

Base Preparation Guidelines for Tisanos Systems

DISCLAIMER

These guidelines are provided for information only and are not intended as a specification for an individual project. Reference should always be made to the architects or engineer's drawings and project specifications for actual construction details.

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1 APPLICATIONS

Tisanos systems are engineered specifically to enhance the performance and safety of artificial turf playgrounds. Tisanos is designed to optimise drainage, provide additional stabilisation of the sub base and act as thermal insulation layer to protect the sub grade from frost. Tisanos may be used on two types of construction; either where the sub-base is permeable and water flows through the structure into an underlying drainage system or soaks away into the underlying soil, or where the sub-base is impermeable and water falling onto the surface drains vertically through the turf system surface and laterally through the Play Base system into perimeter drains.

2 SURFACE PROFILES

Playgrounds are constructed with a number of different profiles (flat, sloped single plane, crowned), the Tisanos system may be installed on any plane profile.

The design of the drainage system beneath and/or around a playground will depend on the type of profile, size of the area, sub grade soil conditions, runoff restrictions and the local climatic conditions.

3 FOUNDATIONS

The extent of earthworks depends on ground conditions and site topography. Artificial turf playgrounds are typically laid to very flat gradients, so sloping sites may require more extensive earthworks compared with relatively flat sites. The cheapest option will be the one that produces the least amount of spoil or minimises the amount of imported sand, stone or other base materials. The most expensive tasks are transporting earthworks materials to and from site and the disposal of surplus materials.

A well-engineered foundation is essential to the long-term integrity of a playground. A playground may be subjected to many different stresses such as frost heave, clay shrinkage, clay swelling and settlement. The degree to which the performance and durability of the playing surface will be affected by these forces depends on the site conditions, (e.g. climatic conditions, type of sub-soil and the type and depth of the construction).

A geotechnical investigation report can provide information that will enable the designer to assess the suitability of the formation layer. The scope of the site investigation depends on site conditions and should include examining and sampling the ground conditions on site together with laboratory testing. The information requirements will include the following:

- Ground strength
- Groundwater level
- The sub-soil hydrolytic conductivity
- Topsoil thickness
- Soil particle grading (for coarse-grained soils)
- Soil plasticity indices for fine-graded soils. (Soil plasticity index is a measure of soil clay content, which is vital to assessing shrinkage potential.)
- An engineering description of the ground.
- Surface water outfalls
- Soil Porosity

In locations subjected to frost the potential for frost heave of the natural ground has to be considered as this can have an adverse effect on the playground surface. Frost heave occurs when frost penetrates into susceptible sub-soils, normally those that include a lot of fine silts in their composition. The presence of the silts allows water to be drawn by capillary action into the freezing zone, causing ice crystals to form which then expand and push up towards the surface. The longer and deeper the period of frost, the greater the effect. After thawing, the ground will eventually settle back but the displacement and subsequent inconsistent settlement can leave an undulating playing surface.

To minimise the risk of frost heave it is necessary to provide a thermal barrier that prevents frosts penetrating to the susceptible soil layers. Play Base, a component of the Tisanos system, has a much lower thermal conductivity value than stone aggregates or sands. This means that it is more able to resist frost penetration potentially allowing for a shallower construction whilst still providing adequate protection against frost heave. Therefore the thermal insulation value of the Play Base system is to be considered by the engineer when evaluating the risk of frost heave. Thermal conductivity and thermal resistance values of the Play Base systems are provided in the product specification sheets.

4 SUB BASE

The depth of the sub-base will be determined by the architect or engineer based on the geotechnical and meteorological conditions of the site and any local restriction relative to drainage discharge. The sub-base for any artificial playground should be designed to meet the following criteria.

- It should be capable of supporting - and transmitting to the existing ground - the loads to be used in the construction an surface installation, without causing deformation of the site.
- After the playground 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 people playing, jumping, running, and maintenance equipment.
- It should ensure that water, whether rainwater or natural ground water will drain away freely either into the natural subsoil or into the drainage system.

In the absence of a geotechnical investigation, it is recommended that a sub base construction have a minimum depth of 150mm and shear strength of at least 100kN/m² or a minimum California Bearing Ratio of 15% or equivalent.

5 DRAINAGE

Drainage of a permeable base playground is by way of water absorption into the sub base and subsequently into the underlying formation soil, or by installing a drainage system. Reference should be made to the project engineer's drawings for drainage design.

A unique feature of the Play Base system it is engineered with lateral drainage channels and can be installed over an impermeable base construction, where lateral drainage is through the Play Base component to a perimeter drain.

6 GENERAL GUIDELINE FOR INSTALLING A TISANOS SYSTEM ON A PERMEABLE OR IMPERMEABLE BASE

The following guidelines are for new constructions.

6.1 Sub-grade preparation

The site should be stripped of all vegetation and topsoil and trimmed and levelled using cut and fill techniques as required to the specified profile. Any filling should be carried out in layers not exceeding 50mm thickness, and each layer should be compacted before the next is spread. Any soft spots should be excavated and backfilled using granular fill material.

The formation soil should be compacted to provide a stable platform for the overlying construction. In the absence of any site specific geotechnical requirements such as soil stabilisation, it is recommended that the prepared soil formation have a minimum un-drained shear strength of at least 50kN/m² or a minimum California Bearing Ratio of 5% or equivalent. The regularity of the prepared formation should be a maximum of ±20mm under a 3m straightedge. The prepared formation should be treated with a weed-killer selected to minimise the risk of future weed growth within construction prior to it being surfaced with a geotextile membrane.

For low expansive soils, non woven air and water permeable geotextile fabric should be laid over the formation. For expansive soils a low permeability geotextile fabric should be laid over the formation. The geotextile fabric should overlap for 200mm on each joint and be intermittently bonded or staked into place.

6.2 Drainage System

Permeable Base: (graded sand, stone or porous asphalt)

Playground drainage is through the Tisanos system and into a permeable sub base with sufficient soak-away capability, or into a permeable sub base with a lateral drainage system connected to a perimeter drainage system and linked to a main drain exit or other drainage discharge system.

Impermeable Base: (asphalt or cement)

Playground drainage is laterally through the Play Base system into a perimeter drain installed around the playground and linked to a main drain exit or other drainage discharge system.

6.3 Permeable sand or aggregate sub-base

A permeable sand or aggregate sub-base is laid directly over the geotextile lining the formation. The depth of the sub-base will be determined by the architect or engineer based on the geotechnical and meteorological conditions of the site. If the sub base depth is in excess of 250mm, a combination of layers of graded permeable base construction sand or aggregate

should be installed for greater load bearing capacity and stability. The sand or aggregate should be evenly laid and compacted so it has an in-situ density of not less than 95% of the maximum dry density. The regularity of the final surface of the installed sub-base should be a maximum of $\pm 3\text{mm}$ under a 3m straightedge.

A non-woven air and water permeable geotextile fabric is laid over the sub base construction beneath the Play Base system. The geotextile fabric should overlap for 200mm on each joint.

7 Asphalt or cement base

A 0-60/65mm graded aggregate sub-base is laid directly over the geotextile lining the formation. The architect or engineer will determine the depth of the sub-base based on the geotechnical conditions of the site. The aggregate should be evenly laid and compacted so it has an in-situ density of not less than 95% of the maximum dry density. The regularity of the sub-base should be a maximum of $\pm 10\text{mm}$ under a 3m straightedge.

The asphalt or cement layer is installed over the aggregate sub-base construction. The regularity of the final surface of the installed surface should be a maximum of $\pm 3\text{mm}$ under a 3m straightedge.

A non-woven air and water permeable geotextile fabric is laid over the asphalt or cement construction beneath the Play Base system. The geotextile fabric should overlap for 200mm on each joint

8 Playground Equipment

Playground equipment is fixed into the sub base construction according the installation guidelines provided by the equipment manufacturer.

9 Play Base / Tisanos turf / Infill

The Play Base system is laid directly over the sub base structure in accordance with Play Base installation instructions. The Tisanos artificial turf is installed over the installed Play Base system in accordance with Tisanos installation guidelines. The Tisanos turf is evenly filled with 22kg/m² of the specified graded sand; 80% rounded, graded 0.4-0.8mm or 0.5-1.0mm.

10 Cross Section Drawings

Example cross section designs with the Tisanos system are available at:

http://www.tisanos.com/www.tisanos.com/Construction_guidelines.html