3.3 Natural Grass

3.3.1 DESCRIPTION

Since the arrival of "all-weather" synthetic running track surfaces in the nineteen sixties, their use has increased substantially and they are now accepted as the best available surfaces for athletics competition. However the use of natural grass is still permissible and often forms the only achievable surface for the many locations unable to secure the substantial finance necessary for a synthetic track or a track with an unbound mineral surface. Also grass surfaces are ideal for intensive repetitive training by middle and long distance athletes.

For warm-up areas grass is still, in many instances, the only surface available, although athletes naturally prefer the same surface as the competition track.

The central arena has always required a surface able to receive and most importantly dampen the impact of implements whilst minimising the possibility of rebound. Throughout the developing period of synthetic surfaces and their fore-runners, unbound mineral surfaces, grass has retained its position as the major acceptable central arena surface. Indeed many arena managers require that the central area offers capacity for alternative sporting events and grass satisfies such requirements admirably.

Whilst initially there may appear to be many disadvantages in the use of grass for athletic events, the flexibility that this surface offers is substantial. Many sites do not require, or are unable to provide, permanently marked out facilities for athletics, for example educational campuses, which because of their hostel accommodation and extensive playing fields, are often utilised for major international events. They are frequently required to expand their existing athletic facilities out of proportion to their normal usage. Grass surfaces give this flexibility, combining the all important training opportunities with scope for setting out tracks for preliminary rounds on areas normally used for other sports.

3.3.1.1 Lifespan

In comparison to other types of athletic surfaces, grass surfaces offer significant advantages in that, with careful maintenance, they will, at very low capital cost, last a very long time.

3.3.1.2 Climate

In many parts of the world varieties of grass are substantially different to those in Europe and Northern America. Their use is similar, however, in that they use their root system and rhizomes layers to act as soil stabilisers ensuring a firm yet flexible surface. The grass surface or sward acts as an adjustable running surface that may be tuned, by adjusting the height at which it is cut, for specific activities.

Specialist construction and irrigation techniques are partly able to alter the firmness or resilience of the running surface by adjusting the amount of water retained within the overall construction. Such techniques, often used for American football and baseball events, indicate the adaptive nature of grass constructions. Grass is not an “all-weather” surface and is affected by adverse weather conditions. If events continue under these conditions, the important top running surface and complicated growing medium may be permanently destroyed.
This can require major reinvestment and, more importantly, the loss of substantial periods of time until the rejuvenated area is again ready for use. Such reestablishment periods can be as much as six to twelve months depending on climatic and soil conditions.

Differing climates, top soils and subsoils all require differing construction techniques according to local conditions and no one specification or indeed seed mixture is suitable for worldwide use. In each case the advice of regional sports field construction experts should be taken.

3.3.1.3 Construction Considerations

The types of grass used should be selected for their surface durability and for suitability as a stabilising medium. The type chosen for tracks should endure 1.5cm to 2cm high cutting, and for the in-field 3cm to 4cm high cutting. Careful analysis is necessary but types used regionally for football or similar activities are often suitable.

One of the most important factors in many grass running surfaces is the drainage. The capacity to perform during periods of inclement weather is imperative, as heavy rainfall can quickly turn an idyllic green sward into a wet, muddy and unusable surface.

Sports field land drainage techniques have now advanced to the stage where highly accurate drainage designs can be installed to cater for anticipated rainfall and required dispersion rates. Although these techniques are commonly utilised on many sports field activities, additional care is required on their application for athletics.

Such systems often incorporate sand slits or sand grooves to transfer surface water down and away to subsurface dispersion drains. Unless the grass surface is adequately top dressed with sand and the slits or grooves properly filled at the time of installation, ruts and trip points may occur through settlement of the sand. Regular re-application of sand will be required to ensure that good drainage is preserved and hazards avoided. Such settlements will be especially noticeable in climates that experience high fluctuations of moisture and temperature causing large soil movements through expansion and contraction.

3.3.1.4 Usage

The programming of athletic events on grass surfaces with large numbers of competitors, or over a long period experiencing difficult climatic conditions, can be crucial. Abuse will often result in a destroyed running surface. This may well be the case if the grass is poorly laid or not properly maintained. It may be necessary for a number of preliminary rounds to take place on areas away from the main arena to ensure the suitability of the track for the prestigious final events. The programming of preliminary rounds should, wherever possible, use adjacent grass surfaces that are still accessible to the viewing spectators.

3.3.1.5 Marking out

In common with all types of tracks not provided with a raised kerb, grass tracks are measured in lane one along a theoretical line of running calculated at 0.20m from the inside running edge of a marked white line. (See "Construction of the Standard Oval Track" in Chapter 2). Often plastic road cones or marker flags (inclined towards the central arena) are provided to visually increase the definition of the inside running edge. Unless these are provided for the continuous length of the track (they are often only provided to divert the runner towards the steeplechase water jump) the 0.20m distance continues to be used.

3.3.2 PERFORMANCE REQUIREMENTS

Natural grass should be viewed as the basic surface for athletics. The natural constraints implicit within its make-up mean that the strict tolerances normally associated with synthetic running track surfaces are not fully appropriate.

3.3.2.1 Grass Coverage

Grass must be seen as the top, biological layer of the sports surface and, because of its root zone, as the biological stabiliser of the top soil. As for sporting activities such as football, hockey or cricket the grass surface has to interact with the athletes through their footwear and in addition has to allow the javelin, discus or hammer to travel through the grass sward before embedding itself in the ground beneath. The movement of a football for example will be affected to a great degree by the height, density and types of grass present on the playing surface. In the same way, athletics will be influenced.

Whilst weed or undesirable plant types can adversely affect the overall appearance of the running surface they do not always directly interfere with the athlete. It is important to ensure a good quality surface and to operate the same maintenance methods as for other sporting grass surfaces. Otherwise undesirable plant types that may seriously affect the durability of the grass sward will take over.

3.3.2.2 Cutting Height

The grass should be maintained at its most appropriate height (3cm to 4cm) to ensure the maximum durability of the running surface. Before a competition, it must be cut to 1.5cm to 2cm, in order that it does not physically restrict the progress of the athlete. For a similar reason, excessive grass clippings must be removed.

In order to facilitate the judging in the throws, the grass height in the field should not exceed 2.5cm.

3.3.2.3 Constructions

The ground or soil structure can significantly affect the athlete in a number of ways. These are normally through particles of an undesirable size and the flatness of the ground (See 3.3.2.4) and as a less durable or excessively soft surface due to the impermeability of the track's upper layer rather than the evenness of the height or the way the grass has been cut.

It is essential that the top layer (root zone of the soil layer) is porous so that excess water can be carried off into the underlying drainage layer or ground.
This means that the soil layer must be of a suitable composition and thickness. Moreover, the ground must be sufficiently flat, for example local settling and grooves must be eliminated. Great care must be taken during construction if both requirements are to be fulfilled. (See 3.5 for the drainage of excess water.)

For the construction of the grassed surface, the methods explained below are recommended, and take into account on the porosity of the ground and the extent of local precipitation.

a) Applicable on sufficiently porous ground for example sand and gravel (Fig 3.3.2.3a).
After creation of the foundation, soil is laid to a uniform depth of 8cm to 12cm. The bottom of the soil layer is mixed with the surface of the underlying ground to key the two layers. The soil is then levelled and grass is sown.

b) Applicable on ground which is less porous yet capable of improvement (Fig 3.3.2.3b).
After creation of the foundation, granular materials (sand, gravel) with particles of 0/2mm to 0/4mm are applied to improve porousness. The necessary quantity depends on the porosity of the underlying ground.

The ground can then be mixed to a coarse tilth with the layer of granular material. Pipe drains are then laid at intervals of 4m to 6m according to the porosity of the improved ground. When the soil is then laid on the improved ground, the performance of the drains must not be impaired. The soil is laid to a standard depth

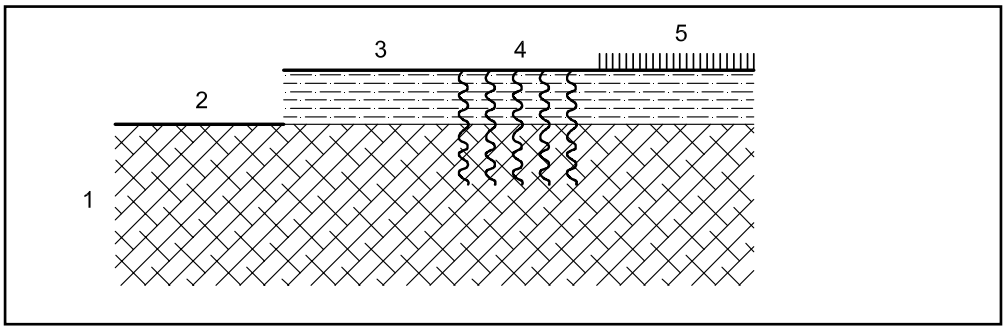

Figure 3.3.2.3a - Method of construction
Example 1: Sufficiently porous subgrade
1 Porous subgrade, 2 preparing of construction ground, 3 applying the grass-supporting layer, 4 loosening/keying, 5 sowing

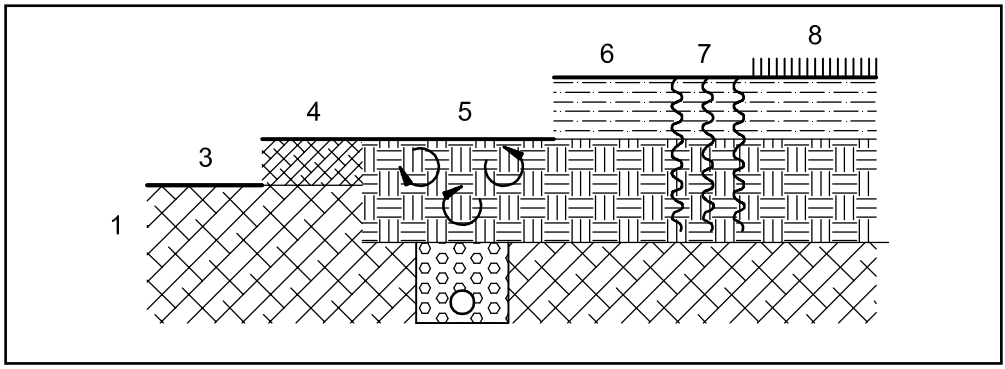

Figure 3.3.2.3b - Method of construction
Example 2: Less porous subgrade yet capable of improvement
1 Subgrade, 2 drain, 3 preparing of construction ground, 4 applying sand, 5 mixing, 6 applying the grass-supporting layer, 7 mixing/keying, 8 sowing

of 8cm to 12cm. After the soil and improved ground have been loosened to key the two layers, the soil is levelled and grass is sown.

c) Applicable on ground capable of improvement for enhanced porosity or load-bearing capacity (Fig 3.3.2.3c and 3.3.2.3d).

This system consists of combined pipe and slit drainage. Slits are installed parallel, and the drains at 90°, to the layout of the track.

After creation of the foundation, drains are laid at intervals of no more than 12m at 90° to the inside edge of the track (at right-angles to the slits). The drain filling of gravel or suitable chippings has a particle size similar to that of the slits (See below). The slit-drains are then created at intervals appropriate to the porosity of the ground and the thickness of the top-soil (usually 1.0m to 1.5m). The slit drains should be 5cm to 8cm wide and at least 25cm deep, and connected in to the drain runs. The slit drains are filled with gravel or suitable chippings with a particle size of 2/8mm.

If necessary, the ground fitted with the combined drainage system may then have to be worked further. After this the soil is laid to a uniform depth of 8cm to 12cm. The thickness of the layer depends on the porosity of the underlying ground and the distance between slits. After the soil and ground are loosened to key them, the surface is levelled and grass is sown.

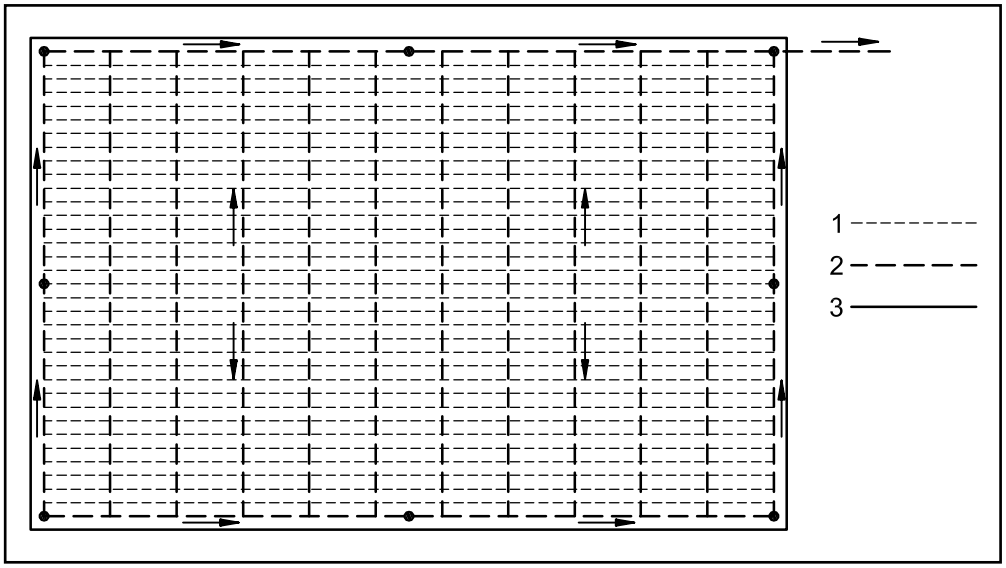

Figure 3.3.2.3c - Method of construction
Example 3: Less porous subgrade
Combined slit drain and drainage system - 1 Drain slit, 2 drain, 3 pitch

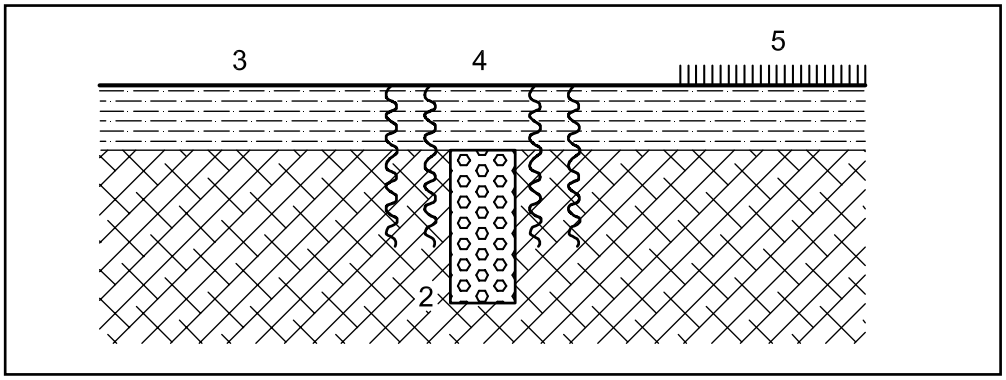

Figure 3.3.2.3d - Method of construction
Example 3: Less porous subgrade
Combined slit drain and drainage system - 1 Subgrade, 2 drain slit , 3 applying the grass-supporting layer, 4 mixing/keying, 5 sowing

Ground of insufficient load-bearing capacity must be stabilised before installation of the drainage system.

d) Applicable on ground of insufficient porosity and limited capacity for improvement, e.g. water-sensitive or unstable ground, rock, or in areas of high precipitation and valley sites at risk from flooding (Fig 3.3.2.3e).

After creating the foundation, drains are laid at intervals of 5m to 8m depending on the porosity of the ground. The drainage layer is then applied to a uniform depth of 12cm to 15cm. After this the soil is laid, also to a uniform depth of 12cm to 15cm. After mixing the soil with the drainage layer to key them, the surface is levelled and grass is sown.

The maintenance of athletics facilities is described in Chapter 7. In addition, attention has to be directed to checks that must be undertaken to remove all stones prior to the surface's use for athletic events. The presence of such stones would adversely affect an athlete's spikes or create a hazard by deflecting a field event implement.

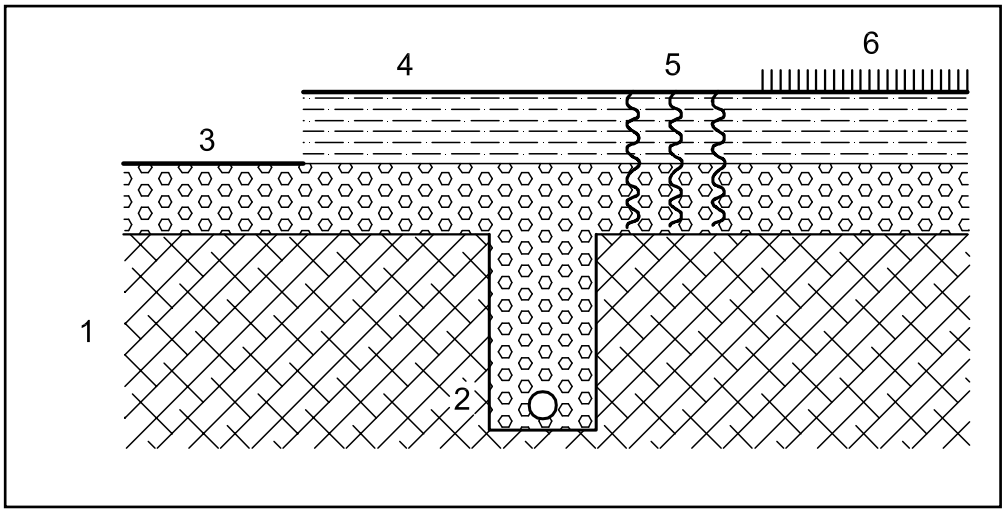

Figure 3.3.2.3e - Method of construction
Example 4: Subgrade with insufficient porosity and limited capacity for improvement
1 Subgrade, 2 drain, 3 drainage layer
4 applying the grass-supporting layer, 5 loosening/keying, 6 sowing

3.3.2.4 Flatness

The overall gradient tolerances of IAAF Rules shall be adhered to. However the flatness of the grass surface cannot be to the same tolerances as synthetic surfaces. Settlement, maintenance operations such as spiking and slitting and the important additions of top dressings will all result in minor local differences of level. However, reasonable tolerances are achievable and must be observed to remove trip hazards and problems of water ponding.

On a localised level there shall be no bumps or depressions beneath a 3m straight edge exceeding 10mm, and beneath a 0.50m straight edge exceeding 8mm. Surface changes caused by the actions of burrowing animals, worms or insects

shall be "made good" prior to any athletic event. It must always be recognised however that many such actions have important and beneficial effects upon the overall soil structure and are therefore necessary to promote good grass growth.

3.3.2.5 Thickness

The upper layer should have a minimum consolidated depth of 8cm prior to seeding, turfing or commencement of the grass layer. This is necessary to ensure good root establishment, ground stability and penetration of the spike of the athletes' shoe without meeting any solid item.

3.3.2.6 Drainage

The recommendations and proposals in Sections 3.5 and 3.6 will enable the facility to meet the IAAF Specification for synthetic tracks, that no standing water should be present twenty minutes after rainfall has stopped.
This requirement is normally achievable with natural grass.

3.3.3 TESTING

Some of the dynamic tests which have been developed can be applied to natural grass surfaces, and there are proprietary items of equipment which have been developed for such ground, in the form of "impact hammers" which give readings of loading and penetration of test cylinders into the surface. However, these procedures have not been routinely applied to natural grass for athletics tracks, and it is not possible therefore, at this stage, to define their use or set limits for the various surface characteristics which they measure.

7.2.3 NATURAL GRASS SURFACED TRACKS

7.2.3.1 General Aspects

Natural grass surfaces are mainly used for infield throwing events. However, they can be used for tracks. Turf requires specialist care. Since it is a living material, particular attention must be paid to the frequency of use.

7.2.3.2 Suitable Equipment

For normal maintenance, the following equipment is required:

- tractor
- ride-on grass-cutter
- nutrient spreader
- sand spreader
- seed spreader
- hand tools
- renovation equipment

For renovation, the following equipment is recommended:

- top dresser
- airifyer/aerator with slices/pipes
- slotter
- verticutter
- vertidrain
- seeder

7.2.3.3 Necessary Materials

The following materials must be available:

- substitute grass area
- seeds
- nutrients
- sand in specific gradients
- growth medium of standardised quality

7.2.3.4 Required Properties of the Surface

The most important factors are: evenness, compactness, growth and height of grass.

7.2.3.5 Regular Procedure

A natural grass surface should be inspected daily. The normal procedure consists of cutting and watering (frequency varies) and repair of the surface, when necessary.

7.2.3.6 Basic Procedure

The following main tasks should be undertaken in a basic maintenance plan:
When mowing, the cutting height must take into consideration the sports activities for which the surface will be used. Prior to a track and field competition the grass should be cut to 1.5cm to 2cm in height.
All grass cuttings should be removed, ensuring they are not spilt onto a synthetic or unbound mineral surface.
A quantity, quality and time programme of nutrition must be established.
For watering, flush sprinklers are recommended.
Local damage must be repaired immediately. All thatches are to be removed.
When necessary, the surface must be loosened with special tools and sanded with 0.2mm to 0.4mm particles. Leaves, litter and other deposits are to be removed.
Plant protection must be observed in accordance with national law.

7.2.3.7 Seasonal Works

The seasonal preparation of the grass surface is of great importance. Plans should be established for Spring works (general preparation), Autumn works and maintenance after each training session.

7.2.3.8 Restrictions on Use

Natural grass must be protected. The frequency of use must be regulated and sufficient time allowed for growth and maintenance (repair of bad spots, general treatment, renovation). The surface should be protected from heavy vehicles.
For the hammer event, the surface should only be used for competition and not for training.
The inside lane should be closed for training using barriers.

7.2.3.9 Regeneration/Renewing

Even with well planned and practiced maintenance, a natural grass surface will require a carefully planned regeneration after 6 to 10 years. Based on analysis of the growth medium, compactness, porousness and the condition of the grass, there are different principles for regeneration or renewing.

- Simple surface renovation
  This method is recommended as a natural renovation for uneven surfaces of large areas of worn grass.
  The procedure consists of cutting the grass 1cm, verticutting for cleaning the surface and removal of dead grass and thereafter levelling with growth material. It is important that all compact areas are loosened. This is followed by a top dressing of sand and, finally, overseeding.

- Combined surface and depth renovation
  To be used in cases of greater compactions, bad drainage and poor grass cover. The surface should be cut, cleaned and levelled. In addition, it should be vertidrained to a depth of 15cm to 30cm before sanding and overseeding.

- Renewing
  This procedure is to be recommended in acute circumstances. The grass surface may be waterfilled due to compaction. The procedure for renewing is the removal of the top layer of approximately 5cm. The drainage must be inspected and, if necessary, renewed. The ground should be loosened and levelled with granular materials to the required standard consistency.
  New soil of a standardised sand-based composition should be laid to a depth of 8cm to 12cm. This soil should be levelled and seeded.