

**A GUIDE TO THE
DESIGN, SPECIFICATION
& CONSTRUCTION
OF
MULTI USE GAMES AREAS
(MUGAs)
INCLUDING
MULTI-SPORT SYNTHETIC TURF PITCHES (STPs)**

**Part 1 (of 3) – General Guidance and Design
Considerations; Dimensions and Layouts**

Produced by Sport England, in conjunction with
the Sports and Play Construction Association.



For comments/queries please email mugas@sportengland.org



Contents

	Page
Disclaimer	4
Executive Summary	5
Section 1	
General Guidance & Design Considerations	
1. Introduction	8
2. Existing Standards and Guidance	8
3. Design, Installation and Operational Issues	9
4. The Choice of Playing Surface	9
4.1 Table Showing Suitability of Surface Types for Various Sports	
4.2 Macadam Surfaces	
4.3 Polymeric Surfaces	
4.4 Types of Synthetic Turf Surface	
4.5 Shockpads	
5. Preliminary Investigations	12
6. Design and Construction Considerations	12
6.1 Site Considerations and Location	
6.2 Infrastructure	
6.3 Trees	
6.4 Drainage	
6.5 Base Construction	
6.6 Playing Lines	
6.7 Initial Settling Period for Surfaces	
6.8 Corrective/Remedial Action to Surfaces	
6.9 Equipment	
6.10 Equipment Storage	
6.11 Fencing	
6.12 Divider Netting and Screening	
6.13 Ball Rebound Systems	
6.14 Floodlighting	
7. Professional Services	21
7.1 Design Team	
7.2 Contractor	
7.3 Construction Contracts	
8. Health & Safety	24
9. Selection of Contractors	24
10. Maintenance	24
10.1 Playing Surface	
10.2 Floodlighting	
11. Replacement Funds	25
Section 2: Layouts and Dimensions	26

Part 2 (Downloadable as a separate document)
General Procurement and Contracts Guidance

Part 3 (Downloadable as separate document)
Guideline Specifications for Multi Use Games Areas and Synthetic Turf Pitches

Appendix A: Facility Specific Requirements

- Type 1 - Painted Open Textured Macadam MUGA
- Type 2 - Open Textured Macadam MUGA
- Type 3 - Polymeric Surfaced MUGA (Principal sport netball)
- Type 4 - Polymeric Surfaced MUGA (Principal sport 5-a-side football)
- Type 5 - Sand filled/dressed synthetic turf surfaced MUGA (STP)

Appendix B: Site and Project Specific Requirements

Appendix C: Typical Generic Product Specifications

Acknowledgements and Further Information

Disclaimer

Every effort has been made by Sport England to ensure that the information contained in each part of this publication is accurate but no warranty is given as to the accuracy of that information. This publication has been prepared as a basic guide only and should not be viewed or relied upon as a substitute for obtaining comprehensive expert or professional advice. Any party wishing to undertake the development of a Multi Use Games Area or Synthetic Turf Pitch should obtain professional and expert advice before doing so and in particular must take its own advice so as to ensure any construction undertaken complies with all relevant Statutes and regulations concerning health and safety and with all relevant British and European safety standards.

Any party who makes use of any part of this Guide in a development of a Multi Use Games Area or Synthetic Turf Pitch project shall indemnify and keep indemnified Sport England, its servants, its consultants or agents, against all claims, proceedings, actions, damages, costs (including legal costs), expenses and any other liability for loss or damage to any property, or injury or death to any person (save as insofar as it is caused by Sport England's negligence), howsoever caused, that may be made against or incurred by Sport England arising out of or in connection with such use.

As the research carried out in relation to the design and development of a Multi Use Games Area or Synthetic Turf Pitch project cannot be considered as exhaustive, applicants are strongly advised to make use of the advice available through Sport England's School Sport Facility Advisors, Professional Advisors and other Sport England staff and visit existing outdoor facilities to gain a greater understanding of the issues faced by Managers and users of existing facilities.

EXECUTIVE SUMMARY

Sport England has produced these guidelines in partnership with the Sports and Play Construction Association (SAPCA) for the design and construction of multi-games areas (MUGAs) and including multi-sport Synthetic Turf Pitches (STPs).

The specifications define the minimum standards considered acceptable by Sport England for the procurement and construction of MUGAs. Sport England employs Facility Advisors in each of its regional offices to assist applicants with the technical development of their projects, and applicants are recommended to discuss proposals with them.

The guidance is split into **four principal sections**, which should be read in conjunction with each other:

- **Part 1** focuses on general guidance for consideration in all MUGA and STP projects, and details the layouts and dimensions for the most popular sports undertaken on MUGAs and STPs.
- **Part 2** offers advice on the procurement routes currently recommended by Central and Local Government, and assistance in selecting the most appropriate form of contract. This advice is not specific to MUGAs and STPs.
- **Part 3** offers advice on general conditions and preliminaries to be included in a contract. This advice is specific to MUGAs and STPs.
- The **Appendices (A-C) of Part 3** detail site and project specific requirements.

Five principal types of MUGA/STP are detailed in this guidance. These are:

Type 1 MUGA

Open textured porous macadam areas used for ball rebound sports where tennis is the priority and sports such as mini-tennis, netball, and basketball are secondary users. These areas are suitable for wheelchair sports although care is needed in warm weather during the first year of use.

Type 2 MUGA

Open textured porous macadam areas used for ball rebound sports where netball is the priority and sports such as tennis, mini-tennis, and basketball are secondary users. These areas are suitable for wheelchair sports although care is needed in warm weather during the first year of use.

Type 3 MUGA

Polymeric surfaced areas used for ball rebound sports where netball is the priority and sports such as tennis, mini-tennis, and basketball are secondary users. These areas are suitable for wheelchair sports.

Type 4 MUGA

Polymeric surfaced areas used for five-a-side football, basketball and general sports and recreational training and play. Due to their greater shock absorbency and lower surface friction these areas are not recommended for tennis or netball.

Type 5 MUGA

Synthetic turf areas (MUGAs or STPs) surfaced with a shockpad and either sand filled or sand dressed synthetic turf or a needle-punch carpet. The areas are used for sports such as hockey, uni-hockey, five-a-side football, football, lacrosse, American football and training areas for activities such as athletics and rugby union and rugby league.

The guideline specifications detail the performance and construction requirements for the sports most commonly undertaken on MUGAs. MUGAs are also used for a wide range of other sports. If the MUGA is to be used for sports not included in these guidelines, guidance should be sought on the most suitable form of design and surfacing from the sports governing body, BS 7044 Artificial Sports Surfaces: Part 1: Classification and General Introduction or Sport England's Facility Advisors.

Whilst a MUGA may appear to only be a simple macadam construction with a synthetic or painted surface the exacting demands and tolerances of sport mean that they are best built by companies with the relevant and proven construction expertise. Likewise, bodies with specialist expertise are best to undertake the design, specification and project/construction management of a MUGA. You should therefore make the necessary checks on the contractors and designers you are selecting to ensure they have the necessary experience, financial standing and proven quality of workmanship to undertake the work.

Proper quality assurance procedures should be applied throughout construction; certain components of a synthetic surfacing system will be factory-prefabricated, whilst others may be manufactured in-situ from complex chemical mixtures, the properties of which can be influenced by faulty workmanship, defective materials or adverse weather conditions. In every case, it is advisable to check that the physical properties of each component of the system conform to the anticipated values.

To ensure the MUGA facility satisfies the requirements of the contract specification and Sport England's expectations all but the smallest areas (less than 1,500 m²) should be tested on completion, prior to handover, to ensure the contractor has achieved the level of performance specified. On larger or more complex projects testing may also be advisable just before the end of the defects period so that any deterioration in performance can be identified and can be rectified by the contractor under the terms of the contract. Testing of smaller areas may also be required in cases of concern or dispute or where a specific sports governing body requires facility approval or accreditation.

The testing, following construction, of a MUGA to demonstrate compliance with the design brief requires specialist test equipment and expertise. Some of the laboratories that are able to undertake such work are:

- Accredited by the United Kingdom Accreditation Service (UKAS) or other recognised accreditation services such as the relevant sports governing bodies.
- A member of SAPCA's Professional Services Group.

When letting the works a formal building contract should be placed by the Employer with the Contractor. The use of such a contract will provide greater protection in cases of dispute and clearly define the responsibilities and liabilities of both parties. See Part 2 of this guidance for guidance on Contracts and Procurement.

***Please note that some sections of this document are highlighted by the use of different colour text, and that the guidance notes contain a large number of hyperlinks to internet websites, where further information can be retrieved. As such, printing this document in 'black and white' will result in the loss of some of the functionality of the guidance note.**

If you have any comments, queries or suggestions on any part of this guidance note, please contact Sport England at:
mugas@sportengland.org or SAPCA at info@sapca.org.uk

SECTION 1 GENERAL GUIDANCE & DESIGN CONSIDERATIONS

1. Introduction

Multi-sports surfaces offer a cost-effective solution for schools and other facilities with a wide range of sporting demands. Whilst a multi-sports area is often seen as a “safe option”, it must be recognised that there will almost always be a need to compromise, primarily in terms of dimensions and the performance of the playing surface. There are also widely differing requirements for the playing surfaces for various sports and many different needs for individual facilities. It is not possible to provide a simple solution or formula that will satisfy every situation. Each facility must be carefully planned according to specific demands and priorities. The guidance in this document is intended to raise a number of important issues, which, if carefully considered and addressed, should help to produce the most suitable design. The advice detailed is based on many years experience from contractors, designers, users of MUGAs and STPs and sport’s governing bodies. Whilst there are many ways of designing, constructing and surfacing a MUGA or STP these guidelines describe the systems most commonly used and found to provide the playing qualities and experience that users require, whilst at the same time providing a safe and durable environment.

Critical to the success of any sports facility is an initial assessment of the likely use of the facility, and the ability of a particular location to meet the strategic and local sports needs. It must be determined which sports the facility will provide for, the standards of playing performance needed, and the priorities for usage between them. The choice of sports, and the feasible balance between them, may also depend on the different levels of income generation that are possible. The initial planning stage should also include a thorough assessment of the proposed management and operation of the new facility.

In many ways the construction and performance of a synthetic turf MUGA is similar to a STP, but there are differences. These primarily relate to the design of the drainage and foundation layers and the types of fencing and floodlighting used. As a general rule any facility surfaced with macadam or polymeric surfacing is considered to be a MUGA, as are synthetic turf areas of less than 3000m².

2. Existing standards and guidance

These guidelines provide an introduction to the design and construction of multi-use outdoor sports facilities. Reference should be made, as appropriate, to other relevant sources of information, including: British, European and other technical standards; industry and other Codes of Practice; Sport England’s Technical Guidance Notes; and information leaflets and technical requirements for the performance of playing facilities produced by individual national governing bodies of sport.

-8-

Particular attention is drawn to Sport England's Technical Guidance Notes 374 (*Multi-use Games Areas*) and 596 (*Synthetic Turf Pitches*), and the SAPCA *Codes of Practice for the Construction and Maintenance of Tennis Courts and Artificial Grass Sports Pitches, BS 7044: Part 4: 1991 Artificial Sports Surfaces – Specification for Surfaces for Multi-sports Use* and The Institute of Lighting Engineers - *Guidance Notes on the Reduction of Light Pollution*.

3. Design, Installation and Operational Issues

It is important at the briefing and design stages of a MUGA or STPs development to consider issues that might have a direct impact on the installation and operation. Critical consideration should be given to:

- The predominant sporting use;
- The degree of intensity of use;
- The sports performance and playability characteristics required;
- The intended maintained lifespan of the MUGA.

4. The Choice of Playing Surface

Among the most commonly played sports on multi-sports games areas are tennis / mini tennis, netball, basketball, soccer / five-a-side soccer, and hockey. Other sports that might also be played include rugby / tag rugby, rounders, athletics practice, tri-golf, roller hockey and volleyball etc. The need for facilities to compromise arises mainly due to the choice of playing surface, as certain surface types are more suitable than others for different sports.

One of the important issues relating to the choice of surface is the need for some form of shock absorbency, (or cushioning), but again, there can be conflicting requirements between the sports. On the one hand there are clear benefits for participants in protection from injury, but too much cushioning of the surface may be detrimental to the performance of certain sports, such as tennis, basketball and netball.

It is increasingly possible to quantify the playing performance of sports surfaces, using a series of standard test methods to measure the different characteristics and a number of sports governing bodies can provide guidance on the individual recommendations for their own sports.

Table 4.1 below identifies the general suitability of main types of playing surface discussed in these guidelines for a range of sports, although this will also depend on the standard of play that is intended. **Please note that these descriptions are provided as a general guide only** and are not necessarily indicative of the views or requirements of individual National Governing Bodies of sport.

Sports Surface/ MUGA Type	5-a-side Football	Tennis	Mini Tennis	Netball	Basketball	Hockey	Rugby Training	Athletics Training	Football Training
Macadam (Type 1)	4	1	1	2	1	4	4	4	4
Macadam (Type 2)	4	2	2	1	2	4	4	4	4
Polymeric (Type 3)	3	2	2	1	2	3	4	3	3
Polymeric (Type 4)	2	3	3	3	2	3	3	1	2
Sand filled synthetic turf (Type 5a)	1	4	4	4	4	1	2	3 (excluding spikes)	1
Sand dressed synthetic turf (Type 5b)	2	3	3	4	3	1	3	3 (excluding spikes)	2
Needle- punch synthetic turf (Type 5c)	2	3	3	4	3	2	3	3 (excluding spikes)	2

Key 1 = Preferred surface 2 = Suitable surface 3 = Possible surface though less suitable 4 = Unsuitable surface

4.2 Macadam Surfaces

Macadam surfaces may take the form of *dense* or *porous* macadam. Whilst the former may provide a more durable surface and is typically laid on School playgrounds etc; its inability to drain is a major constraint on sports use. For this reason porous macadam is considered more suitable and is used on around 80% of all tennis courts in the UK. Porous macadam can be played on in most weather conditions year round.

Porous macadam courts may be colour coated to improve aesthetics and the playing environment. This is achieved by either using pigmented materials to form the macadam or by painting the un-pigmented surface after installation. Although the use of pigmented macadam may be initially higher the increased durability of the colour may make it more suitable for areas of high use.

4.3 Polymeric Surface

Polymeric surfaces have a degree of inherent shock absorption, which may be varied by increasing the thickness of the surfacing layer or altering the composition of the polymeric materials. To provide the high degree of slip resistance required by sports such as tennis and netball a specially modified final coating can be applied, although the use of this surface for ball contact sports will cause a rapid reduction in its slip resistance. It is for this reason that combining sports such as five-a-side football and netball is not recommended.

Thicker forms of the surface may be specified where the intended sports include five-a side, football or athletics' training. This type of polymeric is also capable of taking a running shoe spike.

4.4 Types of Synthetic Turf Surface

There are many different types of synthetic turf construction with a range of properties, and advantages and disadvantages. Variables include the polymer used for the fibre yarn (such as polyolefin and nylon), the cross-sectional area of the individual ribbons of fibre, the method of carpet manufacture, the pile height and pile density. Two principal designs are offered for multi-sports areas, those with a vertical pile of tufted, woven or knitted construction that is supported with a sand filling or dressing and those with an interlocking pile of needle-punch construction that are also filled or dressed with sand.

The majority of synthetic turf pitches are surfaced with tufted sand filled carpets. Experience has shown this form of carpet to have good durability and performance when used in the extreme wear conditions experienced on MUGAs.

Sand-dressed carpets are a more recent innovation. They have a shorter, denser pile than the standard filled systems with a reduced quantity of sand fill

and are primarily suited for MUGAs where hockey is the primary sport.

Needle-punched carpets offer benefits of increased sand stability within the pile and higher drainage characteristics.

4.5 Shockpads

A shockpad is a resilient layer introduced between the base and the playing surface. The shockpad is used to provide a degree of comfort to players and to create defined playing characteristics for specific sports. The most common components are rubber crumb/shred mixed with a resin binder, either manufactured as prefabricated rolls or mixed and laid in-situ.

Shockpads constructed in-situ vary in thickness from 15mm to 35mm depending on the performance required and consist of a polyurethane binder mixed with rubber crumb/shred. The thicker pads also may contain pea gravel or other smaller aggregates. The rough texture of the shockpad helps grip the back of the synthetic turf carpet, minimising the risk of carpet creep or movement.

Pre-fabricated rubber pads come in two basic types: 'flat' or 'dimpled'. The type and thickness chosen will be dictated by the priority sport, although several different options may be able to provide a surface that complies with the requirements in terms of playing characteristics. Dimple pads have a flat upper surface, with a regularly spaced pattern of undulations on the lower surface to form a rounded 'egg box' type structure. Rolls are usually 1.25m in width. Lengths vary depending on thickness, but are normally between 25m and 35m.

Rolls of prefabricated shockpad may be laid perpendicular or parallel to the subsequent rolls of artificial grass carpet. Whichever arrangement is used, it is important that all rolls should be laid straight and true with the minimum of distortion. Head joints should be staggered by at least 1.0m. Prior to head jointing, each roll should be allowed to reach its optimum length before trimming. No joints should have a variance in height greater than 2mm.

Several other forms of proprietary shockpad are marketed and installed by contractors in the UK. These include fibre pads, pads of closed-cell foam; pads which are an integral part of the carpet system; composite pads, etc. Each has properties that the manufacturer will confirm and demonstrate before a choice of system is made.

Experience has shown that the intensity of use of a MUGA can initiate carpet movement when a smooth surfaced shockpad is used. If this form of shockpad is selected the combination of carpet and shockpad needs to provide adequate protection against carpet creep, this may involve ribbon bonding, anchoring or other means of carpet retention.

5. Preliminary investigations

The cost of a new facility is greatly influenced by site conditions. Costs will be much higher for engineering a difficult site, and it should be recognised that some sites are not cost effective to develop as sports facilities. A designer has to consider the following factors: topography, access, site drainage, electrical supply, water supply, trees and ground conditions. Before starting detailed design, the designer will require as much information as possible about the site and its surroundings. Allowing sufficient resources for initial information gathering greatly reduces the risk of unforeseen problems, (and increased costs), during, construction or even later. It is strongly recommended that this information be obtained at an early stage of the design process and be made available to all contractors tendering for the construction of the facilities.

Understanding the ground conditions is vital, as the greatest risk of unforeseen problems and additional cost usually lies in the ground. Gathering information is only the first step and may need to be followed by fieldwork and laboratory testing. The most important element in ground investigation is to confirm the underlying soil or rock. This is done using either boreholes or trial pits to allow close examination of each layer to provide a detailed engineering description in accordance with BS 5930. This is required right across the site to try to detect any variations.

If floodlighting is to be installed it will be necessary to determine the amount of power required and establish the availability of a suitable supply.

6. Design and Construction Considerations

6.1 Site considerations & location

The location of the MUGA should be sympathetic to its surroundings and any adjacent infrastructure and early guidance should be sought on policy and any necessary permission that may be required from the Local Planning Authority. It is normally advisable to locate a MUGA (especially floodlit ones) at least 12m, and ideally at least 30m from other residences. On flat terrain sites, landscaping and mounding can be used to obviate noise breakout and floodlight spillage.

The location of the facility must not create a vehicle log jam-especially where access roads and infrastructure is limited (typically one car per three players, which is doubled in the case of non staggered changeovers, can be used to assess traffic impact).

Good locations for MUGAs and STPs include:

- Those close to car parks and support facilities (especially where constantly supervised)

- Those where there are good sound absorbing/spectator terracing and banking possibilities e.g. the facility sits in a natural amphitheatre-where it is possible to view activities (even remotely using CCTV) from on high and where the facility will be sheltered by the surrounding terrain
- Those where there is good access to the facility for people with disabilities.

Avoid locating a MUGA or STP:

- Where steep gradients lead to and away from the area, especially at personnel and maintenance vehicle access points.
- Where there is poor access to the facility for people with disabilities.
- Where the facility is remote from support facilities such as changing accommodation.
- In very exposed terrain (where needs dictate it is advisable to install a shelter belt of evergreen trees-especially to the NE, N and NW geographical aspects of a facility)
- Where it is not possible for access roads/footpaths and maintenance routes to reach the main personnel/maintenance gates
- Where incoming services (electricity feed cables and water/drainage) will be prohibitively expensive to install
- Where too many site perimeter and internal security/access gates have to be passed, meaning gates keep having to be locked and unlocked
- Where it is not possible for a facility supervisor to monitor persons, vehicular and cycle movements (especially on access routes and in relation to changing rooms, parked up cars etc)
- Where emergency vehicles cannot readily get to the facility
- Where users have to traverse naturally turfed areas (mud, debris and contaminants all lead to the rapid deterioration of the playing surface)
- Too close to unstable ground (landslides) or drainage outfalls (back falling or ponding on the MUGA due to blocked drains)
- Too close to deciduous (leaf drop in autumn) or leaf sap forming trees
- Where non-sports users may be passing and be at risk of injury, through unauthorised entry or access etc.

-13-

6.2 Infrastructure

The location should ensure the MUGA is readily accessible, ideally located to the front and/or side of a management facility or site. If this is not possible good supervision and amenity/security lighting and pedestrian/vehicular and cycle routes will be required.

Access roads etc need to be wide enough to be used by visitors, maintenance and emergency vehicles (including equipment attached to a tow bar or on the back of a trailer etc). Footpaths should be wide enough to ensure wheelchair users can access the facility. Dropped kerbs at crossing points and general access for disabled infrastructure should be DDA compliant as well as satisfying Sport England's Access requirements as detailed in the Access for Disabled People Guidance Note:

http://www.sportengland.org/resources/download/download_1.htm, BS 8300 and Part M of the Building Regulations. A disabled person hard-standing parking bay must provide allowing direct pathway access to any support facilities and the MUGA.

Amenity/security lighting installations should be installed along access routes help to allay any severe contrast of lighting conditions when a user comes away from a floodlit facility.

To ensure safe egress from the floodlit area, arrangements should be made to retain a small part of the main lighting in operation for a limited period. This will usually be just prior to the curfew time, if one is imposed by the planning approval.

For anything greater than a one-court size of MUGA (and to a degree needs should even be assessed for these) access to support facilities and changing provision is essential.

When sand filled or sand dressed surfaces are used it is advisable to install at all ingress/egress points drained catchment pits and gratings, complete with barrier matting. Certain designs of catchment pits and grilles will also double as animal deterrents, especially if pits are wide enough to prevent them being jumped over and if gates are self-closing.

Where the use of a STP focus on the need to cater for team changeovers throughout the day installing a one court 'rec-zone' to act as a pre-match warm up and practice area is beneficial. This may be surfaced using a more cost effective surface if budgets are limited but matching the exact STP surface is preferable where higher standards of competitive play are envisaged

Experience suggests that taking the synthetic turf carpet up to the fence line on a STP is desirable as a macadam border can become dangerously

slippery, when sand or rubber particulates from the carpet infill migrate onto it. Carpeting the whole area in multi-sport situations, where cross pitch sub lettings and casual play lettings are envisaged, also allows the soccer goalmouths to be positioned outside the side lines of a hockey pitch. This will prevent excessive wear to the wings of the hockey pitch reducing the possibility of patch repairs that can prove hazardous.

6.3 Trees

Trees adjacent to a site may have the advantage of providing privacy, shelter or screening from a low sun. Their roots, however, can be a threat to the facility itself, by distorting or cracking the surface. This is especially the case for strong-rooted varieties such as poplar, willow and sycamore. Where such a threat exists, preventative action will be necessary, such as tree surgery or the construction of a root trench to inhibit the growth of roots onto the site. This is usually done by digging a trench, cutting any roots in the process and removing them as far as possible to a depth of 1000mm. The wall of the trench is then lined with suitable material, such as concrete, before backfilling.

It should be noted that whilst such measures will inhibit root incursion, the only certain preventative measure is repositioning the MUGA, generally to a distance equivalent at least to the potential height of the tree and its potential canopy width.

Branches that overhang sports facilities are usually a cause of various problems, such as the continuous dripping of water and leaf sap, insect secretions and bird droppings. These can result in damage to the playing surface and impaired porosity. It is strongly recommended that overhanging branches be pruned back or, if possible, the facility re-sited.

6.4 Drainage

The MUGA should have a suitable drainage scheme that will:

- Ensure that all surface water is removed from the MUGA at a rate which will safeguard against surface flooding occurring
- Not allow excess water to remain present in the construction which might result in a reduction of the load-bearing capacity of the formation or in any frost damage to the construction
- Protect the installation from the effects of ground or surface water from the surrounding areas

One area where MUGAs and STPs differ is in the design of the drainage system. Due to the relatively small dimensions of most MUGAs they do not have any form of sub-court drainage other than a perimeter drain that is laid

around one or more sides of the facility. Most STPs do incorporate lateral drains beneath the pitch, the centres of which are determined by the composition of the subsoil and the designed infiltration rate, but usually range from 5m to 15m. The ends of lateral drains should be capped to prevent contamination and connectors should be used to join lateral drains to collector drains. Collector drains are normally located on the outside of the perimeter edging.

Interceptor drains (which may act as collector drains) should be installed at the toe of any embankments to prevent run-off from surrounding areas onto the MUGA or STP.

Silt/inspection chambers should be installed where perimeter/collection drains change direction, and the provision of rodding eyes should be included at the head of collector drain runs for ease of access for maintenance.

6.5 Base construction

The base for a MUGA is normally a porous engineered construction consisting of two courses of open-textured bituminous macadam laid above a graded stone foundation. This form of construction has gained acceptance due to its ability to offer the greatest possible level of stability to the final surface, resisting frost heave and spreading surface loading. These factors all mean that it is simpler to replace or upgrade the surface of the MUGA when the need arises.

The base to any MUGA should be designed to meet the following criteria:

- It should be capable of supporting – and transmitting to the existing ground – the loads of all vehicles, plant, machines and materials to be used in the construction, without causing deformation of the site.
- After the MUGA is built, the sub-base should be capable of supporting and transmitting all loads on the playing surface without permanent or long-term deformation of the playing surface. Such loads arise mainly from players and maintenance equipment.
- It should ensure that water, whether rainwater or natural ground water, will drain away freely through the sub-base material, either into the natural subsoil or into the drainage system.

The foundations should be constructed using hard, clean, crushed frost-resistant aggregates. In order to prevent contamination from the sub-grade it may be necessary to install a geotextile membrane on the formation prior to installation of the sub-base.

The macadam upper layers of the base should be of a carefully graded, open textured construction and not the standard 'car-park' type mix, prevalent in school playgrounds.

6.6 Playing lines

One of the obvious limitations of a MUGA is the possible difficulty for players in identifying the relevant play lines, where there are many overlapping sets of lines on the same surface. For this reason it is unwise to include lines just for the sake of completeness, if the sport is not likely to be played very often. The problem is usually more pronounced for sports such as tennis, where it is very important that the lines should be quickly and clearly seen by the players.

Playing lines can be painted on to most surfaces, but with synthetic grass they are usually either tufted in during manufacture or cut in when installing the surface. The choice of colours is also important, and advice should be taken on the most suitable combinations of colours for the sports to be included. As a rule of thumb, the most frequently used sport should be marked out in white, the second most played sport in yellow, followed by blue, and red.

6.7 Initial settling down period for surfaces

Most playing surfaces require some degree of extra care when used during the immediate post-construction phase. It is important for purchasers to be fully informed as to when the MUGA may be first used and any precautions that may be necessary until the surface has fully settled in. This is particularly important in the case of bitumen-bound surfaces, which may be subject to some softening during hot weather and the use of wheelchairs during the first year of use need very careful monitoring.

6.8 Corrective / Remedial Action to surfaces

Some surfaces, most notably macadam, are extremely difficult to repair imperceptibly. A degree of reasonableness should therefore be applied when assessing minor areas of non-compliance for their effect on performance and suitability for purpose, and the appropriate extent of any remedial action.

Where remedial works are required the repaired surface should match adjoining areas in colour, texture and levels and, except where invisible mending can be achieved, (e.g. some synthetic grass surfaces), should be replaced to the nearest play lines or construction joints. Joints should be neat, straight and unobtrusive.

6.9 Equipment

There is a wide range of nets, posts, goals, division netting and rebound boards to choose from. Consideration must be given to the precise use of each facility, so that the change of usage from one sport to another can take place with the minimum of effort and inconvenience.

Nets, posts and goals can be free-standing, and therefore easily moved, though it is important to make proper provision for their storage when not required, from the point of view of both safety and security. **It is vital that great care should be taken to ensure the safe anchorage of all freestanding equipment.**

- Football goals (full size) should comply with BS EN 748.
- Five-a-side or small-sided football metal goals should comply with PAS 36-1.
- Five-a-side or small-sided football plastic goals should comply with PAS 36-2.
- Handball goals should comply with BS EN 749.
- Hockey goals should comply with BS EN 750.
- Netball goal posts should be supplied with protective post pads in accordance with AENA requirements.
- Tennis posts and nets should comply with BS EN 1510.

Recessed sockets in the playing surface are quite usual for surfaces such as macadam and polymeric, though less practical for sand-filled synthetic grass. Also available are proprietary sports equipment systems, which offer high quality bespoke solutions, such as integrated surround fencing and a variety of goal units. Especially preferable are recessed goals for five-a-side football, in order that the goals should be flush with the rebound boards or walls.

6.10 Equipment storage

Mainstay portable sports equipment can be stored outdoors – it is designed to be exposed to the elements.

Specialist non-personal equipment e.g. training cones, goals netting etc are best kept in a secure facility or vandal resistant storage container close to the MUGA.

On facilities where football and its derivatives are likely to be played it is sensible to build into the perimeter fence suitably sized recesses to accommodate and anchor portable soccer goals. The design should ensure there is sufficient height clearance in the fence goal recess to prevent cranial and thoracic injury - largely caused by someone running towards the goals or keeping goal. The design should ensure it is easy to retrieve balls from the fence recesses and goal itself (goals may not even require netting for certain

standards of play). Above all the ability to securely anchor the frame of the goals to prevent them toppling over is paramount.

If goals are required to stand inside the perimeter fence line during play it is essential they are returned to storage recesses when the full pitch (or portions), are to be used. Beyond the play lines, run-offs are provided to ensure users can stop safely, so it is important to ensure that equipment is not stored in them.

The suggested layout for STPs shown in Section 2 allows for full size portable football and hockey goals to be relocated into fence design recesses, conveniently located behind the goal locations at each end zone of the facility. Such recesses should have secured posts of sufficient height (equivalent to the main perimeter fence height) with a high level permanent tensioned wire - to allow a netting to be pulled across to containment for seven-a-side football end zone utilisation of the main pitch, when the main pitch goals are retracted into their equipment recesses.

6.11 Fencing

The choice of surround fencing is usually dictated by the priority sport, site constraints and budget. The two basic functions of a surround are to retain balls within the playing area and to allow spectators to view the game safely. In some locations other important considerations may be security and the need to keep out animals. For greater durability weldmesh cladding is strongly preferred, together with rebound boards or perimeter kickboards as appropriate for the sports being played.

Single gates should be 1.2m wide. Double gates should be 3.0m wide with removable lintel panel above for ease of access with soccer goals. All gates should be fully infilled with weldmesh / rebound boards / kick boards as appropriate, and provided with a suitable locking mechanism. All gates should open outwards for safety of players.

At main access gates, boot cleaning facilities should be provided to prevent contamination of the playing surface with mud and material from outside the playing area.

Consideration should be given to having a bolt hole gate to allow persons backed into a corner in bullying situations to escape from the MUGA - it need only be rebound board wall height, but should have a panic spring latch release lock (operated from inside of MUGA only) with a closing mechanism (spring coil hinge restraint) to return the gate to the shut position.

All gates thresholds should be level or slightly ramped (i.e. not stepped). Gates should also be positioned so as not to create "tight" gathering or milling points, especially where pitch/games area team changeovers are scheduled.

6.12 Divider netting and screening

In order to maximise the use of larger MUGAs and STPs, good quality division netting should be installed to split the playing area into separate, smaller areas of activity, as required. Care should be taken in the selection of the netting to ensure the safety of players at all times, avoiding, as far as possible, potential trip hazards.

The greatest care should be taken if site screening or windbreak materials are to be hung on the surround fencing, to ensure that the design of the fencing is sufficiently robust. A heavy-duty surround system will normally be required for this purpose.

6.13 Ball rebound systems

Where appropriate, particularly on MUGAs where five-a-side football is to be played, a rebound wall or board system should be installed. Rebound walls and boards can be constructed from a variety of materials and may be stained or painted in order to improve their aesthetic appearance. A number of companies now also offer rebound fencing. These are advantageous where user and site security issues are a concern as they allow viewing of the total area.

6.14 Floodlighting

It is strongly recommended that any area provided for intensive use should be floodlit. The advantages of floodlights are:

- **Increased use of facilities.** Floodlighting facilities enables them to be used on winter evenings, giving substantially higher usage rates than equivalent non-floodlit facilities and increasing choice and flexibility of playing times for users.
- **Programming flexibility.** Longer operating hours give facility managers and users more freedom in programming and in initiating sports development programmes.
- **Additional income.** Increased use means greater potential to generate additional income – essential with the high capital cost of providing a MUGA or STP, although there will be increased wear and tear of the surfaces reducing its service life.
- **Usage options.** A floodlit MUGA adjoining a sports hall can accommodate activities such as football, netball and tennis, releasing more expensive indoor space for other activities.

It is essential, before deciding to install floodlights, to be satisfied that the benefits of increased use, flexibility and additional income will justify the initial capital cost and, thereafter, help offset the ongoing energy costs, costs of maintenance and the additional management costs necessary to maximise these benefits. A profile of a typical week's use during the playing seasons will help in this assessment. Such a profile should include:

- Club matches, training and coaching sessions for all adult and junior teams
- The likely casual use of the facility by other clubs, teams and individuals – the sports or leisure department of the local authority should be able to help in this respect

With the profile it should be possible to predict the likely levels of additional income and expenditure that providing floodlights will generate and whether such provision is likely to be financially viable. It may also be helpful to consult the local authority's Sport and Recreation Strategy or the Regional Recreation Strategy and Sport England's Facility Planning Model to ascertain whether a need for floodlit sports facilities has been identified for the area.

Where floodlighting is to be installed as part of a MUGA construction, independent specialist technical advice should be taken regarding the choice and performance of the lighting system, the illumination requirements for the specific sports that will be catered for, and the management of the lighting system. Many local authorities have planning guidance on sports lighting and early consultation with the planning authority is advisable.

It should be noted that conflicting guidance might sometimes be given by different organisations or publications regarding the recommended standards of lighting for different sports. In such instances, reference should be made to the appropriate National Governing Body for the sport(s) concerned. Guidance may also be obtained from Sport England Technical guidance Note 370 - *Floodlighting*.

7. Professional services

7.1 Design Team

The key to a successful project is the appointment of competent consultants to form a design team; the architect who designed the science block may not necessarily have the necessary knowledge to design a MUGA. The size and composition of the team will vary according to the size and nature of the project. Further guidance on the selection of competent consultants can be found –

- Construction Industry Board, “*Selecting Consultants for the Team: Balancing Quality and Price*”
- Sport England’s Technical Guidance Note, “*Construction Project Management in the Voluntary Sector*”
- Commission for Architecture and the Built Environment “*Client Guide for Arts Capital Programme Projects*”

Construction contracts usually have a delegated individual who is not a party to the contract, but who has powers to supervise and administer the project/works and check that they are installed in accordance with the contract requirements. The title of this individual depends on the contract details but includes ‘The Engineer’, ‘Employer’s Agent’ or ‘Supervisor’. Similarly, the powers under the contract also vary. Duties may include the following:

- Value and certify completed work.
- Check that materials and components comply with the specification.
- Authorise and value any additional works.
- Monitor progress against the target programme and dealing with delays.
- Agree method statements for construction tasks.
- Audit Contractor’s compliance with Construction (Design & Management) Regulations (CDM).

NB: The above list is not to be deemed as exhaustive.

Additional staff such as ‘Engineer’s Representative or ‘Clerk of Works’ can be appointed as assistants with reduced powers. Such site-based personnel would have responsibilities limited to inspecting quality as work progresses. The benefits of properly supervised construction include ensuring that standards of specification and workmanship are maintained and dealing promptly with changes or unforeseen problems. Refer to guidance on selecting the Design Team.

7.2 Contractor

Whilst a MUGA may appear to only be a simple macadam construction with a synthetic or painted surface, the exacting demands and tolerances of sport mean that they are best built by construction companies with the relevant and proven construction expertise. It is recommended that Contractors have:

- Experience of constructing MUGAs/STPs
- Demonstrate that they will have key resources including personnel to deliver the project successfully
- Subject to appropriate financial checks. As part of a management strategy to ensure successful project delivery and to minimise risk, it is essential that an applicant does not enter in to contract wherein it is reasonable to believe that the contractor may go in to liquidation/administrative receivership.
- Has satisfied the Employer that they are competent and have dedicated appropriate resources in respect of statutory health and safety requirements

NB: The above list is not to be considered exhaustive. In addition, Local Authorities may have selected contractors from their in-house tender list and are confident that they are competent in respect of financial standing, statutory health and safety requirements, previous experience etc.

7.3 Construction contracts

Unlike most products, construction projects do not take place in controlled factory conditions, but in the ground and are subject to weather conditions. This introduces elements of risk in to the procurement of a project. A construction contract is an essential requirement for the procurement of a building/MUGA/STP. The construction of a sports facility will involve the Employer and Contractor entering such a contract. The contract and contract documents should address:

- Parties to the contract
- Members of the design team, Test House and their responsibilities
- What is expected from each party to the contract?
- How risk is allocated.
- How work is valued and payment terms.
- Provision of insurance, Employer's Liability, Public Liability, etc
- Dispute resolution and remedies if problems arise either during or after construction.
- The dates for possession of the site and completion of the works.
- Remedies the Employer may take if the Contractor is late in completing the proposed works /MUGA/STP.

NB: The above list is not to be considered exhaustive.

Refer to the Procurement Guidance in Section 1 of Part 2 of this guidance for advice on choosing the appropriate form of contract. There are a number of contract options and the lead consultant/designer can provide advice according to the client's specific circumstances. Factors to consider include:

- Project complexity and cost.
- Design responsibility
- Level of cost certainty required
- Risk items, such as ground conditions, and how they can be managed.
- The risk of having to make changes on site.
- Safety hazards.
- How much flexibility and financial control the Employer wants.
- Under most forms of contract late variations or changes to the proposed works /MUGA/STP cost more and may jeopardise the original completion date of the project.
- Transferring design or construction risk onto the Contractor can cause construction problems or higher tender prices unless sufficient information is provided to enable the Contractor to assess the risk. This is why the

provision of a ground investigation at the beginning of the design process is recommended.

NB: The above list is not to be deemed as exhaustive.

8. Health & Safety

For each new sports facility built, there is a legal obligation shared between developers, designers and contractors, to promote health and safety. This applies throughout the entire project cycle from design and construction through to operation, maintenance and demolition. This obligation is given in the Construction (Design and Management) Regulations. Any breach of these regulations is a criminal offence. The key duties of the client include the following.

- The selection and appointment of a competent Planning Supervisor and Principal Contractor.
- Ensuring that designers and contractors are competent and will allocate adequate resources to health and safety.
- Providing the Planning Supervisor with information relevant to project health and safety.
- Ensuring work does not commence until the contractor has prepared a suitable health and safety plan.

9. Selection of contractors

As a result of the considerable expansion in leisure activity over recent decades, and the increasing demand for all-year-round outdoor sports facilities, there had been a corresponding increase in the number of contractors offering their services as constructors of synthetic sports facilities. Not surprisingly, the large number of contractors operating includes a wide range of size, structure and ability, from which a choice must be made for any project. A minimum of three quotations should be sought from specialist sports facility builders that have a proven track record and relevant experience - it is strongly recommended that clients should inspect previous similar projects undertaken by any contractors under serious consideration.

Sport England advises that only contractors with relevant experience and expertise should undertake the construction of MUGAs and STPs and associated floodlighting work. Before retaining contractors to carry out such works you should make necessary checks and make contact with recognised bodies who can assist in the selection and provide a list of suitable contractors.

10. Maintenance

10.1 Playing surface

The maintenance of any synthetic sports surface is of vital importance if it is to remain consistent in play, good to look at, permeable (if appropriate) and long lasting. The contractor upon completion of the project should provide full maintenance instructions. The contractor's guarantee will usually be conditional on the recommended maintenance requirements being carried out with reasonable diligence.

The precise maintenance requirements will vary according to the type of surface and the particular product and guidance should be sought from the contractor/manufacturer. Detailed maintenance guidelines are included in the Codes of Practice for the Maintenance of Sports Surfaces, published by the Sports and Play Construction Association and available on their website, www.sapca.org.uk.

10.2 Floodlighting

The maintenance of the floodlighting installation is of vital importance if it is to continue to meet, over its working life, the performance standards set at the design stage. The maintenance will include routine work on all the associated electrical services, cleaning of fittings and the correct adjustment of them to maintain the 'aiming angles' set up during final commissioning. To enable future maintenance of the lighting to be related to the 'burning hours' a suitable *hours run counters* should be included in the control/ monitoring system. When the performance of the lamps falls below the design standards, the maintenance budget must allow for all lamps to be replaced as a complete set, and not individually on lamp failure.

11 Replacement Funds

Project co-ordinators should be aware at an early stage and plan for, the full life costs of the facility they are undertaking. Information should be sought regarding the on-going costs of routine maintenance of the chosen playing surface, together with the cost of replacement of the surface at the end of its useful life. The manufacturer of the surface will be able to advise on the likely lifetime of the surface, provided it is properly maintained. Similar information should be obtained in respect of the floodlighting installation.

Both a maintenance fund and a 'sinking' fund should be established as soon as the new facility is in use, in order to ensure that sufficient funds are available to replace the surface when necessary. Consideration of the cost of maintaining and, eventually, replacing the surface of the facility should be reflected in the business plan and charges for use of the facility by the wider community.

SECTION 2 - LAYOUTS AND DIMENSIONS

The success of a MUGA or STP is dependent on the layout for the various sports to be played on the facility being correct. The critical consideration when designing the layout of a MUGA is to maximise the available space, whilst providing an acceptable playing environment. The size and layout of the pitch or MUGA should suit local and strategic sporting need and user profiling.

The total area of the pitch or court comprises the principal play area (the area within the line markings and run-offs that are provided to ensure players do not collide with fences, floodlight columns etc). For some sports e.g. tennis, a secondary total play area is prescribed for floodlighting. This is the area outside the principal playing area but less than the total fenced area. The rules of the various sports define the pitch or court size. Many sports governing bodies also give guidance on what they consider to be adequate run-off areas. If space is limited the governing body's recommendations on run-offs should always prevail and the pitch or court size be reduced accordingly. The current recommendations of the governing bodies on dimensions for the primary sports played on MUGAs and STPs are summarised on the following pages. Project teams are advised to check with the relevant governing bodies these recommendations have not been amended before drafting the layout for a facility.

It is generally recommended that playing areas should be orientated approximately in a north-south direction. This orientation is preferred because it minimises the effect of a setting sun on the players, but in the UK climate, the inability to achieve this orientation need not preclude the construction of the facility. It is also worth noting that where a facility is built primarily with daytime play in winter in mind, a north-south orientation may be far from ideal, especially where shading from the south may need increased time for thawing of frosty areas.

Typical layouts for MUGAs and STPs follow the governing body recommendations. The MUGA layouts are based on single units. Where multiple units are required, sectional boarding or fencing may be used to separate areas, particularly where five-a-side football is to be played.

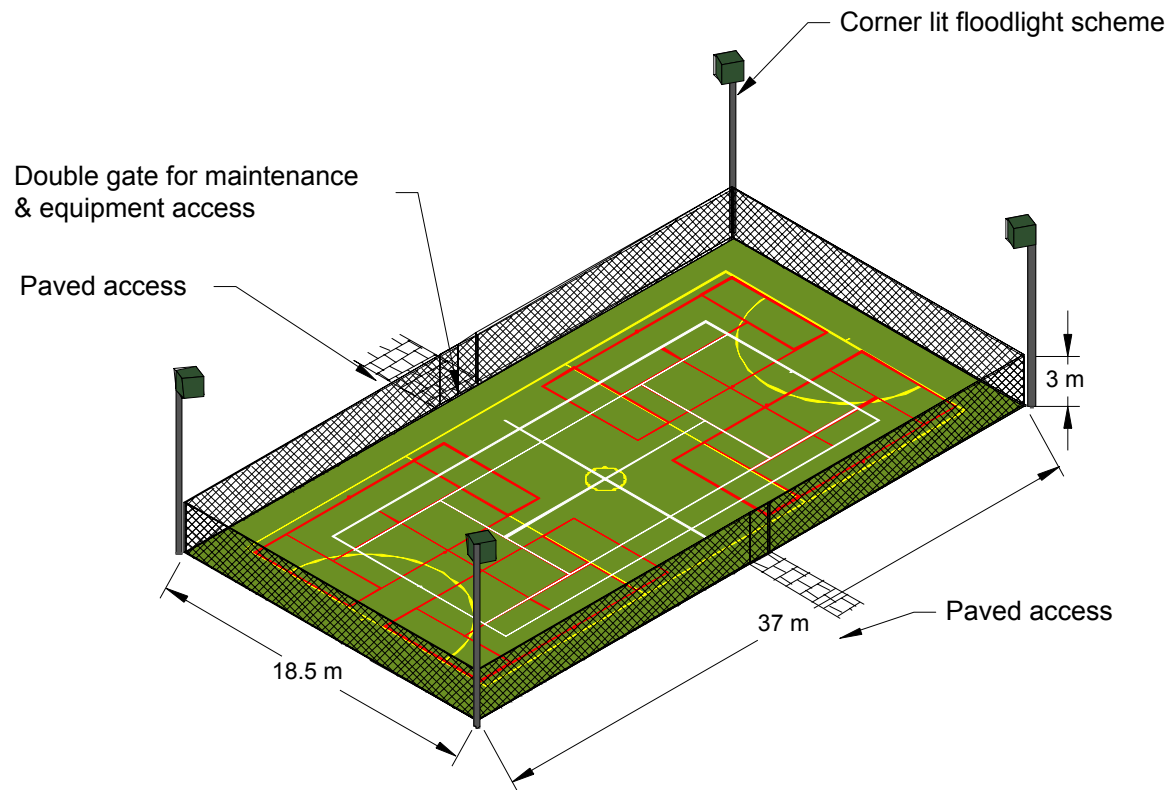
Dimensions and run-offs - MUGAs

Sport	Principal playing area (pitch or court size)		Minimum run-off	
	Length (direction of play)	Width	Run-back or end run-off (per end)	Side-run (per side)
Tennis	23.77m	10.97m	5.49m (6.40m recommended)	<u>Court to fence</u> 3.05m (3.66m recommended) <u>Between courts</u> 3.66m (4.27m recommended)
Mini-tennis (red)	12.0m	6.0m	<u>Court to fence</u> 2.0m (3.00m recommended) <u>Between courts</u> 1.5m	<u>Court to fence</u> 1.0m <u>Between courts</u> 1.5m
Mini-tennis (orange)	18.0m	10.97m	<u>Court to fence</u> 3.0m <u>Between courts</u> 7.0m	<u>Court to fence</u> 1.7m <u>Between courts</u> 2.5m
Netball	30.5m	15.25m	2.0m	<u>Court to fence</u>

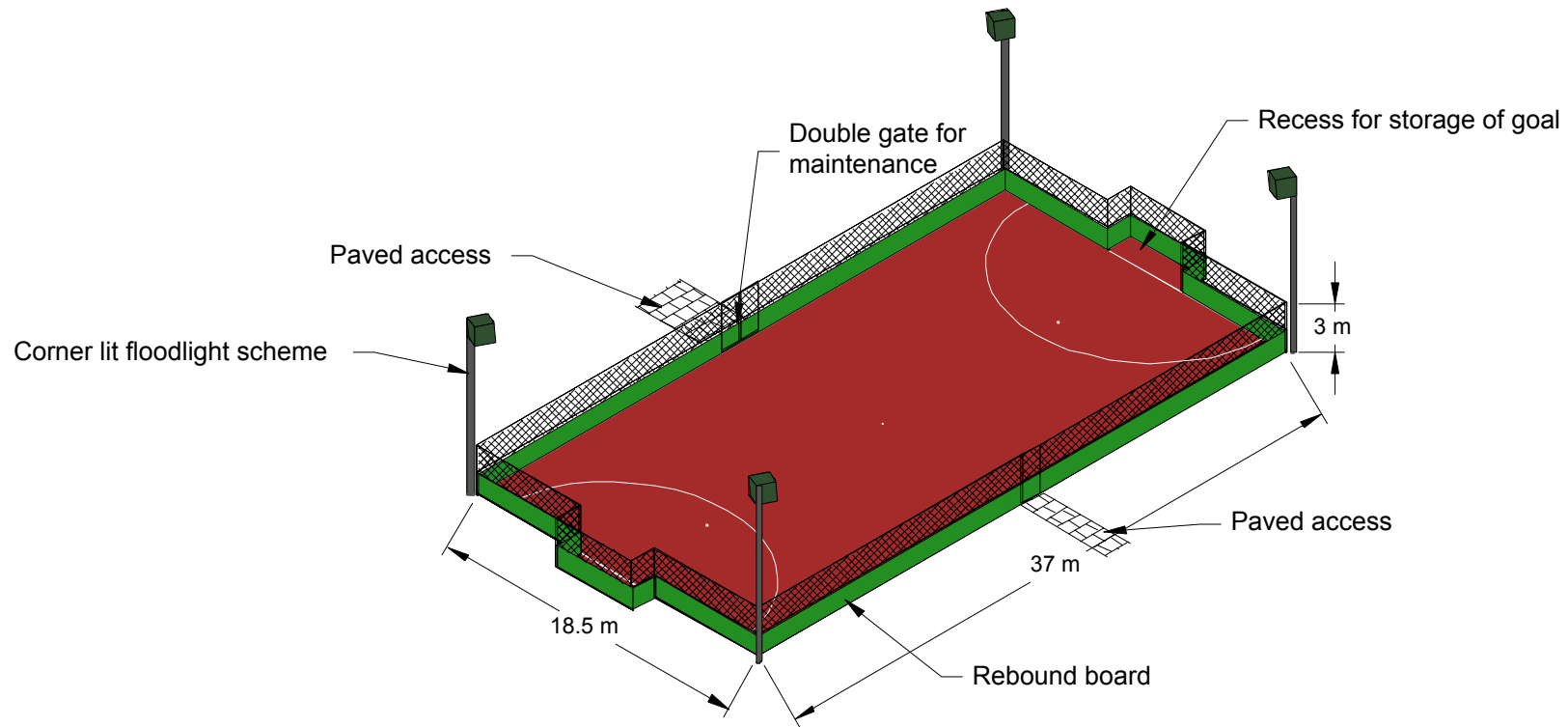
				1.5m <u>Between courts</u> 2.0m
Basketball	28.0m	15.0m	2.0m	3.0m
Five-a-side football	Ratio of length to width = 2:1		Not applicable Boundary fence of MUGA forms boundary of pitch	
	Typically 37m	Typically 18.5m		

Dimensions and run-offs - synthetic turf pitches

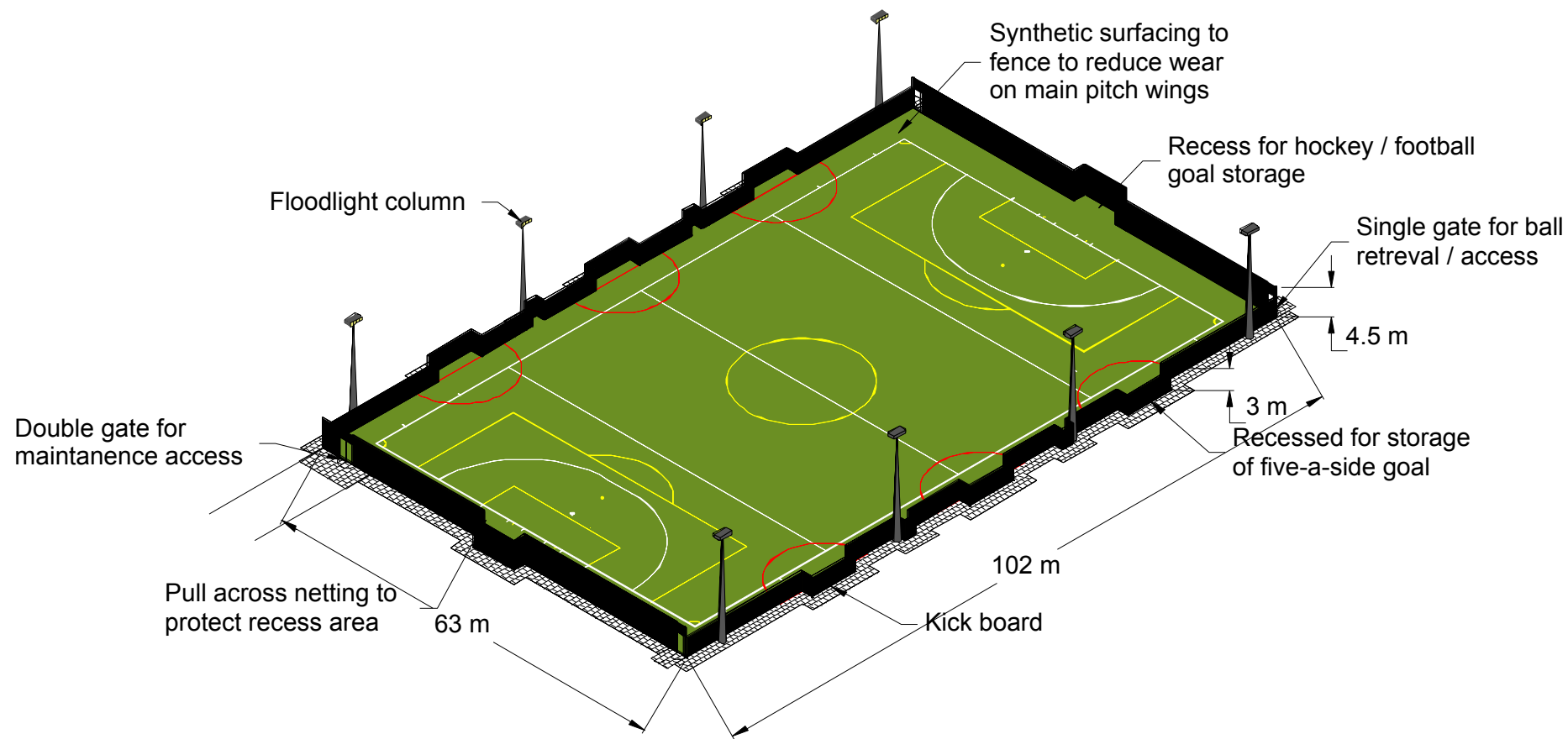
Sport	Principal playing area (pitch or court size)		Minimum run-off	
	Length (direction of play)	Width	Run-back or end run-off (per end)	Side-run (per side)
Football	90.0m minimum 120.0m maximum	45.0m minimum 90.0m maximum	5.0m of which 3m must be of the playing surface	4.0m of which 3m must be of the playing surface
Hockey	91.4m	55.0m	5.0m of which 3m must be of the playing surface	4.0m of which 3m must be of the playing surface
Seven-a-side football	Maximum 64.0m	Maximum 45.0m	3.0m	3.0m



Typical Type 1, 2 or 3 MUGA layout with line markings for tennis, mini-tennis and netball



Typical Type 4 or 5 MUGA layout with line markings for five-a-side football.



Typical STP layout with line markings for hockey, football and five-a-side football.