured short course scheme to develop the skills and expertise of cricket groundsmen. The scheme consists of three levels of progressive training offered in four courses. The initial stage is the Spring and Autumn Practical courses, Level 1 Parts A & B, then followed by 'Understanding The Science', Level 2 and culminating in the 'Management Practises', Level 3 course.

A Five Day course is run annually that encompasses all three levels and specific Performance Quality Standards instructional day courses are also available.

The outline programme for each course is:

Level 1, Part A
'Spring Preparation'
Early Spring Maintenance
Preparation of the Square
Machinery, Mowing
Rolling, Watering
Scarifying & brushing
Fertiliser Application
Preparation of the Match Pitch
After Match Repairs & Renovation
Maintenance of the Non-Turf Pitches

Level 1, Part B
'Autumn Renovation
Sequence of Operation
End of Season Repairs & renovation
Scarification, Aeration
Overseeding
Top Dressing
Fertiliser Application
Care of the Outfield
Maintenance of the Non-turf Pitches
Winter Work

These are one day courses at various sites around the counties.

Level 2
'Understanding the Science'
Pitch Specification
Soils Grasses
Fertilisers used in Turfculture
Pest, Diseases & Weeds of Turf
Synthetic Pitches
Machinery & Equipment

Level 3
'Management Practises'
Pitch construction
Preparing the Ideal Pitch
Pitch Allocation – The Outfield
Net and Practise Areas
Budgeting – Resources
Health & Safety management

These are two day courses at specific sites in the British Isles

Five Day Course
All Levels

PQS (Performance Quality Standards)

All courses are certified and accompanied by comprehensive handouts.

For further information and application forms contact your County Cricket Development Office, County Cricket Board or The Institute of Groundsmanship on 01908 312511
Email training@iog.org
Website www.iog.org

For County Board contact details please visit www.ecb.co.uk

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20
PEUGE
WOLF GLASS WINES
WOLF GLASS WINES



England and Wales Cricket Board
Lord's Cricket Ground London NW8 8QZ
[redacted]

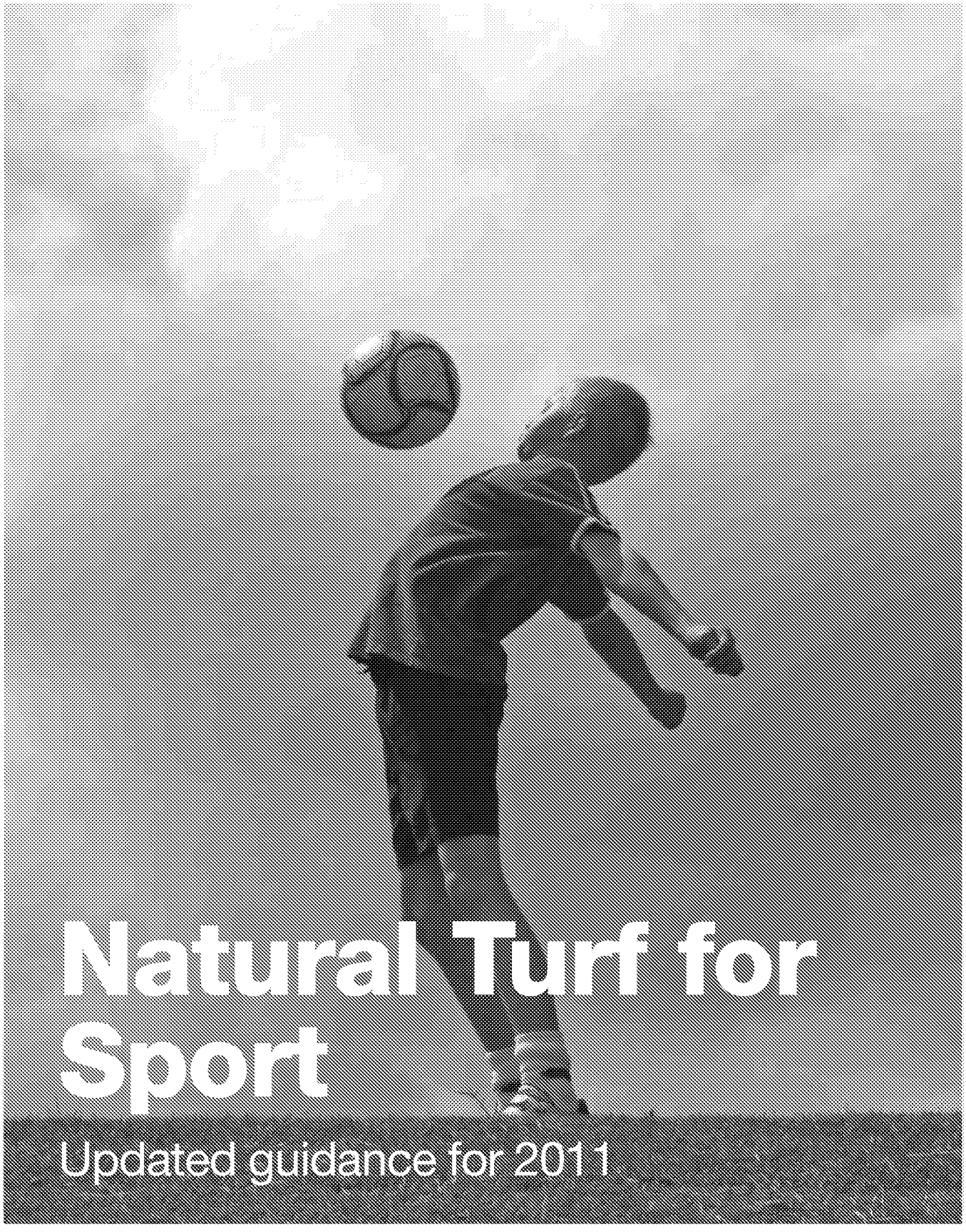
From playground to Test arena

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SPORT ENGLAND

Design
Guidance Note

Creating sporting opportunities in every community



Natural Turf for Sport

Updated guidance for 2011

May Revision 002

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Natural Turf for Sport

Design Guidance Note

Foreword

Sport England believes that good facilities are fundamental to developing sporting opportunities for everyone, from the youngest beginner to the international class athlete. The provision of good quality facilities, whether large or small, can be a springboard for developing civic pride and assisting the process of regenerating deprived neighbourhoods. Facilities that are well designed, built to last and well maintained are a pleasure to use and give ample return on the time and money invested in their construction and day to day management.

Good design needs to be based on a sound understanding of the current trends and practices within individual sports, developments in the sport and leisure industry and the lessons learnt from previously built schemes.

It is essential that this is embraced from the beginning of a particular project and instilled in the initial briefing stage through to the final detailed specifications and operational arrangements.



Sport England Design Guidance Notes aim to promote a greater general understanding of overall design concepts as well as an appreciation of technical issues and the critical design factors for individual sports. These need to be considered in reaching the appropriate solution for a particular project. They also advise where further information, advice and expertise may be found and point to benchmark examples.

Sport England's Design and Development Guidance Notes aim to:

- *Increase awareness of good design in sports facilities*
- *Help key building professions, clients, user representatives and other stakeholders to follow best practice*
- *Encourage the development of well designed sports facilities that meet the needs of sports and are a pleasure to use.*

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Natural Turf for Sport

Design Guidance Note

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1.0 Introduction

This guidance note highlights the key issues that need to be considered in the construction of safe and sustainable natural turf pitches. It should be used as a point of reference in the process to ensure that suitable playing surfaces are created and maintained.

It focuses principally on pitches for the following sports[1]:

- Baseball / Softball
- Cricket
- Football
- Rugby Union and League.

Appropriate planning, design, management and maintenance are critical factors and except for the smallest of projects, advice must be sought from qualified, experienced and independent professionals.

Seek expert advice from experienced, qualified and independent professionals from the start of a project.

Timely consideration of the pertinent issues will result in a good quality playing surface. This should ensure it is appropraite for the planned level, type and quantity of use and be physically as well as financially sustainable in the long term.

[1] For **golf** see: STRI – Guidelines for Golf Green Construction - Dr Stephen Baker http://www.stri.co.uk

The European Institute of Golf Course Architects - http://www.eigca.org/

The United States Golf Association http://www.usga.org/

For **hockey** see: Sport England Design Guidance Note *'Artificial Surfaces for Outdoor Sport'*

For **tennis** see: LTA *'Grass Court Guidance'* http://www.lta.org.uk/

STRI - *'Grass Tennis Courts How to Construct and Maintain them.'* J Perris http://www.stri.co.uk/

Avoiding common problems

It is essential to consider in detail all the implications of the proposal before deciding how to proceed. Failure to consider all aspects of the project early in the development process may result in lost opportunities and sub-optimal facilities. It may not be possible to correct resultant problems without making radical alterations to the construction.

Lack of appropriate planning in the early stages of the design of natural turf playing surfaces could be costly and severely affect the long-term viability of the project. A poorly considered proposal resulting in a mediocre facility will discourage users and/or increase maintenance costs to unsustainable levels.

Common problems can be summarised as:

- Inadequate site assessment
- Inappropriate specification
- Ineffective monitoring during the construction phase
- Poor site management
- Inexperienced contractors
- Unsuitable materials
- Inappropriate timing of construction work
- Inadequate maintenance
- Overuse.

The construction and maintenance of safe and sustainable natural turf surfaces is a fundamental prerequisite for the safety and enjoyment of participants of sport from the community level through to the professional game.

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Development of standards

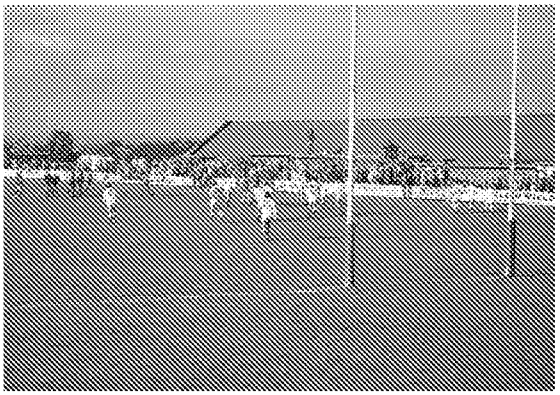
There have been a number of initiatives within the industry to define minimum standards and improve the quality of pitches. In particular the development of:

- Codes of Practice for Design, Construction and Maintenance (SAPCA)
- Performance Quality Standards (PQS)
- Model Contract Specifications [2].

Performance Quality Standards (PQS) were originally developed by a voluntary technical consortium comprising representatives from the Sports Turf Research Institute (STRI), National Playing Fields Association (NPFA) and the Institute of Groundsmanship (IOG). They provided a mechanism for objectively benchmarking the quality and performance of natural turf sports surfaces.

Sport England successfully used the concept for the 'Playing Field and Green Spaces Programme' in 2003 and have since promoted the use of PQS's as key criteria for the design, procurement and construction of natural turf sports pitches. They provide a way to ensure that natural turf playing surfaces are constructed and maintained at an acceptable standard against a defined benchmark for a particular level of play.

A summary of PQS information is presented in Appendix 4 and represents selected key minimum criteria for football rugby and cricket [3].



A well-designed surface, properly constructed and maintained, is enjoyable to play on

[2] Downloadable from the Sport England website.

[3] See IOG publications or specific guidelines for cricket set out in '*Recommended Guidelines for the construction, preparation and maintenance of cricket pitches and outfields at all levels of the game*'. www.ecb.co.uk

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An overview of sports turf technology

It is helpful to understand some of the science behind the design and engineering of natural turf and to appreciate that there are certain limitations. This requires specialist knowledge of soils, drainage and agronomy.

A natural turf surface is dependent upon the health of the grass and the type and strength of the soil. Inappropriate conditions and excessive usage can cause a cycle of wear and damage that needs to be limited through good sustainable design and maintenance.

Grass, like most plants needs light and heat from the sun, carbon dioxide and oxygen from the atmosphere and structure, water, oxygen and nutrients from the soil. When any of these components is compromised, the grass plant will suffer and will not recover from the stress of play.

Good natural turf sports surface design aims to ensure that the plant has sufficient, but not excess, of all these components.

A natural turf surface is dependent upon the health of the grass and the type and strength of the soil.

Soil types:

The proportions of sand, silt and clay particles within soils influence the characteristics that make them more or less suitable for individual sports. For example, sports like cricket and tennis, where ball bounce is critical, are best played on dry, compacted clay soils. A cricket pitch is hard when it is dry but will soon lose strength when it becomes wet – this is why rain can stop play.

In contrast, elite-level football and rugby are mainly played on very sandy soils. The reason for this is because sandy soils drain quickly and the strength does not change as much when the soil is wetted as in a clay soil. In football and rugby, play goes on when it rains so the surfaces must be able to maintain strength. Without strength in the soil, players will not be able to generate traction and playability is affected.



Poorly constructed and / or maintained playing surfaces are dangerous, affect quality of play and limit use

Drainage:

Good drainage contributes to maintaining surface strength and helps to maintain oxygen within the soil for plant roots. Sandy soils drain best, and this explains why many well known natural turf surfaces such as the Wembley pitch, the outfield at Lord's and the greens at many golf clubs have been constructed from sand.

But these are constructed surfaces, that required the sand to be imported to build the pitch. The reality in England is that most natural turf pitches are not built in this way. They tend to be located on the native soils that may often be poorly draining clay/silt soils.

However, drainage systems needs to be sustainable. Installing a drainage system into a clay soil increases the rate at which water reaches watercourses during a storm and for this reason drainage is becoming increasingly more regulated to help reduce the impact of flooding.

Pitch economics and other factors:

It might seem that the obvious solution is to build sand construction pitches but this is expensive because significant quantities of imported sand are required. So whilst this might be a solution for relatively smaller bowling greens, it is extremely expensive for large football and rugby pitches.

Other factors also come into play. Sands are naturally very free draining (helping remove excess surface water) but this can cause drought stress to the plant, meaning that an irrigation system is required. Again this might be possible for bowling greens but on football and rugby pitches, a large-scale irrigation system will be required adding extra cost to the initial construction. In addition,

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water for irrigation adds extra cost to the ongoing maintenance budget and is likely to be more expensive to source as demand for water increases and supplies are stretched.

Sand soils also lack the nutrient retention properties of clay soils. This means that nutrients are washed from the soil, away from the plant and have to be replenished more frequently, increasing the fertilizer bill.

There are alternative and more sustainable strategies not requiring large amounts of imported sand, that still focus on improving drainage. By diverting the water from the poorly draining soils at the surface, to collector drains located below the surface via 'grooves' or 'slits' cut into the surface and then filled with permeable sand. The sand provides a 'super-highway' for water to move away from the surface where ball, player contact and wear takes place. These solutions still require maintenance but generally do not require irrigation or as much fertilizer as a full sand construction.

Sports pitches and the wider public realm.

See the following documents:

- *For guidance on producing playing pitch strategies:*

  'Towards a Level Playing Field: A Guide to the Production of Playing Pitch Strategies'.

  Sport England / CCPR document - see Sport England website.

- *'Green Space Strategies - a good practice guide' by CABE SPACE on how sport pitch provision can relate to strategies in the wider public realm. The guidance draws on the principles of the Government's Planning Policy Guidance Note 17 and will help contribute to national objectives for better public spaces.*

www.cabe.org.uk/publications/green-space-strategies

- *Specific sports have their own turf performance criteria that are tailored to the level of the game played. These provide a benchmark for the effective assessment, design, construction and maintenance of natural turf pitches.*

  See Appendix 4.

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2.0 General Project Planning

Key project stages

As with any construction project, it is important to proceed in a logical and efficient sequence. The key stages, project information and decisions are summarised below. However, more detailed guidance is provided in Appendix 3.

- **Preparation**
  - Appraisal of requirements
  - Business justification
- **Design**
  - Outline proposals
  - Scheme and planning
  - Detailed design
- **Preconstruction**
  - Detailed design information
  - Tender documentation
  - Tender process
- **Construction**
  - Project planning
  - Construction
  - Practical completion
- **Use**
  - Completion
  - On going maintenance.

The following paragraphs in this section describe some of the key issues that need to be considered when developing new or improved pitches. A competent and experienced pitch consultant will work with you to develop the right solution for your defined needs.

Appointing a competent pitch consultant

The selection of the right consultant for sports turf and sports drainage work is as critical as getting the right architect to design the clubhouse or sports hall. Choosing the right consultant will save time and money and will bring real added value to the design, construction and maintenance of the pitch over many years. See Appendix 1 for further guidance on selecting the right consultant for the project and Appendix 2 for the schedule of services that a competent pitch consultant should be able to provide.

User profile

Information regarding types of use and users should be compiled from the outset of any project:

- Identify the sports to be played month by month so that the number and size of pitches required can be determined.
- Expected level of user performance, for example, local league, regional or national
- Each sport has its own set of PQS which constitutes the minimum acceptable performance criteria (e.g. drainage capacity, hardness etc.) for different levels of the game (e.g. local, regional or national). These are essential for the effective design, construction, maintenance and long-term sustainability of the surface.
- Likelihood that the facility will be used for training to determine the total anticipated number of hours of play per pitch per week.
- Number of times per week for each activity, duration and whether for junior or senior use
- Will artificial sports lighting be required?
- Is there a requirement for phased development which will affect the number of pitches available during the proposed construction period? Will there be a need to identify alternative facilities?
- Will there be any non-sport use during the year, for example, as temporary car parking or a venue for a local gala?
- What long-term resources will be available to maintain the playing surface?
- How much money is available to carry out the necessary work?

Additionally it is important to take into account of the likely long-term developments in sport that might affect facility use, for example, the introduction of mini-games or the move from the winter to the summer season. Consider also the need to introduce facilities for additional sports, for example, a cricket square located between winter games pitches.

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Location of playing surfaces

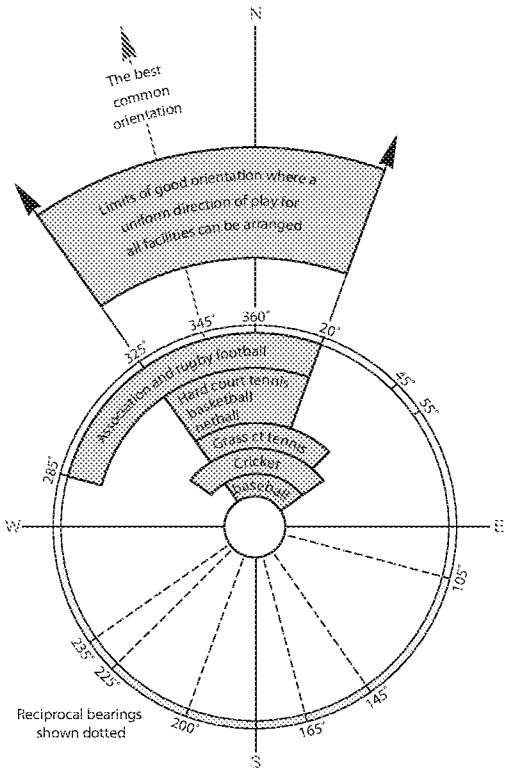
The shape and contours of the site will influence the location of the playing areas. This is particularly true for natural turf playing surfaces where the need for well-drained areas is paramount.

Careful consideration must be given to the specific requirements of the playing surfaces and the supporting ancillary facilities. It should not be assumed that because an existing facility, a pavilion or pitch, for example, is located in a certain position that it should stay there. Careful design will be rewarded by efficient layouts that are often easier and more economic to construct and maintain.

When analysing the suitability of a site ensure that:

- There is sufficient space for the proposed facility and space for future expansion.

The size and layout of pitches should take into account the level of play, necessary safety margins and optimal orientation.



Recommended pitch orientation
(Goal to goal, wicket to wicket, or baseline to baseline based on the National Playing Fields Association's pitch and orientation diagram, but amended to take account of ECB guidance).

- There will be adequate space for car parking based on local authority requirements and for any potential overflow.
- Access is available for service and emergency vehicles.

Requirements for proposed activities

Check all dimensions with relevant Sport NGB for relevant standards / levels of play.

Each sport will have specific dimensions defined by the relevant national governing body (NGB) or league. These requirements will not only define the size of the playing surface but will include 'safety margins' around it. Additionally, they may define relationships to other facilities such as a changing room or pavilion [4]. Other considerations include:

- Facilities and viewing positions should be orientated to avoid low sun angles.
- Ensure that there are no conflicting relationships between uses. For example, adjacent to a cricket pitch, do not locate an activity immediately behind the bowler's arm.
- Consider issues relating to access and security; visibility, lighting, roads and footpaths.
- Ensure adequate car parking provision can be made available.
- New developments will require planning permission involving the submission of detailed drawings. Car parking, access and potential effects on neighbours will be considered as part of the application.
- Protection of users from inclement weather should be provided.
- Requirements for temporary roads providing access for machinery during construction and for maintenance equipment that may be required later [5].

[4] See separate Sport England Design Guidance Note *'Pavilions and Clubhouses'*.

[5] See separate Sport England Design Guidance Note *'Car Parking and Landscaping Design'*.

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Feasibility study

A technical appraisal of the site must be carried out by a competent, independent professional.

The appraisal must take account of the expected usage and associated implications for the design and construction of the playing areas, and identify any potential restrictions or difficulties in developing the site, including the need for any further investigations. The study report should include outline proposals for the facilities with outline costs, an indicative programme for the proposed works and an estimate of when the facility will be available for play.

This should also indicate likely maintenance operations and associated costs and the capital cost of purchasing the equipment necessary to cover this essential work.

Site surveys

For most projects a detailed survey, with levels, will be required to establish the key features of the site. The areas for consideration are detailed below:

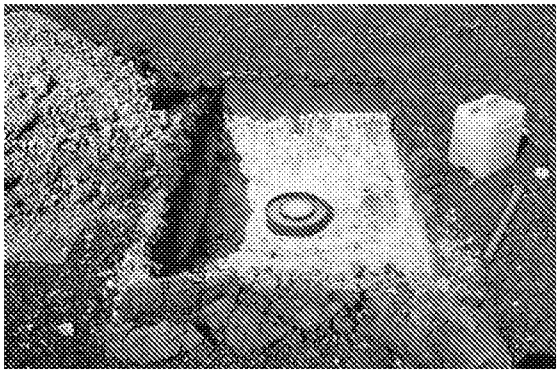
- The local climate and excess winter rainfall must be considered to evaluate the impact on the need for drainage and irrigation. For projects involving drainage, commissioning a consultant with experience of natural turf drainage (as opposed to civil or agricultural drainage) is essential.
- The topography of the site will determine the need for any level adjustment in order to comply with appropriate PQS. Sites with significant slopes will need to be regraded by cutting and filling the subsoil after stripping off the topsoil to produce playing surfaces with acceptable gradients.
- Where drainage improvements are required, a positive outfall should be identified into which water from the site can be discharged. Soakaways can be used in some situations, however these must be designed in accordance with recognised procedures.
- The need for irrigation requires assessment along with that of potential water resources and storage.
- The condition of physical structures, such as retaining walls and fences.
- The location and type of services that may affect the construction.
- Planting, including the location and condition of trees and whether they are covered by tree preservation orders (TPO).
- Site boundaries / perimeters: condition and ownership.

Undertake a detailed site survey. Key considerations include local topography, ground conditions and provision of effective drainage outlets.

Ground conditions

The particular ground conditions of the site should be fully understood and issues to consider include:

- The general underlying geology of the site including the type of soil and underlying rock formations. This information can often be obtained from geological maps, but needs to be corroborated during a detailed site investigation.



An investigation of the infiltration on the site is necessary to inform the design of the natural turf facilities

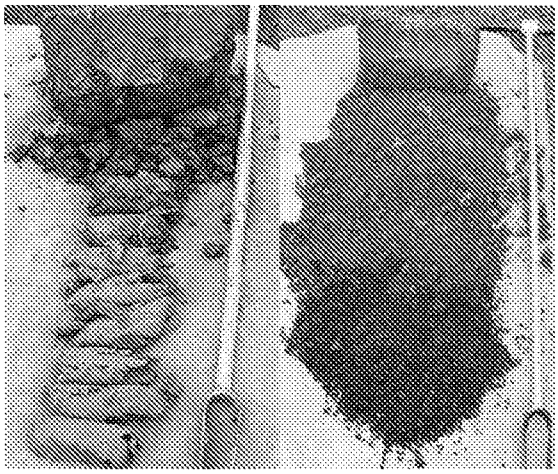
- The type and depth of the topsoil should be assessed by professionally qualified consultants with a detailed knowledge of sports turf.
- The potential for soil shrinkage to occur may influence the development options available.
- The site's natural drainage capacity including the permeability of the soil and subsoil should be assessed. Reliable information must be obtained from on-site sampling and associated laboratory analysis.
- The history of the site should be investigated to establish whether the site has been contaminated by tipping or other industrial uses.
- All reclaimed sites should be treated with caution. Former household refuse tips are vulnerable to localised settlement and the

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production of hazardous gases. Glass and other debris in surface soils are hazardous to players, while the presence of asbestos, heavy metals or toxic chemicals can give rise to further complications.

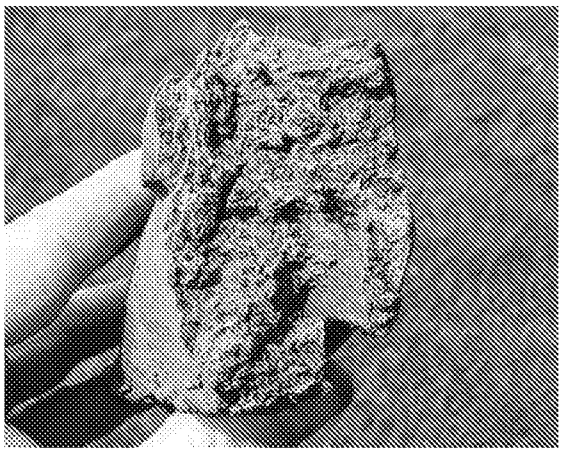
- Investigations for the site can be carried out with an environmental search company to provide data on the site history and the possibility of soil contamination. This should be followed up by a detailed site evaluation if required.
- It may be necessary to engage a specialist company to undertake an assessment of contaminated materials on site.
- Rainfall levels will affect the performance of all surfaces. Areas of high prevalent rainfall will need higher standards of construction and drainage.
- Drainage design should also take account of recent climate trends and future projections.
- The scheme design must include the design, calculations and specification of a sustainable outfall or soakaway system (see section on Planning and Consents).

The pitch drainage system must be designed by a consultant with a detailed knowledge of sports turf drainage.



The condition of underlying soil needs to be assessed by a competent consultant

On some sites, industrial waste and possible contamination will require specialist advice on how this could impact on the development in terms of user safety, environmental protection and safe disposal



Red mottles in clay can indicate seasonal water logging and the need for land drainage

- The designer must prepare a fully specified maintenance schedule to ensure the surface is maintained to promote good grass establishment.
- The report must include recommendations for appropriate maintenance equipment and any special training that may be required to adequately maintain the pitch.

When planning a natural turf surface, it is essential to take account of the specific sports turf performance applicable (see Appendix 4) along with future maintenance requirements (see Appendix 5).

Key performance criteria for natural turf sports surfaces include:

- *Grass height (mm)*
- *Broad leaved weeds*
- *Thatch (accumulation of organic matter)*
- *Hardness*
- *Water infiltration rate*
- *Evenness*
- *Slope*
- *Ground cover.*

See Appendix 4

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Planning and other consents

The consents required and the information needed to support any applications should be considered at the early stages of a project to avoid delays or abortive work. The planning authority should be consulted to understand the detailed requirements:

- For new pitch developments, or for demonstrating compliance with planning conditions, details and supporting information will have to be submitted for Planning Approval. Different levels of information are required for an 'Outline' or a 'Full' planning application and in some situations consultation with Sport England [6]. Site investigation and the feasibility study work will be needed to demonstrate that the new or improved pitch will be able to cope effectively with the proposed programme of use.
- The planning officer and Sport England will use this guidance note and the PQS for the relevant sports to demonstrate that the new construction / the proposed pitch improvement works will provide a pitch that is suitable and will maintain its performance in the long term.
- New developments will be screened by the Local Planning Authority to determine if a full Environmental Impact Assessment (EIA) is needed.
- Information of primary environmental importance is identified through a scoping opinion obtained from the Local Planning Authority based on a preliminary review of the development proposals.
- A full EIA usually includes the following topics:
  - Ecology
  - Landscape
  - Water quality / hydrology
  - Traffic and transport
  - Archaeology / cultural heritage
  - Land use and clarification
  - Social and economic factors.
- Legislation is in place to protect particular habitats, birds and animals and this legislation must be considered when developing designs for the site.
- An Environmental Management Plan may be required, identifying potential environmental impacts and how these will be mitigated or managed.
- Consent for drainage outlets may be required. This will be obtained from the relevant local authority and / or the Environment Agency.
- The need to control flooding in watercourses and urban drainage systems is now paramount and in most cases there will be a requirement to follow the principles of Sustainable Urban Drainage Systems (SUDS). This will control the flow of drainage water from the site and appropriate designs, calculations and specifications will need to be prepared and approved. This can be very expensive in terms of capital and maintenance costs and therefore it is essential that they are designed byproperly qualified and experienced consultants.
- In England, for projects costing more than £300,000, a Site Waste Management Plan (SWMP) will be required setting out how materials will be managed to reduce waste during the project.

See Sport England web site for further information on planning applications.

http://www.sportengland.org/facilities_planning

Further information on making planning applications can be found on www.planningportal.gov.uk.

[6] Planning applications that affects a playing field should be referred by the local authority to Sport England for comment. It is strongly recommended that Sport England is consulted prior to submitting an application.

See separate Sport England publication '*Making a planning application - A guide for sports clubs*'.

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3.0 General Pitch Construction

Contracts and contractors

This section discussed the general construction issues that arise in the creation of a natural turf pitch.

The procedures and arrangements for engaging contractors and supervising the contract are important as they can ultimately influence the success of the sports facility.

Having established the requirements for the site, the information should be set out in the form of a tender document. This should include a specification [7] with drawings and sufficient information to enable the contractor to price the work as specified. Alternatively, the performance requirements for the work can be set out so that the contractor can develop a scheme on a 'design and build' basis.

The document should clearly define the conditions of contract to avoid any confusion regarding the work to be carried out, the programme and the arrangements for payment. Standard contract conditions are available to which specific requirements for the project may be added.

The tenders received should be properly assessed before awarding the contract. This may involve interviewing contractors for larger projects to ensure that all aspects of the project have been covered and costs included.

Proposed materials should be tested by a competent consultant and approved laboratory before work commences to ensure that they comply with the specification. Further testing of materials should be carried out during the works. An effective programme of monitoring the workmanship will ensure that good standards are achieved. It is very difficult and costly to rectify problems afterwards.

The work should be tendered to experienced contractors with a proven track record in sports turf development.

Clearly specified works and a well defined contract implemented by a competent contractor, combined with effective supervision and turf maintenance will eliminate many problems experienced with new turf sports facilities.

[7] See *'Model Contract Specifications'* that are downloadable from the Sport England website.

Site clearance

The general construction processes are set out in the following paragraphs:

- Site clearance
- Adjustments of levels
- Drainage - general principles
- Cultivation and seeding
- Early maintenance
- Maintenance equipment.

Before any clearance work can be carried out it is essential that all necessary consents are in place and that all measures to protect habitats, birds and animals have been carried out.

The site must be cleared of rubbish, rough grass and all unwanted hedges, trees and scrub before works start. Tree felling must only be done where absolutely necessary and after all consents have been obtained. If any waste is to be removed to a tipping facility it will require characterisation to establish the Waste Acceptance Criteria (WAC). This will govern the location of a licensed tipping facility suitable for the materials and the cost of disposal.

Adjustments to the surface levels

In general it is preferable to minimise the extent of earthworks and to carry these out under dry conditions, to reduce the potential for soil compaction.

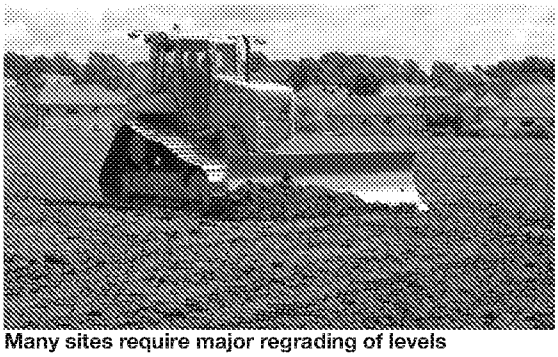
A constant slope is desirable on all pitches to assist in shedding surface water in periods of heavy rainfall. The slope will also help drainage in areas such as goal mouths where heavy wear and tear would be expected. The actual gradient of the slope may depend on a number of factors including the overall drainage strategy for the site, specific features around the pitch and general topography.

Generally, depending on the standard of facility required, the playing surface should be no steeper than 1:80 - 1:100 along the line of play and 1:40 - 1:50 across the line of play.

Recommended maximum gradients are given in Appendix 4 *(Performance Quality Standards)* and with pitch construction options in Section 4.

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Many sites require major regrading of levels

Where the surface is slightly uneven and the overall gradient is acceptable it may be possible to prepare a smooth surface by moving soil from slightly higher ground to lower areas with a blade grader. This can often be supplemented by spreading topsoil recovered from the building or car parking areas.

There must be a minimum of 150 mm 'firmed' depth of topsoil to promote and sustain a healthy grass sward. That is to say an expanse of short grass.

On steeper sloping or very uneven sites where extensive adjustment is necessary major regrading will involve altering the levels in the subsoil.

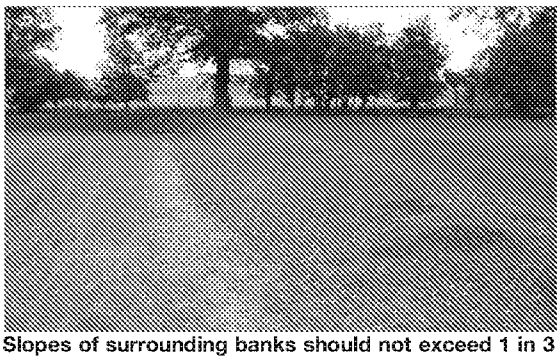
The first stage is to scrape off the existing topsoil cover and retain for eventual respreading. Avoid mixing the topsoil with the underlying subsoil. The levels are then adjusted in the subsoil using the surplus soil cut from the high ground to fill lower areas. In some situations imported fill material may be required to build up low areas.

Filling must be done in consecutive layers not exceeding 250 mm. Each layer must be adequately consolidated to avoid subsequent settlement. The final formation must be trimmed smooth to the required level before replacing the topsoil.

On completion of the grading operations the topsoil is replaced to a uniform depth to produce a finished surface that marries in with the surrounding ground levels.



To create a level surface, it may be necessary to strip the topsoil, regrade the subsoil, and replace the top soil



Slopes of surrounding banks should not exceed 1 in 3 to facilitate mowing

It should be appreciated that soil levelling will always have some impact on the soil structure and so it is essential to minimise this by conducting earthworks only under dry conditions. Stockpiling the soil for long periods should be avoided and the height of the stockpile should be kept to a minimum if possible. As a guide, the maximum height should be no more than two metres. It may be helpful to firm the surface of the soil to facilitate the shedding of surface water.

Where possible, the best topsoil should be recovered for the playing areas and care should be taken to prevent contamination with stones or rubble from any building work.

In some cases a high stone content in the soil, particularly sharp stones, may mean that the soil should be screened to ensure that a safe playing surface can be prepared. This will increase the tendency for soil compaction to occur and remedial action will be needed after respreading the soil.

In general, the height and gradient of banks around the playing areas should be kept to a minimum wherever possible. On steeper sites it may be necessary to take additional precautions to ensure that the banks are stable. This may involve the use of retaining structures and the advice of a qualified civil engineer may be required.

Any surrounding embankments should be no steeper than 1:3, for safe and effective maintenance.

In many locations, it is possible that rock or unstable ground may be encountered where a deep cut is necessary. This should be anticipated in the early design stages and an appropriate design prepared.

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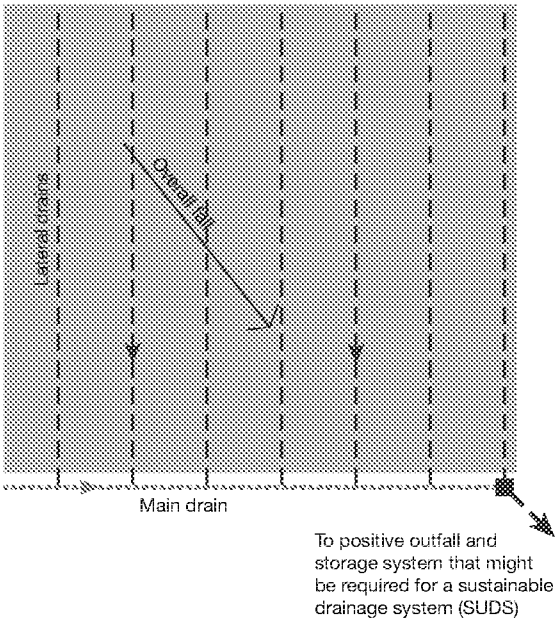
Where high banks are essential, consideration should be given to the safety of users and the maintenance required. Additional fencing may be needed along the top of a high bank.

For larger banks, a catchwater drain may be required to prevent any 'run-off' affecting adjacent playing and spectator areas.

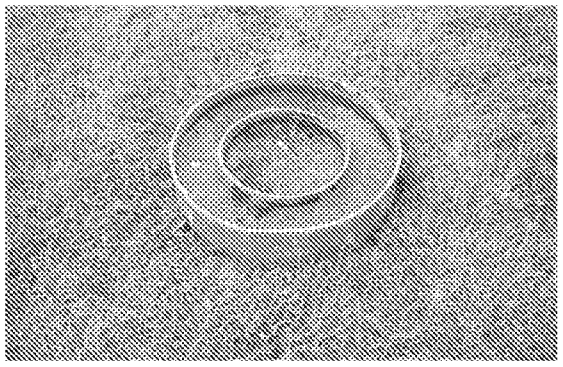
Drainage - general principles

Consider the permeability of the soil and the requirements for the drainage systems and the long term maintenance of good drainage.

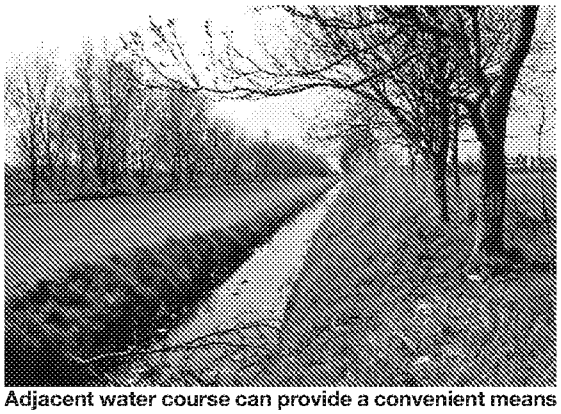
In some instances, particularly where the indigenous soil has a high sand content, the natural drainage capacity of the site soil may form an effective basis for a good playing surface, although this is unusual. In most cases the soil is less permeable and so an effective drainage system must be provided to prevent deterioration of the playing surface and to ensure that the required standards can be met. The natural contours of the ground may be able to assist the drainage system and these should be carefully studied against the recommended slope requirements for the pitch. See Appendix 4 - *Performance Quality Standards*.



A typical pipe-drain layout for football and rugby pitches with main drain outside the playing area. The overall slope of the pitch assists the new drainage system



The rate at which water moves through the surface can have a major impact on the quality of the facility



Adjacent water course can provide a convenient means of achieving efficient drainage provided that a 'land drainage consent' can be obtained

The need for well drained pitches with a smooth even surface is paramount.

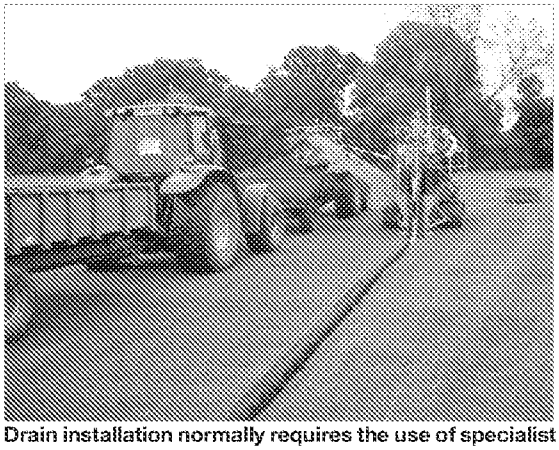
At the feasibility stage it is essential to consider the effect of 'run-off' from adjacent areas or new embankments.

The capacity of surrounding drainage infrastructure must also be considered and, in particular, whether there is a restriction on the drainage discharge from the site. It may be necessary to carry out infiltration tests so that an effective system of soakaways or an attenuation facility to control the flow can be designed and constructed.

The design of the drainage system must take account of the intended frequency and standard of use.

The intensity of drainage infrastructure installed may vary for different pitches on the same site

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Drain installation normally requires the use of specialist trench machinery fitted with laser guidance

according to the nature of use. The main pitch, where the most important matches are played at specified times, will require greater reliability and therefore the installation of a more intensive drainage system.

An effective pipe drainage system is fundamental to all sports turf drainage. On pitches this may be supplemented with a secondary system of slit drains or sand grooves. This will provide a more intensive system to offer more rapid surface drainage.

These systems can be installed with specially designed equipment to reduce the damage to the soil surface or existing turf. Backfilling trenches can also be carried out with purpose designed equipment with low ground pressure tyres or on tracks to reduce the impact of carting heavy aggregates, such as sand and gravel.

Drainage systems should be designed to intercept the movement of water down the main slope of the site. The layout of the systems should be as simple as possible with good access points provided for inspection and maintenance such as removal of silt accumulation in silt traps and clearing blockages in pipes by rodding or jetting.

The permeable trench backfill material should be carefully specified to ensure that it meets the required drainage performance criteria and that all materials are hydraulically compatible (i.e. an abrupt change in the range of particle sizes contained within adjacent layers can impede water movement). Drain trenches and slits should be wide enough to ensure that water can flow satisfactorily through the permeable fill to the drains. It is also essential that water flow into permeable drain trenches is not impeded by inadvertent capping over with less permeable material.

Very often, there is a requirement to attenuate drainage water before it reaches its final outfall (e.g. ditch, river, or connection to the surface water drainage scheme). These systems may comprise the following:

- Attenuation basins, ponds or lakes
- Grassland swales
- Shallow or deep-bored soakaways.

The design of such systems is site specific, and typically, will be subject to statutory approval from the Environment Agency, who will require supporting calculations to demonstrate its compliance to their requirements [8].

For recommended methodologies for calculation of drain flow and greenfield run-off rates see ADAS *Reference Book 345*: ISBN 0 11 241515 6 Institute of Hydrology Report No. 124 – *'Flood estimation for small catchments'*.

Cultivation and seeding

The preparation of the soil or rootzone material (i.e. a mixture of sand and soil) is critical to the standard of the finished playing surface whether it is for a bowling green, football pitch or cricket field.

The surface should be smooth and even at the designed gradient with a fine tilth for good seed germination, emergence and establishment.

Major nutrient deficiencies can be rectified more easily at this stage by incorporating the fertilizer through the topsoil. The type and quantity of fertiliser should be based on soil analysis to ensure that the nutrient levels are satisfactory to promote good growth.

For football and rugby pitches it may be advisable to incorporate sand into the surface of the pitch to improve infiltration and to improve surface playability.

Seeding should be carried out at the optimum rate to promote good sward density. An appropriate mixture of seed should be selected for the type of use with reference to the Seed Booklet produced by the STRI and the British Society of Plant Breeders.

[8] See design and construction of such systems at http://www.ciria.com/suds.

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General maintenance

Performance Quality Standards (PQS) provide a benchmark for assessing the efficacy of maintenance operations in terms of achieving and maintaining the quality and performance of natural turf sports surfaces.

Refer to Appendix 4 for selected key PQS.

If weeds, pests or diseases are evident, herbicides and pesticides should only be applied according to manufacturer's recommendations, and by qualified personnel holding the relevant certificate issued by the National Proficiency Test Council (NPTC). www.nptc.org.uk

As soon as the grass has started to establish, a rigorous programme of aftercare must commence with a sequence of operations to encourage the development of a strong dense sward.

This must continue until the surface is ready for play. The turf will continue to mature and the ongoing maintenance must take this into account.

A fully specified maintenance schedule must be produced by a competent Consultant and acted upon. Consider the frequency of mowing, aeration, irrigation, seeding, use of fertilizer, and weed/pest control.



During periods of dry weather, it may be necessary to irrigate newly seeded areas

The management regime for a new facility is different to that required for old, well established turf:

- Regular mowing is fundamental to the maintenance of surface quality. Frequency of mowing will depend on the time of year and will vary according to the location of the site.
- To aid growth and recovery, as well as to maintain good presentation, fertilizer must be applied at the optimum rate and at appropriate times. The exact requirements must be determined by soil analysis.
- Aeration, the process of increasing the availability of air to soil and roots, is essential to relieve compaction and maintain surface drainage. Additionally, it promotes strong root growth and sward resilience.
- Irrigation may be required to aid grass growth during dry periods.
- Regular seeding is necessary to repair damaged and weakened areas of turf. Full grass cover is essential to maintain consistency and to prevent weed invasion.
- Ongoing preventive measures are required to protect the playing surface from pest damage.

Specific maintenance requirements for each type of playing surface are detailed in the appropriate sections that follow.

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Maintenance equipment

There are two main approaches to the provision of maintenance resources; to either employ staff and purchase own equipment or to engage a turf maintenance contractor.

It is possible to hire specialist machinery used occasionally to supplement the basic equipment. Hiring equipment and engaging contractors will save on the initial capital cost. It will also reduce problems associated with maintaining the machinery in a safe and efficient condition. The appropriateness of this method will depend on the size of the facility and the availability of skilled local contractors with the appropriate equipment. Factors to be considered are presented in Appendix 5 - *Maintenance resource check list.* It may be possible to purchase some maintenance materials and achieve savings but this will depend on the purchasing power of the contractors.

Appropriate timing of maintenance operations in relation to the weather and ground conditions is important for the effective maintenance of the turf. Where contractors are appointed for maintenance, it is essential they are contracted to achieve the performance standards with all operations carried out at the appropriate times and under the right conditions. It is paramount this is taken into account by grounds staff and contractors.

In practice, a combination of these approaches may prove to be the most economical and effective. The cost of maintenance will vary considerably according to the method of procurement and the availability of contractors and materials.

Good maintenance practice is regarded as the most important factor influencing the success of a new pitch development [9]***.***

Designers should consider maintenance and capital cost together.

A budget should be prepared to provide for new equipment, annual servicing and the replacement of worn out implements to ensure the quality of the playing surface is maintained.

Create adequate, secure storage provision for maintenance and sports equipment.

Facilities must be provided for the secure storage of equipment on site with space for materials that are used for maintenance such as top dressing sand or cricket loam.

Provision must be made for the safe storage of pesticides, all other chemicals and fuels conforming to current legislation. Additional information on pesticide storage is available in the Agriculture Information Sheet No. 16 available from the Health and Safety Executive [10].

Protective measures must be adopted to prevent the discharge of any contaminated drainage water to public sewers or watercourses. To this end, care must be taken to ensure that waste materials (e.g. grass clippings, engine oil etc.) are stored appropriately prior to disposal.

[9] SAPCA Code of Practice for Design, Construction and Maintenance of Natural Turf Pitches.

[10] www.hse.gov.uk.

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4.0 Football and Rugby Pitches

This section discusses in more detail the use, design, configuration, construction, establishment and ongoing maintenance of football and rugby pitches. The summary table on page 27 shows estimated costs, maintenance and the advantages and disadvantages of various construction techniques.

Traditionally, football and rugby union are played on a seasonal basis when grass growth is minimal and soil very wet. Frequently grass cover is worn at the beginning of winter and quagmire conditions can develop in high wear areas of the pitch such as goalmouths and centre circles. As a result players are unable to experience a satisfactory quality of game.

The pressure to get matches played means they often take place at inappropriate times, for example, during heavy rain. Frequently, maintenance routines during and after the season are unable to restore the pitch to an adequate state for quality play to take place. A vicious circle of deterioration sets in as a direct result of poor drainage and compaction of the playing surface.

Designing for likely use

Performance Quality Standards (PQS) provide a benchmark for the quality and performance of natural turf sports surfaces, as well as to assist with their management. These constitute the minimum acceptable performance criteria (e.g. drainage capacity, hardness etc.) for different levels of the game (e.g. local, regional or national) and are an essential mechanism for the effective design, construction, maintenance and long-term sustainability of the surface. Refer to Appendix 4 *Performance Quality Standards* for PQS relating to football and rugby.

The majority of playing surfaces require a designed drainage system to provide satisfactory playing conditions throughout the playing season.

Consider the frequency and intensity of use. A hard wearing seed mixture would be suitable for pitches with winter use.



Good surfaces maintain safety levels and maximize quality of play

Poor construction, lack of effective maintenance and overuse of the pitch will, eventually, lead to poor drainage and unacceptable playing conditions. It is essential that pitches are designed taking into account the estimated intensity of use.

Players under the age of 15 are judged to inflict about half the damage to a pitch than their more senior counterparts. Therefore, a pitch used predominantly by juniors can accommodate approximately twice the capacity of one used solely by more senior players.

The pattern of use must be taken into account when designing a pitch. Where use primarily takes the form of a large number of games played during weekends with little play during the rest of the week, demand cannot be staggered to make best use of a single 'high specification' pitch. In these circumstances, general upgrading of pitches using sand grooving or slit draining and sand amelioration (i.e. the incorporation of sand into the surface to improve playability - see Section 4 *Pitch Construction* pages 21-27) would be more appropriate than the creation of a single 'premier' pitch.

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Pitch configuration

The layout of the pitches should be considered carefully to maximise the use of the available space and the future flexibility. Pitch marking with safe clearances and ball stop fencing where appropriate should meet the current recommendations of the relevant sports NGB.

The location of spectators needs to be considered to avoid interference or damage to adjacent playing surfaces. This can be a particular problem if football /rugby pitches are located too close to a cricket square.



Laser-guided grading of a pitch

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Pitch construction

Pitch construction falls into six main categories according to the system of drainage used:

- Type 1: Undrained
- Type 2: Pipe drained
- Type 3: Pipe drained with mole drains
- Type 4: Pipe drained with sand grooves
- Type 5: Pipe drained with slit drains
- Type 6: Topsoil and drainage layer
- Type 7: Suspended water table.

Increasingly the 'Type 4: Pipe drained with sand grooves' system is seen as the most suitable for the creation of good quality pitches as it is cost effective to construct and produce a pitch that, in most cases, is also cost effective in terms of maintaining the specified sports turf performance criteria. Sand grooving systems are now widely recognised as being preferable to the more traditional slit drain systems which are prone to premature failure due to limited resources of facility operators in terms of irrigation and sand top dressing requirements.

It should be noted that undrained and even pipe drained solutions are unsuitable for clay soils.

In some situations it may appropriate to adopt different standards of drainage for different pitches on a single site. Key matches played at specific times on the main pitch may require a more intensive system of drainage to provide the reliability in wet conditions. Pitches for more routine use may not be subject to the same intensity of use and it may be possible to adopt a different approach to the development of these pitches.

It is essential to take professional advice from a sports turf specialist to ensure that the quality of the pitches is not compromised and the chosen solution is sustainable.



Type 1: Undrained

There are few situations where pitches of this type will provide a sustainable, quality playing surface. They are likely to be of use only on naturally well-drained soils. For example, sand, well-structured topsoil over gravel, limestone or chalk and where there is sufficient gradient to assist in shedding excess surface water.

There are very few situations where undrained pitches will be suitable.

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Type 2: Pipe drained

In the past, simple pipe drainage has been the most frequently used system. However, unless the site has reasonably free-draining sandy soil or sufficient gradients to remove large quantities of water by surface shedding, pipe drainage alone is often inadequate and the pitch can be susceptible to wet weather cancellations. The system requires:

- Corrugated plastic pipe lateral drains that are usually installed at 5 - 10 m centres at a depth of 450 - 600 mm below ground level.
- Increasingly twin wall pipes are being used for main drains providing a more rigid pipe with better flow characteristics.
- All drains must be laid with a steady fall with the pipe diameter and gradient designed such that the design flow rate can be achieved. Falls in the region of 1:100 are common.
- A positive outfall must be provided in the form of an existing watercourse or surface water system or an effective soakaway system should be constructed. This will have to comply with requirements imposed by the drainage authority or Environment Agency.

When the drains have been laid trenches must be backfilled with porous material to ensure that the high percolation rates necessary for effective drainage are achieved.



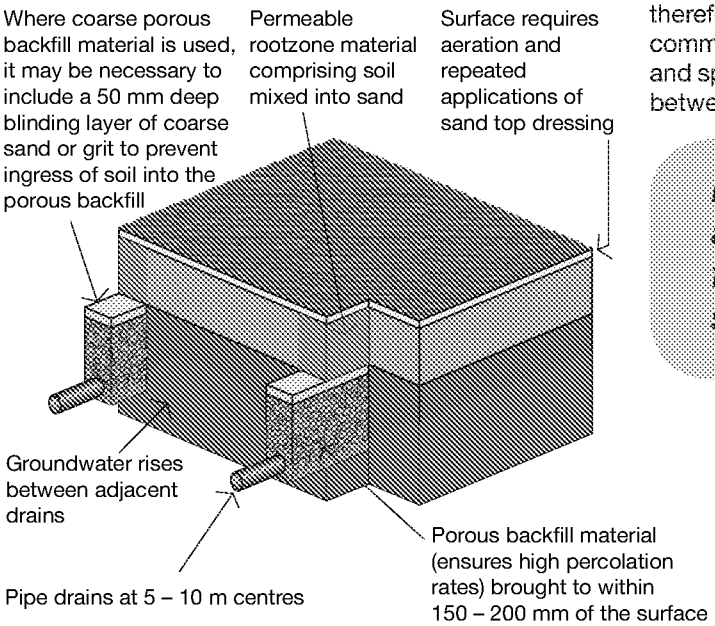
Installing pipe drainage in a new pitch

Predominantly single-sized, hard, angular gravel or broken stone within the range 6 – 10 mm must be used as backfill. This should be brought to within 150 – 200 mm of the surface.

The trench backfill is often 'capped' with a 50 mm 'blinding layer' in the form of coarse sand or fine grit to prevent infiltration of the topsoil. The trench is backfilled to ground level with preserved topsoil or an imported, permeable sandy rootzone material.

Given reasonably permeable soils and good management, fairly good playing surfaces can result. However, in many areas of the UK this method is not suitable, given the slowly permeable nature of the indigenous soil. This system is therefore generally only suitable for situations where the indigenous soil is permeable but is affected by shallow groundwater levels. The lateral drains serve to 'pin down' the water table. It is therefore essential that a competent consultant is commissioned to establish the optimal drain depth and spacing to ensure that wet strips do not occur between adjacent drain runs.

Pipe drained systems alone are only suitable for free-draining sandy soil conditions.



Pipe drainage construction on cultivated topsoil

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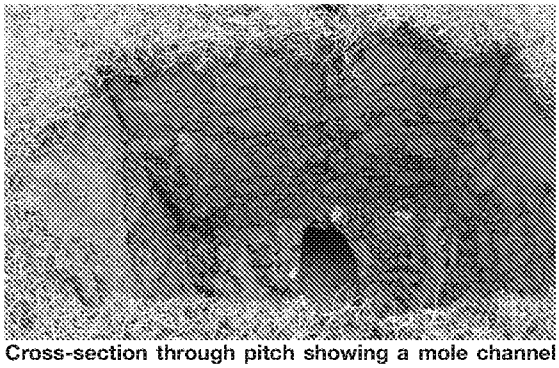
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Type 3: Pipe drained with mole drains

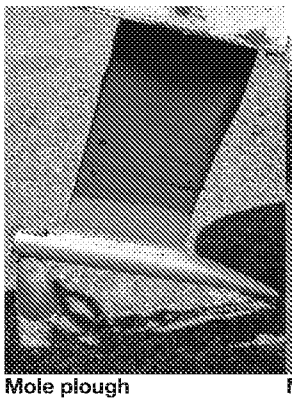
Mole drainage potentially offers a very cost-effective solution to surface water drainage. This system comprises pipe drains installed at 5 - 10 m centres in combination with mole drains installed at approximately 1 m centres. The mole drains are created by a tractor-mounted mole plough which creates stable channels within the clay subsoil that are connected to the surface through fine fissures and by the leg slot, and that also connect with the permeable backfill over the pipe drains.

For this approach to work, the clay content must be sufficiently high (> 30%) and the clay must be of the correct mineralogy such that it does not disperse when saturated. Soil samples should be tested to confirm the suitability of this approach. However the following should be noted:

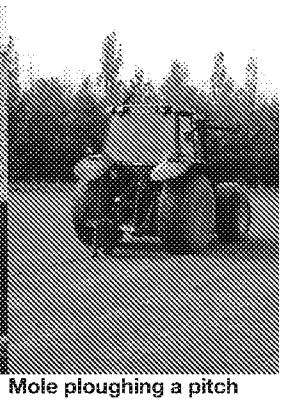
- Mole channels have a finite operational lifespan and typically, re-moling will be required every three to five years.
- Some clay soils suffer significant shrinkage on drying and there is a risk of surface cracks developing might make the pitch too dangerous to play on. This is most likely to occur during the first summer after mole drainage installation.
- The risk of large surface cracks developing can be mitigated to some degree by installing closely spaced linear slits (typically at 260 mm spacing), parallel to the mole drains so that numerous small, but safe, cracks develop.



Cross-section through pitch showing a mole channel and leg slot



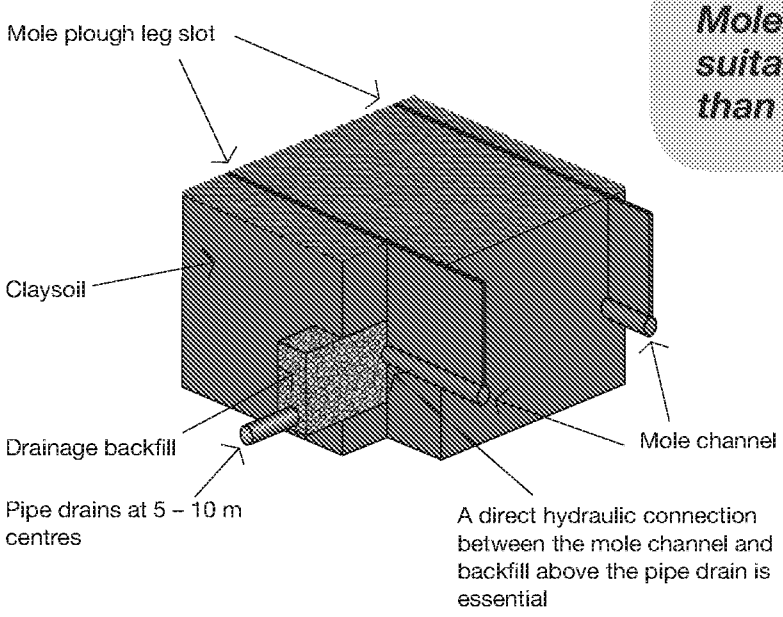
Mole plough



Mole ploughing a pitch

- Successful mole drainage is dependent upon a number of interacting factors (e.g. clay stability, clay plasticity, mole channel depth, mole plough size and mole plough set-up). It is therefore strongly recommended that advice is sought from a sports turf consultant experienced in mole drainage.

Mole drains are only suitable for soils with more than a 30% clay content.



Mole drainage construction on cultivated topsoil

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Type 4: Pipe drained with sand grooves

This type of construction is now becoming the most frequently used type of drainage system where an effective pitch construction is required, and provides an intensive and effective method for intercepting water from the pitch surface. It is cost-effective to construct and maintain as well as reducing the potentially serious problems of shrinkage associated with the pipe drained with slit drainage form of construction.

The pitch construction is similar to that of the pipe drained pitch above with the addition of a series of sand grooves, approximately 150 mm deep and 20 mm wide, introduced by a machine at a spacing of 260 mm. These grooves are forced into the soil with a tine rather than being created by excavating a narrow trench, and can be filled with sand or fine grit. It is essential that the sand grooves connect efficiently with the permeable backfill of the pipe drainage system below.

Heavy top dressings of suitable sand are essential for the successful construction and management of pipe drainage and sand grooved pitches:

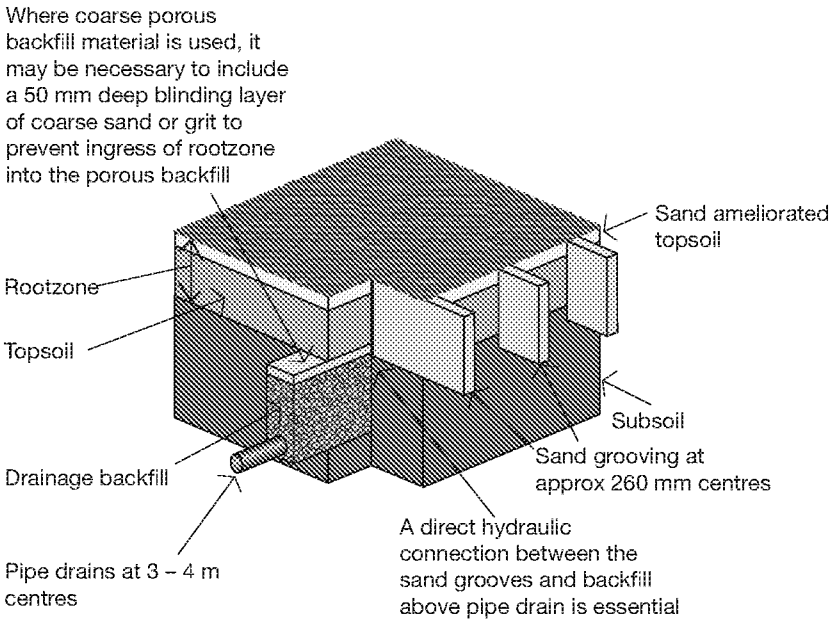
- The dressing should be applied immediately after installation of the sand grooving and subsequently reapplied as part of routine maintenance works in the close season. This process will be necessary for at least three to five years following installation.



Sand grooves installed at 260 mm centres

- Each application of dressing should be in the region of 60-100 tonnes, depending on the size of pitch.

Pipe drainage with a secondary drainage system is considered to be the most suitable type of construction for the creation of good quality pitches that can meet the necessary PQS.



Pipe drainage construction on cultivated topsoil with supplementary sand grooving

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Type 5: Pipe drained with slit drains

Supplementary slit drains will significantly improve the removal of water into pipe drains. Basically the construction mirrors that of a pipe drained system with the addition of a series of narrow, commonly 50 mm wide, sand and gravel filled trenches excavated across, and into the porous backfill of the lateral drains. Slit drains are typically 250 - 350 mm deep and installed at 0.5 - 2.0 m spacing.

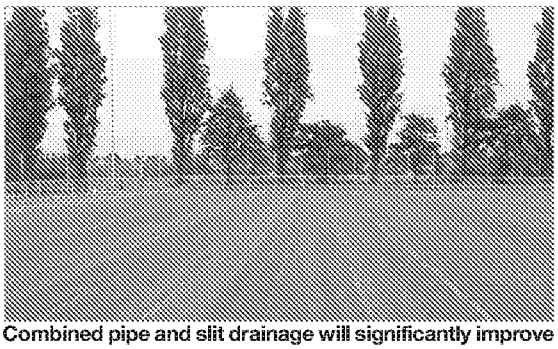
Heavy top dressings of suitable sand are essential for the successful construction and management of slit drained pitches.

The dressing should be applied immediately after installation of the slits and subsequently reapplied as part of routine maintenance works in the close season. This process will be necessary for at least three to five years following installation.

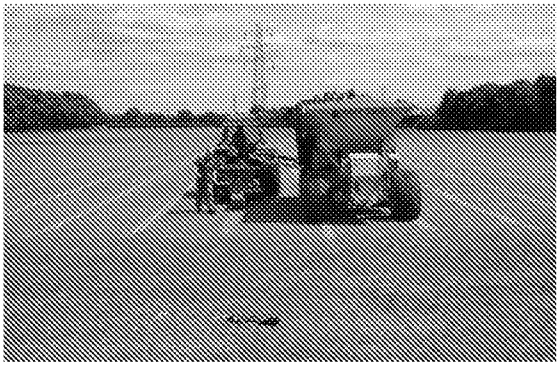
Each application of dressing should be in the region of 60 – 100 tonnes, depending on the size of the pitch.

A drawback of slit drains is that they can become capped and sealed over with topsoil, which can render them ineffective. Also, slit drains installed in clay soil can be prone to settlement in dry weather due to the clay shrinking on drying. They therefore require frequent topping up, particularly during the first year following installation, to prevent an uneven and possibly dangerous surface developing. It is for this reason that 'Type 3' constructions, comprising narrowly spaced sand grooves, are becoming the industry standard for improving the surface drainage of pitches.

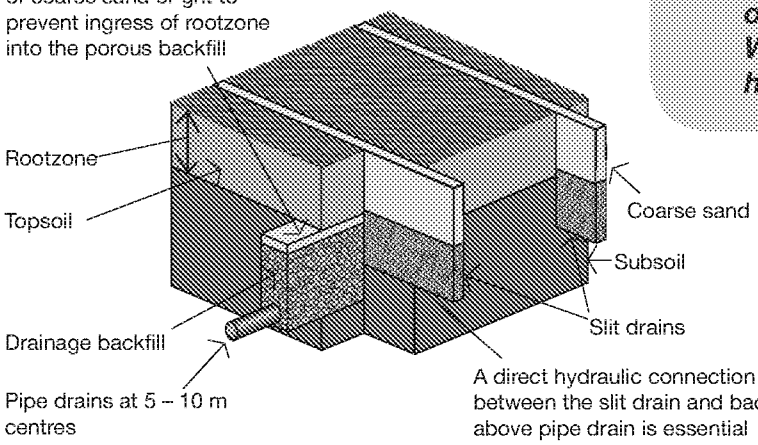
Adequate maintenance is essential in order to produce and maintain a vigorous, dense sward.



Combined pipe and slit drainage will significantly improve the drainage of most pitches



Where coarse porous backfill material is used, it may be necessary to include a 50 mm deep blinding layer of coarse sand or grit to prevent ingress of rootzone into the porous backfill



Pipe drainage and slit drainage construction on cultivated topsoil

It should be noted that pipe drained surfaces with slit drains might:

- ***Be uneven during the first season.***
- ***Settle in the summer months due to shrinkage in clay soils. These must be monitored and filled with sand to maintain the safety and quality of the surface and the effectiveness of the drainage system. Where available, irrigation will help to reduce this problem.***

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Type 6: Pipe drained with topsoil and drainage layer

In some cases, particularly on reclaimed land such as former school buildings, it may be appropriate to develop pitches on a drainage layer or grit raft combined with a soil growing medium rather than a sand based rootzone material as used in the suspended water table construction (see Type 7).

This approach can produce a higher standard of playing surface but with less reliance on high rates of fertilizer or irrigation compared with a sand-based pitch profile (e.g. Type 7).

The method can be used effectively where the underlying subsoil materials are unsuitable for a conventional pipe and slit system.

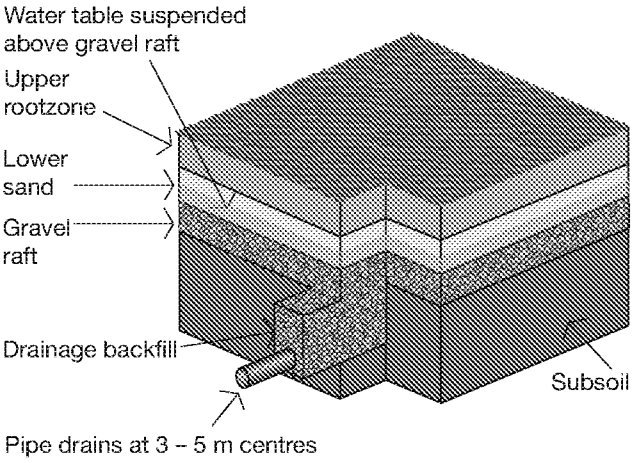
It is essential to include a secondary system to connect effectively through the soil to the grit layer.

The design of the profile and the materials used are critical to the successful development of the pitch and depend on the soil available.

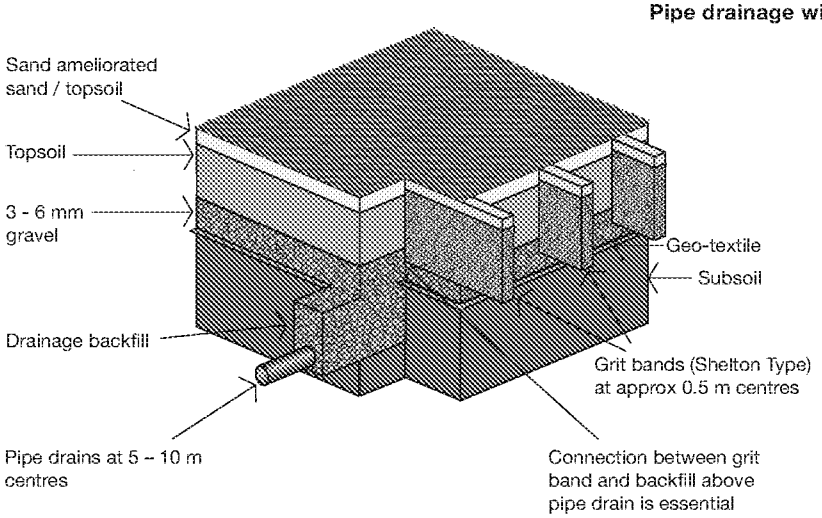
As with all pitches, the need for good maintenance is essential and irrigation should be included.

Type 7: Pipe drained with suspended water table

This type of construction forms the basis for very high standard pitches and is very demanding in terms of management, particularly with regard to fertilizer and irrigation requirements. The more efficient the drainage system, the greater the need for effective irrigation and feeding. This method is appropriate for a high standard of pitch where the timing of matches is critical or for training at a high level, e.g. for a professional football or rugby club.



Pipe drainage with water table suspended above gravel raft



Pipe drainage and slit drainage construction on grit raft

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Table 1 Summary of pitch drainage types

Pitch type		Adult weekly use [11] (hours)	Comparative capital and maintenance costs for different pitch types based on a senior football pitch (£) (Ex. VAT)		Maintenance	Advantages	Disadvantages
			Construction and / or Improvement works [12] (including 12 months maintenance)	Ongoing annual maintenance costs [13]			
1	Undrained	Under 2	15,000 up to 45,000 (Regrading)	5,000 – 10,500	Aeration and sand dressing when conditions allow.	Low capital cost.	Likely to be suitable only in naturally well-drained soils.
2	Pipe drained	2 - 3	40,000 (Drainage) up to 70,000 (Drainage + regrading)	5,000 – 10,500	Aeration and sand dressing when conditions allow.	Low capital cost. Drainage intensity can be increased later. Can be very effective in controlling shallow or rising groundwater.	Susceptible to cancellations in wet weather. Suitable only as a 'dry weather pitch.'
3	Pipe drained with mole drains	2 - 4	42,500 (Drainage + mole drains) up to 72,500 (Drainage + mole drains + regrading)	6,000 – 11,000	Aeration when conditions allow. Sand dressing not essential, but beneficial. Re-moling every 3 - 5 years.	Low capital and ongoing maintenance cost.	In dry weather, surface cracks can render pitches unplayable
4	Pipe drained with sand grooves	3 - 6	72,500 (Drainage + sand grooves) up to 102,500 (Drainage + sand grooves +regrading)	7,500 – 12,500	Aeration and regular sand top dressing (approx 60 - 80 tonnes per annum). Higher drainage rates mean that some irrigation may be necessary during dry periods.	Cost-effective way of improving drainage thereby allowing increased use without damage to the playing surface. Can be used to reinstate slit systems capped with topsoil. Lower cost and less susceptible to soil shrinkage problems.	Bands may be capped with topsoil more easily. Depth of bands limited and may not connect with drain trench backfill.
5	Pipe drained with slit drains	3 - 6	70,000 (Drainage + slit drains) up to 100,000 (Drainage + slit drains + regrading)	7,500 – 12,500	Aeration and regular sand top dressing (approx 60 - 80 tonnes per annum). Higher drainage rates mean that some irrigation may be necessary during dry periods.	Cost-effective way of improving drainage thereby allowing increased use without damage to the playing surface.	Slits can be capped and sealed with topsoil significantly reducing drainage rates. Surface may be uneven in the first season. Slits may open up during the summer due to soil shrinkage.
6 [14]	Pipe drained with top soil and drainage layer	3 - 6	145,000 (Drainage + reuse of topsoil from site) up to 240,000 (Drainage + importation of topsoil)	5,000 – 10,500	Some increase in maintenance required. Aeration and sand dressing essential. Increased requirement for irrigation.	Increased drainage rates and wear tolerance. Can be constructed over poor subsoil material. With proper maintenance a hard wearing surface can be achieved.	Higher level maintenance required. Pop-up irrigation may be required.
7	Pipe drained with suspended water table	4 - 6	380,000 – 510,000	10,500 – 20,000	Higher levels of fertilizer and irrigation to maintain hard-wearing turf. Top dressing with rootzone-compliant material. Surface aeration work. Artificial upper rootzone reinforcement can be installed for greater durability.	Increased wear tolerance and the performance of play. Very high drainage rates achieveable. With proper maintenance a very high standard of playing surface can result.	Regular high level of maintenance required. Pop-up irrigation system essential.

[11] These figures are a general guide.The playability of pitches depends upon a combination of prevailing weather conditions, physical characteristics of the soil profile and the standard of management provided. The usage levels shown will increase by approximately 50% for players 15 years of age and under.

[12] Estimated at 2011 rates including an allowance for professional fees and contingency. They exclude associated external works and site abnormals which are site specific and subject to site survey.

[13] Estimated at 2011 rates for situations ranging from where volunteer help is available (e.g. for mowing, fertilizer application, spiking and line marking) to all maintenance operations being contracted out.

[14] Preferred option for school development projects where new buildings are constructed on existing playing fields, and new pitches are constructed where buildings have been demolished.

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Cultivation

Cultivation is the physical manipulation of soil using soil engaging implements and is an essential part of seedbed preparation. Cultivation at a deeper level (with a 'subsoiler') may be necessary on sites levelled by major grading in order to alleviate compaction.

It is important that the works are correctly timed and that soils are only worked in appropriate conditions (i.e. in the Spring or Summer when the soil is dry and friable). To achieve the desired tilth it is essential that the appropriate equipment is used.

With stony topsoil, allowance must be made for the removal of stones or other debris using appropriate stone picking/rotary equipment.

The final seedbed must comprise a smooth surface that is uniformly firm but not over-compacted.

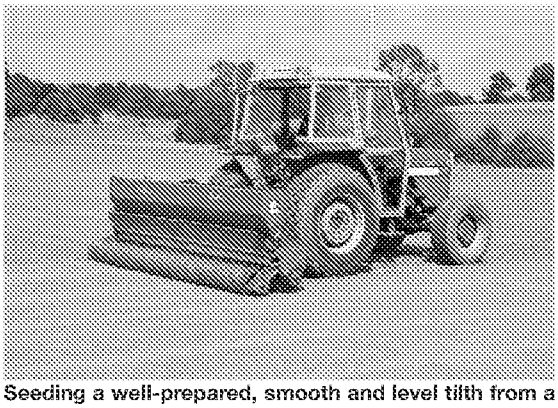
An appropriate fertilizer dressing should be applied prior to seeding or turfing.

Grass cover

The cheapest means of establishing grass cover is by seeding. It is essential that seeding is uniform over the working area.

For rugby and football pitches the seed mixture must comprise predominantly, if not entirely, hard-wearing and fine-leafed cultivars (varieties) of perennial ryegrass. Cultivation of the subsoil is particularly important after major regrading.

Where time is limited, pitches can also be established using purpose grown imported turf, although this is a more expensive option. The turf must contain hard wearing grass cultivars suitable for winter games and be predominantly weed-free. The turf must be grown on light sandy topsoil and should not be excessively fibrous. On specialist constructions, a washed turf may be considered. This is where the entire topsoil base has been washed away before laying.



Seeding a well-prepared, smooth and level tilth from a tractor-mounted seedbox

Turfed pitches often require intensive hollow tine aeration in order to assist surface drainage in the early years of establishment.

Upgrading pipe drained pitches

Properly constructed pipe drained pitches can be upgraded by adding further pipe-drains to achieve a more intensive system. These systems can be supplemented further by installing sand grooves or slit drains to improve the surface drainage performance. However, for this approach to be fully effective, a good drainage connection must be achieved between the sand grooves and the drains below.

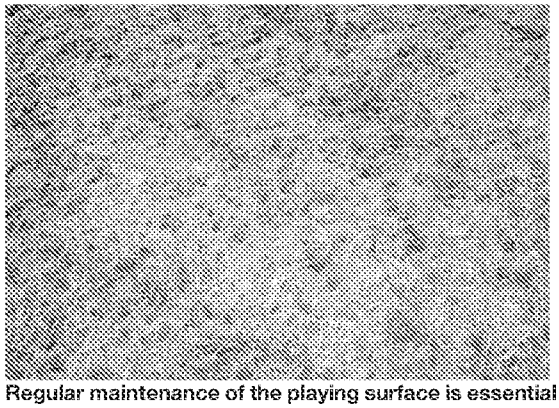
Sand amelioration

The drainage characteristics and surface playability of topsoil can be improved by adding suitable sand but it should be noted that a high proportion of sand is required to achieve a significant improvement in drainage performance. Where a high standard pitch is required, the quantity of sand should be determined by laboratory analysis to determine the particle size distribution of the soil and sand. In some cases the sand will be mixed with topsoil off-site with the final rootzone material being spread over the prepared base.

For the majority of pitches it is more cost effective to spread a layer of sand on the pitch (typically 25 mm deep) and lightly work this into the surface of the topsoil to improve infiltration and reduce surface damage from wear. This sand layer is particularly effective when combined with secondary slit drainage and sand grooving systems.

Irrigation

Watering facilities are desirable for winter games pitches not only for initial grass establishment but to assist with renovation of the playing surface. Due to high percolation rates, well-drained pitches will require intensive irrigation to combat problems caused by drying out during periods of low rainfall.



Regular maintenance of the playing surface is essential to prevent expansion of wet areas

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The minimum requirement for all pitches is for conveniently located hydrant points where a hose or mobile sprinkler can be connected. For free-draining rooting mediums over drainage rafts, an automatic pop-up irrigation system is essential.

The irrigation system must comply with local water company regulations and this will involve the installation of a system incorporating facilities to prevent reverse siphoning into the water main.

Irrigation may also be required to offset potential problems with soil shrinkage on drain lines where the indigenous soil has a high clay content.

Maintenance

The design of an irrigation system will normally require advice from a specialist Irrigation Consultant on issues such as:

- Irrigation demand
- Capacity and location of water storage
- The potential for use of grey water
- The source and cost of water
- Potential for abstracting groundwater (up to 20 cubic metres per day may be abstracted without a licence)
- Potential for abstracting surface water (up to 20 cubic metres per day may be abstracted without a licence)
- Pumps, power supplies, pipe work, hydrants and sprinklers
- Irrigation scheduling.



Specialist equipment such as a verti-drainer can be hired to maintain pitch quality



Alleviation of soil compaction can greatly improve the condition of natural turf facilities

Maintenance is key to the success of all pitches and is an essential requirement to provide pitches that meet relevant PQS over a long period. There are too many examples of well constructed pitches that fail after a short period of time due to inadequate maintenance, and then require further significant investment to make them effective again.

Typically, post-match work will involve replacing divots and may require the application of top dressing material to the most badly damaged areas of turf. Ensure provision of a reasonable quantity of top dressing sand and that adequate storage facilities are available to keep it dry and clean.

To restore the pitch for the following season a number of operations may need to be performed at the end of the playing year. Provision should be made for aeration, cultivation, sanding, seeding and/or re-turfing.

The following equipment is fundamental to successful maintenance:

- Mower: various models fulfill different requirements. Cylinder mowers produce a better quality finish.
- Aerator: tractor-mounted or pedestrian. This can be hired when appropriate.
- Sprayer: for application of liquid fertilizer and pesticides.
- Chain harrow/roller: to break up clumps and re-level the surface. Heavy rolling should be avoided due to adverse effects on the soil or rootzone.

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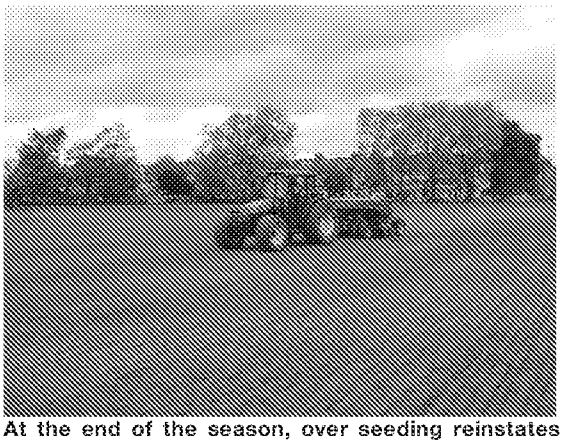
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- Hand tools should include spade, fork, halfmoon turf edger, dragbrush, edging shears, wheelbarrow, measuring and line marking equipment.
- Health and Safety: appropriate Personal Protective Equipment (PPE) should be used.

There is a wide range of equipment available that can be used for aeration or for renovating the pitch surface when a more thorough operation is necessary to restore good surface drainage or to remove excessive fibre or thatch.

This expensive equipment can be hired in as and when required but care is needed to ensure that the work is carried out in suitable conditions.

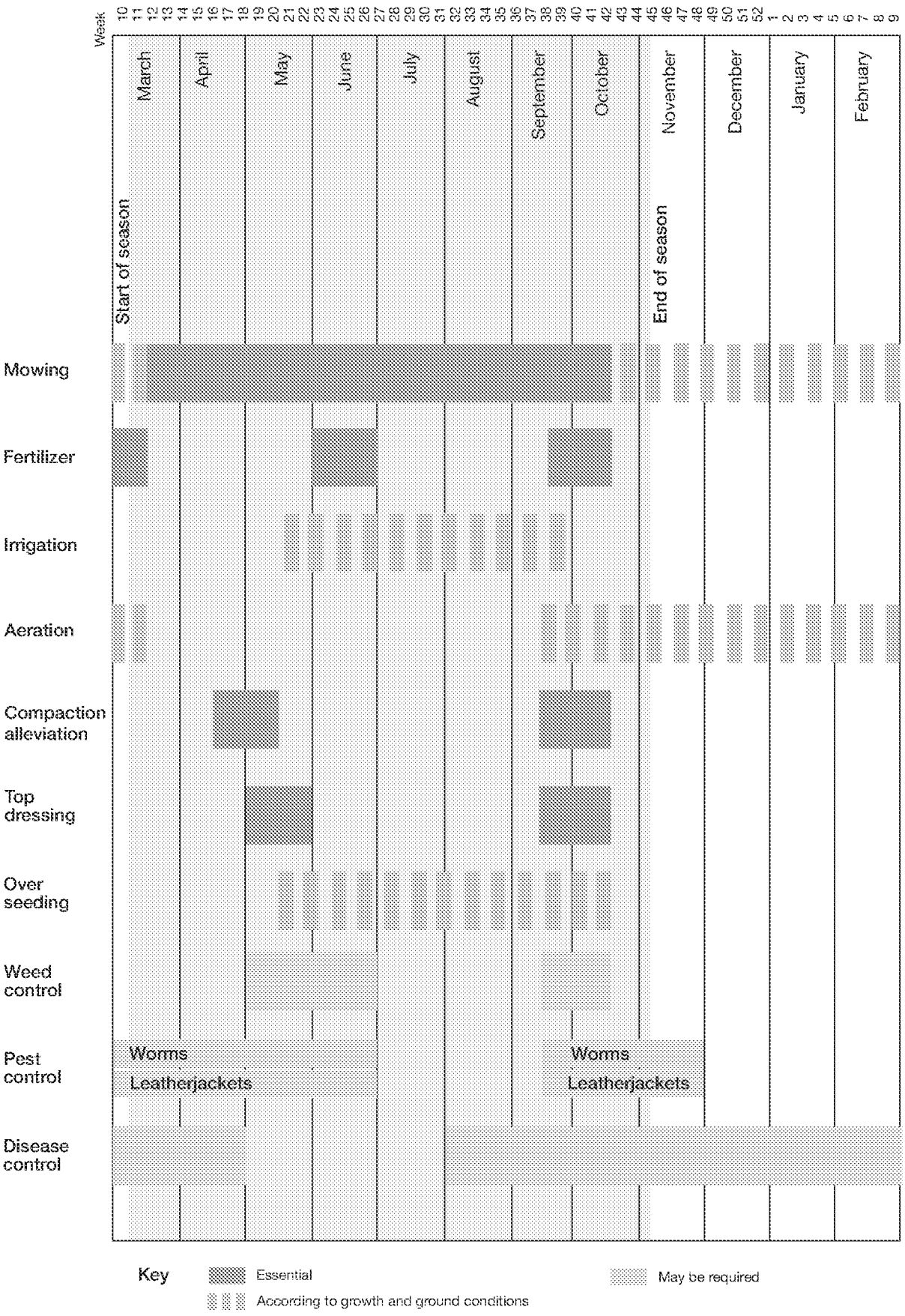
It is essential to bear in mind that the maintenance requirements for a newly established facility may be considerably higher than for mature playing surfaces.



At the end of the season, over seeding reinstates worn turf

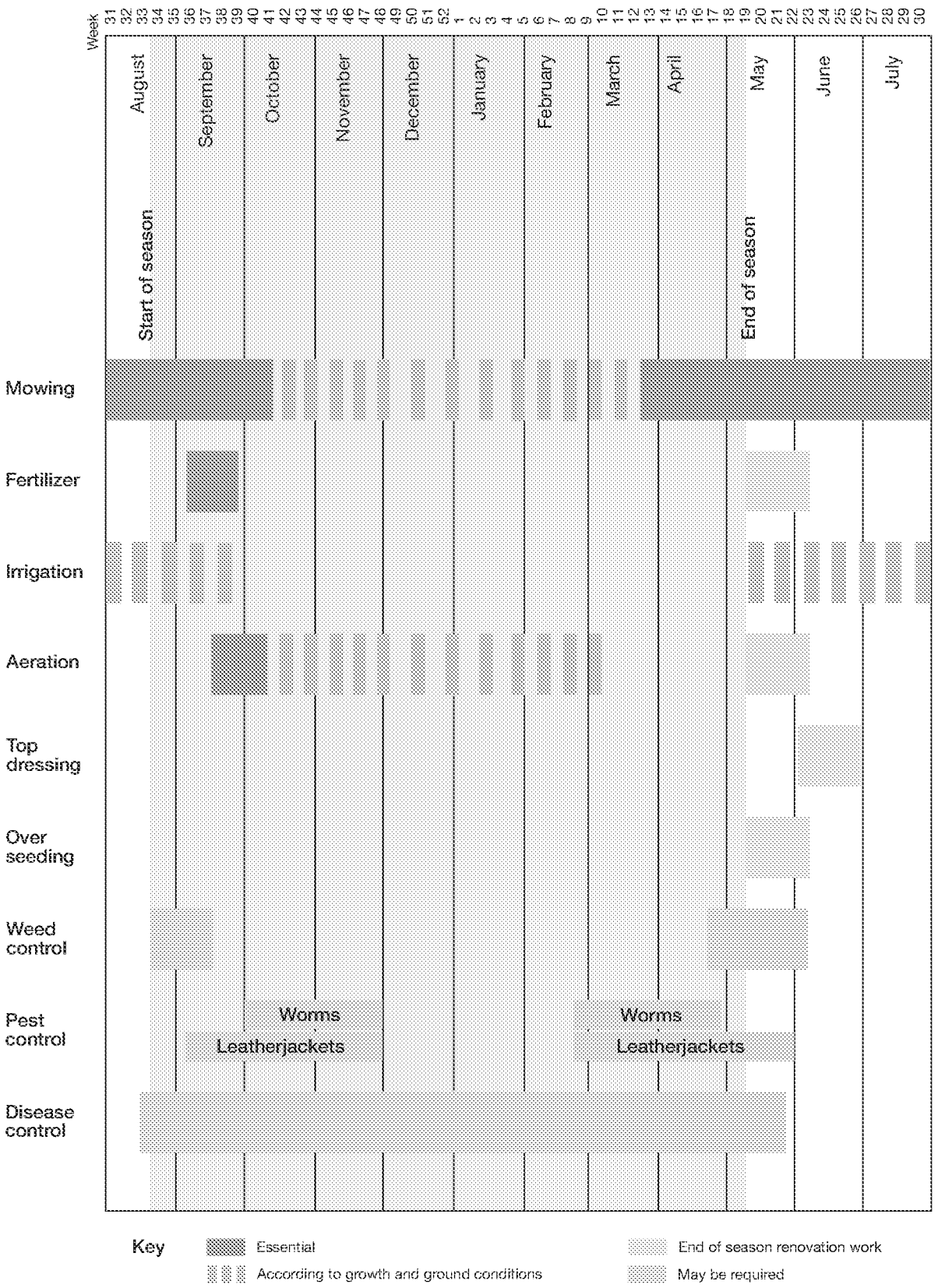
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Summer Rugby League: Summary pitch maintenance programme

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Winter Football and Rugby League: Summary pitch maintenance programme

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5.0 Flat And Crown Bowling Greens

Site considerations

Consider the following points when selecting the location for a new bowling green:

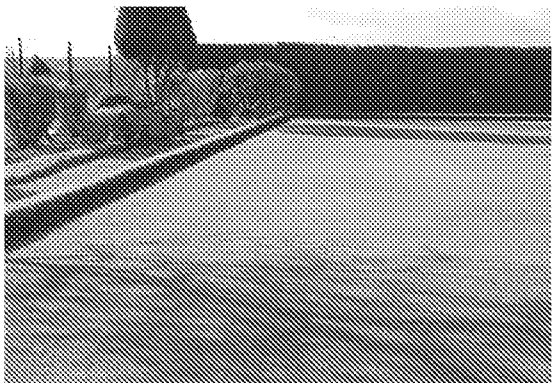
- There must be sufficient land available to accommodate the required dimensions of the green and its immediate surrounds.
- Allowance should be made for a surround path, usually 1.5 – 2.0 m wide, and outer planting borders/grass verges as required.
- A detailed survey drawing of the site will be required to establish finished levels relating to the surrounds and to establish the relationship of the pipe-drainage system. Ideally, to avoid subsequent settlement problems, bowling greens should not be built on 'filled' areas.
- The green must be located away from tall buildings and trees that may cast shadows over the bowling surface thereby affecting turf performance.
- Avoid tall plantings around the bowling green.
- There must be good access to the site to facilitate construction work and subsequent maintenance operations.

The basic construction of flat and crown greens is similar – both require the formation of a smooth and uniform bowling surface.

The following sections cover the main stages of construction and the requirements for both types of green.



The green must be located away from tall buildings and trees that may cast shadows over the bowling surface



Plan a perimeter hedge and seating around the green

Grading

Flat greens

A completely level and smooth subsoil formation surface must be prepared with a tolerance of ±15 mm. Allowance must be made for the various layers of materials used in construction and for making the surface of the green a minimum of 230 mm lower than the surrounds.

Crown greens

Adjustment to subsoil levels must allow for a crown formation between 254 and 380 mm above the corner levels. A 380 mm crown is the Crown Green Bowling Association's recommended height for a 37 x 37 m green and pro rata for other sizes.

Drainage

Greens constructed over porous subsoils such as gravel or sand may not need any special drainage measures but this is exceptional. Most sites will require a drainage raft and an underlying system of pipe-drains.

Flat and crown greens require a perimeter drain beneath the outer ditch channel.

Flat greens

A system of pipe drains should be installed through the graded subsoil formation surface usually at 5.0 - 8.0 m centres with an outlet to an outfall or soakaway.

Crown greens

A drainage system may be omitted from the body of the green as the contouring of the formation allows speedy surface and subsurface water run-off.

All drains must be laid to an appropriate fall with pipework conforming to the relevant industry standard. All junctions, end stops and fittings must be provided as required.

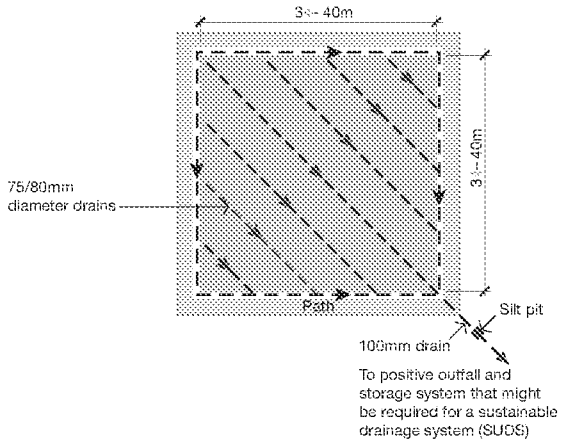
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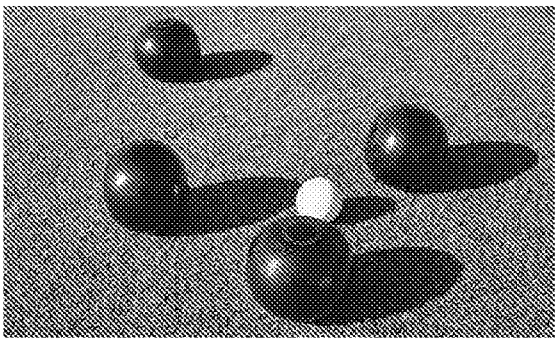
All drain trenches must be backfilled to the formation surface with a layer of hard, clean gravel (6 – 10 mm gravel size).

A suitable silt chamber should be provided at the lowest point of the drainage system on the green surround. A sealed outlet pipe will be required from the silt pit to a positive outfall such as a watercourse, surface water drain or possibly a soakaway.

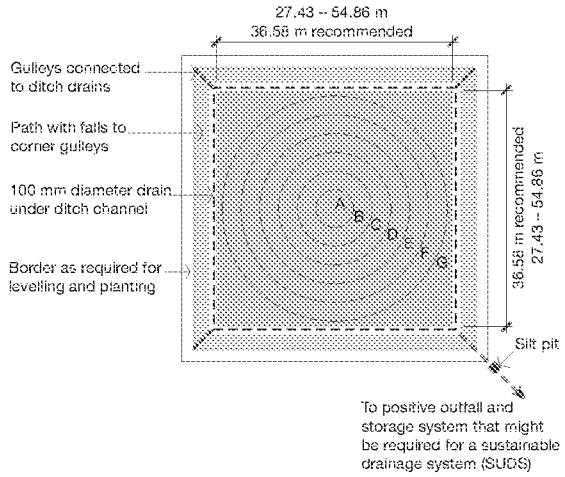
Once the pipe drains have been installed, a 100 – 150 mm deep drainage layer of 6 – 10 mm hard gravel is spread over the graded formation surface. The layer is then blinded with a coarse, gritty sand to a firmed depth of 50 mm.



Flat bowling green drainage system



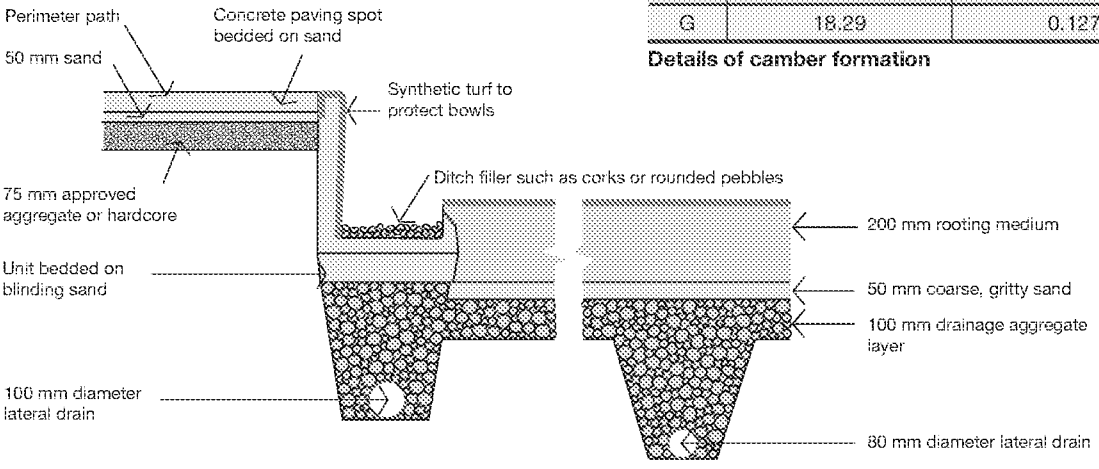
All sports require a quality-playing surface. Detailed consideration of design, construction and maintenance is essential



Crown green showing contours and ditch drain

	Circle radii (m)	Circle heights (m)
A	-	0.254
B	3.05	0.248
C	6.10	0.235
D	9.14	0.216
E	12.19	0.190
F	15.24	0.165
G	18.29	0.127

Details of camber formation



Cross-section through flat bowling green

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Ditch channels

Flat greens

The dimensions of the outer ditch channel must conform to the statutory criteria laid down by Bowls England. The height of the outer path surround above the bowling surface is critical.

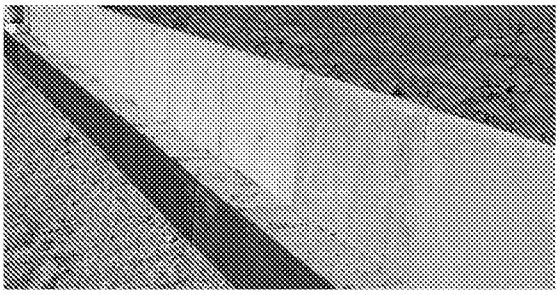
Traditionally, treated timber boards and / or precast concrete kerb edgings, haunched on concrete, were used to form the ditch channels. More up-to-date systems for ditch channels are now available in the form of pre-cast units manufactured to conform to Bowls England criteria.

In most cases some form of protection is required to protect the bowls when striking the outer ditch face. This can be in the form of treated wooden battens, artificial turf or rubber 'bumper' bars.

Some form of ditch filler such as corks, rounded pebbles or other suitable inert durable material that will not harm the bowls will also be required.

Crown greens

For crown greens where ditch requirements are rather less rigid, traditional timber edging or pre-cast concrete kerbs are usually used. Additionally, crown greens require treated timber striking boards along the outer ditch kerb. Alternatively, synthetic turf may be used.



Pre-formed ditch channel simplifies construction

Rootzone

A free-draining rootzone is required for both crown and flat greens, particularly where rainfall levels are high.

Sufficient rootzone material should be prepared to provide a minimum of 200 mm firmed depth over the blinded drainage layer on completion.

Depending on the location of the green, it may be possible to utilise indigenous topsoil if it is a light textured (i.e. sandy) material. Some preliminary screening of the topsoil to remove larger stones and other debris may be required prior to spreading.

In some situations the drainage qualities of the topsoil might be improved by blending in approved sand. Quantities should be determined by laboratory analysis, and mixing should be done off-site in dry conditions using appropriate shredders/screeners to ensure the production of uniformly blended rootzone.

If local topsoil is unsuitable, provision must be made to import suitable commercially prepared sand/soil rootzone material. The approved rootzone must be spread using appropriate equipment taking care not to disturb the underlying blinded drainage layer.

Seed / turfbed preparation comprises alternating hand-raking and heeling operations in order to produce a fine, smooth and evenly consolidated tilth.

Preparation

Note that for all greens it is imperative that topographical information is available to aid the design and setting out.

Flat greens

Levelling pegs must be set up on a 3 m grid or alternatively 'screeding battens' can be used to accurately set out the levels. Final levels must be to a tolerance of ± 6 mm.

Crown greens

It is important to maintain correct contours and levels by setting up level pegs at 3 m centres on each contour line.

Seed bed / turf bed preparation

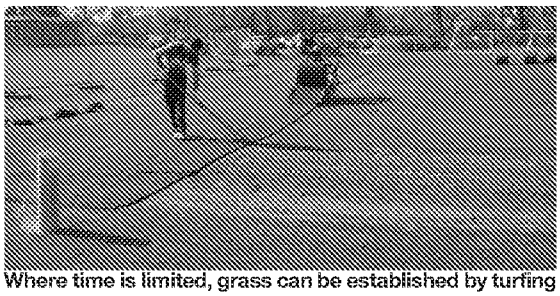
In the final stages of seedbed / turfbed preparation a suitable fertilizer dressing should be well raked into the surface.

Grass cover

Grass cover can be established by seeding or turfing, depending on the budget and the time available before the facility is required for use.

Seeding is the cheaper option but a longer establishment period is required, usually a minimum of 18 months. The seed mixture should contain approved cultivars of fescue and bents. A sowing rate of 35g / m^2 is normally used.

Turfing is more expensive, but requires a shorter period to become established (usually between six



Where time is limited, grass can be established by turfing although this is more expensive

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and nine months). Turf must be purpose grown on a light sandy topsoil using fescue and bent grasses and should be free of broad-leaved weeds and weed grasses.

Traditionally turf is supplied in narrow rolls (approximately 300 mm wide) and laid by hand working from boards. Wider rolls, up to 1.2 m across, are now available. These can be laid directly from specially made tracked machines.

Irrigation

During construction works, a suitable irrigation system must be installed. This is necessary to assist establishment of the grass sward and to aid future maintenance of the green.

A basic system comprises one or two water hydrants located around the outer edge of the green. Given adequate pressures and flow rates, these can be used for supplying portable sprinklers, spray lines or self travelling sprinklers.

A more expensive option involves the installation of an automatic pop-up irrigation system. This comprises between four and eight sprinkler heads located outside the bowling green perimeter.

This system also includes a storage tank, pumps and control. All will require safe and secure housing near the bowling green.

The irrigation system must comply with local water company regulations and this will involve the installation of a system incorporating facilities to prevent reverse siphoning into the water main.

Green surrounds

Some form of path will be required on the outside of the green for pedestrian access and/or spectator viewing. The following must be considered:

- The perimeter path must be formed from a durable, level material such as brick / slab paving or macadam.
- Provide safe, easy access to the green for wheelchair players.
- Outer borders may be required for the planting of ornamentals, shrubs and/or perimeter hedging.
- Tree planting demands a cautious approach owing to the potential for harmful shading of the green, as well as penetrating root systems.
- A well-detailed type of outer perimeter boarded fence must be provided for shelter and security.
- Make allowance for sufficiently wide access gates through the fence for maintenance machinery.
- Facilities such as seat recesses, litter bins, path drainage gulleys and access ramps to the green must also be provided.

Maintenance

Maintenance requirements will depend upon site conditions and prevailing growth. Proper management will be vital to the achievement of the best possible playing surface and top dressing the green will be crucial in achieving this.

Other maintenance requirements should be discussed and agreed with the green design specialist who should provide a detailed maintenance schedule with the original design.



Regular maintenance is essential to ensure a high quality playing surface is achieved

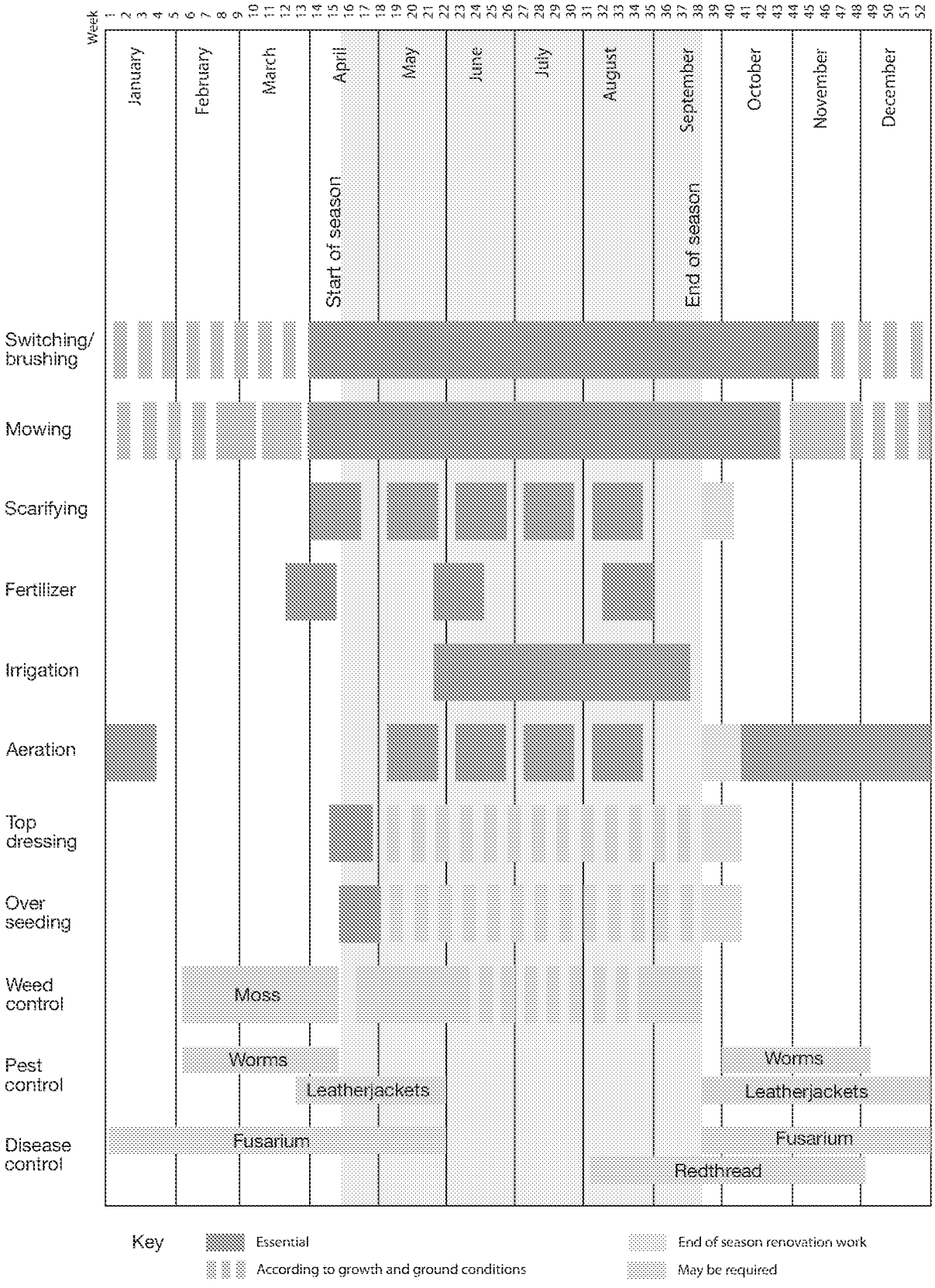
Consideration of these requirements must not be left until the works are completed.

The following equipment is fundamental to successful maintenance:

- Mower: a high quality professional cylinder mower, the most expensive and important piece of maintenance machinery.
- Aeration machine: ideally a powered, pedestrian version.
- Scarifier: the most efficient are powered, pedestrian models.
- Sprayer: for pest and disease control.
- Spinner-type pedestrian distributor: to achieve even application of granular materials, especially fertilizers.
- Irrigation: portable sprinklers or spray line to water the green. Hydrant points should be fitted with reverse siphon valves.
- Hand tools: including a switch, dragmat or dragbrush, edging shears, fork, spade and springbok rake. A large lute will be required for flat greens.

Expensive equipment that will rarely be used such as a punch-action hollow tine machine or top dresser, should be hired in as and when required.

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A summary maintenance programme for bowling greens

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6.0 Cricket Grounds

The following guidance will assist clubs and schools during the early stages of planning a new cricket square or pitch. The guidance does not, however, go into great detail in terms of design, construction and maintenance issues and therefore, these must be considered in relation to the guidelines available from the England and Wales Cricket Board (ECB). In particular, the ECB publish their own guidance on the construction, preparation and maintenance for the relevant standard of play [16]. Additionally, for all but the smallest projects, expert independent advice must be sought.

ECB publish their own PQS for cricket and these are very important in the design, construction and maintenance of cricket facilities and must be achieved for the relevant standard of play.

Initial planning

Firstly, identify the level of cricket to be played and the associated PQS required.

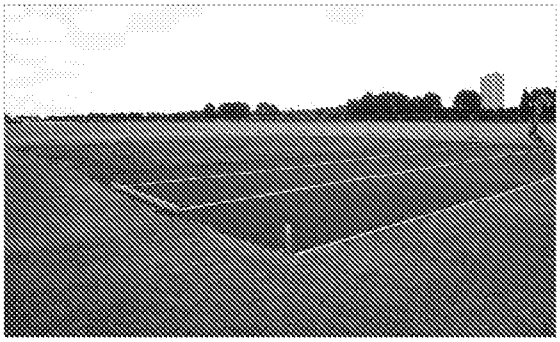
Plan the square to have a lifespan of 25 years and factor in realistic maintenance costs to achieve this.

The boundary should be a minimum of 37.00 m (for 'juniors') and 45.72 m (for 'seniors') from the middle stumps of the pitch in current use.

Pitches must run approximately north / south to minimise the risk of batsmen or bowlers facing a low sun. The pitch axis must point in a direction between 325 and 55 degrees on the compass.

For seniors, a single pitch area is 20.12 m long x 3.05 m wide. For juniors, the pitch length is reduced to 19.20 m (U13), 18.29 m (U11) and 16.46 m (U9) respectively. The size of the cricket square is determined by the number of pitch areas required in a season.

[16] See ECB website at www.ecb.co.uk .



Precise placement and consolidation of cricket loam is crucial to the success of cricket square construction

To calculate this:

- Assess the total number of matches to be played during the season.
- Assess the number of times each strip can be used during the playing season. This is variable but could be between two and five times dependent on the type of cricket, the standard of maintenance and the time available to the groundsman to maintain and prepare the pitches.
- Calculate the number of pitches required and hence the total width of the square: the number of matches to be played divided by the assessed number of games per pitch gives the total number of pitches required.

Site investigation

Before making decisions about the construction of the cricket ground it is important to identify the characteristics of the indigenous soil. This is achieved by analysis of the topsoil and the subsoil from a minimum of six locations on the site. The soil analysis should be conducted by an experienced consultant using an approved, independent soil laboratory.

The initial investigation should identify the site's natural run-off and the location of existing drainage. Where available, obtain copies of drainage plans.

Ensure there will be reasonable access for construction vehicles and take steps to protect the outfield from damage by heavily laden traffic.

Following initial planning and site investigation and before proceeding further, the following information must be available:

- Required size of square
- Depth of dig for construction of the square
- Drainage requirements for the proposed square and outfield including any anticipated future expansion.

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Falls

The final surface level of the square must be of a consistent and uniform grade and blend in with the outfield. However, it should be 25 mm higher to encourage surface water to run off.

Ideally, the square must be completely level along the line of play, although a slight fall of up to 1:100 might be acceptable.

A slight cross-fall of between 1:80 and 1:100 is also acceptable to assist surface run-off.

Materials

Cricket demands a firm, level surface that provides consistent bounce and pace. The selected soil will have a major influence on the physical characteristics of the playing surface and will also affect the selection of grass cover.

The nature of the existing topsoil will determine the extent of the construction works required to develop the square. For different standards of pitch, the clay content should be:

- First class and county 28 – 35 %
- Club 25 – 30 %
- School 23 – 28 %.

Note that marl should not be used.

The clay content of the topsoil will be indicated by a soil analysis carried out at the initial planning stage. Where existing topsoil is unsuitable, make allowance for importing an appropriate cricket topsoil from a specialist supplier.

To accommodate the imported topsoil, an equivalent depth of existing material must be removed. The imported topsoil must be blended with the indigenous topsoil.

For cricket squares refer to specialist advice from the England & Wales Cricket Board (ECB).

See their document entitled 'TS4 - Recommended Guidelines for the construction, preparation and maintenance of cricket pitches and outfields at all levels of the game'.

Drainage

The drainage system must be designed by a specialist to meet the demands of the location and planned pitch use.

In its simplest form the drainage system will comprise a single perimeter drain around the outer edge of the square.

Except when designed with a drainage raft, never install a pipe-drainage system under the square as this will result in differential drying out at the surface. Drains should not be laid with falls less than 1:200.

'Drainage rafts' are required only in exceptional circumstances, such as in situations where shallow ground water results in very wet sites or where the highest standards of construction are required, for example, at county level.

Construction

Excavate topsoil to required depth, invariably 100 – 150 mm. Install the drainage system. If excavation exceeds 100 mm introduce appropriate loam in layers no deeper than 50 mm.

Soil should be consolidated every 50 mm by heeling. While time-consuming, consolidation is the most important element of the construction process and must be carefully supervised.

Alternative methods of consolidation are available, for example with 'wacker plates' but this should be discouraged. All levels must be keyed in and air pockets removed. Failure to carry out this process diligently will curtail the expected lifespan of the pitch or square and lead to disruption and additional costs.

Levelling and construction can be achieved with levelling pegs or laser levelling equipment and, if correctly carried out, there should be no need for overlapping. The success of this procedure relies on exact marrying up with the outfield.

A roller must not be used for the final levelling as this may leave isolated pockets that can only be eradicated by 'walking and heeling'.

Seeding

Note that turfing a pitch or square is strongly discouraged. Grass cover is normally established by seeding using appropriate cultivars of suitable grass species sown at a rate of 35 g/m^2. The selection of a suitable seed mixture will depend on proposed intensity of use and levels of management and maintenance available.

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The seed mixture should be selected in consultation with a specialist and take account of advice available from the ECB. Successful seedbed preparation relies on the following steps:

- Ensure all stones are removed
- Rake the surface and, where necessary, apply a pre-seeding fertilizer
- Spread the seed uniformly then lightly rake into the surface and roll with a hand-roller
- Water the seedbed
- Provide protective fencing around the perimeter to prevent encroachment onto the new surface.

The square will be ready for use between 18 months and 2 years after seeding.

Irrigation

Provide at least one hydrant point at a location convenient to the square such that it is possible to water each of the pitches. A hose or sprinkler can be attached for general watering of the square and / or preparation of pitches. The irrigation system must comply with local water company regulations and this will include the installation of a system incorporating facilities to prevent reverse siphoning into the water main.

Automatic pop-up irrigation systems are not usually installed on cricket grounds.

Outfield

The outfield must comprise smooth and even levels that permit balls to roll freely across the surface. If the outfield is to be cut from grassland the site must be checked for:

- Uneven surfaces
- Inadequate drainage
- Inappropriate grasses.

Where the quality of turf is satisfactory and site undulations are isolated, it should be sufficient to strip away portions of turf and, where necessary, adjust the underlying ground level.

The turf is then replaced to form a level and firm surface.

Where site undulations are more severe but there is a good depth of topsoil, it may be enough simply to regrade the site to a uniform surface.

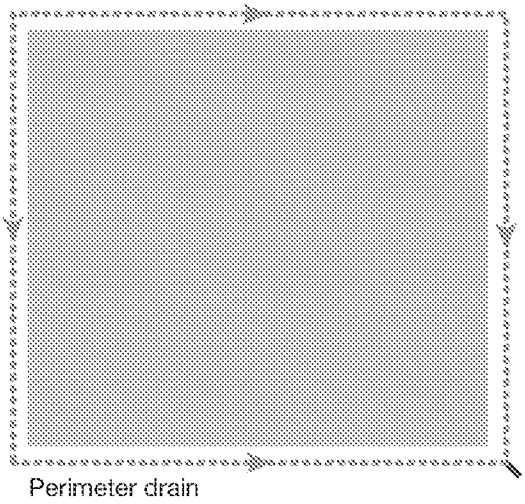
Where existing gradients are too steep, more drastic level adjustment may be necessary involving the removal of topsoil and grading of exposed subsoil, followed by topsoil replacement.

The outfield need not be completely level and a slight gradient of up to 1:50 may assist shedding of surface water.

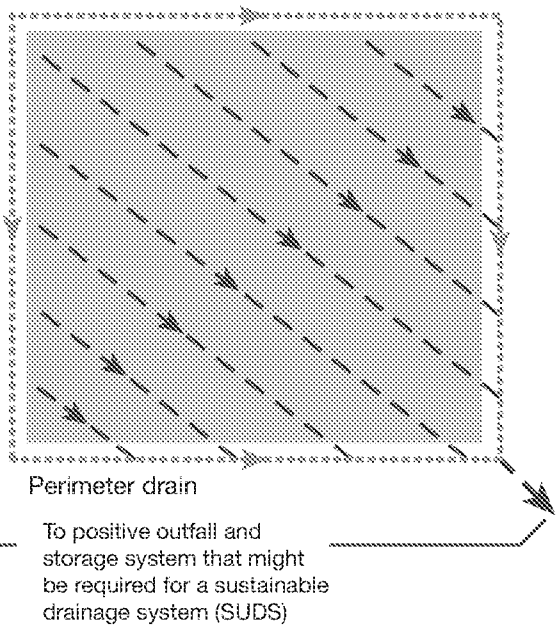
Outfield drainage

Where rainfall levels are low and topsoil is naturally free-draining there should be no need for artificial drainage, particularly if the outfield is to be used for summer cricket only.

If the ground is relatively impervious some form of pipe drain system may be required.



Cricket square without drainage raft



Cricket square with drainage raft

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Where the outfield will be used as a playing surface for football, rugby or hockey, construction should follow recommendations for those sports. While supplementary slit drains may be used on cricket outfields caution is advised owing to the possibility of settlement of backfilling material within the slits during dry weather. This will result in an uneven playing surface which is potentially dangerous for fielders. Make allowance for topping up the slits with suitable sand when settlement occurs.

Grass cover

For the finest quality outfields, mixtures containing appropriate species of fescue and bent are most appropriate.

Where winter games are to be played on the outfield, the inclusion of a proportion of perennial ryegrass is essential to maintain the hard wearing quality of the surface in anticipated wet winter playing conditions. The cultivars chosen should have a high tolerance to close mowing. A seed mixture containing between 40 – 60% by weight perennial ryegrass would be suitable for most winter games situations.

Maintenance

Detailed guidance on the maintenance of cricket squares and outfields is available from the ECB.

Requirements will depend on:

- Site conditions
- Prevailing growth
- Intensity of use.

Equipment

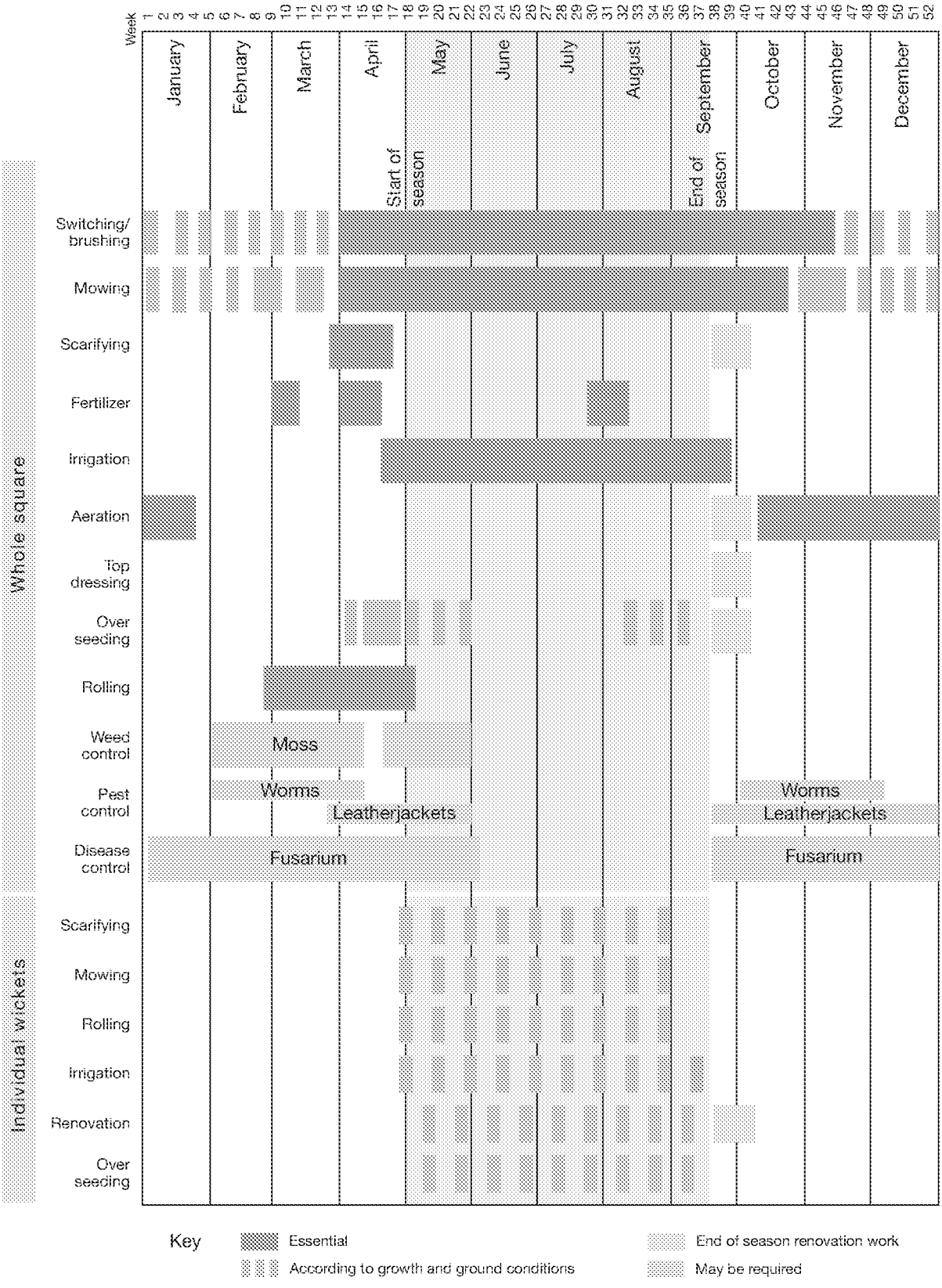
The ECB provides detailed guidance on the equipment necessary to maintain the quality of the playing surface throughout its life. It is vital that this guidance is considered in detail during consultation with your appointed specialist from the outset of the project. In particular, provision will need to be made to house specialist equipment such as a roller.

Non-turf pitches

Non-turf pitches are popular for practice and occasionally for matches. The ECB has set performance standards for these pitches which are implemented through suppliers approved and regulated by the Board.

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A summary maintenance programme for cricket squares

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APPENDIX 1

Selection criteria for consultants on turf / grass projects

The selection of the right consultant for sports turf and sports drainage work is as critical as getting the right architect to design the clubhouse or sports hall. Choosing the right consultant will save time and money and will bring real added value to the design, construction and maintenance of the pitch over many years.

The following are critical issues that need to be considered when selecting a suitable consultant:

- Does the consultant have relevant qualifications and expertise such as:
  - currently recognised as acting as an independent consultant in the sport turf/ grass industry?
  - a recognised plant or earth science degree?
  - references from at least two clients for similar work?
  - sufficient expertise to cover all of the work required for example drainage as well as pitch works?
- Ensure that the consultant:
  - is independent and does not have any formal association or understanding with any commercial organisation that could influence his or her impartiality.
  - holds an appropriate level of professional indemnity insurance.
  - demonstrates a clear understanding of the brief and your requirements.
  - has the ability and the resources required to meet the necessary deadlines.
  - confirms the total cost of the professional services and if there are likely to be any additional costs.
  - demonstrates a willingness to attend for an interview and/ or present their submission.
  - provides ongoing support following the completion of the main works.

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APPENDIX 2

Schedule of services for a sports turf consultant employed on playing field and natural turf pitch improvement schemes

The construction of safe and sustainable natural turf surfaces that meet appropriate PQS is reliant upon competent execution of site assessment, design, construction and maintenance phases. It is therefore advisable to appoint a specialist sports turf consultant to coordinate the project.

A fee proposal from prospective consultants should include details of:

- The Company
- Staff to be assigned to the project and their respective qualifications and experience
- The proposed working and liaison arrangements
- Any sub-consultants proposed (e.g. irrigation consultants)
- A fee bid including key deliverables.

The following is a summary of the Schedule of Services to be provided by a specialist consultant employed on a playing field or natural turf improvement scheme, separated into the following key project phases:

- Feasibility study
- Design
- Tender
- Contract administration.

Feasibility Study

The feasibility phase of the project may include the following:

- In consultation with the Client, identify the appropriate PQS for the site with reference to the range and level of the sports to be played.
- Undertake a topographic (levels) survey of the site to establish gradients and surface level uniformity to assist with the design of earthworks and drainage.
- (Optional) undertake a geophysical survey (e.g. Electro-Magnetic Inductance Scans) to assist in establishing soil variability beneath the site and to target detailed investigations.
- Determine hydrological characteristics for the catchment including the standard-period average annual rainfall (to inform future drainage design), proximity to watercourses, potential for runoff and whether the site lies within an indicative flood plain or groundwater source protection zone. This information can be used to establish whether there is scope to undertake site remodelling works without affecting the volume or dynamics of a flood plain, and whether the construction of a deep-bored soakaway for the discharge of surface water is likely to be permitted should a more convenient method of outfall not be available.
- Determine the likely underlying geology from geological maps and/or soil survey records.
- Identify site factors that may require further surveys or investigative work (e.g. site history, previous use, tree protection, ecology, archaeology, conservation Site of Special Scientific Interest (SSSI), utility services, contaminated land and land drainage consent).
- Conduct a physical site survey to confirm the following:
  - Site location and access including any restrictions to construction traffic and contact details for site access arrangements.
  - Current land use.
  - Existing site layout including the orientation and dimensions of pitches to ascertain whether they comply with Sport England recommendations.
  - Excavation of test pits to characterise the underlying soil profile in terms of soil type, nutrient status, salinity, organic matter content, compactive state, rooting depth, depth to shallow rock and drainage status (including depth to groundwater if encountered). This should also include additional pertinent information such as stone content, suitability of the underlying material for site remodelling and the presence of material that could potentially be contaminated.
  - Determine whether there is evidence of the presence of existing drainage infrastructure and, if so, scope for utilising this within the proposed remediation works.
  - Conduct an agronomic and PQS assessment to include grass height, ground cover, presence of weeds, thatch depth, rate of water infiltration through the surface, surface evenness, site gradient, hardness and pH.

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- Assess irrigation requirements (if any).
- Assess floodlighting requirements (if any).
- Establish the current and proposed level of site usage.
- Establish whether planning consent is required or whether certain planning conditions need to be discharged.
- Establish whether a Flood Risk Assessment is required.
- Summarise of the principal factors affecting the condition of the natural turf sports facility.
- Propose development options and cost.
- Propose an appropriate maintenance programme with budget costs.
- Provide an indicative work programme for the possible phasing and duration of the proposed construction works. This should also indicate when the sports facilities may be available for use.
- Summarise implications of the proposed works on future maintenance, longevity and usage.

Design

Production of detailed designs, specifications, construction drawings and bills of quantities to address the development issues identified in the feasibility study. This will ensure that the appropriate PQS can be achieved. The documentation should include the following information [17]:

- Introduction and site information.
- Site location and access.
- A summary of findings from the feasibility study.
- General scope.
- Detailed specification.
- Drawings showing details such as proposed layout, existing and proposed levels, drainage layout, cross-sections, schedule of inspection chambers including invert levels and Isopachytes.
- Indicative work programme.
- General notes.
- Confirmation or otherwise as to whether the project is notifiable under the Construction (Design and Management) Regulations 2007 and inform the Client of their responsibilities under these regulations.
- Assist in the appointment of a CDM Coordinator (if appropriate).
- Designer's assessment of residual risk.

Tender

- Recommend the Form of Contract to adopt.
- Produce tender documentation which, assuming a traditional procurement route is selected, may include:
  - Instructions for tendering
  - Preliminaries
  - Conditions of Contract
  - Site information
  - Description of the works
  - Scope of works
  - Constraints of how the contractor provides the works
  - Contractor's design elements
  - Programme
  - Specifications
  - Bill of quantities / Work Schedules
  - Design drawings
  - Requirements for Construction (Design and Management) Regulations 2007
  - Underground and overhead services
  - Form of Tender
  - The Agreement.
- Despatch tender packs.
- Attend mid and post tender interview as appropriate.
- Produce a tender analysis report with recommendations for the appointment of a suitably qualified contractor.

[17] See Model Contract Specifications that are downloadable from the Sport England website.

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Contract Administration

Manage the construction phase to ensure that the requisite PQS are achieved. This should include the following:

- Chair a pre-contract meeting to address any issues raised prior to presiding over the signing of a contract agreement.
- Produce a Project Directory.
- Organise, chair and administer regular site meetings/visits including the provision of agendas and minutes, and observe key operations to confirm compliance with the specification. These may include, but are not limited to, inspections and testing of:
  - Site remodelling / re-grading
  - Topsoil placement
  - Drainage installation
  - Materials testing (soil, sand, rootzone and gravel)
  - Seedbed preparation
  - Grass establishment.
- Initiate and maintain a Site Visit Log to keep a record of site activities as the project progresses. Information may include:
  - Project name
  - Client, Contractor, Contract Administrator and CDM Coordinator
  - Project start date
  - Date of visits
  - Plant on site
  - Weather conditions
  - Ground conditions
  - Comments and observations on progress
  - A summary of recommendations agreed during the site visit
  - Details of materials conformance testing.
- Prepare financial statements and cash flow forecasts as required.
- Assess valuations provided by the contractor and produce interim and final valuation certificates.
- Produce sectional and practical completion certificates.
- Prepare snagging list.
- Monitor the site during the defects liability period.
- Assess the site against the requisite PQS prior to project sign off.
- Project sign off.

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APPENDIX 3

Key Project Stages

	RIBA Work Stage	People involved	Key Actions	Key Outputs
PREPARATION	Stage A Appraisal / Briefing	Client Stakeholders	Identification of Client's requirements and any possible constraints on development, including funding. Preparation of studies to enable the Client to decide whether to proceed.	Inauguration of project steering group. Compilation of relevant information including: • A site plan showing extent of land, ownership, legal agreements, covenants, way-leaves, rights of way, existing buildings, mains services, pitch layouts, local knowledge of ground conditions and any other site factors. • Maintenance arrangements, detailing who will be responsible for pitch maintenance, and the annual budget required. • Layout details of existing and proposed pitches and associated sports. • Existing and proposed programme of use including age and sex of players. • Changing room provision. • Car park requirements. • Access arrangements for spectators/players with disabilities. • Expected level of user performance (e.g. local league or county standard) and relevant Performance Quality Standards (PQS). • Project programme including anticipated commencement and completion of works, and when the pitch(es) will be ready for play. • Arrangements for using alternative facilities during the construction phase. • The outcome of initial consultation with the Local Planning Authority to gauge likelihood of obtaining planning permission. • The outcome of initial consultation with The Environment Agency or other statutory body to gauge likelihood of discharging pitch drainage into a watercourse or existing piped infrastructure. • Possible funding sources.
	Stage B Business justification	Project Steering Group	Confirmation of key requirements. Identification of potential Pitch Consultants. Assessment of project viability.	Obtain competitive quotations from competent consultants (see Appendix 1) to carry out the required consultancy services (see Appendix 2): • A baseline PQS assessment. • A detailed site investigation in order to characterise the underlying soil profile. • Determination of a range of appropriate development options for the pitch(es) in consultation with the Client. • Derivation of indicative remediation/construction costs for budgetary purposes and costed options where applicable including recommended maintenance operations. • An indicative work programme in order that the Client has a clear picture of the duration of the proposed construction works and when the pitch(es) may be available for use. The following is optional, but desirable: • A detailed topographical (levels) survey of the site to establish gradients and surface level uniformity to assist with the design of earthworks and drainage. • A geophysical survey (Electro-Magnetic Inductance Scan) to assist in establishing soil variability beneath the site and to target detailed investigations. Assessment of project viability based on findings from the feasibility study.

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Key Project Stages

	RIBA Work Stage	People involved	Key Actions	Key Outputs
DESIGN	Stages C, D & E Outline proposals Scheme design and planning Detailed design	Project Steering Group Pitch Consultant	Establishment of procurement strategy and form of contract to be entered into between the parties. Preparation of designs or Employer's Requirements – as appropriate. Application for full development control approval.	For traditional contract: • Production of detailed designs, specifications, construction drawings and bills of quantities for addressing the development issues identified in the feasibility study. For design and construct contract: • Production of Employer's Requirements document to include information on: o Scope of Works (Provision of design development and working drawings, tender and detailed specifications, calculations, method statements, samples and mock ups for testing, testing of materials and assemblies, operating and maintenance manuals, protection of works and a turf maintenance manual). o Detailed Scope of Works (Details on requirements such as trimming the formation surface, profile construction materials, land drainage system, under soil heating system, irrigation system, pitch reinforcement system, grass sward establishment (seeding or turfing), initial agronomic maintenance and requirements for goal posts and sockets). o Design Principles. o Design responsibility (Contractor and Consultant). o Statutory Approvals. o Drawings (requirements). o Tender Submissions (General systems and materials specification, outline methods statement, drawings, outline programme of works, risk assessment, health, safety and welfare). o Post Tender Submissions (Detailed specifications, detailed programme of works, samples and analyses of materials, supporting calculations, quality control procedures and detailed method statements). o Construction Submissions (Construction materials, operating and maintenance manuals, record information and drawings). o Performance Quality Standards. o Level and Pattern of Usage. o Design Life.
PRE-CONSTRUCTION	Stages F, G & H Detailed design information Tender documentation Tender process	Project Steering Group Pitch Consultant Potential Contractors	Final agreement on design, specification, construction and cost. Statutory approvals. Preparation of tender documentation. Identification of potential Contractors. Receipt and appraisal of Tender Bids. Recommendations made to Project Steering Group to allow appointment to be made.	• Production of contact documentation. • Preparation of tender packs. • Hold pre-tender briefing for potential Contractors to ensure that they have a good understanding of the project. • Obtain and appraise tenders. • Select Contractor.

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Key Project Stages

	RIBA Work Stage	People involved	Key Actions	Key Outputs
CONSTRUCTION	Stages J & K Project planning Construction through to Practical Completion	Project Steering Group Pitch Consultant Contractors Sub-Contractors	Appointment of Contractor. Site hand over to Contractor. The Consultant administers the contract up to Practical Completion. Site handed back to Client.	• Appointment of Contractor. • Site hand over to Contractor for mobilisation. • Production of construction programme by Contractor. • Construction monitoring by Consultant including preparation of interim payment certificates and compilation of the final account. • Regular site inspections to ensure that the specification is adhered to. • Site handed back to Client.
USE	Stage L Completion On going maintenance	Pitch Consultant Contractors Sub-Contractors Project Steering Group	Defects liability period commences. Final inspections. Project sign-off. Final account is settled. Maintenance budget.	• Site inspections by the Consultant during the defects liability period. • Defects made good by the Contractor. • Testing against Performance Quality Standards. • Project sign-off. • Aftercare and ongoing maintenance programme. • Periodic testing against PQS.

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APPENDIX 4

Performance Quality Standards

Objective testing to establish the PQS of turf facilities forms an essential part of the development and maintenance of natural turf playing surfaces. These standards should be included in specifications for developing, improving and maintaining natural turf for sports facilities, as appropriate, to provide a consistent measure to confirm compliance with the specification.

Many of these test procedures are described in BS7370 Part 3 and in the STRI test procedures for the assessment of pitch hardness. The PQS information contained within this table constitutes selected key minimum criteria. For more detail, please refer to the relevant IOG publications.

These standards should be regarded as a minimum standard for the provision of pitches for football, rugby and cricket. In some cases, these standards can be refined or supplemented with additional requirements where it is appropriate to the site or the standards required.

For cricket there are more detailed guidelines set out in *'Recommended Guidelines for the construction, preparation and maintenance of cricket pitches and outfields at all levels of the game'*. This is available for download from the ECB website at www.ecb.co.uk .

Element [18]	**Limits adopted by** Football Association	**Limits adopted by** Rugby Union / Rugby League	**Limits adopted by** Cricket			**Method of Test**
			Square	Pitch	Outfield	
Grass height (mm)	30-60 GS 20-70 NGS	25-65 GS 25-75 NGS	8-14 GS 16-25 NGS	6-7 GS	16-25 GS 18-38 NGS	BS 7370 : P3 A3
Ground cover (%)	>75	>70	>80	50-70	>80	BS 7370 : P3 A6
Broad-leaved weeds (%)	<10	<10	Nil	Nil	<3	BS 7370 : P3 A6
Thatch depth (mm)	<15	<15	<2	Nil	<15	BS 7370 : P3 A7
Water infiltration rate	5 (mm/h)	>2 (mm/h)	N/A	N/A	2 (mm/d)	BS 7370 : P3 A8
Evenness - 2 m straight edge (mm)	<25	<25	<10	<10	<20	BS 7370 : P3 A4
pH value	5.8-7.5	5.8-7.5	5.5-7.0	5.5-7.0	5.8-7.5	ISO 10390
Slope [19]						BS 7370 : P3 A5
Direction of play (%)	<1.00 - 1.25	<1.00 - 1.25	<1.11	<1.11	<1.67	
Across play (%)	<1.25 - 2.00	<1.25 - 2.00	1.25 - 1.67	<1.67	<1.67	
Hardness (gravities)	35-200	40-180	N/A	>200	30-200	STRI method of test using a 0.5 kg Clegg Impact Hammer from a drop height of 0.55 m
Key: GS = Growing season NGS = Non-growing season						

[18] The PQS information contained within this table constitutes selected key minimum criteria. For more detail, please refer to the relevant IOG publications.

[19] These values are expressed as a minimum that will avoid the slope having an adverse effect on play, but should be regarded as the preferred values in terms of surface drainage. However in some locations with heavy annual rainfall, these figures may need to be exceeded.

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APPENDIX 5

Maintenance resource check list

When considering the viability of developing a new natural turf sports facility, or improving existing facilities, the provision of sufficient maintenance resource is crucial to the success of the project.

The maintenance operations required, and the timings of these activities, will vary depending on the range of sports supported and site specific factors (e.g. construction type, usage, level of play and weather conditions). See the '*Summary Pitch Maintenance Programmes*' in Sections 4.0, 5.0 and 6.0 for specific sports contained within this guidance note.

The following check list is not exhaustive, but is intended to provide stakeholders of a potential natural turf sports development with a list of resources that may be required in order to optimise the quality of the facility and the longevity of the capital investment.

People and skills	When recruiting grounds staff (either voluntary or paid) responsible for the agronomic maintenance of the facility, consider if applicants: • Are practical and fit • Have suitable experience, or whether there is a need to attend appropriate Institute of Groundsmanship courses • Have at least 3-4 years experience at 2 or more grounds (for a Head Groundsman) • Lack experience or knowledge, and will require provision for commissioning the services of a Sports Turf Agronomist to carry out routine visits and produce agronomic recommendations.
Premises	Facilities required and available should include: • Secure machinery maintenance and storage area • Appropriate storage for consumables (e.g. sand, fertilizer and agro-chemicals) • Fuel storage • Machinery wash down area • Storage area for disposal of grass clippings and composting (away from water courses) • Welfare facilities for staff.
Machinery and tools	Basic maintenance equipment should include: • Mower • Fertiliser distributor • Line marking equipment • Selection of hand tools such as strimmer, spade, shovel, devotting fork, brushes, switches, rakes and a wheel barrow • Measuring tapes, ropes, strings, measuring jugs / cylinders, buckets and pegs. Access to the more specialised maintenance equipment, or provision to use specialist contractors, particularly for end of season renovations should include: • Scarifier • Topdressing distributor • Overseeding drill • Sprayer • Vertidrainer • Hollow and solid tining equipment • Linear decompactor • Chain harrows • Drag mats • Irrigator.

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APPENDIX 6

Playing areas

Ensure that consideration is given to the essential support facilities such as:

- Changing and social facilities
- Access and car parking
- Secure storage for maintenance machinery and sports equipment
- Storage for pesticides.

See the following separate Design Guidance Note downloads available from the Sport England website:

- *'Pavilion and Clubhouses'*
- *'Car Park and Landscape Design'*
- *'Compartive Sizes of Sports Pitches and Courts'*.

The Football Association publish their own PQS.

See Appendix 4.

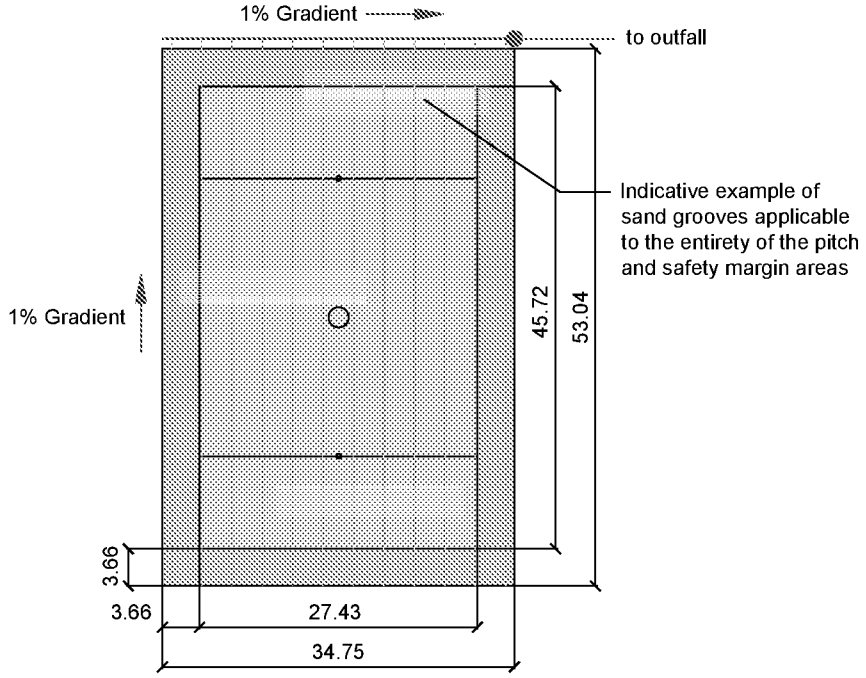
See also their publication 'Football Facilities in Schools' for recommended goal posts and pitch sizes.

The following pitch layouts are included:

- Mini soccer
- Youth football
- Senior football
  - with sand grooves
  - with mole drains
  - with slit drains
- Rugby Union
- Rugby League
- Softball
- Baseball
- Cricket
  - Standard pitch layout
  - Combined cricket and winter games pitches
  - Pitch markings.

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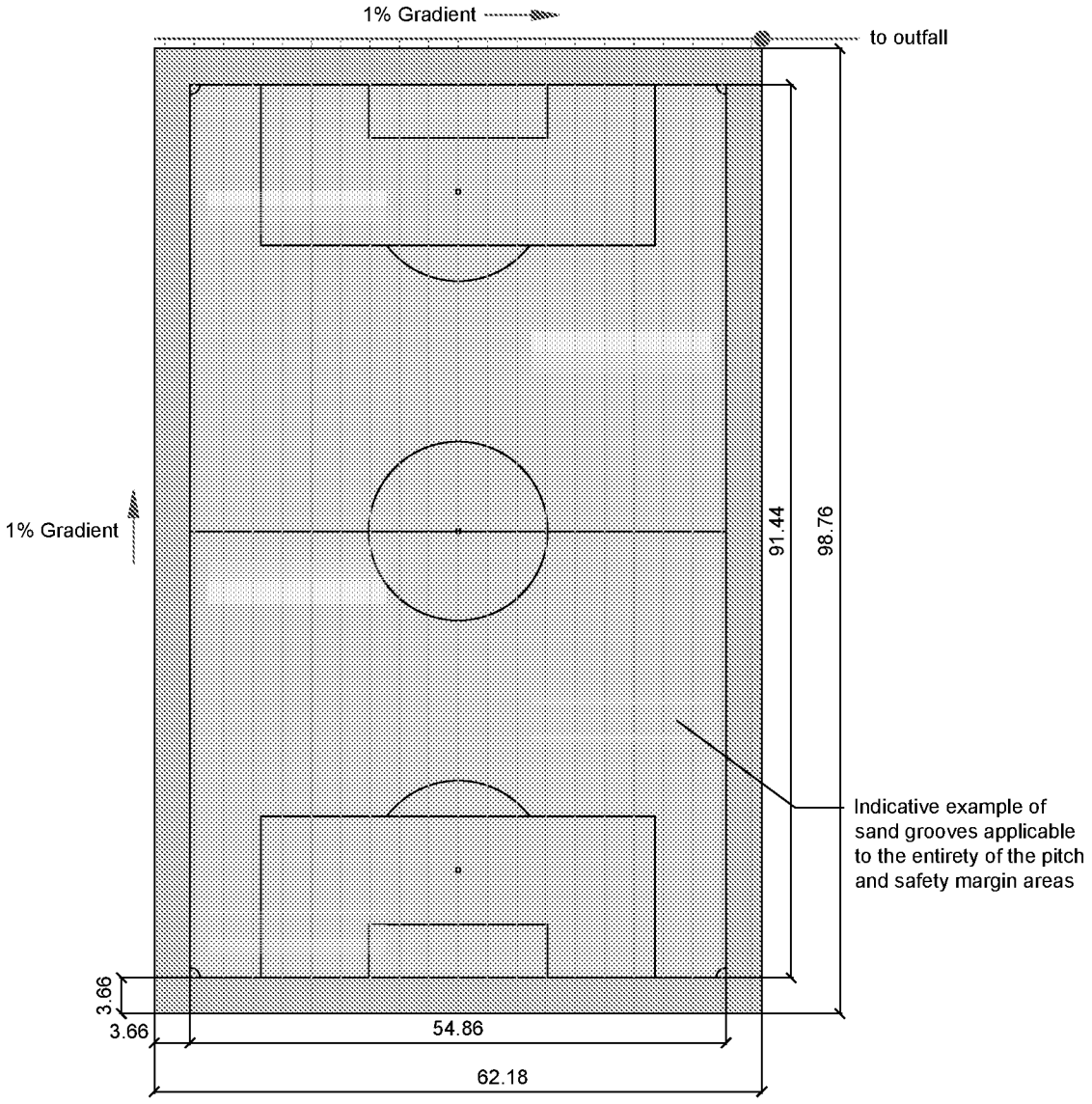


KEY

- 80 mm Ø corrugated perforated laterals @ 3 m intervals
- 160 mm Ø corrugated perforated collector
- 150 mm Ø non-perforated twin wall smooth pipe
- Indicative sand grooves @ 0.26 m intervals
- Inspection chamber
- Pitch area
- Safety margin 3.66 m wide

Playing area for Mini Soccer U8 - U7 (45.72 m x 27.43 m) - standard layout with sand grooves

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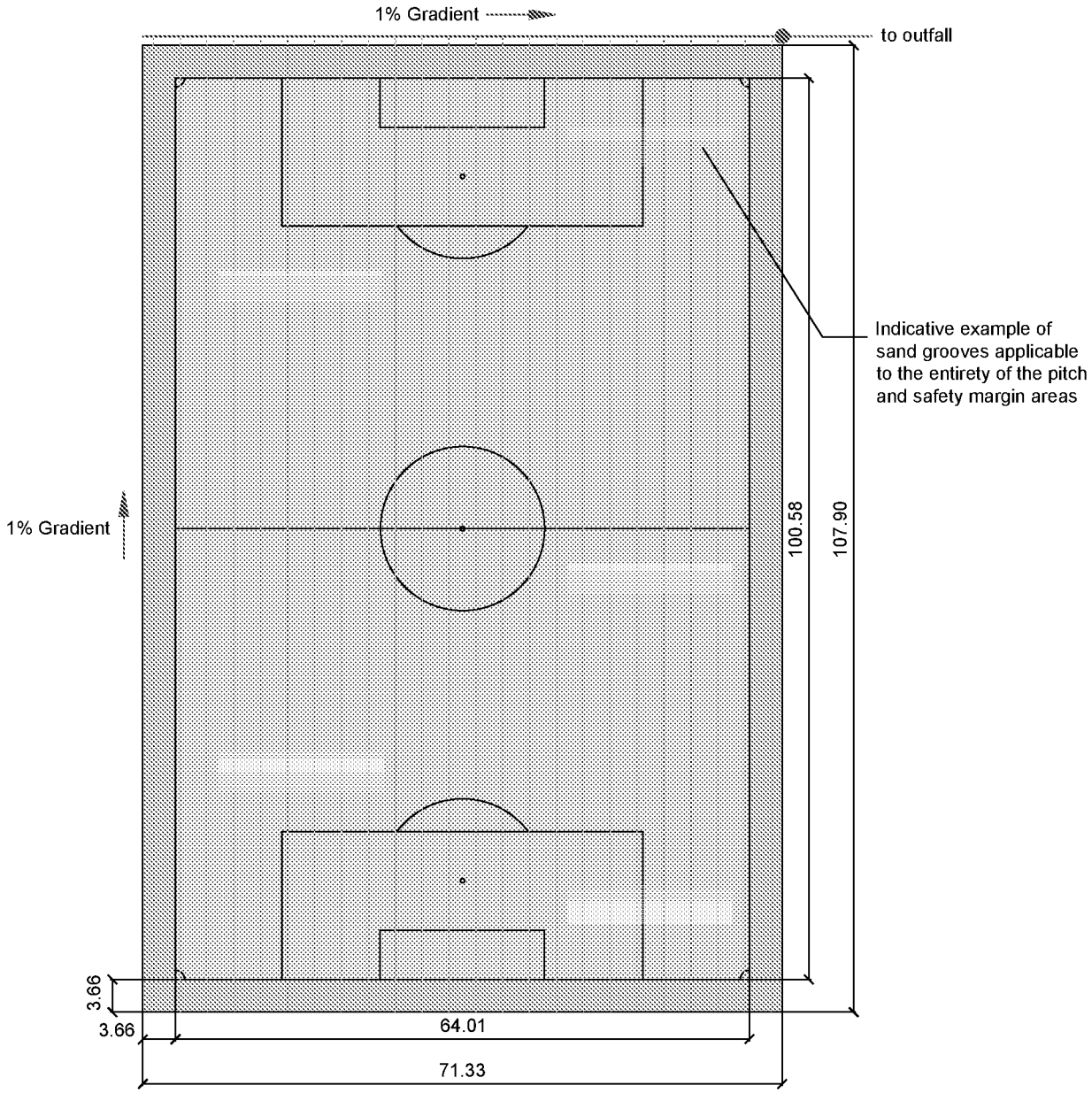
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- Inspection chamber
- Pitch area
- Safety margin 3.66 m wide

Playing area for Youth U15 - U16 Football (91.44 x 54.86 m) - standard layout with sand grooves

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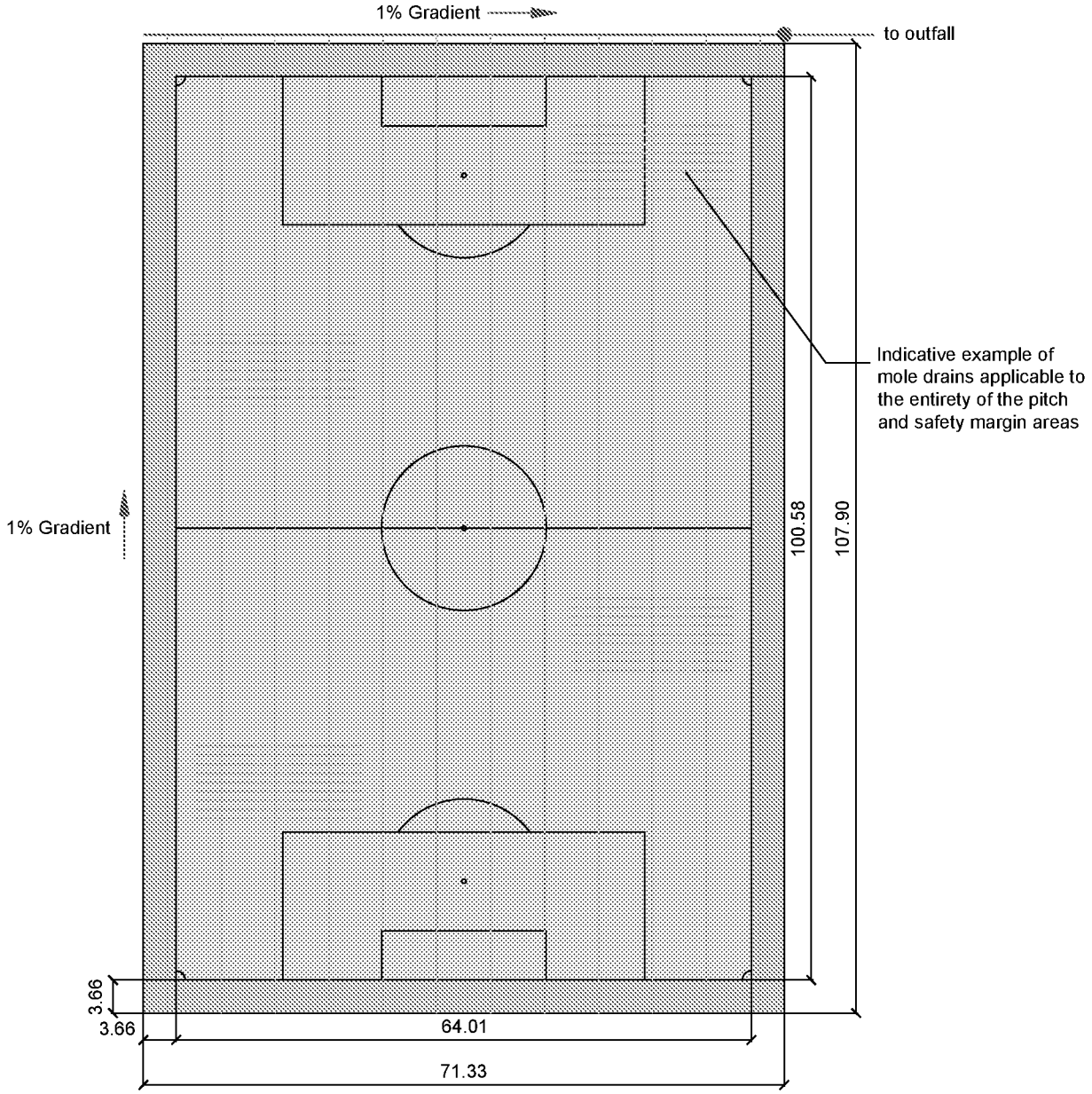
KEY

- 80 mm Ø corrugated perforated laterals @ 3 m intervals
- 160 mm Ø corrugated perforated collector
- 150 mm Ø non-perforated twin wall smooth pipe
- Indicative sand grooves @ 0.26 m intervals
- Inspection chamber
- Pitch area
- Safety margin 3.66 m wide

Playing area for Senior Football (100.58 x 54.01 m) - standard layout with sand grooves

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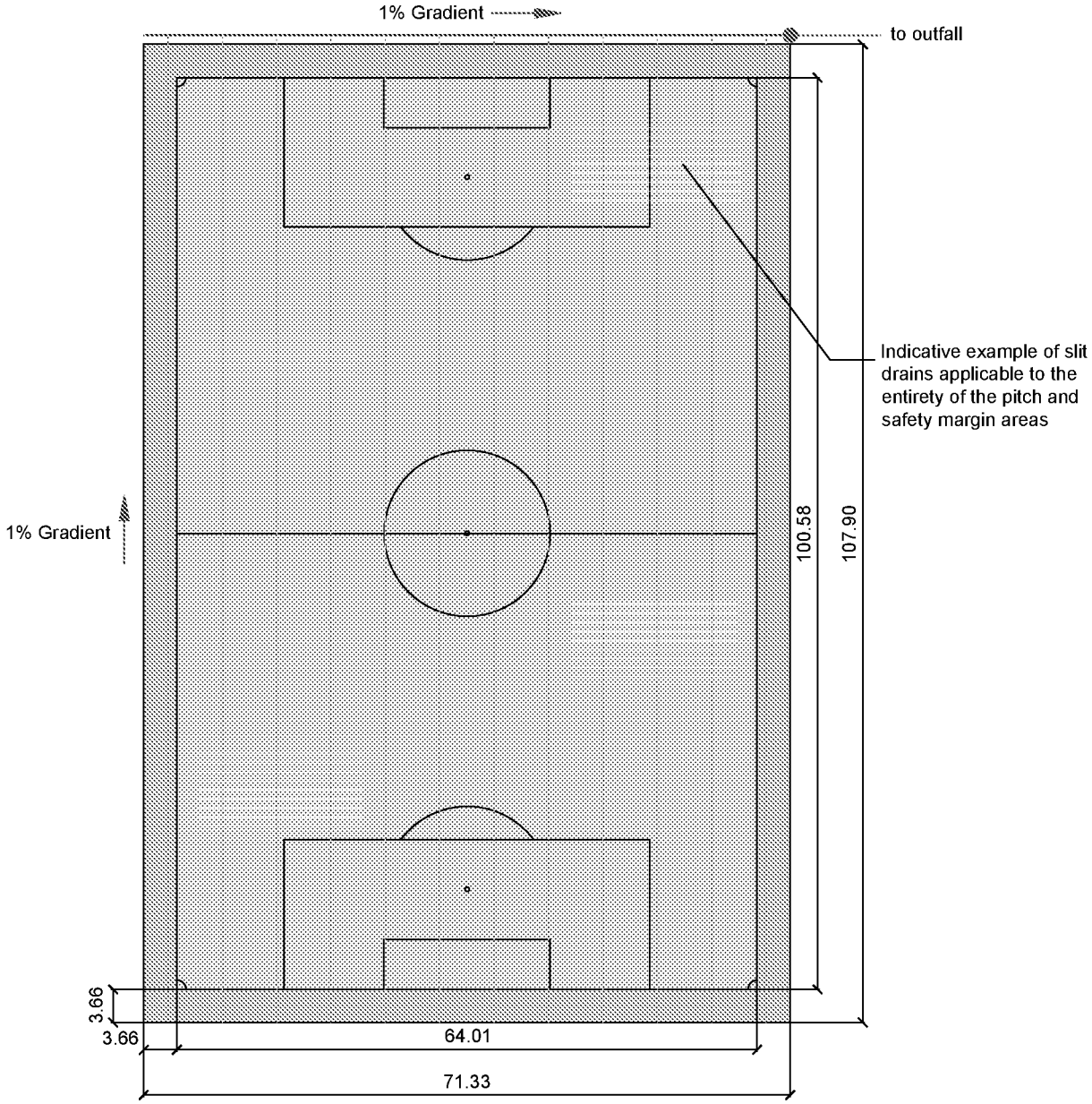


KEY

- 80 mm Ø corrugated perforated laterals @ 6 m intervals
- 160 mm Ø corrugated perforated collector
- 150 mm Ø non-perforated twin wall smooth pipe
- Indicative mole drains @ 1 m intervals
- Inspection chamber
- Pitch area
- Safety margin 3.66 m wide

Playing area for Senior football (100.58 x 64.01 m) - standard layout with mole drains

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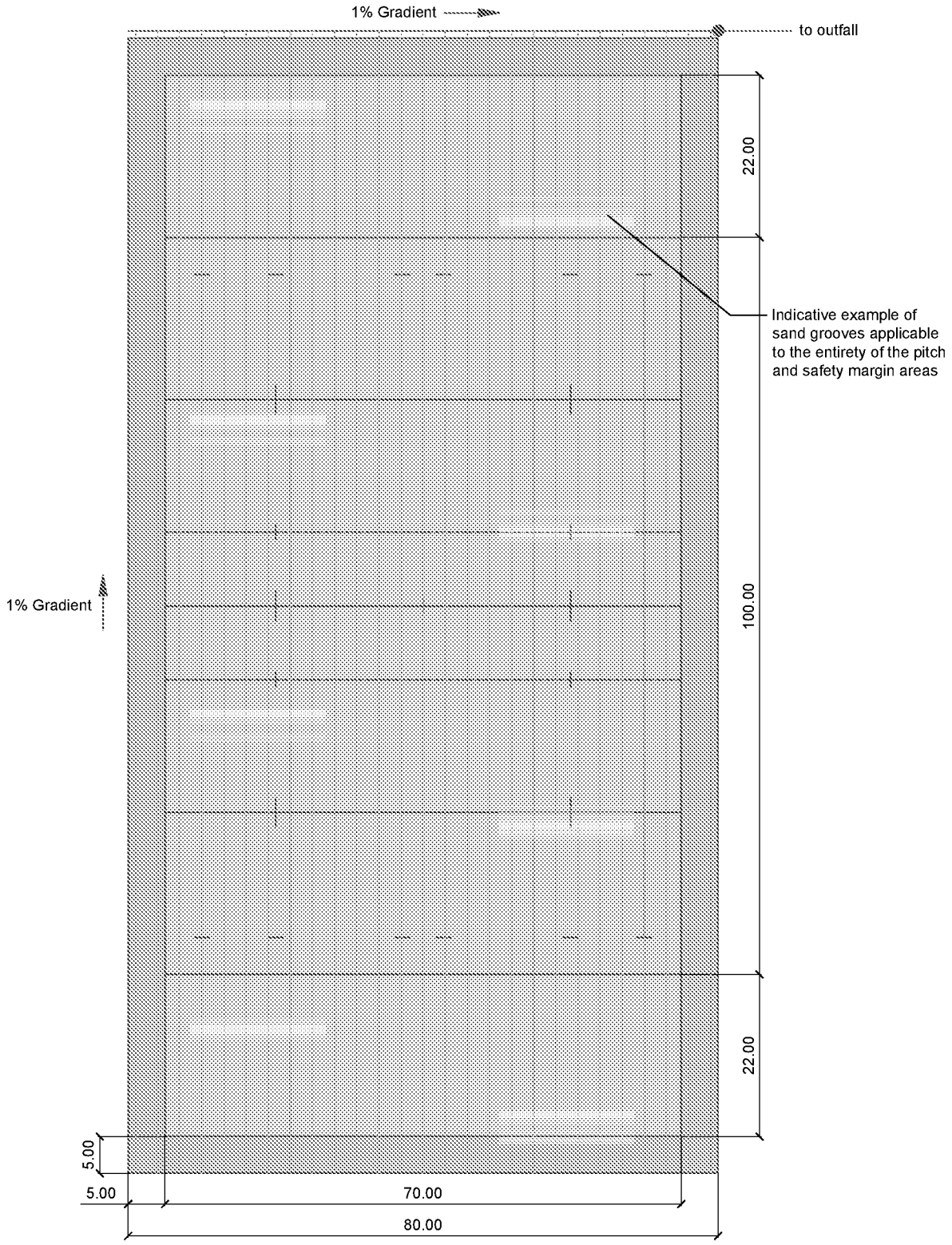
KEY

- 80 mm Ø corrugated perforated laterals @ 6 m intervals
- 160 mm Ø corrugated perforated collector
- 150 mm Ø non-perforated twin wall smooth pipe
- Indicative slit drains @ 1 m intervals
- Inspection chamber
- Pitch area
- Safety margin 3.66 m wide

Playing area for Senior / Youth U17 - U18 Football (100.58 x 64.01 m) - standard layout with slit drains

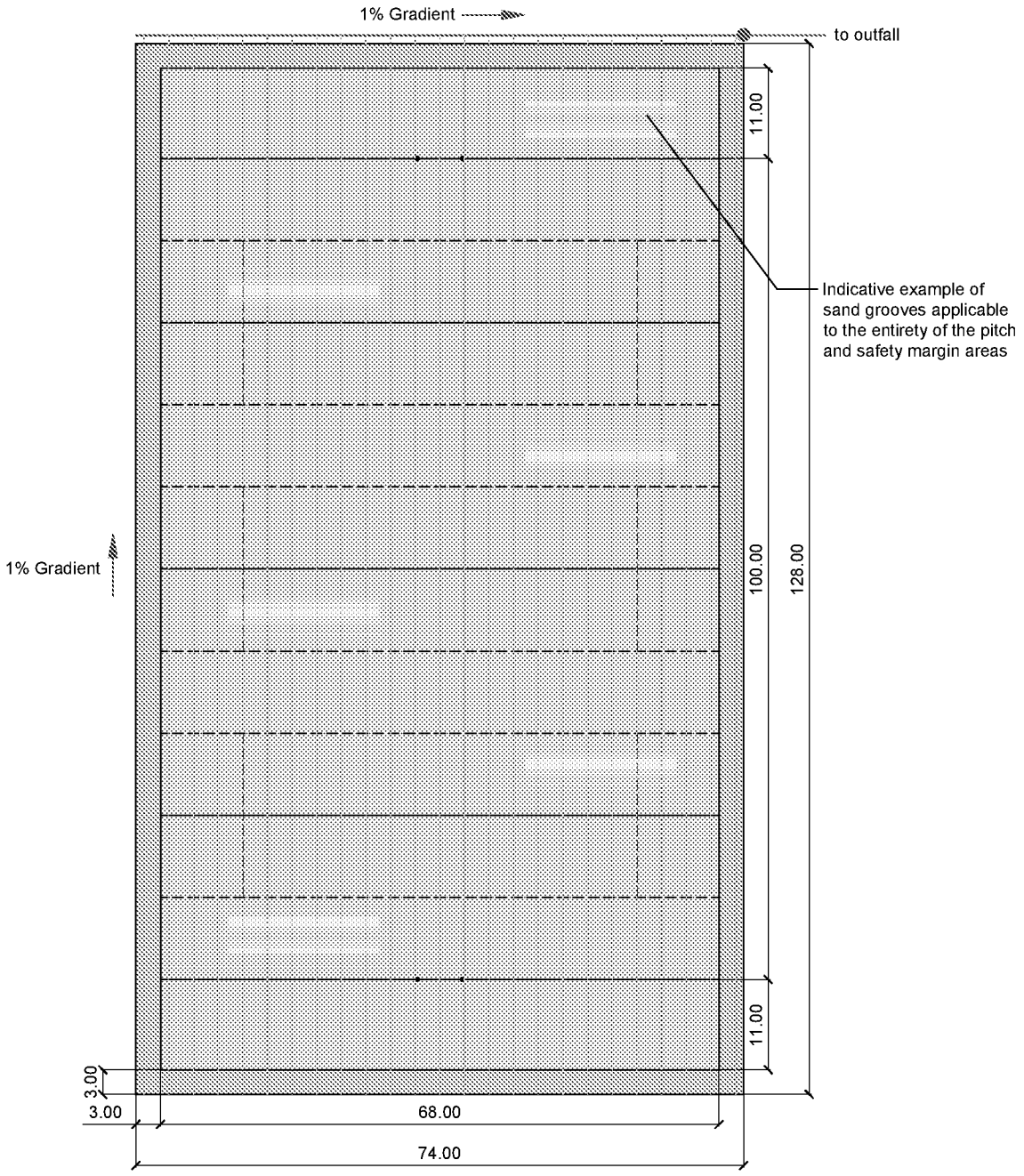
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Playing area for Senior Rugby Union (100.00 m x 70.00 m) - standard layout with sand grooves

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KEY

- 80 mm Ø corrugated perforated laterals @ 3 m intervals
- 160 mm Ø corrugated perforated collector
- 150 mm Ø non-perforated twin wall smooth pipe
- Indicative sand grooves @ 0.26 m intervals
- Inspection chamber
- Pitch area
- Safety margin 3.00 m wide

Playing area for Senior Rugby League (100.00 m x 68.00 m) - standard layout with sand grooves

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Levels of Play

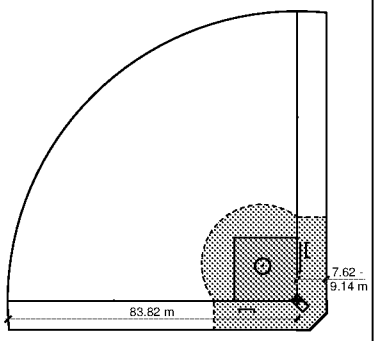
Slowpitch dimensions (Adult)

Mixed	Bases 19.81 m (65') Pitching 15.24 m (50') Home run 83.82 m (275')

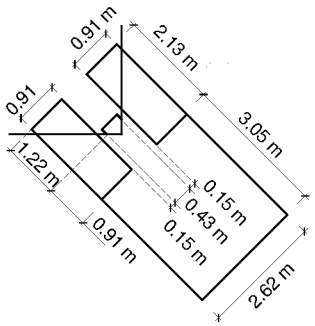
Slowpitch dimensions (Youth)

Over 14	Bases 19.81 m (65') Pitching 15.24 m (50')
Under 14	Bases 19.81 m (65') Pitching 14.02 m (46')
Under 12	Bases 18.29 m (60') Pitching 12.19 m (40')
Under 10	Bases 16.76 m (55') Pitching 10.67 m (35')

Playing field dimensions (Adult)



Home Plate and Catcher's Box Detail



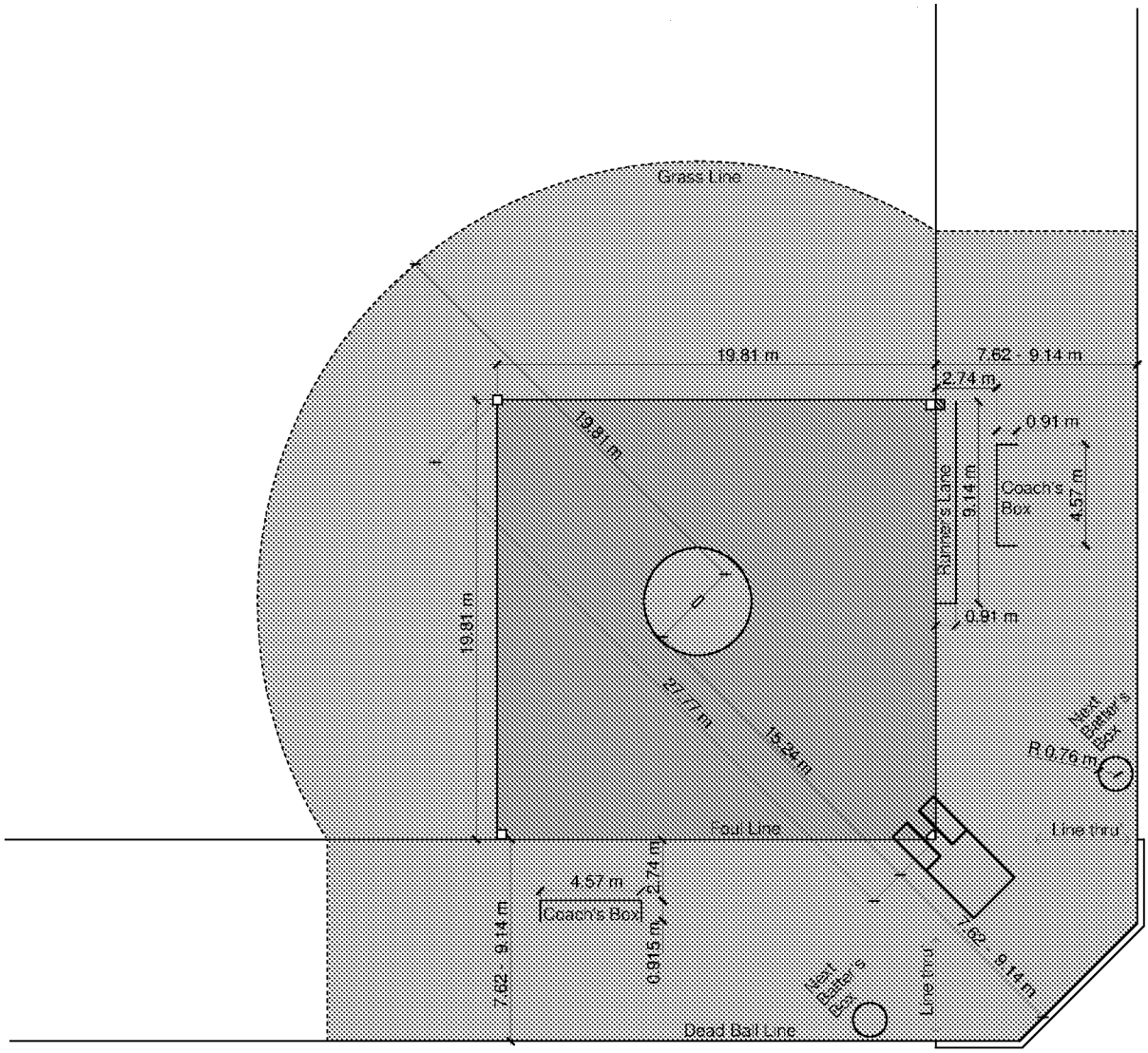


Diagram indicated is for Softball

ADULT SLOWPITCH

Note: All data based on BaseballSoftballUK / British Softball Federation guidelines

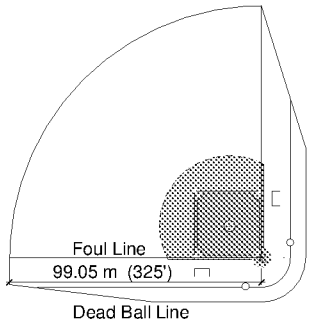
Playing area for Softball

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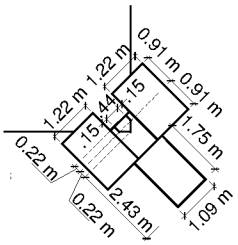
Field Dimensions

Adult	Diamond Size 27.43 m (90') Pitching 18.44 m (60'6") Home Run: ◦ Left and right field min 99.05 m (325') ◦ Centre field min 121.92 m (400')
Under 16	Diamond Size 27.43 m (90') Pitching 18.44 m (60'6") Home Run 76.20 m (250')
Under 13	Diamond Size 21.34 m (70') Pitching 14.02 m (46') Home Run 60.96 m (200')
Under 10 and PlayBall!	Diamond Size 18.29 m (60') Pitching 14.02 m (46') Home Run 60.96 m (200')

Playing field dimensions



Home Plate and Catcher's Box Detail



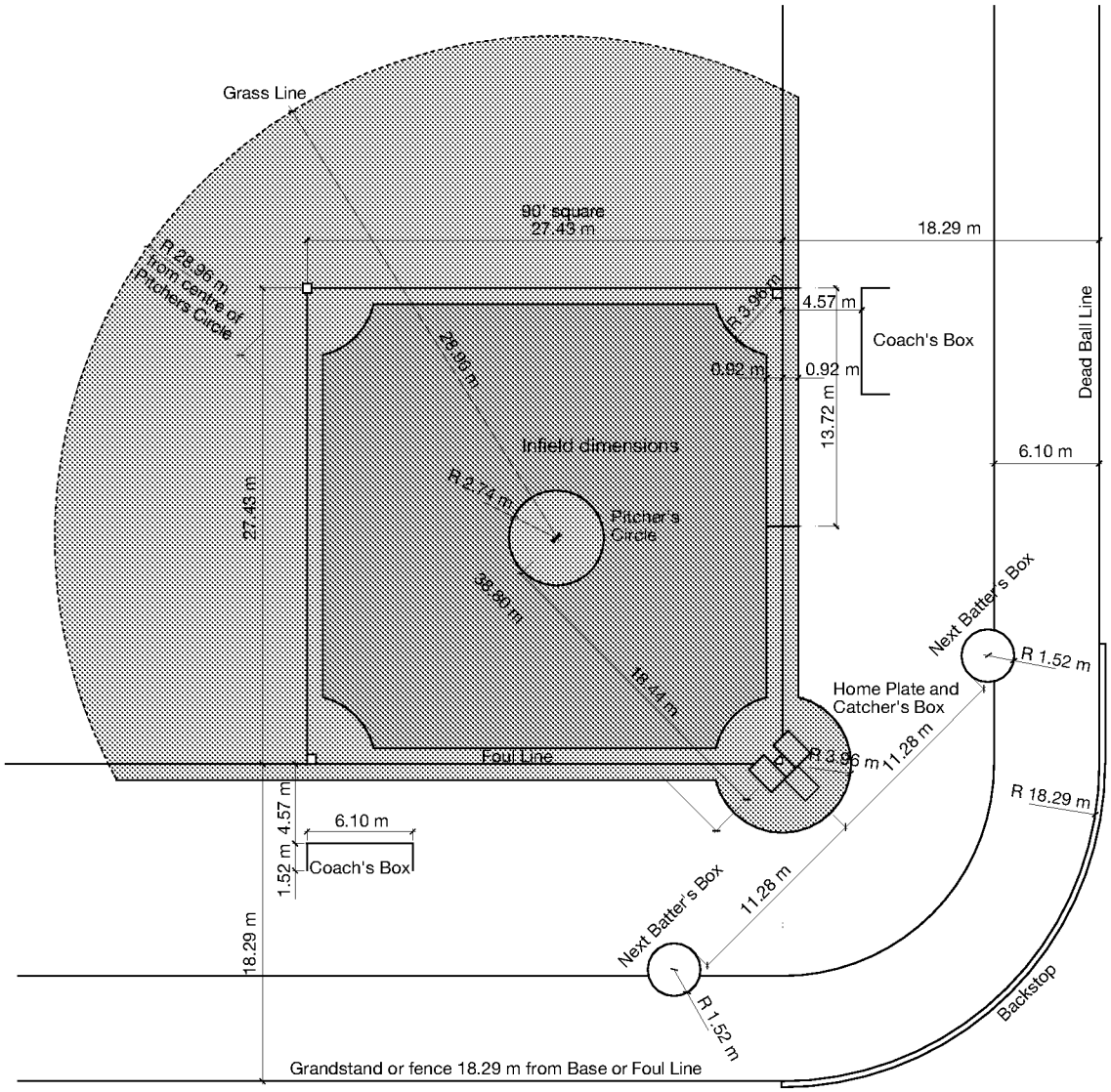


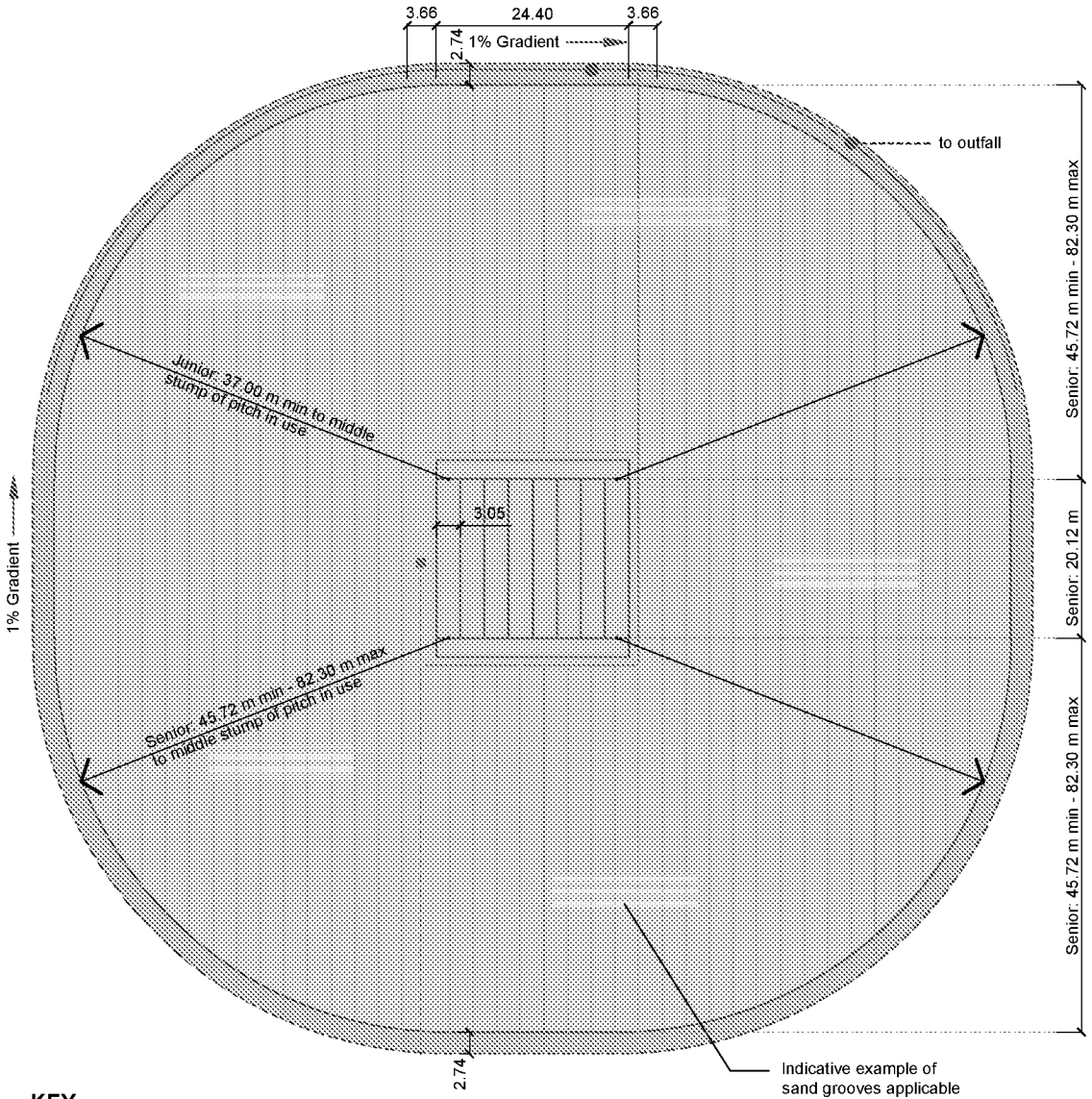
Diagram indicated is for Baseball

ADULT PITCH

Note: All data based on BaseballSoftballUK / The British Baseball Federation guidelines

Playing area for Baseball

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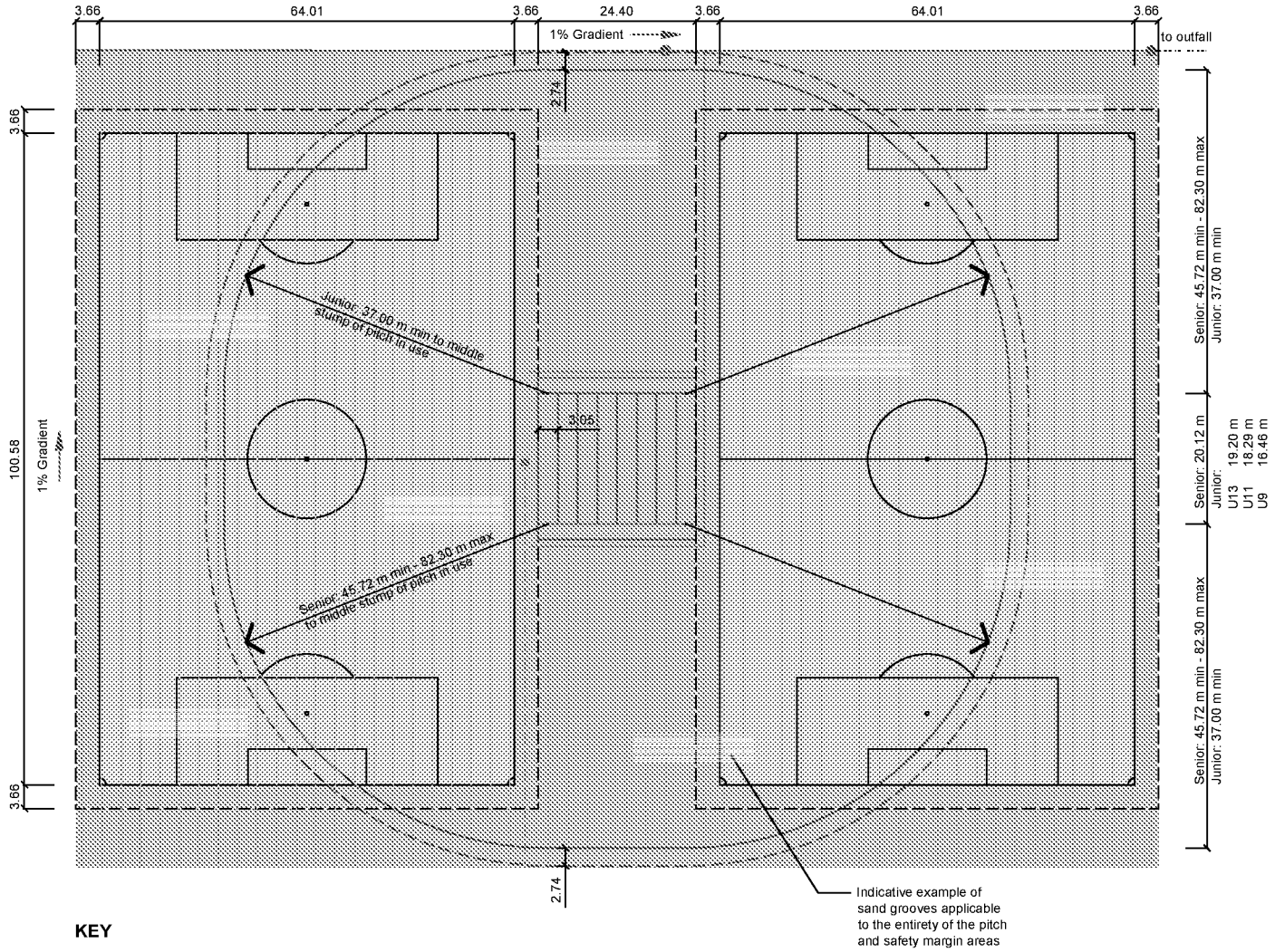


KEY

- 80 mm Ø corrugated perforated laterals @ 3 m intervals
- 100 mm Ø ring drain
- 160 mm Ø corrugated perforated collector
- 200 mm Ø non-perforated twin wall smooth pipe
- Indicative sand grooves @ 0.26 m intervals
- Irrigation pipe
- Irrigation hydrant
- Inspection chamber
- Pitch area
- Safety margin 2.74 m wide

Playing area for Senior Cricket (8 wicket pitch) - standard layout with sand grooves

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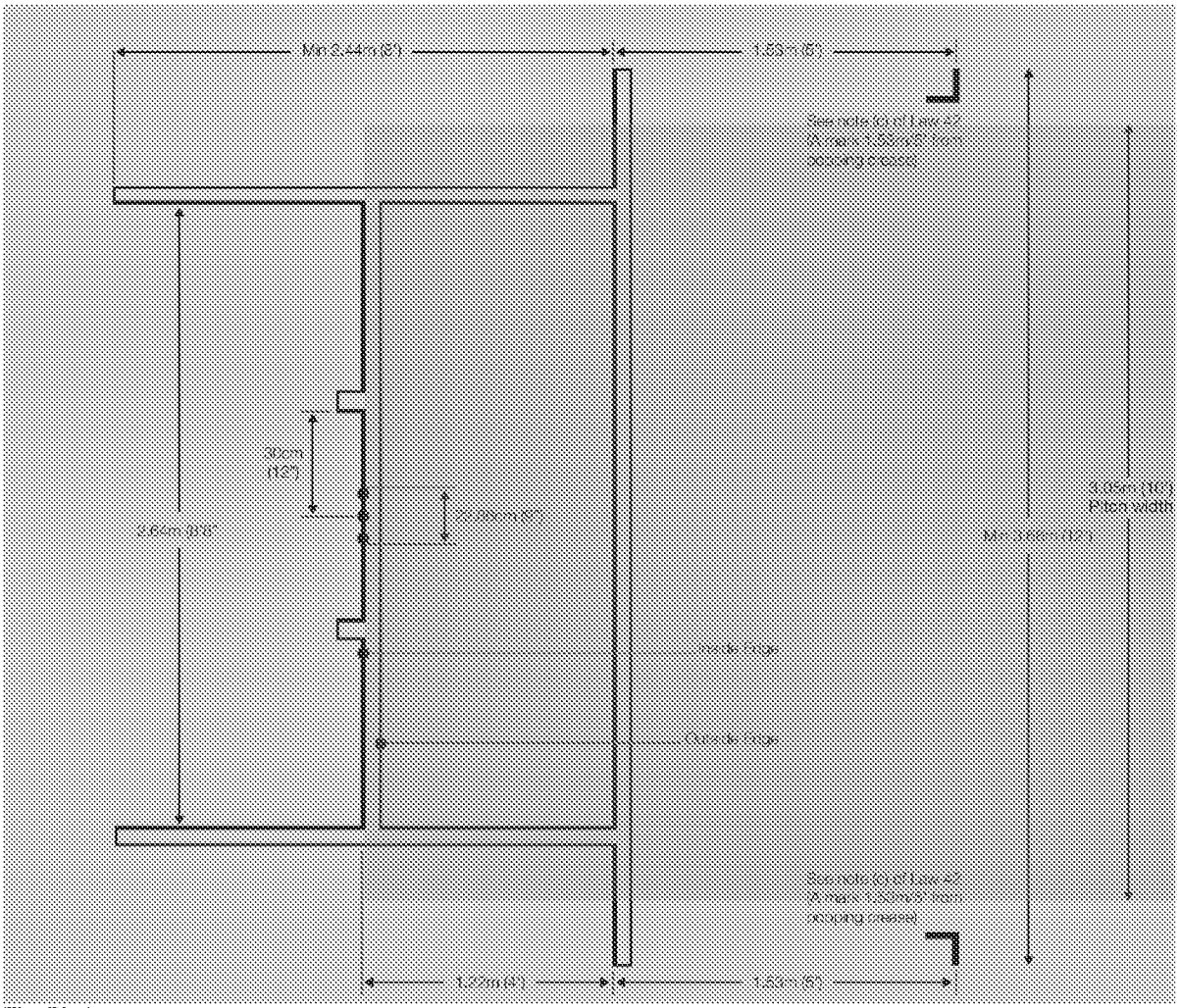


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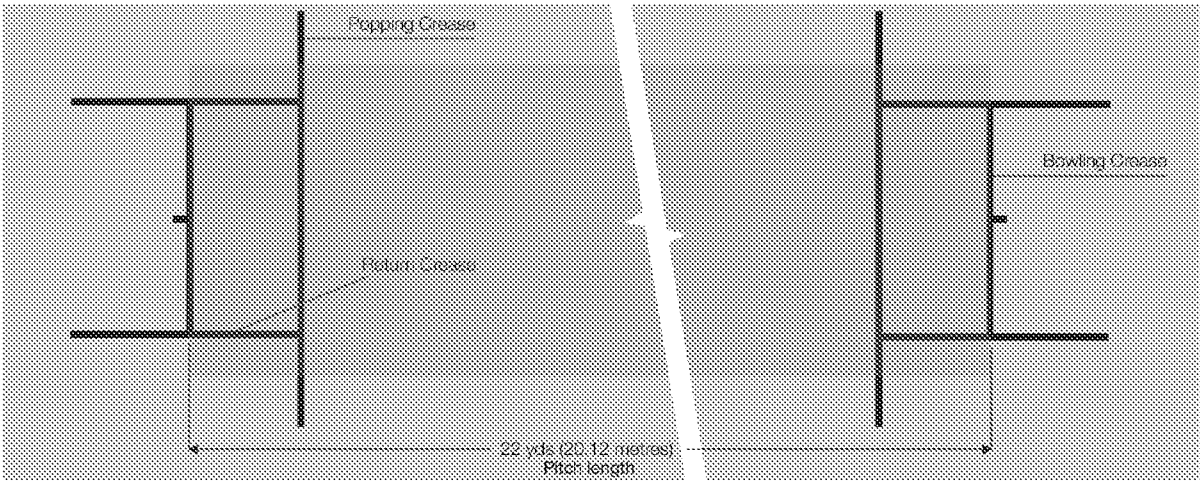
- 80 mm Ø corrugated perforated laterals @ 3 m intervals
- 100 mm Ø ring drain
- 160 mm Ø corrugated perforated collector
- 200 mm Ø non-perforated twin wall smooth pipe
- Indicative sand grooves @ 0.26 m intervals
- Irrigation pipe
- Irrigation hydrant
- Inspection chamber
- Winter sports pitch area

Playing area for Combined Cricket (8 wicket pitch) and Winter Games Pitches - standard layout with sand grooves

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The Pitch



The Bowling, Popping and Return Creases

Based on extracts from Appendix B: Laws 7 and 9 of The MCC Laws of Cricket, Pitch Marklings & ICC/ECB Playing Conditions [20]

[20] Drawing taken from ECB document '*TS4 Recommended Guidelines for the construction, preparation and maintenance of cricket pitches and outfields at all levels of the game.*'

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APPENDIX 7

Related organisations

BaseballSoftballUK

www.baseballsoftballuk.com

BaseballSoftballUK is the development agency for baseball and softball in the United Kingdom.

Bowls England

www.bowlsengland.com

Bowls England is the National Governing Body (NGB) for the sport of flat green lawn bowls in England.

Cranfield University: Centre for Sports Surface Technology

http://www.cranfield.ac.uk/sas/sst

Specialist research centre involved in sport turf research including:

- the modelling of maintenance regimes that reduce CO^2 omissions and cost of turf pitches
- Guidelines for rolling in cricket
- Sports turf aeration in cricket pitches and outfields.

England and Wales Cricket Board

http://www.ecb.co.uk/

Governing body of Cricket in England and Wales.

Fields in Trust / National Playing Fields Association

http://www.fieldsintrust.org/

Fields in Trust is the new operating name for the National Playing Fields Association, a charity that owns 471 public recreation grounds set up as a memorial to King George V and campaigns to protect and promote open spaces for sports and recreation in British cities and towns.

Institute of Grounds Maintenance (IOG)

http://www.iog.org/

Membership organisation that promotes quality surfaces and technical expertise and represents grounds men, green keepers and all others involved in landscaping, horticulture, sports turf and amenity turf.

Land Drainage Contractors Association (LDCA)

http://www.ldca.org/

An association promoting best practice for contractors undertaking drainage of sports turf, leisure and amenity areas. These include pitches at schools, colleges and universities, private sports clubs, football and rugby clubs, cricket pitches, golf courses, equestrian facilities, polo grounds and racecourses.

Lawn Tennis Association (LTA)

http://www.lta.org.uk/

Governing body for tennis in Britain

Learning through Landscapes

http://www.ltl.org.uk/

A national charity who work with schools, early years settings, organisations and individuals to improve and develop school grounds.

Playlink

http://www.playlink.org/

Playlink is a multi-faceted independent play and informal leisure consultancy working in the areas of design, planning, policy, strategy, local engagement, fundraising and organisational development.

Register of Independent Professional Turfgrass Agronomists (RIPTA)

http://www.ripta.co.uk/

The RIPTA register promotes quality standards for Independent, Professional, Turfgrass Agronomists and lists organisations that meet certain criteria. It is supplied free of charge on request to anyone with a need for such consultancy services.

Rugby Football Union

http://www.rfu.com

The governing body for the game of Rugby Union in England.

Sport and Play Construction Association (SAPCA)

http://www.sapca.org.uk/

UK trade association for the sports facility construction industry. SAPCA represents specialist constructors, manufacturers and suppliers of sports surfaces and related products and plays an important role in the promotion of high standards for sports facilities.

Sports Turf Managers Association

http://www.stma.org

A non-profit making professional association for the men and women who manage athletic fields worldwide.

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The British Baseball Federation (BBF)

http://www.britishbaseball.org

The British Baseball Federation (BBF) is baseball's national governing body. It administers, develops and promotes baseball in Britain.

The British Softball Federation (BSF)

http://www.britishsoftball.org

The British Softball Federation (BSF) is softball's national governing body. It administers, develops and promotes softball in Britain.

Play England

http://www.skillsactive.com/playwork

Play England provides advice and support to promote good practice, and works to ensure that the importance of play is recognised by policy makers, planners and the public.

The Football Association

http://www.thefa.com/

The organisation responsible for all regulatory aspects of the game of football in England.

The Sports Turf Research Institute (STRI)

http://www.stri.co.uk/

A centre for turf grass research and Agronomy and an independent consultancy in sports and amenity turf including golf, football, rugby, cricket, horse racing, bowling and tennis.

Turfgrass Growers Association

http://www.turfgrass.co.uk/

The Association is dedicated to the advancement of quality turf productions in the UK and Ireland.

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APPENDIX 8

Glossary of Natural Turf Terms

Aeration	The process of increasing the availability of air to soil and roots. Surface aeration involves the removal of thatch and debris accumulation at the base of the grass plant. Sub-surface aeration involves the creation of air-filled pathways between the surface and the soil below.
Aerator	Machinery for improving aeration including springbok rakes and scarifiers for surface aeration, and slitting, hollow tining and solid tining machines for sub-surface aeration.
Aggregate	A broad category of coarse particulate material including sand, gravel, crushed stone and recycled concrete. Due to the relatively high hydraulic conductivity value as compared to most soils, aggregates are widely used in land drainage applications.
Agronomy	The application of soil and plant sciences to land management.
Archaeology	The scientific study of past societies through artifacts, fossils, etc.
Attenuation (water)	The retention of water within the ground (and the reduction of flood water).
Blinding layer	A layer of grit which acts as a filter at the interface between coarse and fine aggregate (e.g. gravel and sand).
Bowling Crease	The bowling crease is the line through the centres of the three stumps at that end. It is 8 ft 8 in / 2.64 m in length, with the stumps in the centre.
Clay	• Soil, comprising very fine-grained particles (<0.002 mm), which behaves plastically when moist. • A soil textural class containing >35 % clay, <45 % sand and <45 % silt.
Chain harrow	An implement comprising a series of vertical tines, loosely linked together, that is towed across the surface to improve surface aeration and surface uniformity.
Cricket loam	A blend of sand, silt and clay tailored for use in the construction and maintenance of cricket tables.
Cultivar	A variety of a plant developed from a natural species.
Cultivation	The physical manipulation of soil using soil engaging implements.
Design and construct contract	In this type of contract, the contractor is responsible for taking a concept developed by the employer (often set out in an 'Employer's Requirements' document prepared by a consultant), completing the detailed design, and then pending the employer's approval on the design, proceed with construction.
Dragbrush	A tool for brushing in top dressing on natural turf and sand filled synthetics surfaces.
Dragmat	A tool for working in sand, top dressings and fertilizers. Can be used as a hand tool or drawn behind a small tractor.
Drainage	The removal of excess water held within the soil or ponding on the surface.
Drainage layer	An alternative term for a 'raft' which is a layer of gravel or stone chippings typically constructed 300 mm beneath a sports field to provide a means of collecting excess drainage water.
Drift	Transported rock debris overlying solid bedrock.
Ecology	The branch of biology concerned with the relationship between organisms and their environment.
Environmental Management Plan	A document providing a framework for dealing with the pollution risks associated with a site and activities on that site.
Fertilizer	Nutrients that are applied to soil to make it more fertile.
Friable	A term to describe the condition of soil when it is prone to crumbling rather than to deforming plastically.

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Geology	A science that deals with the history of the earth as recorded in rocks.
Geotextile	Permeable fabric used to separate, filter, reinforce or protect soil.
Grading	The process of using cultivation to improve uniformity of surface levels.
Gradient	The slope across a playing field.
Grass	Species of vegetation used as a ground cover for aesthetic purposes or recreational use.
Gravel	Any loose rock that is larger than 2 mm in its smallest dimension and no more than 64 mm in its largest dimension.
Grit bands	Narrow grit-filled trenches, typically 30 mm wide and 250 mm deep, installed above a network of lateral drains to improve surface drainage.
Gulley	A surface drain comprising an perforated cover, set just below the surrounding land to provide a receptor for water accumulating on the surface.
Heeling	The consolidating of soil into an excavated area by a person using the heel of the foot.
Herbicide	A chemical agent that destroys plants or inhibits their growth.
Hollow tine aeration	The process of removing cores of soil, using hollow tines, to improve aeration and address soil compaction.
Hydrology	A branch of geology that studies water on the earth and in the atmosphere.
Infiltration	The movement of water through the surface of a playing field.
Irrigation	The application of water to land.
Isopachytes	A line on a map connecting points below which a particular rock stratum has the same thickness.
Loam	Soil comprising a blend of sand, silt and clay.
Lute	A tool for grading loose soils prior to seeding or turfing or for incorporating and levelling topdressings.
Marl	A loose and crumbling earthy deposit consisting mainly of calcite or dolomite.
Mottles	Spots of different colours (typically red) on the surface of a broken lump of soil which is indicative of seasonal water logging.
Outfall	A point at which water exits a drainage system (typically into a ditch or watercourse). A 'positive outfall' is where the difference in levels ensures that the drainage water is always flowing.
Over seeding	Application of additional seed to an existing sports field to address grass loss through wear.
Percolation rate	The rate at which water moves through soil.
Permeability	The readiness with which soil can be pervaded by water.
Performance Quality Standard (PQS)	The minimum acceptable performance criteria for a playing surface (e.g. drainage capacity, hardness etc.) for different levels of the game (e.g. local, regional or national).
Pesticides	A chemical used to kill pests.
Popping crease	The popping crease is in front of, and parallel to, the bowling crease and 4 ft / 1.22 m from it. The popping crease is marked to a minimum of 6 ft / 1.83 m on either side of the imaginary line joining the centres of the two middle stumps and is considered to be unlimited in length.
Pop-up irrigation	An irrigation system comprising an arrangement of sprinklers that rise above the playing surface during operation and return to a position that is flush with, or just below, the surface upon completion.
Positive outfall	An efficient means of disposal of excess drainage water emanating from a drainage scheme (typically a ditch or watercourse).

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Raft	An alternative term for a 'drainage layer' which is a layer of gravel or stone chippings typically constructed 300 mm beneath a sports field to provide a means of collecting excess drainage water.
Reinforcement	The inclusion of synthetic fibres within the rootzone to increase wear resistance and strength.
Return Crease	The return creases are at right angles to the popping crease at a distance of 4 ft 4 in / 1.32 m either side of the imaginary line joining the centres of the two middle stumps. Each return crease is marked from the popping crease to a minimum of 8 ft / 2.44 m behind it and shall be considered to be unlimited in length.
Rootzone.	• The region within the soil profile where the majority of roots are located. • A blend of sand and soil used to construct sports surfaces.
Run-off	The movement of excess water across the surface of a playing field following significant rainfall.
Safety margin	An additional area around the perimeter of a court or pitch to reduce the risk of injury to players as a result of interaction with adjacent games or site infrastructure.
Sand amelioration	The application and incorporation of sand into the surface of a sports field to improve playability.
Sand grooves	Narrow slits, approximately 150 mm deep and 20 mm wide, introduced by a machine at a spacing of 260 mm to improve surface drainage. These grooves are forced into the soil with a tine rather than being created by excavating a narrow trench, and can be filled with sand or fine grit.
SAPCA	A UK trade association for the sports facility construction industry (Sport and Play Construction Association). SAPCA represents specialist constructors, manufacturers and suppliers of sports surfaces and related products, and plays an important role in the promotion of high standards for sports facilities.
Scarification	A process of mechanical raking the turf surface in order to remove underlying thatch or moss material.
Secondary drainage	Drainage systems designed to intercept surface water and convey it to a subsurface drainage system (e.g. sand grooves, slit drains and grit bands).
Seedbed	A term referring to the state of soil following preparation for seeding (i.e. through cultivation). Typically, the tilth would be characterised by fine crumb structure.
Silt	Soil comprising fine-grained particles (0.060 mm to 0.002 mm).
Site Waste Management Plan	A document that sets out how resources will be managed and waste controlled at all stages during a construction project. In England, , a site waste management plan (SWMP) is required for all construction projects worth more than £300,000.
Slit drains	a series of narrow, commonly 50 mm wide, sand and gravel filled trenches excavated across, and into the porous backfill of, lateral drains below. Slit drains are typically 250 to 350 mm deep and installed at 0.5 to 2.0 m spacing.
Specification	An explicit set of requirements to be satisfied by a material, product, or service.
Springbok rake	A hand tool for thatch and moss removal and leaf raking.
Soakaway	An underground structure that disposes of unwanted water, most commonly storm water runoff, by dissipating it into the ground, where it merges with the local groundwater.
Soil compaction	A reduction of air-filled pore space in soil following loading, resulting in an increase in dry bulk density.
Soil profile	A cross-section through an area of land.
Soil Texture	A description of the proportion of grain and mineral particle sizes in soil.
Subsoil	The layer of soil under the topsoil.
Subsoiler	A tractor-drawn implement for alleviating compaction in the subsoil.

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Suspended water table	Sports field or golf green construction that provides maximum removal of water during heavy rain, but stores water in rootzone above a gravel raft during periods when the ground is not saturated.
Sustainable Urban Drainage Systems (SUDS)	Water management practices and facilities designed to drain surface water in a manner that will provide a more sustainable approach than what has been the conventional practice of routing run-off through a pipe to a watercourse.
Sward	Expanse of short grass.
Switch	Hand tool designed to remove dew, debris and worm casts from the surface of fine turf.
Tilth	A term referring to the state of soil following tillage (cultivation with soil-engaging implements).
Tine	A soil-engaging implement.
Thatch	The accumulation of partially decomposed organic matter at the base of a grass sward.
Top dressing	• The application of sand or rootzone to the surface. • The application of fertilizer to a growing crop (mainly in agriculture).
Topography	The practice of graphic delineation in detail, usually on maps or charts, of natural and man-made features
Topsoil	The soil horizon immediately below the grass sward (typically extending to between 100 and 300 mm below the surface).
Traditional contract	In such a contract the employer contracts with an architect, engineer or consultant to carry out the design. The architect, engineer or consultant, acting as the agent of the employer, supervises the construction of that design. The contractor enters into a contract with the employer to build that design.
Turf	A grass, root and soil system maintained for aesthetic purposes or recreational use
Turfbed	A term referring to the state of soil following preparation for turfing (i.e. through cultivation). Typically, the tilth would be characterised by fine crumb structure.
Twin wall pipe	Drainage pipe that is corrugated on the outside to provide additional strength, but smooth on the inside to reduce frictional losses during the conveyance of water.
Verti-drainer	A tined aerator typically used to alleviate soil compaction by imparting 'heave' during the operation to create cracks and fissures in the soil.
Waste Acceptance Criteria (WAC)	Criteria to be met before waste is accepted at a landfill site. There are different acceptance criteria for: • Inert waste • Non-hazardous waste • Hazardous waste.
Watercourse	Any flowing body of water including rivers, streams and brooks.
Wacker plate	A machine, comprising a vibrating plate, for compacting soil (also known as a soil plate compactor).

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SPORT ENGLAND

Alternative Languages and Formats:

This document can be provided in alternative languages, or alternative formats such as large print, Braille, tape and on disk upon request.
Call the Sport England switchboard on 08458 508 508 for more details.

Information Prepared By:

Sport England, Robin Wilson Consulting & S&P Architects

Acknowledgements:

Sport England is indebted to the individuals and organisations that have contributed to this guidance note with excellent advice, information and photographic material. In particular (in alphabetical order):

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Dr Iain James, Centre for Sports Surface Technology, Cranfield University

Dr Richard Earl, TGMS Ltd, Cranfield Innovation Centre

Institute of Groundsmanship (IOG)

Labosport UK

Maber Architects

Materials Science Consultants (MSC)

Sport and Play Construction Association (SAPCA)

Sports Turf Research Institute (STRI)

Stock Exchange

User Guide:

Before using this design guidance note for any specific projects all users should refer to the User Guide to understand when and how to use the guidance as well as understanding the limitations of use.

Click here for 'User Guide'

Click here for current 'Design and Cost Guidance'

Issue Tracker

002 – Reformatted with amendments: May 2011
001 – Initial Publications: March 2000

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Awarding funds from The National Lottery®

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Sport Facility Calculator

The Sports Facility Calculator (SFC) is a planning tool which helps to estimate the amount of demand for key community sports facilities that may be generated by a given population. The SFC is hosted on the Active Places Power website - https://www.activeplacespower.com.

The SFC results presented below are based on the following criteria:

Area of Interest:	Arun	**Population:**	3,359
Population Profile:	Arun	**Date generated:**	11/04/2022
Build Costs:	Q2 2021	**BCIS:**	June 2021
Population:	Population: Projection for 2021, based on 2011 Census data and modified by 2018-based Subnational Population Projections for Local Authorities. Adapted from data from the Office for National Statistics licensed under the Open Government Licence v.3.0. London boroughs modified by GLA 2018-based Demographic Projections - ward projections, SHLAA-based, © Greater London Authority, 2020.		

Facility Requirements:

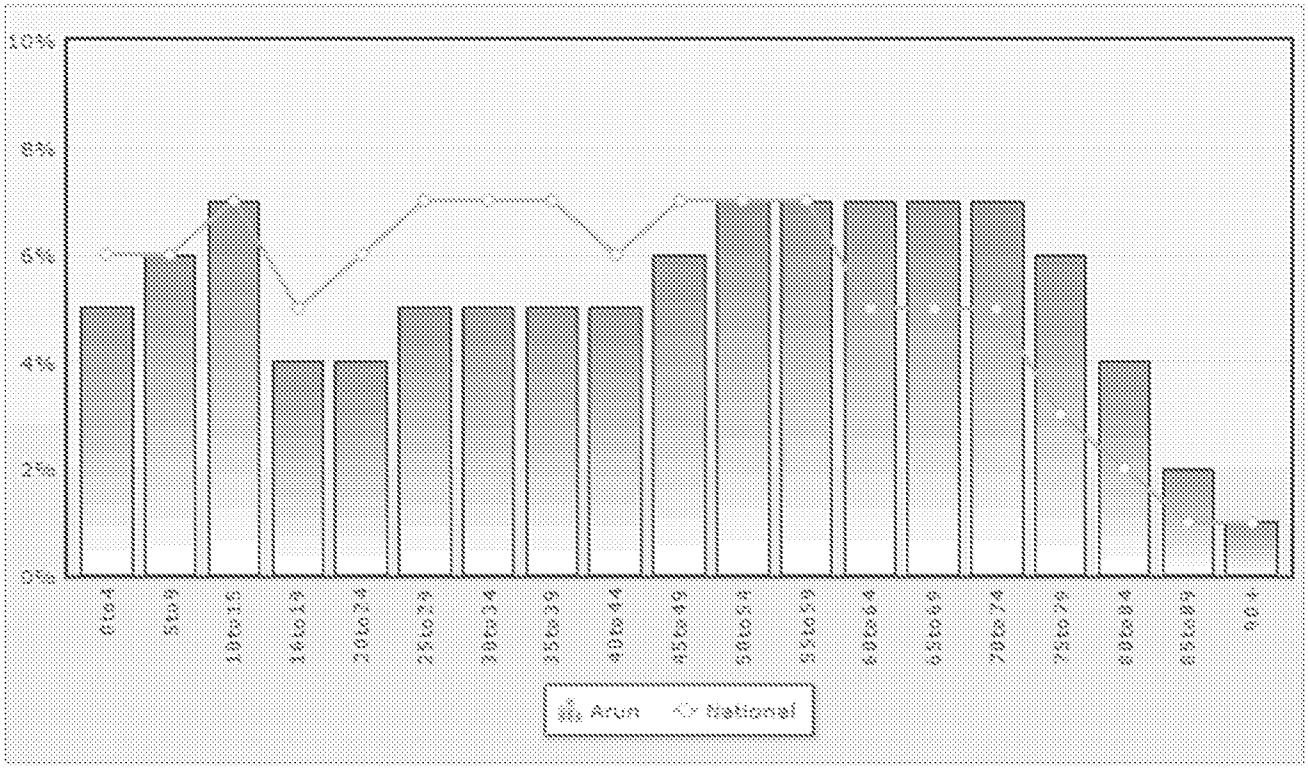
Sports Halls	
Demand adjusted by	0%
Courts	0.89
Halls	0.22
vpwpp	263
Cost	£606,466

Swimming Pools	
Demand adjusted by	0%
Square meters	34.47
Lanes	0.65
Pools	0.16
vpwpp	210
Cost	£670,810

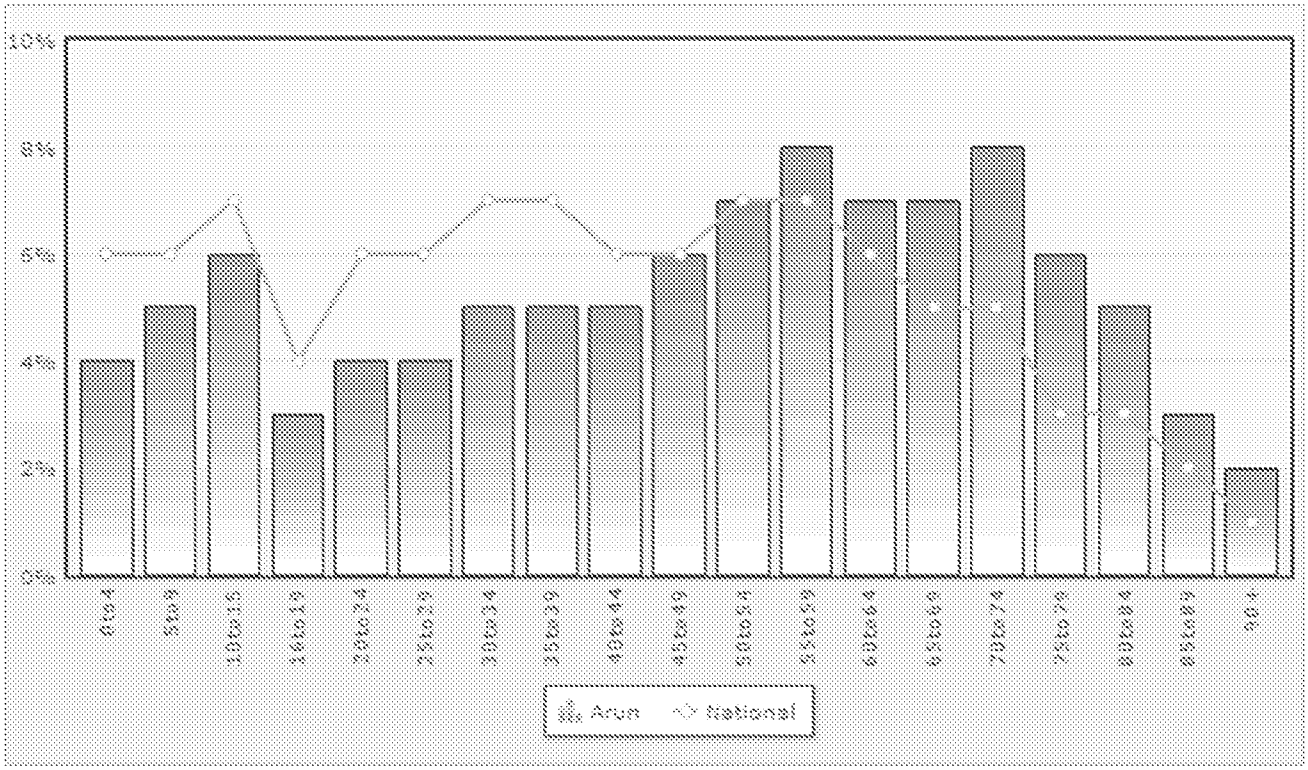
Population Profile:

AOI Age / Gender	Arun		National	
	Male	Female	Male	Female
0to4	5%	4%	6%	6%
5to9	6%	5%	6%	6%
10to15	7%	6%	7%	7%
16to19	4%	3%	5%	4%
20to24	4%	4%	6%	6%
25to29	5%	4%	7%	6%
30to34	5%	5%	7%	7%
35to39	5%	5%	7%	7%
40to44	5%	5%	6%	6%
45to49	6%	6%	7%	6%
50to54	7%	7%	7%	7%
55to59	7%	8%	7%	7%
60to64	7%	7%	5%	6%
65to69	7%	7%	5%	5%
70to74	7%	8%	5%	5%
75to79	6%	6%	3%	3%
80to84	4%	5%	2%	3%
85to89	2%	3%	1%	2%
90+	1%	2%	1%	1%
Total	100%	100%	100%	100%

Male Population by Age group



Female Population by Age group



DISCLAIMER: Sport England has made all reasonable endeavours to ensure the accuracy of the material contained in the Open Facility Calculator. The Calculator has been produced in good faith and Sport England does not accept any liability that may arise from the use of it. The use of the Calculator is entirely at the user's own risk and Sport England does not accept any liability arising from it. Mid-year Population Estimates (November 2021) Small Area (LSOA) and Population 2014 Census data modified by inform and Sport England population projections for 2014, London boroughs modified by GLA 2016 Round Demographic Projections.