



# Code of Practice for the Design, Construction and Testing of Football Turf Fields

2023 edition

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# 1. Introduction

Synthetic turf is a high-quality, cost-effective sports surface that can sustain high levels of use and be used in regions where growing and maintaining natural grass is not viable. In the early 2000s, versions were developed for football to replicate the playing qualities of natural grass. These have become very popular, and today, many thousands of new football turf fields are built every year.

A football turf field is an expensive piece of construction that needs to be designed and constructed correctly if it is to meet the expectations of players, competition organisers and those investing in football infrastructure. Recognising the need to help those planning a football turf field, FIFA has developed its Quality Programme for Football Turf <sup>1,2</sup>. Now, with the benefit of over 20 years of research, the programme has become the definitive international standard for football turf surfaces and fields.

The success of a football turf field is not, however, only dependent on the quality of the football turf, but also the base on which it is laid. Experience has shown that if the base is not correctly designed or constructed, it can result in a field that players find unsatisfactory, or in the worst case, hazardous or unusable. Therefore, to provide further assistance to those designing and building football turf fields, FIFA has prepared this Code of Practice, which describes the construction standards that FIFA recommends be used whenever a new football turf field is being built.

Whilst most football turf fields are intended for 11-a-side football, the guidance given in this Code of Practice can also be applied to smaller fields intended for training and small-sided football (9-a-side, 7-a-side, etc). These fields, do not, however, qualify for certification under the FIFA Quality Programme for Football Turf.

In some countries, there may already be national standards that cover some of the criteria described in this Code of Practice. In such cases, and unless otherwise specified, the national standards should take precedence over this guide.

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<sup>1</sup> [Resource Hub \(FIFA.com\)](#)

<sup>2</sup> Detailed in the FIFA Handbook of Requirements for Football Turf

## 2. Types of base construction

There are two main types of base and drainage systems used for football turf fields. Both methods are proven to work and are considered acceptable.

Where suitable free-draining aggregate (stone) mixes are readily available, fields may be designed to allow water to drain vertically down through the base into a sub-surface drainage system. A typical construction is shown in Figure 1 below.

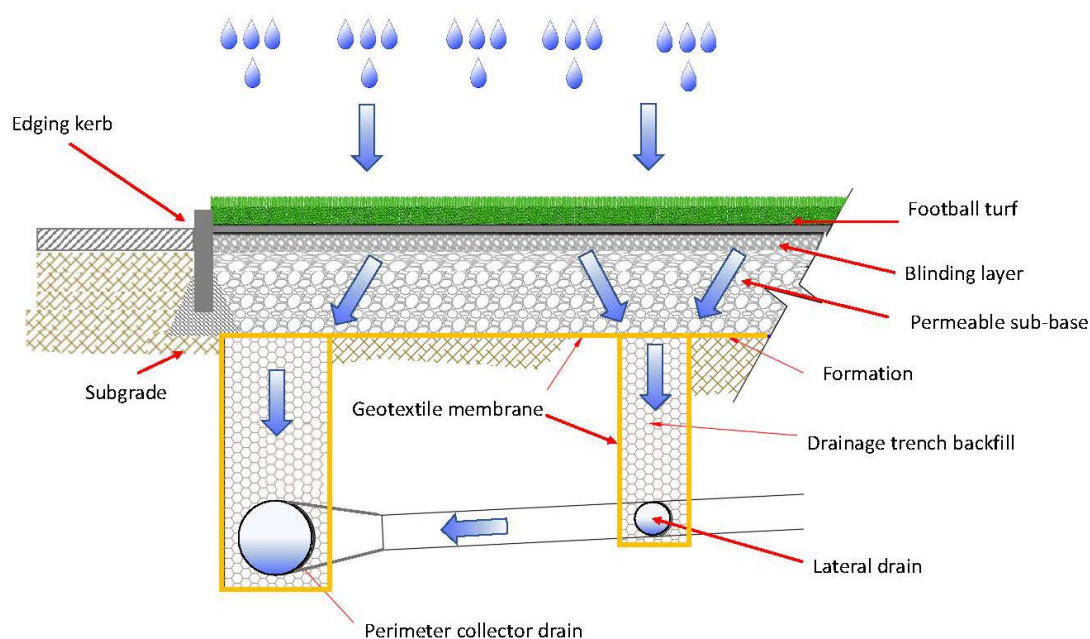


Figure 1: Illustration of field construction with vertical sub-surface drainage

Alternatively, if free-draining aggregate is not readily available or due to the field designer's preference, a horizontal drainage system may be used. These allow the water to flow down through the football turf into some form of drainage cell that allows then allows the water to flow horizontally to perimeter collector drains. A typical construction is shown in Figure 2 below.

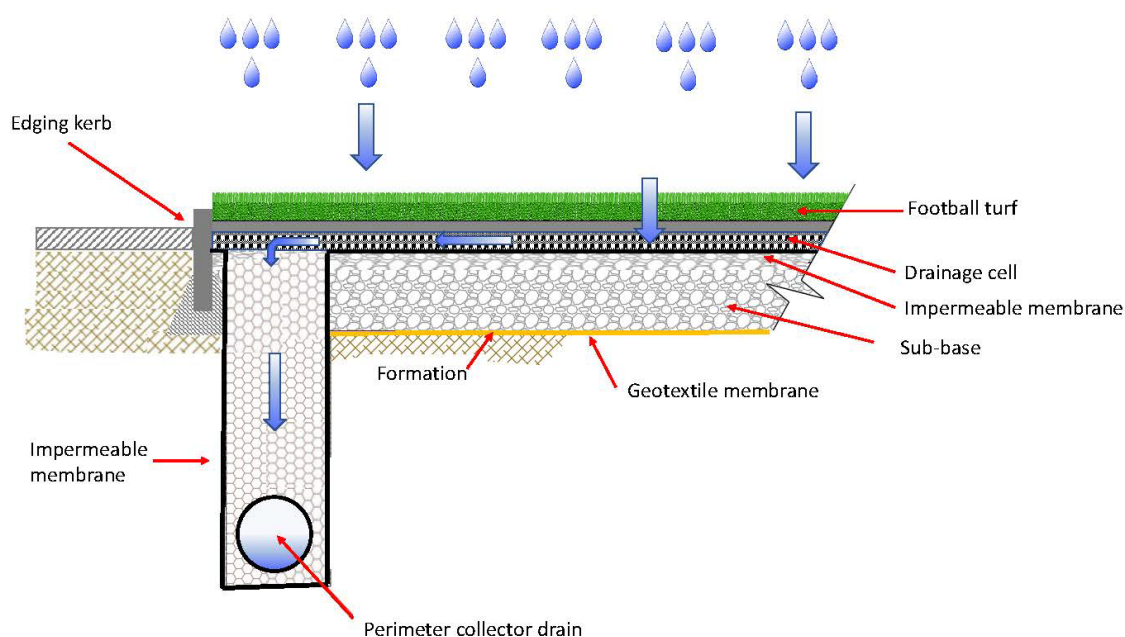


Figure 2: Illustration of field with horizontal drainage

FIFA is also aware that new, innovative methods of base construction and field drainage are being developed to provide alternative, cost-effective, or more sustainable design options. Whilst the criteria detailed in this Code of Practice is based on established design solutions, it is not FIFA's intention to prevent innovation or to restrict the use of these new methodologies.

If innovative methods are proposed, the field designer should demonstrate how they will ensure that the base and drainage design principles described in this Code of Practice will be achieved, along with the methods of verification that may be used to validate satisfactory construction.

### 3. Definitions

The following definitions apply in this Code of Practice:

**Base** – all elements of construction beneath the football turf surface. These include:

- **Subgrade** – the native ground on which the field is located
- **Formation** – the prepared surface of the subgrade on which the field is constructed
- **Drainage system** – a means of removing rainfall from the playing surface so that it does not build up and restrict use of the field. The drainage system also needs to ensure that any water flowing from the surrounding land cannot encroach onto or under the playing surface and compromise the integrity of the field
- **Sub-base** – a layer of unbound aggregate that provides the load-spreading and (when required) frost insulation properties, required to protect the weaker, more susceptible soils forming the subgrade
- **Blinding (or sealing) layer** – a layer of finely graded unbound aggregate that is laid above the sub-base to provide a smooth platform on which the football turf surface can be laid
- **Bound base** – a layer (or layers) of asphalt or concrete used instead of an unbound blinding layer on fields requiring enhanced load-bearing capabilities (e.g. stadium field on which non-sporting events may take place)

**Consolidated construction depths** – the depths of materials after they have been rolled to compact

**Designer** – the person(s) responsible for developing and specifying the design of the field. This can be an independent expert (architect or consultant) or a suitably experienced employee of a sports field construction company

**Design levels** – the finished levels of the field, as shown on the construction layout drawings

**Elastic layers** – layers made from rubber granules (normally produced from end-of-life tyres) and a binder that are mixed on-site and laid with a small paving machine to form a homogenous layer

**Field of play** – the area of the field contained within the touch lines and goal lines

**Football turf** – long-pile synthetic turf surface designed for football

**Geotextile** – a membrane that is used to separate layers of construction from each other or the native soils. They may be permeable to allow water to percolate through them or be impermeable to prevent water percolating into the layers below

**Planarity** – the smoothness or flatness of the construction layer, normally checked by measuring the size of depressions and high spots under a 3m straightedge

**Shockpads** – an underlayer installed beneath the synthetic turf carpet that helps to provide the desired player/surface and ball/surface interactions. They may be produced from flexible foams that are supplied as rolls or interlocking tiles, or as elastic layers that are made from rubber granules and a binder that are mixed together on-site and laid with a small paving machine to form a homogenous layer

**Topsoil** – the upper portion of the native soil that has a high content of organic material

## 4. Design principles

When designing a football turf field, consideration must be given to the way it will be constructed and used. Particular attention needs to be given to the loads that will be applied by the construction equipment used to build the field (including the installation of floodlighting and fencing, etc.), as well as the equipment that will be used to maintain the playing surface and to periodically remove and replace the football turf surface. Based on the specific site conditions, the formation, base and drainage system should be designed to be able to:

- withstand all applied loads without excessive deformation or instability;
- restrict the likelihood of variable heave or settlement caused by frost penetration, soil shrinkage, or other volume changes in the subgrade soils;
- provide adequate drainage to ensure that rainwater is removed sufficiently quickly to avoid surface puddling;
- prevent water from flowing from the surrounding land onto or under the field; and
- meet a design service life of at least 20 years.

## 5. Site and ground investigations

Understanding the ground conditions on which the field is to be built is fundamental to ensuring a good quality, stable and durable construction. Experience has shown that the greatest risks of increased construction costs, programme delays or longer-term premature failures are caused by unforeseen problems in the ground or due to an inadequate site-specific design.

Before any football turf field is designed, a site and ground investigation should be undertaken.

### 5.1 Geotechnical survey

Ground investigations should be undertaken in accordance with internationally recognised guidance such as EN 1997-2<sup>3</sup>, tailored to the specific project proposal. The location of boreholes/trial pits should be proposed by the geotechnical engineer and agreed by the project team. Typically, for an 11-a-side football field, a minimum of five trial pits will be excavated, or one for every 800m<sup>2</sup> of proposed construction, whichever is the greater number. These will typically be excavated to a depth of approximately 1,500mm below the current ground level. If the field is to also have a floodlighting system (which is often installed as a later phase of the facility's development), additional trial pits should be excavated in the approximate

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<sup>3</sup> EN 1997-2: Requirements for the execution, interpretation, and use of results of laboratory tests to assist in the geotechnical design of structures

location of the floodlight columns/poles. These should be excavated to a depth of approximately 3,000mm below the current ground level.

If there are specific areas of concern (known locations of landfill, soft spots, etc.), additional trial pits should be excavated to determine the extent of the affected area.

It is important that the geotechnical report resulting from the survey details the values measured at each test location and not just the site average results. The survey should provide the following information:

- a. An engineering description of each layer of the native ground and subgrade. This should include the thickness of each layer, particle grading for coarse-grained materials, soil plasticity indices for fine-graded materials, and the moisture content of each layer
- b. Laboratory California Bearing Ratio (CBR) tests on soil samples, ensuring that each value is associated with the specific location on the site from where it was taken
- c. Where subgrade soils may be used for cut and fill constructions, the suitability of the soils for reuse
- d. Groundwater levels encountered and an assessment of flow rates. As groundwater levels vary in accordance with the seasons, the geotechnical engineer should also indicate how the groundwater will vary annually

If rainwater is to drain into the subgrade or a soak-away, the ground investigations should include hydraulic conductivity or soak-away percolation tests.

## **5.2 Topographical survey**

In addition to a geotechnical survey, a topographical survey should be undertaken. This should describe the shape and features of the site on which the field will be located. The survey should include:

- a. a desk study of the site and its environs, to include site history, flood risk, buried utilities, etc.;
- b. a topographical survey showing the levels of the site. Measurements should be taken every 10m and recorded to the nearest 1mm over the area of the proposed field plus (typically) 20m beyond the perimeter of the proposed development;
- c. details of boundaries, existing fences and any other primary features;
- d. details of the levels of neighbouring land if they are likely to allow water to run off them onto the site of the new field;
- e. details of how construction equipment will access the site and any restrictions identified;
- f. details of any trees growing on the proposed site of the field or nearby. Details should include their species and height;
- g. details of surface features relating to existing drainage and services such as ditches, utility access covers and overhead power/communication lines;
- h. any other adjacent features such as roads and buildings;
- i. details of potential drainage outfalls;
- j. indication of any ground abnormalities (landfill etc.).

## 6. Field layouts and dimensions

The Laws of the Game, published by The International Football Association Board, define the permitted sizes of the field of play for 11 a-side football. These are shown in Table 1 below. The Laws also state that:

- the field of play must be rectangular; and
- the length of the field of play (distance between the goal lines) must be greater than the width of the field of play (distance between the touch lines).

In addition to the field of play, football fields require a perimeter margin that allows players and match officials to leave the field of play safely without colliding with surrounding infrastructure such as fencing, floodlight poles, etc. The size of the run-off margins is often defined in national or international competition regulations. Where such regulations do not apply, the run-off on each boundary should be at least 3m.

Table 1: Dimensions						
	Field of play (m)		Minimum run-offs (m)		Total size (m) of field of play	
	Length	Width	Behind goal lines	Along touch lines		
Field of play intended for non-international matches*						
Minimum	90.0	45.0	3.0	3.0	96.0	51.0
Maximum	120.0	90.0			126.0	96.0
Field of play intended for international matches*						
Minimum	100.0	64.0	3.0	3.0	106.0	70.0
Maximum	110.0	75.0			116.0	81.0
* Subject to national or competition regulations						

Note: if a field is required to be certified to the FIFA Quality Pro category within the FIFA Quality Programme for Football Turf, the field of play must comply with the sizes specified for fields of play intended for international matches.

Appendix A shows a number of commonly used 11-a-side football field layouts and their sizes.

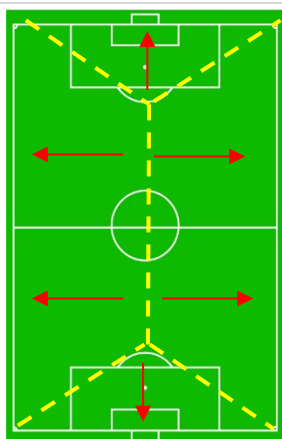


## 7. Field profiles and gradients

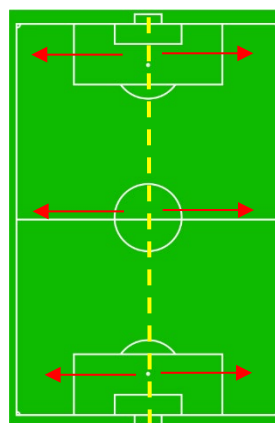
A number of different profiles are commonly used for football turf fields; the most common are illustrated on the drawings below.

Although a field with a vertical drainage system can be built with a flat profile (no slopes), experience has shown that a shallow gradient aids the movement of water and helps to ensure that localised puddling does not occur. For fields using horizontal drainage, a slope to aid the movement of the water is essential.

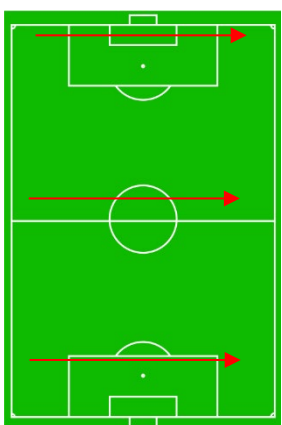
When designing a field, it is also important to ensure that the slopes do not adversely affect the playing qualities of the field and especially the way in which a ball rolls on the surface. It is therefore recommended that the profile of a field has a minimum gradient of 0.5% (1:200) and no gradient greater than 1% (1:100) in any direction.



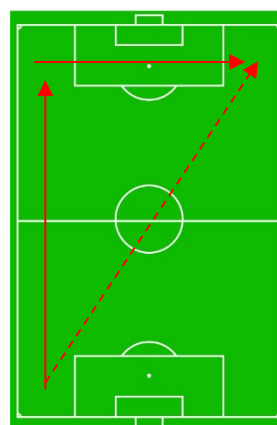
Turtle-back profile with water draining to each perimeter



Ridge profile in which the field slopes from the longitudinal centre line to each side boundary



Field sloping in a single plane from one side to the other



Field sloping from end and one side to the opposing boundaries, creating a diagonal slope

When a turtle-back or ridge profile is used, it is important that the apexes of the profiles do not cause rigids that are greater than 10mm under a 3m straightedge. This may mean that the profile needs to flatten at the apexes and be tapered over several metres.

## 8. Subgrade formation

### 8.1 Design considerations

The formation is the prepared surface of the subgrade on which the field is constructed. It needs to have adequate stability and load-bearing capacity to support the field, and its ability to achieve this will depend on different factors, including the type of soils present and the various weather conditions that will occur. When formation soils are too wet or too dry, or not adequately compacted, they are less able to support the bearing pressures exerted by the overlying field, resulting in the field settling.

Factors that need to be considered include the potential for the following:

#### Clay shrinkage and swelling

Clay soils have high plasticity and are prone to swelling when hydrated, and to shrinking and cracking when dehydrated.

In most cases, potential expansion problems can be reduced to an acceptable level if a field's drainage system prevents water from entering the subgrade soils; and the risks of shrinkage and cracking can be minimised if the sub-base thickness is sufficient to prevent the subgrade soils from drying out in prolonged periods of dry weather.

#### Frost heave

Frost heave is caused when frosts penetrate susceptible subgrade soils. If water is present in the soils, it can freeze and form ice lenses that can cause the soils to then heave or buckle, lifting the construction above them. The longer and deeper the period of frost penetration, the greater the effect. After thawing, the ground will eventually settle back down, but the displacement and settlement will be variable, and this can leave an undulating playing surface.

In general, soils with a high silt content can be expected to be more frost-susceptible than free-draining granular soils or clays with low water infiltration rates. Additionally, if the water table is more than 0.5m below the formation level, ice lenses are less likely to be able to grow substantially, meaning the risk of frost heave is reduced.

### 8.2 Construction criteria

The prepared subgrade should provide a stable platform for the overlying base construction. When the native ground conditions mean that this cannot be ensured, the use of stabilising techniques should be used. These include:

- the installation of suitable additional material to improve the subgrade strength and stiffness;
- the use of lime, cement or other stabilisation procedures;
- the installation of geo-synthetic supporting grids to provide reinforcement between the subgrade and base.

If stabilising techniques are to be used, the designer should provide full details to show how they plan to compensate for the shortcomings of the formation. These should include the appropriate verification tests that will be undertaken to show compliance with this Code of Practice.

All vegetation and topsoil should be removed, and the ground trimmed and levelled, using cut and fill techniques as necessary, to the required profile. All filling should be carried out in layers not exceeding 150mm in thickness, and each layer should be compacted before the next is spread.

Any soft spots must be excavated and backfilled using suitable granular fill material.

A geotextile membrane should be laid over the formation, with its joints overlapping by at least 300mm.

### 8.3 Performance criteria

Following preparation, the formation should be tested to verify compliance with this Code of Practice and the agreed field design.

#### 8.3.1 Formation stability

The consolidation of the subgrade should be checked by using a suitable civil engineering test method. The most common methods are the Dynamic Cone Penetrometer (DPC) and California Bearing Ratio Plate tests.

The measured CBR value at each test position should be  $\geq 5\%$ .

Notes:

- a. If an alternative test method is to be used, the appropriate performance criteria should be agreed in advance by the project's supervising engineer and contractor.
- b. If the creation of a subgrade involves the cut and filling of significant quantities (depth) of material, the method of assessment should be tailored to reflect this.
- c. The suitability of subgrade soils to provide a suitable formation can be assessed by measuring their undrained shear strength or similar properties using standard civil engineering procedures.

#### 8.3.2 Formation profile

The prepared formation should have the same profile as the final field. Individual spot levels should be checked by taking levels on a 10m x 10m grid. They should not deviate from the design level by more than +20mm/-30mm.

#### 8.3.3 Formation planarity

There should be no undulations on the prepared formation that are  $\geq 20\text{mm}$  under a 3m straightedge.

## 9. Field drainage

### 9.1 Introduction

The world can be divided into several climatological rainfall zones:

- **Areas of low precipitation** – these do not normally require sub-surface drainage, and some areas receive so little precipitation that even perimeter drains are unnecessary
- **Areas of light rainfall** – where the use of a simple horizontal drainage system is often adequate
- **Temperate zones** – due to the heavier, frequent rainfall that occurs in these regions, a field will normally require either a sub-surface or horizontal drainage system. This must be designed to handle the rainfall that is known to occur at the field's location
- **Tropical areas subject to monsoons and typhoons** – fields in these regions require an extensive drainage system that is designed to handle the maximum rainfall that is known to occur at the specific location

### 9.2 Design considerations

The drainage system should be designed to:

- remove water from the football turf at a rate greater than 180mm/h, and to ensure that water does not puddle on the surface after the most severe storm that can be anticipated in a storm return period of once every 20 years;
- ensure that excessive water does not remain in the field's construction that could result in a significant reduction of the load-bearing capacity of the base or subgrade or being affected by the actions of the climate;
- protect the installation from the effects of ground water or surface water run-off from areas surrounding the field.

#### Drainage discharge points

The drainage discharge point (or outlet) should be identified on a site-by-site basis. Suitable outlets include storm water sewers, culverts or rivers, or when the soil conditions are suitable, a suitably designed soakaway, etc.

Increasingly, building or planning permits are specifying a maximum permitted discharge rate into public sewers or culverts etc. In such cases, the drainage system may be required to incorporate some form of attenuation system to control the rate of discharge.

If the outlet is into a culvert or river and the peak river level may rise to the height of the outlet pipe, consideration should be given to fitting the pipe with a hinged backflow non-return cover.

### **9.3 Construction criteria**

The spacing between sub-surface lateral drains and all pipe slopes should be in accordance with Table 2 below.

Table 2: Typical drainage system pipe spacings and slopes			
Type of drain	Drainage pipe diameter	Maximum spacing	Minimum pipe slope
Sub-surface lateral drains	≥ 50mm	7m	0.5%
	≥ 80mm	10m	0.5%
Perimeter collector drains	≥ 100mm	n/a	0.5%
	≥ 125mm		0.3%

The minimum depth of drain trenches should be the diameter of the drainage pipe plus 150mm, and the minimum width of drain trenches should be at least three times the diameter of the pipe. The trenches should be encased in a geotextile membrane to prevent contamination.

The drainage pipes should be centrally located in the trenches. Pipe bedding materials should be a clean, rounded gravel or similar. Flexible pipes should be laid on a bed of 75mm minimum depth and the trench backfilled to a minimum depth of 150mm above the crown of the pipe.

Rodding eyes and inspection chambers should be installed at all major junctions to allow the inspection and maintenance of the drainage system.

Note: if a field is surfaced with football turf that contains a polymeric infill, any stormwater surface drains located within 15m of the field should be fitted with suitable microfilters to minimise the risk of any infill being flushed into the aquatic environment.

## 10. Perimeter edgings

The base of the field should be retained within a perimeter edging. This may either be formed from cast in-situ concrete or precast concrete kerbs, block pavers, etc. set on a suitable haunching.

The edgings should be laid to a true line ( $\pm 25\text{mm}$  from a stringline joining their ends) and be level, with an adequate up-stand to finish flush with the infill layer of the football turf.

To ensure that there are no foot entrapment points between the perimeter edging and any adjacent perimeter structure or fencing, the maximum width of any gap should be 10mm.

## 11. Sub-base and base

### 11.1 Introduction

The principal objective of a field's base is to create a stable platform on which the football turf can be laid. To achieve this, it needs to protect the underlying weaker subgrade soils from excessive loads that may lead to deformation and instability of the field.

The base normally comprises two or more layers of granular aggregate materials. The lower layer, which is often called the sub-base, generally consists of coarse-grade aggregates, (typically 0-50mm in size). Above the sub-base is a blinding (or sealing) layer; this regulates the sub-base and provides a smooth platform for the football turf. This blinding layer may be formed from finer graded unbound aggregates (typically 10mm down to dust) or, when a base requires enhanced load-bearing capacity, asphalt.

Ensuring that the depth of the base is adequate for the site and local climate is critical to ensuring the long-term stability of the construction, especially in regions that may experience penetrating frosts.

Note: loads imposed on the playing surface are generally spread at an angle through the construction and will be dispersed over a much wider area with a thicker foundation; doubling the sub-base thickness reduces the effect of stresses at formation level by a factor of four. A thicker sub-base will, therefore, provide greater load-bearing capacity, increased climatic protection, and allow the use of heavier construction and maintenance machinery.

### 11.2 Design criteria

When designing a sub-base, the key objectives are to ensure that it:

- provides adequate stability and load-bearing capacity during the construction of the field and its long-term use, to support any applied loads without excessive deformation or permanent damage to the base and subgrade soils beneath;
- provides adequate protection to minimise the risks of swelling, shrinkage or freezing in the underlying subgrade soils;
- provides, when required, adequate attenuation of infiltrating surface water to comply with any restrictions on drainage discharge rates.

#### 11.2.1 Vertically draining base constructions

If a field incorporates a vertical drainage system, it is important that the fines content (dust) of the aggregate used to form the sub-base is not too high. This typically means that the percentage of particles passing through a 0.63mm sieve should be no more than 5%.

## 11.2.2 Base thickness

The thickness of the base is governed by many factors including the strength of the formation, the nature of the subgrade soils, and the local climatic conditions.

In areas prone to frost, and especially those in sub-Arctic regions, the depth of the base should always be determined by assessing the risk of penetrating frosts and the shrink/swell characteristics of the native subgrade soils.

Table 3 provides guidance on the depth of base constructions that industry experience shows provide satisfactory field constructions. The “typically used depths” are considered suitable for most types of subsoil and climatic conditions, whereas the “minimum depths” are best suited for sites with good ground conditions and a low risk of extreme weather conditions.

Table 3: Typical consolidated base depths (mm)						
	Layer	Permeable base constructions				Impermeable base constructions
		Temperate zones	Sub-Arctic regions	Monsoon regions	Arid regions	
Minimum depth	Sub-base	200	350	200	150	200
	Blinding layer	20	20	20	20	Drainage mat
Typically used depth	Sub-base	275	400-600	275	200	300
	Blinding layer	30	50-100	50	50	Drainage mat

Notes:

- 1 Some forms of football turf incorporate a shockpad that, in addition to contributing to the performance of the playing surface, acts as a bound upper base layer. In such cases, the use of a blinding or asphalt layer is not normally required.
- 2 If the base incorporates an asphalt layer, it should be laid to an average consolidated thickness of at least 40mm.

## 11.3 Construction criteria

### 11.3.1 Load-bearing capacity

To ensure the base is adequately consolidated, it should be tested after installation. The sports field construction industry is increasingly using a Light Weight Deflectometer (LWD), as described in British Standard BS 1924-2<sup>4</sup>, to verify adequate stiffness. When using an LWD, the surface modulus, in each test location, should be  $\geq 40$  MPa.

Notes:

1. If the design depth of the base exceeds 400mm, its consolidation should either be checked incrementally during installation, or an alternative test method used.

<sup>4</sup> BS 1924: 2018. Hydraulically bound and stabilized materials for civil engineering purposes. Part 2: Sample preparation and testing of materials during and after treatment

2. If an alternative test method is to be used, the appropriate performance criteria should be agreed in advance by the project's supervising engineer and contractor.

If a base is found to have areas of low stiffness, additional rolling or other remedial treatments (including allowing very wet bases to dry out) may improve their performance. If, however, a base repeatedly fails to uniformly achieve the required minimum stiffness, the guidance of a suitably experienced civil engineer should be sought on the most appropriate corrective actions.

### **11.3.2 Water permeability rates for vertically draining base constructions**

To ensure that vertically draining base constructions have suitable water permeability rates, they should be assessed using a suitable test method, such as that described in ASTM F2898-11<sup>5</sup>.

When tested in accordance with ASTM F2898-11, industry experience suggests that a permeability rate of at least 250mm/h should be achieved. If lower values are recorded, investigations should be conducted to see if the permeability of the base is adequate.

Note: if an alternative test method is to be used, the appropriate performance criteria should be agreed in advance by the project's supervising engineer and contractor.

### **11.3.3 Aggregate quality**

Most aggregate suppliers operate comprehensive quality control procedures to ensure that the materials they are producing are to the agreed specifications. These normally include batch control testing to ensure the grading and aggregate quality. Therefore, to ensure that the materials used to construct the base of a football turf field are in accordance with the design specification, certificates of conformity should be requested for all aggregates delivered to the site.

### **11.3.4 Base depth**

Base depths should be checked on a 10m x 10m grid. At no point should the depth of the base be less than 90% of the design depth and the total area on which the depth is below the design depth should not exceed 10% of the total field area.

Note: base depths can be calculated by comparing spot levels taken on the formation to levels taken on base.

### **11.3.5 Deviations from design levels**

Individual spot levels should not deviate from the appropriate design level by more than  $\pm 20\text{mm}$ .

### **11.3.6 Surface planarity**

When assessed under a 3m straightedge, there should be no undulations on the finished base that are  $\geq 10\text{mm}$ .

## **12. Football turf surfacing**

The football turf surface should comply with the laboratory test requirements of the FIFA Quality Programme for Football Turf. The programme contains two categories of football turf. The FIFA Quality Pro category is intended for surfaces that will be laid on fields primarily intended for use by professional

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<sup>5</sup> Standard Test Method for Permeability of Synthetic Turf Sports Field Base and Surface System by Non-Confined Area Flood Test Method

players, whilst the FIFA Quality category is intended for surfaces that will be laid on training and community fields, that are often subjected to high levels of use.

Note: a list of approved football turfs can be found on the FIFA website at [Resource Hub \(fifa.com\)](https://www.fifa.com/resource-hub).

### 12.1.1 Shockpads

Some football turfs include a shockpad or elastic layer. Shockpads are normally made from flexible foams that are produced in rolls or interlocking tiles. Elastic layers are made from rubber granules and a binder. The materials are mixed on-site and laid onto the base using a mini-paving machine.

Turf systems including shockpads and elastic layers often have lower pile heights and less performance infill than turf systems without shockpads. This means that the type of shockpad used in the football turf will have been specifically selected to provide the characteristics defined by the FIFA Quality Programme for Football Turf. This means that it is very important that the same shockpad is used when a field is built.

The shockpad should be installed in accordance with the manufacturer's instructions. These will include guidance on how to join shockpad rolls together, and mixing ratios and weather conditions in which elastic layers can be laid.

Once laid:

- the thickness of the shockpad should be  $\geq 90\%$  of the manufacturer's declared thickness;
- the maximum undulation under a 3m straightedge should be 10mm;
- the water permeability of the shockpad should be greater than 150 mm/h.

### 12.1.2 Football turf

Football turf carpets are normally manufactured in rolls that are 4m wide. It is recommended that these be laid across the width of the field (side to side). It is also recommended that the roll lengths allow them to be laid without head joints within the field of play.

If white turf is to be used to form the line markings, the touch lines can normally be incorporated into rolls of turf that are laid along the length of the field and form the side perimeter run-offs.

To minimise the risk of pile lean creating optical colour variations, the turf rolls should all be laid from the same side of the field, so that any pile lean resulting from the manufacturing and transportation of the turf is in the same direction over the whole field.

The carpet rolls can be joined by using adhesive joints or by stitching. Both methods are considered satisfactory, although stitching is more suited to turfs that have a reinforcement backing that reduces the possibility of the carpet tearing along the line of stitches.

Bonded joints should be formed by using a jointing tape of at least 300mm wide, with the glue applied evenly to either side of the tape to a width of at least 250mm.

Following jointing, there should be:

- no carpet rucks, wrinkles or any other form of installation defect within the playing area or run-offs;
- no failed or excessively open joints (greater than 3mm);
- no looped piles;
- no adhesive beads within the pile of the turf.



Occasionally, installation or manufacturing defects require a section of turf to be removed and replaced. Patching of new turfs is often contentious and should be avoided wherever possible. When required, it should only be undertaken if the field owner has agreed to it in advance.

If a patch repair is required, the replacement section of turf should measure at least 1.0m x 1.0m (to ensure adequate adhesive can be applied to each edge of the patch) and it should be laid in the same orientation as the surrounding turf.

### **12.1.3 Line markings**

Field markings may be painted onto the turf or be formed from coloured (white) turf lines.

Turf lines provide permanent markings, whilst some types of painted line can be removed, giving greater flexibility to the use of the field. Irrespective of the type, the line markings should comply with the Laws of the Game.

Some turf lines can be incorporated into the turf rolls during the manufacturing process. The rest are cut into the turf carpet during the installation process.

Lines should have a constant width of between 100mm and 120mm. They should be positioned within  $\pm 50$ mm of their specified position. Straight lines should not deviate over a 30m length from a string line by more than 10mm.

### **12.1.4 Infill**

The infill used in a football turf is a key component of the surface. For turf systems that do not use shockpads, the infill provides many of the sports performance and player comfort properties of the surface.

Most football turfs have two layers of infill: a lower stabilising layer and an upper performance layer. The stabilising layer is normally a rounded sand, whilst a wide range of polymeric granulates and vegetal granulates form the performance infill layer.

Each infill layer must be evenly applied across the field and be brushed into the turf carpet, in accordance with the turf manufacturer's instructions. Typically, the total infill depth will leave approximately 15mm of pile protruding up above the top of the performance infill layer.

Following the application of the infill layers, there should not be:

- an excessively uneven distribution of infill: the difference in infill height between the lowest and highest spots should not exceed 10mm;
- an excessive number of carpet pile yarns trapped under the infill.

As the infill layers are likely to consolidate during the initial months of a field's use, provision should be made for a further top dressing to ensure that the required depths are established.

### 13. Perimeter fencing

Many football turf fields have fencing around their perimeters. The fencing is installed to keep balls within the boundaries of the field, and to protect the field from unauthorised entry and use. Different types and heights of fencing are used, including:

- Ball stop netting
- Twin-bar weld mesh
- Rolled form weld mesh

**Ball stop netting** is primarily intended to keep balls within the boundaries of the field and is often installed behind the goals for a width of 40m and to a height of 5m. It is sometimes mounted about more rigid mesh fence to increase the overall height of the fence. The netting should be 100mm x 100mm x 3mm heavy duty polyethylene mesh. Mounting posts should be a minimum 80mm diameter galvanised steel typically set at 5m centres in 450mm deep bases. The netting should be physically anchored or have a weighted band at the bottom to prevent it billowing in the wind. It is recommended that any netting above 3m in height is mounted on a ratchet and pulley system to allow easy raising and lowering.

If fencing is to be used to protect and secure a field, it is recommended that a weldmesh fencing system be used. These are more robust than ball stop netting or chainlink fences and are better able to withstand the repeated impact of footballs. There are two types of weldmesh fencing that are commonly used:

**Twin-bar weld mesh fencing** typically comprises galvanised 200mm x 50mm mesh with twin 8mm horizontal wires sandwiching 6mm vertical wires, welded at each intersection. It is typically mounted on rolled hollow section steel posts, the sizes of which are designed to suit the panel height. The posts are normally set at 2.5m centres with mounting brackets and clamp bars.

**Rolled form weld mesh fencing** typically has galvanised 50mm x 50mm apertures, with a wire thickness of at least 3mm gauge. The mesh should be mounted on horizontal tensioned line wires with a minimum gauge of 3mm, using stainless steel clips equally spaced, typically at 400mm. Straining posts should be positioned at all corner locations, change in direction and wherever a fence line is terminated, such as a gate location, etc. Two-way straining posts should be installed wherever the length of the fence exceeds 60m and stepped two-way strainers should be used wherever there is a change in the fence height. Intermediate posts should be evenly spaced and set at 3m maximum centres.

**Rebound panel sections** may be fitted to the lower portion of a fence to increase the fence's ability to withstand the repeated impacts of footballs. The panels are typically installed from ground level to a height of between 1.2 m and 2.0 m and are made from 4mm steel wires, welded at each intersection to form 76mm x 13mm rectangles.

**Low-level spectator fencing** is often provided adjacent to a field to segregate players and spectators. Such fencing should have a top leaning rail to protect spectators from sharp wire edges, etc.

**Access gates** should open outwards, away from the field and be back hung to allow them to open 180° back against the fence line. Single leaf gate frames should allow a 1.20m clear opening. Double gates should allow a 3m clear opening, and open to a minimum height of 3m. The mesh should be attached within the frame of each gate, so that when the gates are hung it is on the same side as the fencing, (i.e. the field side). Gates should be supplied with a slide latch to receive a padlock. There should be no fittings or handles protruding into the field area. Double leaf gates should have drop bolts to hold the gates in the opening position, along with one in the closed position. Drop bolt sockets shall be set in concrete footings.

**Fence posts** are normally galvanised box section or round in profile. The size and gauge of the post will depend on the fencing system and site conditions (wind loading etc.). Guidance should be taken from the fencing supplier.

It is recommended that fence posts be fitted with “anti-vandal” security bolts and threaded inserts to securely clamp the mesh to the face of the fence. To help reduce ball impact noise, rubber gaskets can be used at each fixing point, or, alternatively, a full-length rubber strip should be placed between mesh and clamp bars.

Fence post foundation depths will depend on the type of fencing, its height, ground conditions and the local wind loadings that may be expected. Table 4 below shows typical foundation hole sizes for non-exposed fencing that will not have any form of canvas or mesh wind break fitted to it.

Table 4: Typical fencing post foundation sizes				
Fencing height (m)	Up to 1.2m	Less than 3m	3-4m	4-5m
Foundation size L x W x D (mm)	300 x 300 x 600	300 x 300 x 750	300 x 300 x 800	300 x 300 x 600

The concrete surrounding the base of each post should have a minimum strength classification of 20 N. The concrete should be thoroughly mixed, and then placed in position and compacted to the full depth of the hole as soon as possible after mixing.

## 14. Polymeric infill containment measures

Many football turfs contain polymeric (rubber or plastic) performance infills. If allowed to leave the field they can become a source of microplastic pollution.

To minimise the risk of infill leaving a field, infill containment measures should be fitted. The measures should be as detailed in the FIFA Quality Programme for Football Turf, Test Manual 1 – Test Methods and the European Standards Committee’s Technical Report 17519<sup>6</sup>.

**Infill containment barriers** should be installed on all external fence boundaries of the field. They are typically made from either pressure-treated timber, or plastic lumber.

**Boot-cleaning grates** should be located at each entrance to the field. These grates are normally manufactured from galvanised steel with an anti-slip finish. They shall be located within recessed concrete bases fitted with a suitable rainwater drain having a filter bucket and secondary fine micro-filter to prevent the infill from being washed or carried into the drainage system. The grates shall be the full width of the entrance gate and 1.5m in length.

**Maintenance equipment storage buildings** should, wherever possible, be located immediately adjacent to the field to minimise risk of infill being carried into the environment on maintenance equipment.

<sup>6</sup> Surfaces for Sports Areas — Synthetic Turf Sports Surfaces: Controlling Infill Migration to help Minimize Environmental Contamination, European Standards Committee.

## 15. Field equipment

FIFA recommends that all equipment supplied for a new football turf field be manufactured by a member of the FIFA Quality Programme for Football Goals – see [FIFA Quality Programme for Football Goals](#).

Additionally:

- All goals should be supplied with heavy-duty nets.
- Portable goals should have self-weighted back bars to minimise the risk of them toppling and causing injury.
- Portable goals should have wheels to aid movement and to minimise the risk of damage to the playing surface as they are moved around.

**11 a-side goals** should be certified as complying with either:

- The FIFA Quality Programme for Football Goals
- EN 748 <sup>7</sup>
- Other internationally recognised standards

**Small-sided football and training goals** should be certified as complying with either:

- EN 16579<sup>8</sup>
- Other recognised internationally recognised standards

**Corner flag poles** should be mounted on 50mm diameter flexible plastic poles.

**Team benches/shelters** should be designed and made from materials that ensure that the integrity of the shelter is not adversely affected during its use, transportation (mobile shelters), or the climate. The design life of a team bench/shelter should be ten years.

Support frames should be made from non-corrosive metal extrusions having profiles of at least 50mm x 50mm. Translucent roofing and side glazing should be made from impact resistant materials, with a minimum thickness of 3mm. Composite fibreglass and polyester resin shelters should be impact-resistant and have a smooth gel coat finish.

Team benches supplied for fields that are intended to be used for international matches should be positioned in accordance with FIFA and regional competition regulations.

The benches should be securely anchored to the ground to prevent them being moved or blowing over in windy conditions. Ground-anchoring systems should be protected against corrosion.

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<sup>7</sup> EN 748 Playing field equipment — Football goals — Functional and safety requirements, test methods

<sup>8</sup> EN 16579 Playing field equipment – Portable and permanent socketed goals – Functional, safety requirements and test methods

## **16. Key stage inspections during construction**

A new football turf field is a major investment, and it is important that it meets the expectations of players, clubs, national football associations, etc. It is therefore important that proper quality assurance procedures are applied throughout the construction process. These include inspections at key stages of construction, prior to the next stage of the works commencing. A typical schedule of inspections is detailed in Table 5 below.

The inspections should be conducted by an experienced engineer with a background in sports field construction and or civil engineering; this engineer may either be employed by an independent organisation, such as a FIFA-accredited test institute, a locally based construction management consultancy, or, if the field owner agrees, the contractor building the field.

Following completion of the field, it should also be tested by a FIFA-accredited test institute to allow certification by the FIFA Quality Programme for Football Turf. This comprehensive programme of tests is designed to ensure that a field has been constructed correctly; it assesses how the ball interacts with the surface and checks that adequate comfort and protection will be provided to the players. The field test also includes a comprehensive series of quality control checks to ensure that the installed football turf is the same as the FIFA-certified product, ensuring manufacturing and installation mistakes do not go undetected.

Table 5: Recommended schedule of key stage inspections

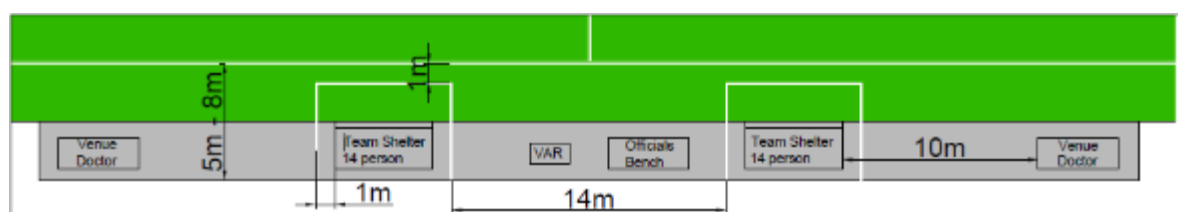
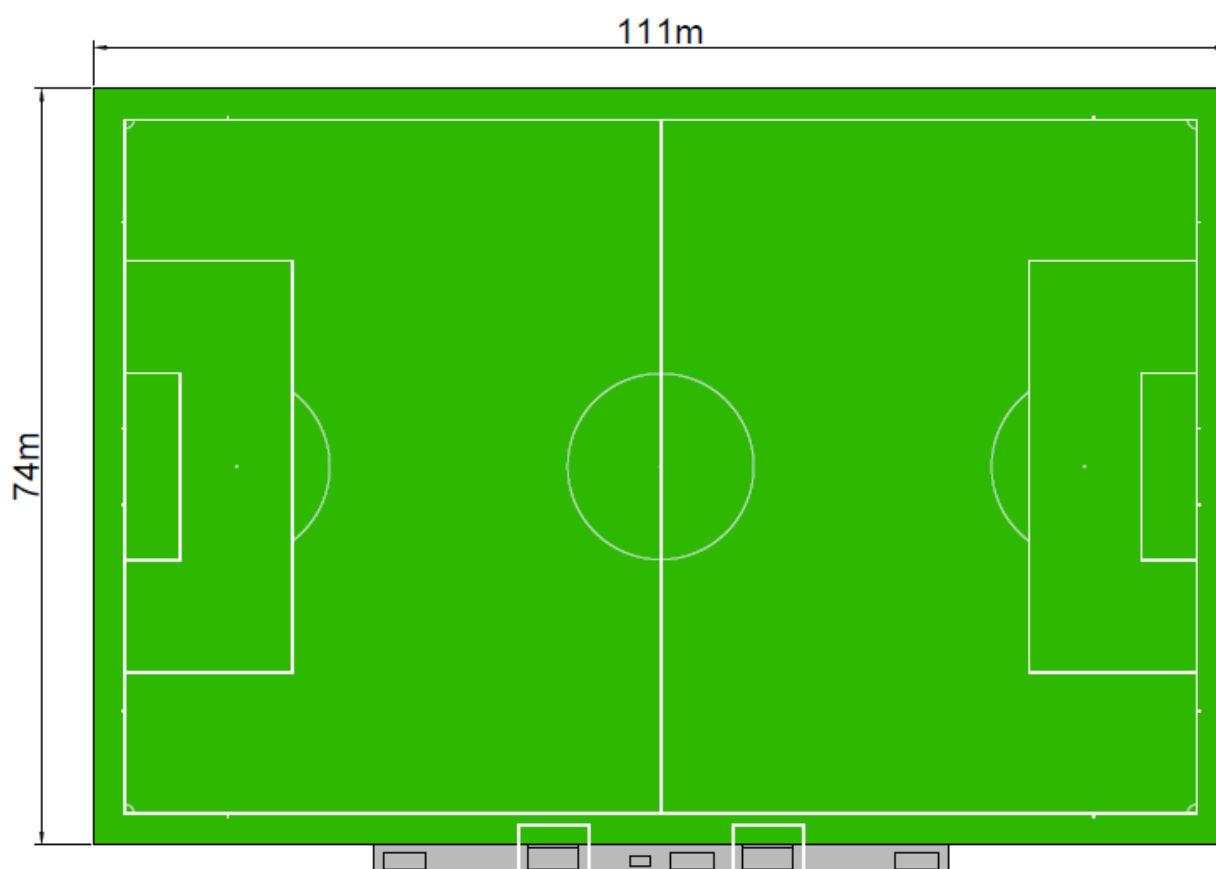
Construction phase and clause reference in this Code of Practice	Property	Recommended survey method and test positions
Subgrade formation Clause 9.3.1	Subgrade compaction	Minimum five tests per field or one test per 800 m <sup>2</sup> , whichever is greater. Positions to be located across the whole area of the field.
Subgrade formation Clause 9.3.2	Subgrade profile	Levels survey on a 10m x 10m grid
Subgrade formation Clause 9.3.3	Planarity	3m straightedge survey over the whole field
Drainage system Clause 10.3	Pipe slopes	Levels survey of major drainage trenches
	Pipe diameters	Measurement
	Drainage trench back-fill	Audit of documentation for materials delivered to site
Perimeter edgings Clause 11	Field dimensions	Measurement along each boundary and central lines (length and width)
	Line and level	Visual check
Base Clause 12.3.1	Load-bearing capacity / surface stiffness	Light Weight Deflectometer or other recognised test method 20m x 20m grid
Base Clause 12.3.2	Water permeability ASTM F2898-11	Tests to be conducted centrally in each quarter of the field
Base Clause 12.3.5	Aggregate grading	Audit of documentation for materials delivered to site

Construction phase and clause reference in this Code of Practice	Property	Recommended survey method and test positions
Base Clause 12.3.4	Construction depths	Levels survey on 10m x 10m grid
Base Clause 12.3.5	Deviation from design levels	Levels survey on 10m x 10m grid
Base Clause 12.3.6	Planarity	3m straightedge survey over the whole field
Football turf Clause 13	Field performance and installation quality	FIFA Quality Programme field test

Tests should also be conducted in any specific areas of concern identified by the inspection agency or project management team.

## Annexe: Typical field layouts and sizes

Standard Field Layout A – Full-Size International Stadium Field						
Field of play		Run-offs			Overall size	
Length (m)	Width (m)	Ends (m)	Side 1 (m)	Side 2 (m)	Length (m)	Width (m)
105.00	68.00	3.00	3.00	3.00	111.00	74.00
Total area = 8,214m <sup>2</sup>						

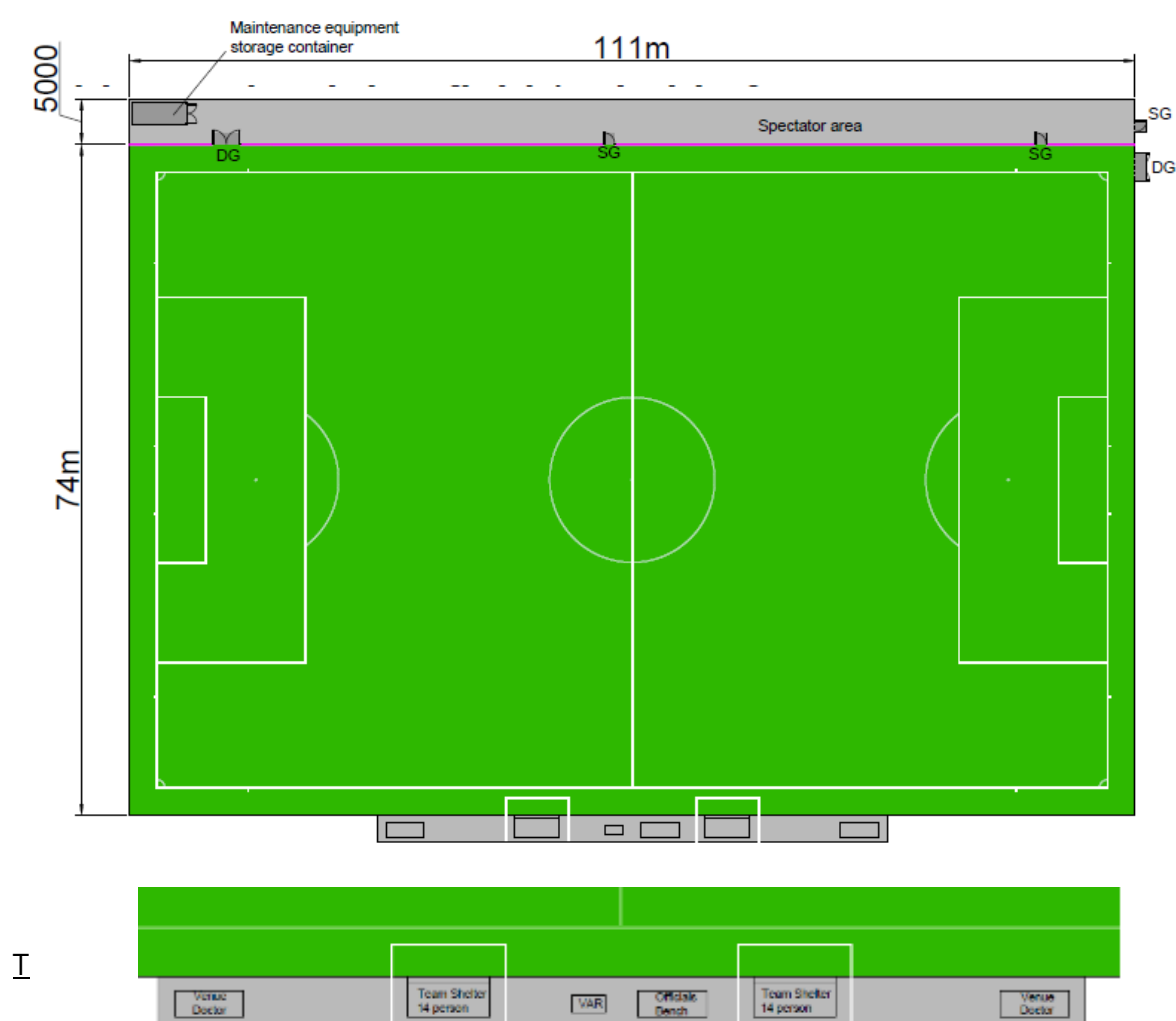


Technical area setting out



## Standard Field Layout B – Technical Centre Competition and Training Field

Field of play		Run-offs			Spectator area (m)		Overall size	
Length (m)	Width (m)	Ends (m)	Side 1 (m)	Side 2 (m)	Length (m)	Width (m)	Length (m)	Width (m)
105.00	68.00	3.00	3.00	3.00	111.00	5.00	111.00	79.00
Total area = 8,214m <sup>2</sup>					Total area = 555m <sup>2</sup>		Total area = 8,769m <sup>2</sup>	

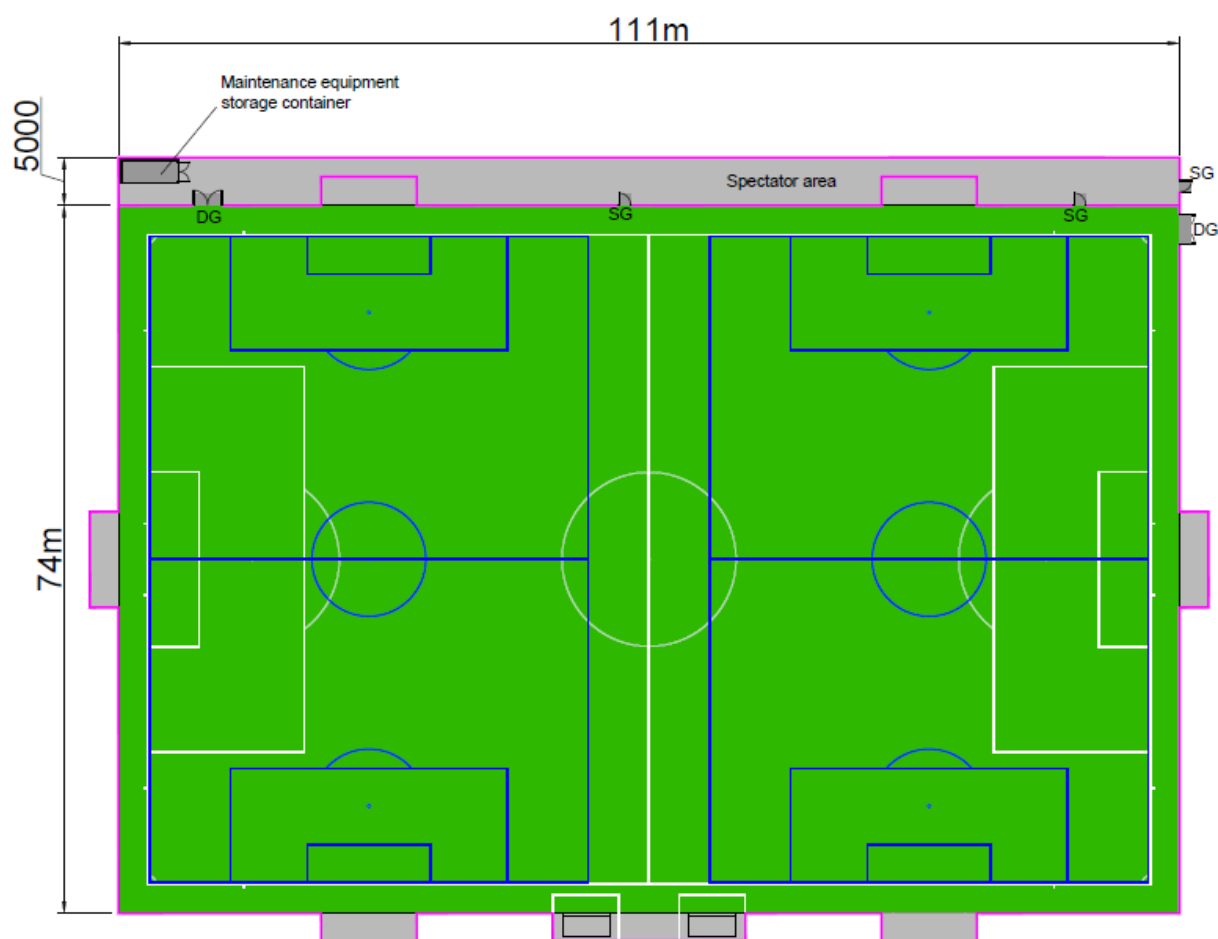


Technical area setting out

## Standard Field Layout C – Technical Centre Training Field

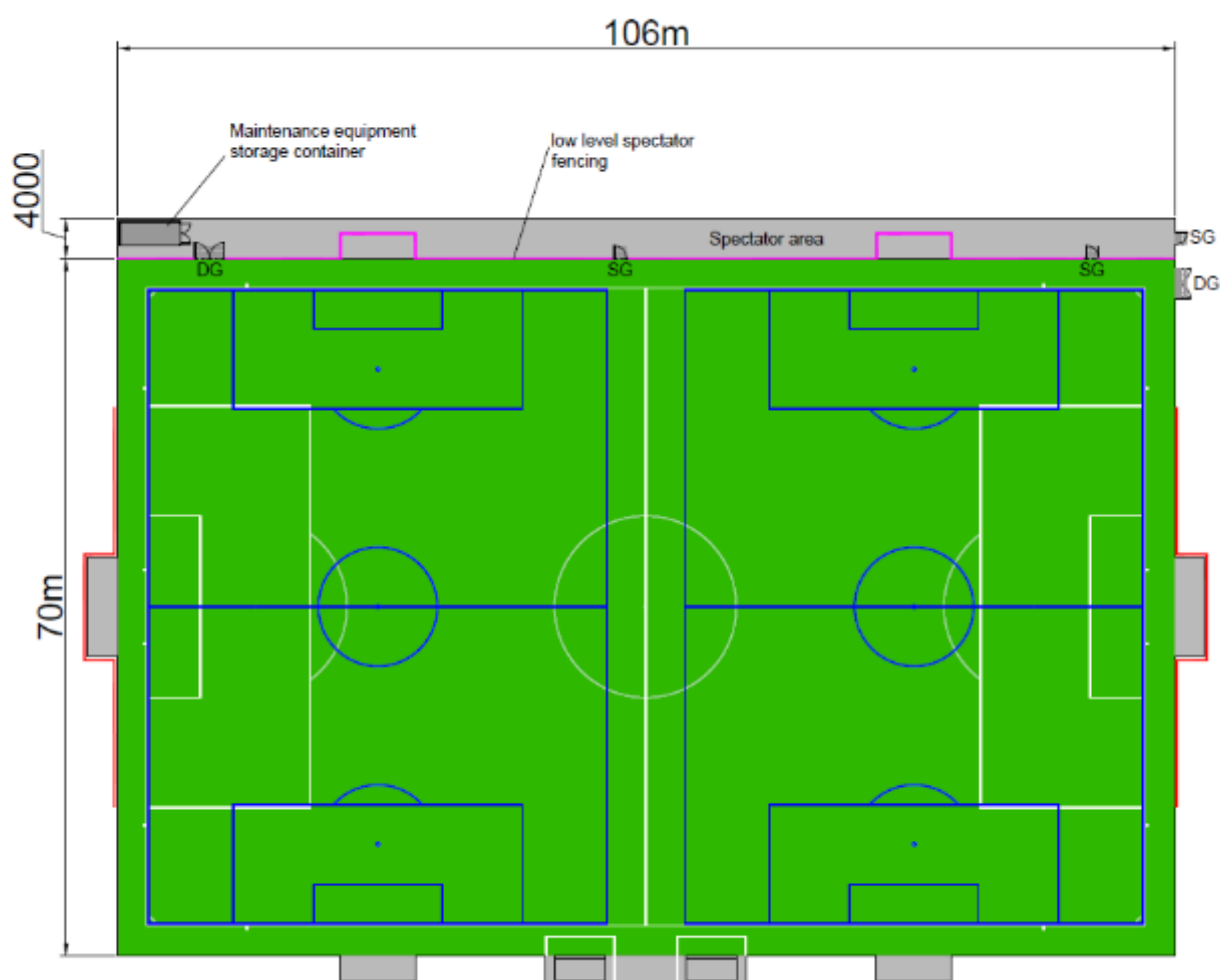
(with recesses for storage of portable goals)

Field of play		Run-offs			Spectator area (m)		Overall size	
Length (m)	Width (m)	Ends (m)	Side 1 (m)	Side 2 (m)	Length (m)	Width (m)	Length (m)	Width (m)
105.00	68.00	3.00	3.00	3.00	111.00	5.00	111.00	79.00
Total area = 8,214m <sup>2</sup>					Total area = 555m <sup>2</sup>		Total area = 8,769m <sup>2</sup>	



**Standard Field Layout D – Community Adult Play**  
(with recesses for storage of portable goals)

Field of play		Run-offs			Spectator area (m)		Overall size	
Length (m)	Width (m)	Ends (m)	Side 1 (m)	Side 2 (m)	Length (m)	Width (m)	Length (m)	Width (m)
100.00	64.00	3.00	3.00	3.00	106.00	4.00	106.00	74.00
Total area = 7,420m <sup>2</sup>					Total area = 424m <sup>2</sup>		Total area = 7,844m <sup>2</sup>	



**Standard Field Layout E – Community and Junior Training Field**  
(with recesses for storage of portable goals)

Field of play		Run-offs			Spectator area (m)		Overall size	
Length (m)	Width (m)	Ends (m)	Side 1 (m)	Side 2 (m)	Length (m)	Width (m)	Length (m)	Width (m)
91.00	55.00	3.00	3.00	3.00	97.00	4.00	97.00	65.00
Total area = 5,917m <sup>2</sup>					Total area = 388m <sup>2</sup>		Total area = 6,305m <sup>2</sup>	

