

Type 3 – High grip finish polymeric surfaces

Polymeric surfaces (Types 3 and 4)
Polymeric surfaces are formed from a complex mix of polyurethane binders and rubber granules with a top coating. The materials are either mixed on site and laid as a wet pour material, normally through a small paving machine (although hand laying is sometimes used) onto an asphalt base, or supplied in factory produced rolls that are bonded to an asphalt base. When installed as a wet pour system the resulting rubber mat may be colour coated to improve appearance and some surfaces have a clear texture coat spray applied to improve the slip resistance of the surface. Play lines are normally applied using a compatible polyurethane paint. Polymeric surfaces should meet the relevant requirements of BS EN 14877: Synthetic Surfaces for Outdoor Sports Areas: 2013

To ensure the surfacing has acceptable durability and resistance to weathering all forms of polymeric surfacing should satisfy the laboratory and if required, field test requirements of BS EN 14877 (2013 edition).

completed by either boreholes or trial pits to allow close examination of each layer to provide a detailed engineering description in accordance with BS 5930. The information required from a ground investigation will include the following: Ground strength [CBR's]Groundwater level The sub-soil hydraulic conductivity Topsoil thickness Soil particle grading (for coarse-grained soils), soil plasticity indices (for fine-grained 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

Sub-base

SAPCA have a Code of Practice for the Design, Specification and Testing of Bases for Outdoor Synthetic Sports Areas (2020). The design of the sub-base layer for a MUGA should apply the The SAPCA Code of Practice for the Construction of Outdoor Multi-Use Games Areas principles of this document to ensure that the sub-base is suitable for the location and ground condition. The MUGA will be subjected to many different stresses throughout its life due to the varying seasons and climatic conditions that occur. These stresses mainly concern the sub-soil on which the MUGA is built, and can include:

- Frost heave
- Clay shrinkage/swelling
- Settlement
- Ground loading (above the surface)
- Vegetation disturbance (e.g. tree roots/weed growth)
- Flooding
- Faulty or inadequate drainage

The degree to which the performance and durability of the playing surface will be affected by these forces depends on: Site conditions e.g., climatic conditions and the type of sub-soil present.

Type and depth of construction.
Certain sub-soils are far more prone to the two main causes of serious problems, frost heave and clay shrinkage, and clearly it is important to determine site conditions before designing the subbase construction. Frost Heave is caused when frost penetrates into susceptible sub-soils that include a lot of fine silty material. The particular pore sizes of these soils draw water by capillary action into the freezing zone, causing ice "lenses" to form which then expand and push up towards the surface. The longer and deeper the period of frost penetration the greater is the effect. After thawing, the surface will eventually settle back but the displacement, and subsequent inconsistent settlement, will leave undulations on the playing surface. Many clay soils are prone to swelling when hydrated and shrinking and cracking when dehydrated. This will often show as cracking in a lawn during a dry summer. Such cracking and settlement or swelling will transmit through to the surface if an insufficient depth of foundation is provided. The sub-base to any MUGA should therefore 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 construction. It 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.

A MUGA's sub-base should be constructed using hard, clean, well-bound, non-frost-susceptible aggregates. These are typically a reduced fines grading (Department of Transport Type 3) aggregate mix or a 28mm to 50mm clean stone capped with a 10mm chipping to act as a blinding layer.

The total construction depth (foundation plus surfacing) is critical for several reasons: The greater the depth the less chance of frost penetrating into the sub-soil. The effects of any forces superimposed at the 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 thickness will reduce the effect of stresses at formation level by a factor of four). Thicker foundations provide greater load-bearing capacity and may allow the use of heavier machinery (e.g., laser-controlled pavers), giving more economic and higher quality surfacing with better surface tolerances.

Experience shows the minimum acceptable total construction depth for a MUGA in suitable sites is 215mm, which is significantly below the 450mm that is generally regarded as the potential frost penetration depth for most regions of the UK. Adopting a "belt and braces" approach and using foundations of 450mm would add significantly to the construction costs and many developers would regard this as excessive although it is the only absolute way of guaranteeing no heave at all on frost-susceptible sub-soils. Achieving the right balance between achieving value for money and minimising (if not eliminating) any risk, is not easy - who knows when the next severe winter will happen? Also, to a large extent it depends on the perception and pocket of the client. Table 4 gives recommendations based on current best practice and the requirements of most clients (i.e., allowing a slight risk of minor displacement). The figures should be used as a guide and may be adjusted to consider specific site information and local knowledge. If in doubt it is recommended that specialist expertise be sought.

Perimeter edging
To keep the base, sub-base and surfacing from subsiding at the edges a low retaining kerb should be installed at the edges of the MUGA, this kerb will normally be formed of pre-cast concrete and the most common dimension is 150mm x 50mm. Other types of kerling systems such as in-situ cast concrete or bricks are used in specific circumstances. The level of the top of the kerb should match the type of surfacing being installed, for porous asphalt and polymeric surfaces the top of the kerb should be installed level with playing surface, whereas with synthetic turf the kerb should be installed level with the top of the infill material within the carpet. The kerbs shall be well haunched in suitable concrete, derived from the prevailing soil conditions, the bed and haunching may incorporate movement joints at appropriate spacing's.

Shockpads
The introduction of a resilient layer between the base construction and the synthetic turf is used to provide a degree of comfort to players and to create defined performance and safety requirements for specific sports. There are a number of ways of achieving this resilient layer, with assorted in-situ laid shock-pad systems, prefabricated or combinations of both. Typical components of in-situ systems are rubber crumb/shred mixed with a resin binder, which are mixed on site and laid to form a continuous layer of material. In the case of pre-formed systems, the shock-pad are delivered to site as rolls or tiles of prefabricated material. To ensure that the shockpad has acceptable durability and resistance to weathering, the product should satisfy the laboratory test requirements of pEN 15330-4 and the shockpad guide, published by the European Synthetic Turf Council.

Drainage to be under taken by SUDS Contractor

A suitable drainage scheme should be designed and installed which will: Ensure that all surface water is removed from the site at a rate that will safeguard against surface flooding occurring. Not allow excess water to remain present in the construction that 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.

Meet the requirements of the Environmental Agency or Local Water Authority.

SAPCA Code of Practice for the Design, Specification and Testing of Bases for Outdoor Synthetic Sports Areas which includes guidance on drainage systems. The design of the drainage and sub-base layer for a MUGA should apply the principles of this document to ensure that the drainage system is suitable to the location and ground conditions of the MUGA. Due to the relatively small dimensions of MUGAs, they do not tend to have any form of subbase lateral drainage. Lateral drains incorporated beneath the playing area, the centres of which shall be determined by the composition of the subsoil and the designed infiltration and outfall rates. Centres usually range from 5m to 15m. The ends of lateral drains should be capped to prevent contamination, and connectors should be used when joining lateral drains to collector drains. Collector drains should be located on the outside of the perimeter edging.

Perimeter drains (which may act as collector drains) should be installed at the toe of any embankments to prevent run-off from surrounding areas. Silt/inspection chambers should be constructed 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. Drains usually consist of perforated plastic pipes, bedded on, and backfilled with, clean stone which should then be compacted. No drains should have less than 150 mm cover over the top of the pipe, and no drain should be laid to a fall of less than 1:200 unless advised by manufacturers' instructions. In certain sub-soils where silting-up may be a problem, a geotextile membrane may be used to line the trench prior to backfilling. The installation of a MUGA may disturb any existing land drainage and render it ineffective; where existing land drains are severed, they should be connected into the new perimeter drain. The Environmental Agency and Local Water Authorities now have strict guidance regarding the outfall of drainage systems. Although the design of MUGAs are usually porous, by installing a drainage system in order to keep the surface and base dry and therefore not subject to frost heave and possible damage, the design will concentrate the water to one outfall point, traditionally this has discharged into an existing outlet or natural watercourse or if ground conditions permit, soakways. However, it is now common practice for planning authorities to require a planning application for a MUGA to include details of a drainage system to the Environmental Agency or Local Water Authorities for their approval. As part of this process it is likely that they will ask for the drainage design to be proven and they may put limitations on the amount of water that may be discharged to a water course or surface water drain. In such cases it may be necessary to use an attenuation system to store the water prior to discharge. Due regard must be given to location and size of either attenuation systems or soakways and to ensure that the calculations regarding their design are undertaken by a drainage expert.

NOTE: MUGA AND NEW CAR PARK DRAINAGE SYSTEM TO BE UNDERTAKEN BY SUDS SPECIALIST

