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Playpave Permeability Test

Sport and recreational surfacing systems may be engineered as either permeable or impervious assemblies, with hydraulic performance governed by material selection, layer composition, and field installation variables.

Most pour-in-place (PIP) playground surfacing systems are designed to be permeable, permitting vertical infiltration of precipitation through the wearing course. This permeability reduces surface runoff, provides a degree of inherent self-cleaning, and allows the area to return to service rapidly following rainfall. Impervious surfacing systems are more commonly specified for water-play environments or food-service play areas, where frequent sanitation and controlled cleaning protocols are required.

ASTM F1551-03 is among the most commonly referenced methods for evaluating permeability. Although developed for synthetic turf applications, it is frequently applied to bound rubber surfacing systems to characterize drainage behavior. Unlike factory-manufactured turf products, PIP systems are installed in situ and therefore exhibit greater variability in pore structure, surface texture, and hydraulic conductivity. Key influencing factors include rubber granule size distribution, wearing-course thickness, bulk density, binder type and dosage, and surface contamination levels.

The following protocol was used to characterize the permeability range of a representative playground PIP system utilizing Playpave aliphatic polyurethane binder and 1–4 mm EPDM rubber granules installed over an SBR buffings base.

Test Method: ASTM F1551-03, Standard Test for the Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials; also referenced to DIN 18035, Part 6.

Test Equipment:

Tube: 4. inside diameter
Tube flow head: 2 litres
Tube index mark: 5 cm

Test Sampling:

Six EPDM wearing-course samples at 12.5 mm thickness (1/2 in.)
Individual sample
System thickness: 4 in.
Pre-test conditioning: 50°F at 75% RH

Test Procedure:

The tube was sealed to a 4” × 4”. specimen using silicone cement to ensure that water drainage occurred exclusively through the wearing surface. Water was introduced into the tube at a rate exceeding the specimen’s drainage capacity until the water level reached the index mark. The elapsed time was measured from the moment the water reached the index point until complete drainage to the specimen surface. The procedure was repeated seven times, with the first run serving as conditioning and the subsequent six runs recorded as timed trials. The resulting values represent system drainage rates only and

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do not account for the hydraulic characteristics of the underlying sub-base, whether crushed stone, asphalt, concrete, or similar construction.

Results:

Test #	Area of Drainage	Water Flow / sec	litres/min	Rainfall Capacity/Hr
1	4" x 4"	2litres/30 sec	4	240
2	4" x 4"	2litres/34 sec	3.53	212
3	4" x 4"	2litres/32 sec	3.75	225
4	4" x 4"	2litres/35 sec	3.42	205
5	4" x 4"	2litres/34 sec	3.53	212
6	4" x 4"	2litres/30 sec	4	240

Average: 3.7 litres/min/4'^{2}, 222 litres/hr

Tests were performed by Playpave LLC.

Technical Comment:
The theoretical rainfall capacity of a PIP surfacing system is a function of the void structure created by the rubber particle geometry and polyurethane matrix. In service, this capacity may decline as open voids are progressively obstructed by silt, sand, organic debris, and other particulates.

In general, a properly designed and installed PIP system remains highly permeable over time, although field performance will typically be lower than initial laboratory values. Long-term hydraulic performance is also dependent on the capacity of the supporting sub-base to convey discharge at a rate equal to or greater than the infiltration rate of the surfacing system. Accordingly, overall drainage performance should be evaluated as a composite function of the wearing course and the underlying base structure.

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