Horizontal Drainage

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Welcome

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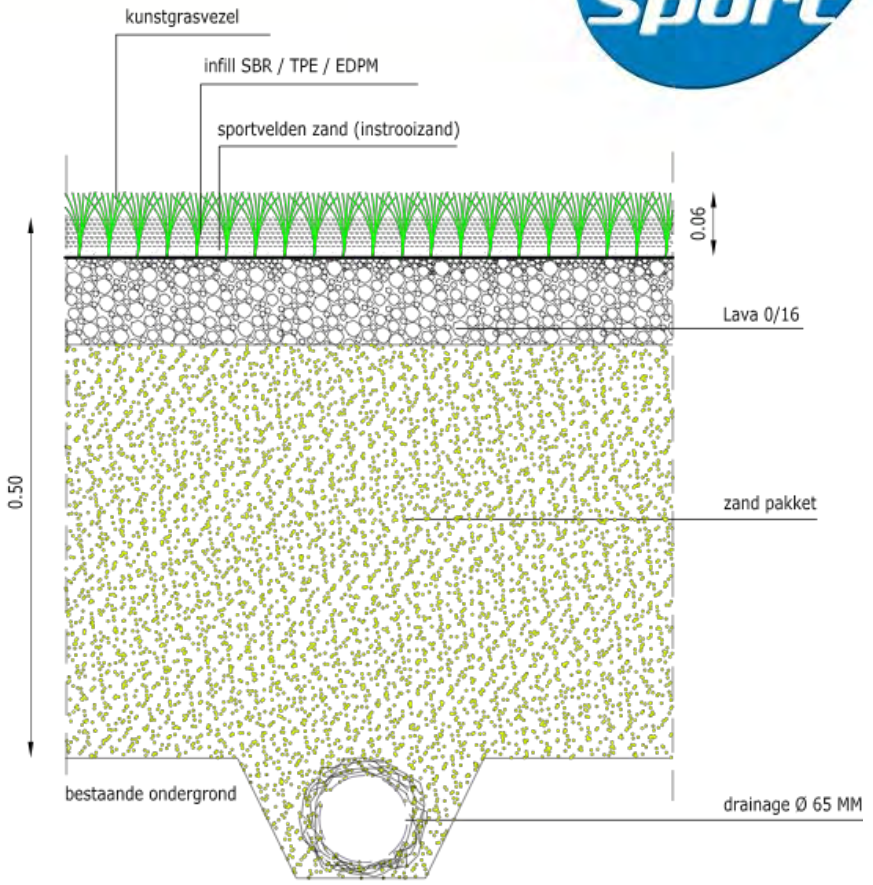
Contents

- Dutch Standard on outdoor surface construction thickness
- Proposed Standard
- Horizontal drainage

- Q&A

Construction

- artificial turf (with infill)
- geotextile
- top base (unbound/bound)
- sub base (sand)
- drainage



Construction thickness

unbound constructions	minimum 400 mm	
Partially bound constructions	minimum 500 mm	
Partially bound constructions on and west of the geografical line Terneuzen - Goes - Vlaardingen - Zoetermeer - Leiden - Haarlem - IJmuiden	minimum 400 mm	
Bound constructions	minimum 600 mm	
Bound constructions east of the geografical line Maastricht – Sittard	minimum 700 mm	
Bound constructions east of the geografical line Hardenberg - Hoogeveen - Assen - Hoogezand - Nieuweschans	minimum 700 mm	

Sub base layer

- Function

  -Drainage and storage
  -Load bearing capacity
  -Thickness

- Materials:

  sand: M50 ca. 200 um, good granular size distribution

  Light weight materials: bims, flugsand, e-bodemas, concrete(foamed), expanded clay granules

Base layer

- Functions
  -water storage
  -stable work floor
  -load bearing capacity
  -sports technical

- Materials
  -lava 0/5 mm, 0/8 mm, 0/16 mm
  -lava/rubber
  -stabilized sand
  -e-bodemas
  -asphalt
  -mixed recycled granulate

- IMPORTANT: Climate proof, stable, drainage capacity

percentage of unbound base layers

Hockey

- sand filled 100% unbound permeable
- semi-sanded 100% unbound permeable
- water pitch (no infill) 50 % unbound / 50% bound, both permeable

Soccer

- artificial turf 99% unbound permeable
- One system with horizontal drainage!

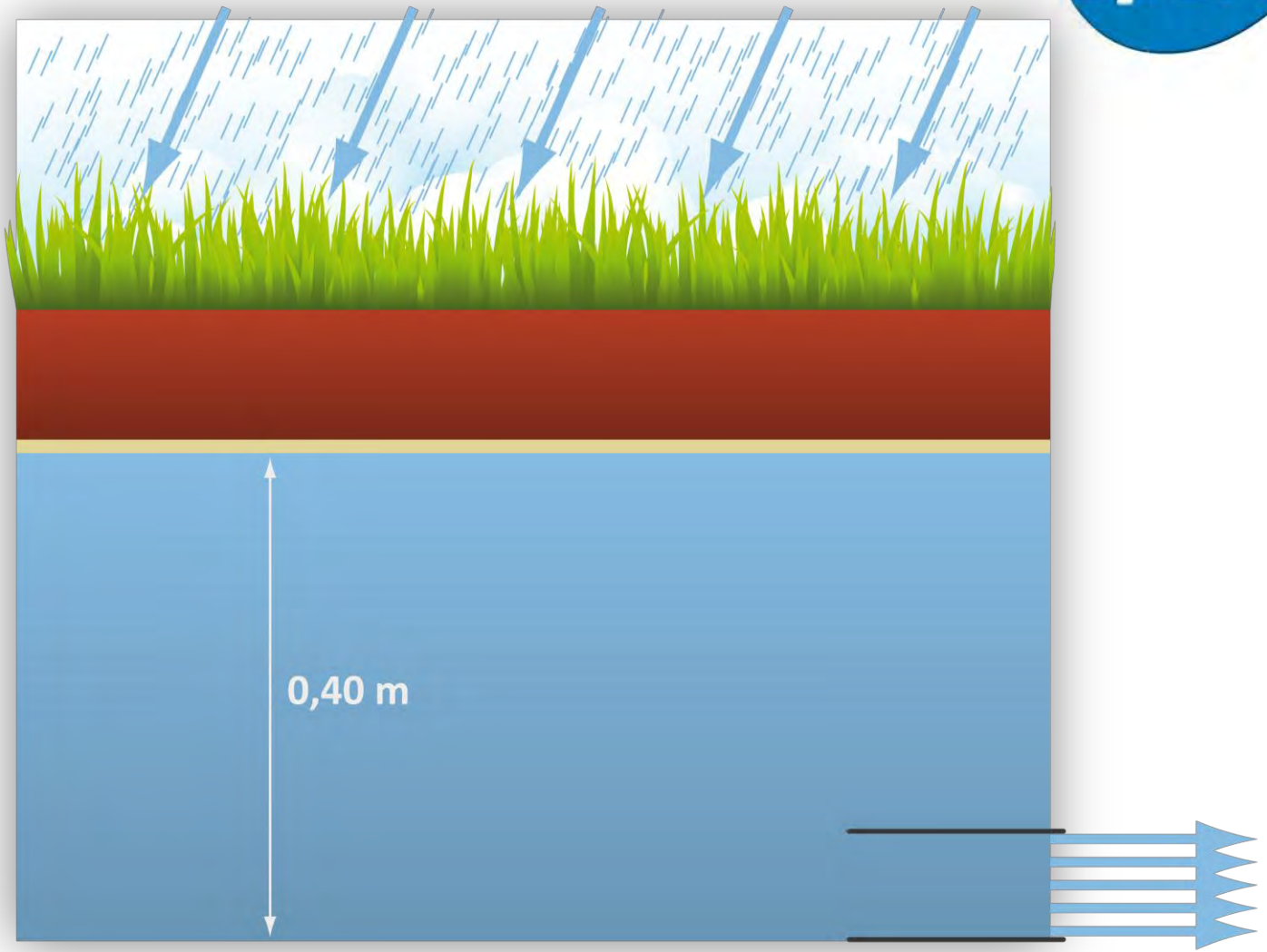
New Concept Construction Standard

- Looking at current standard
- Looking at future developments
- But most important: maintaining high quality!

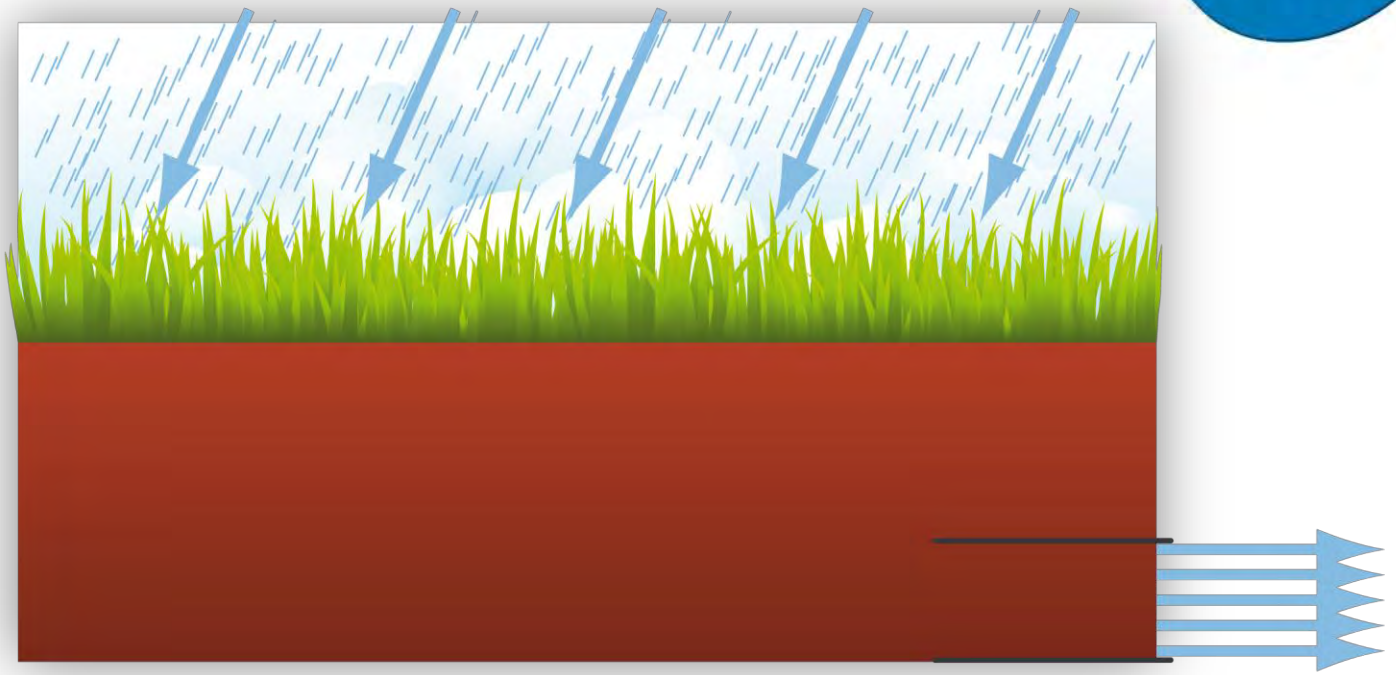
Construction thickness

Determined by:

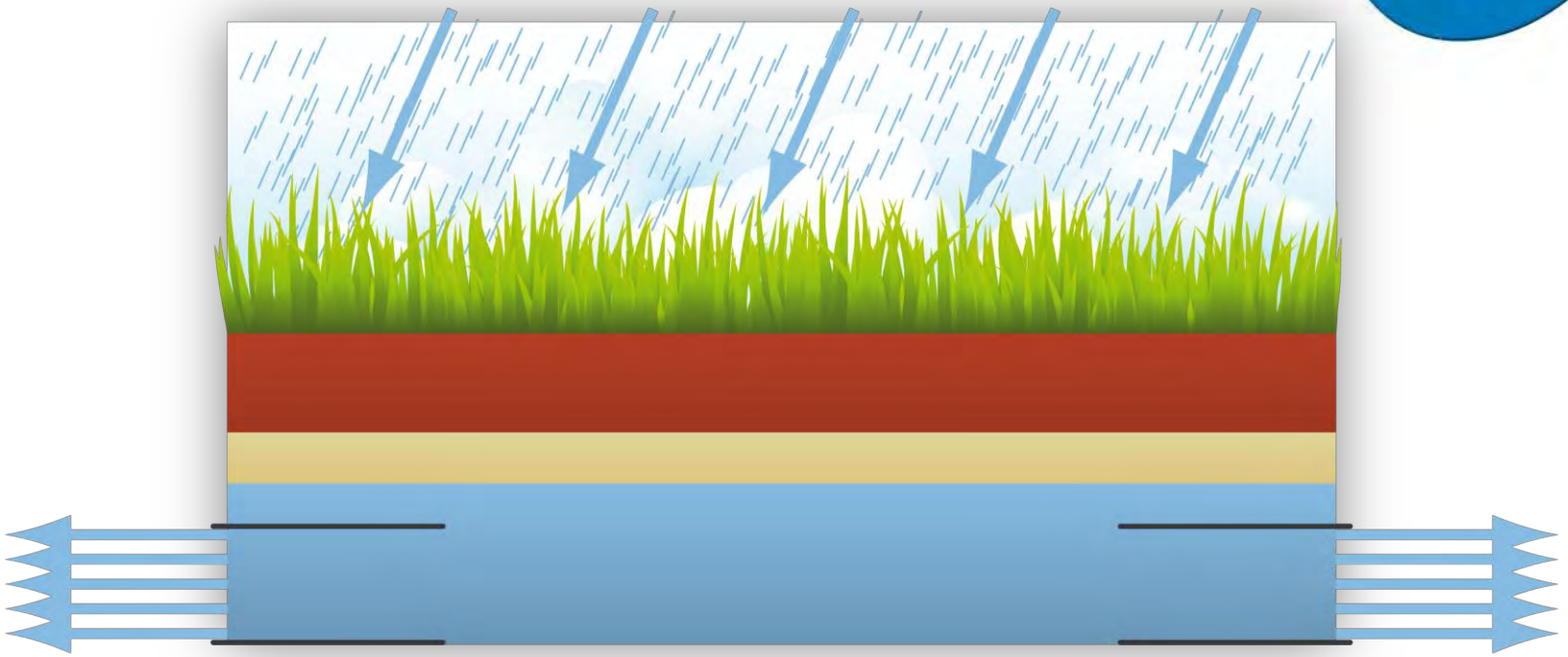
- Prevention of frost damage
- water storage and drainage capacity
- load bearing capacity

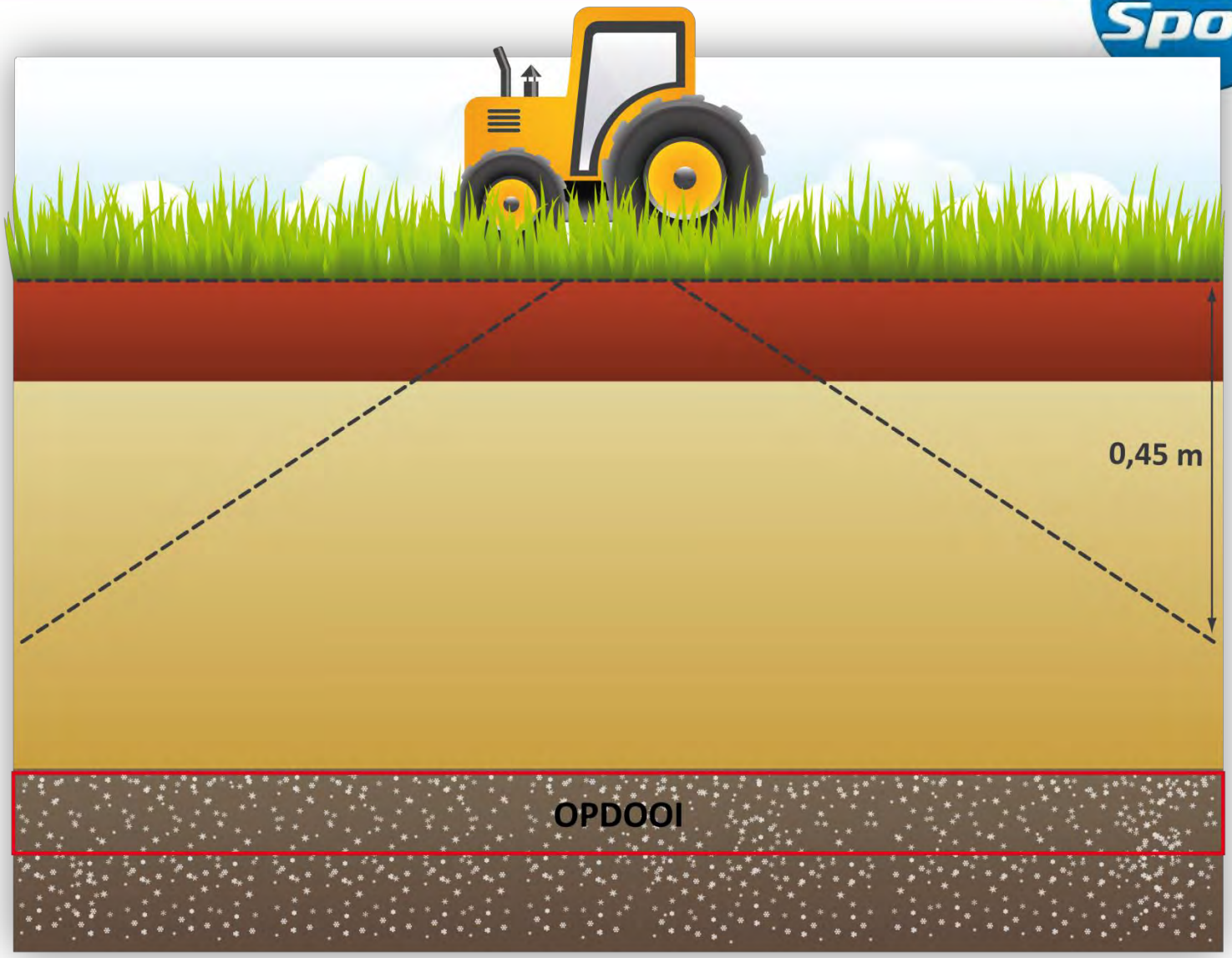

0,40 m

Better permeability and / or more storage

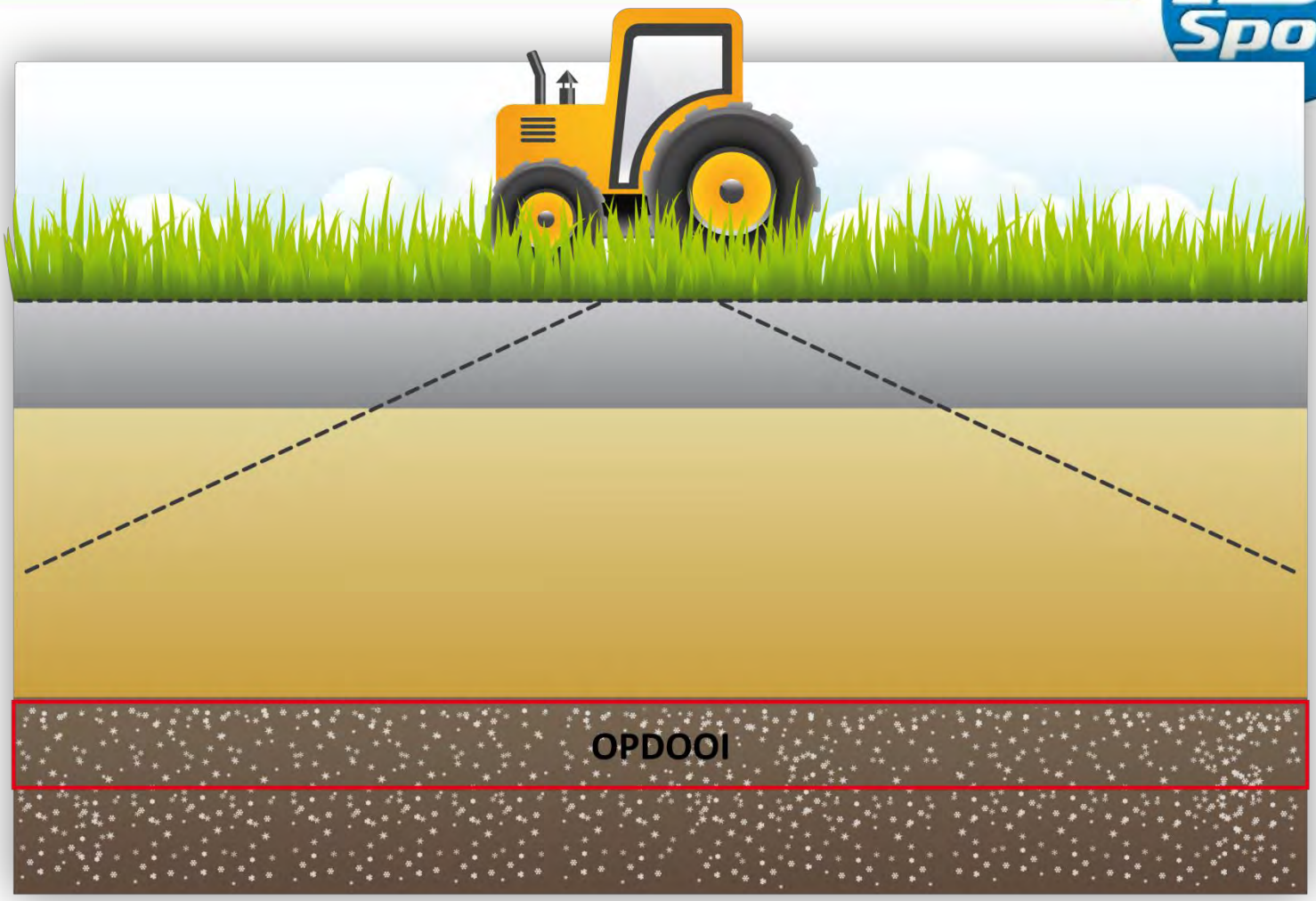


Intensive drainage system




0,45 m
OPDOOI

Bound layer

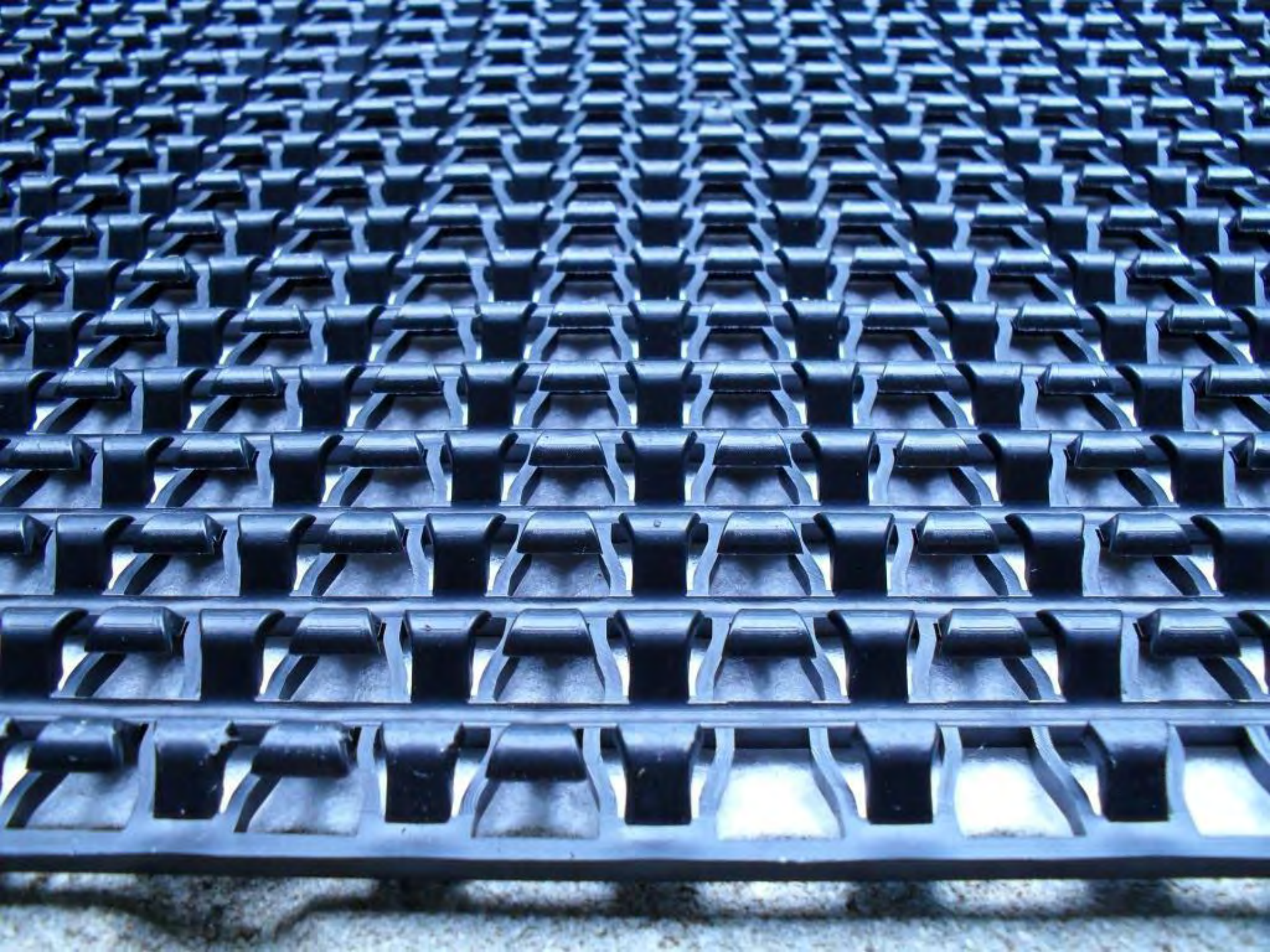


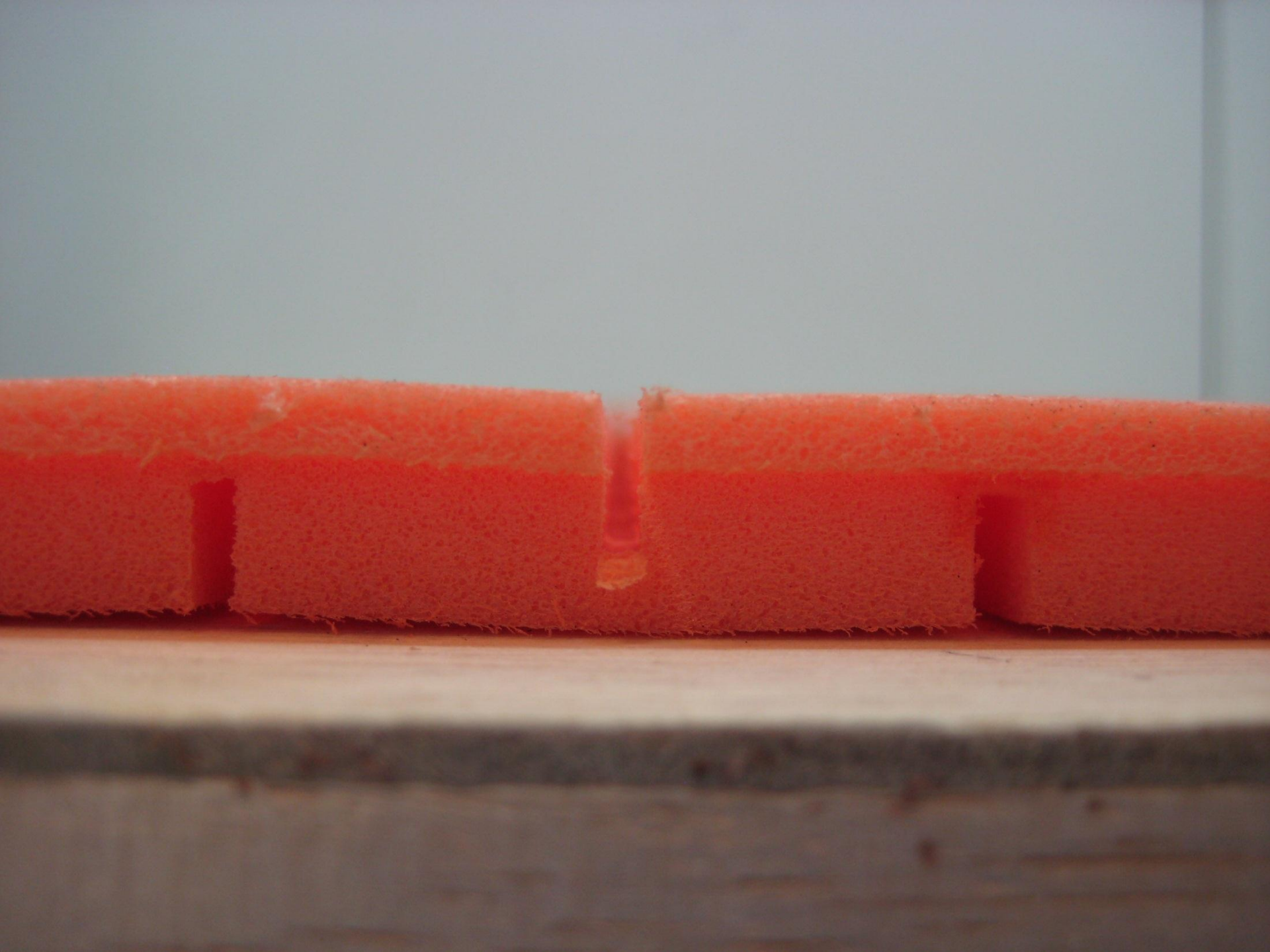
Isolating layer

Partially bound systems

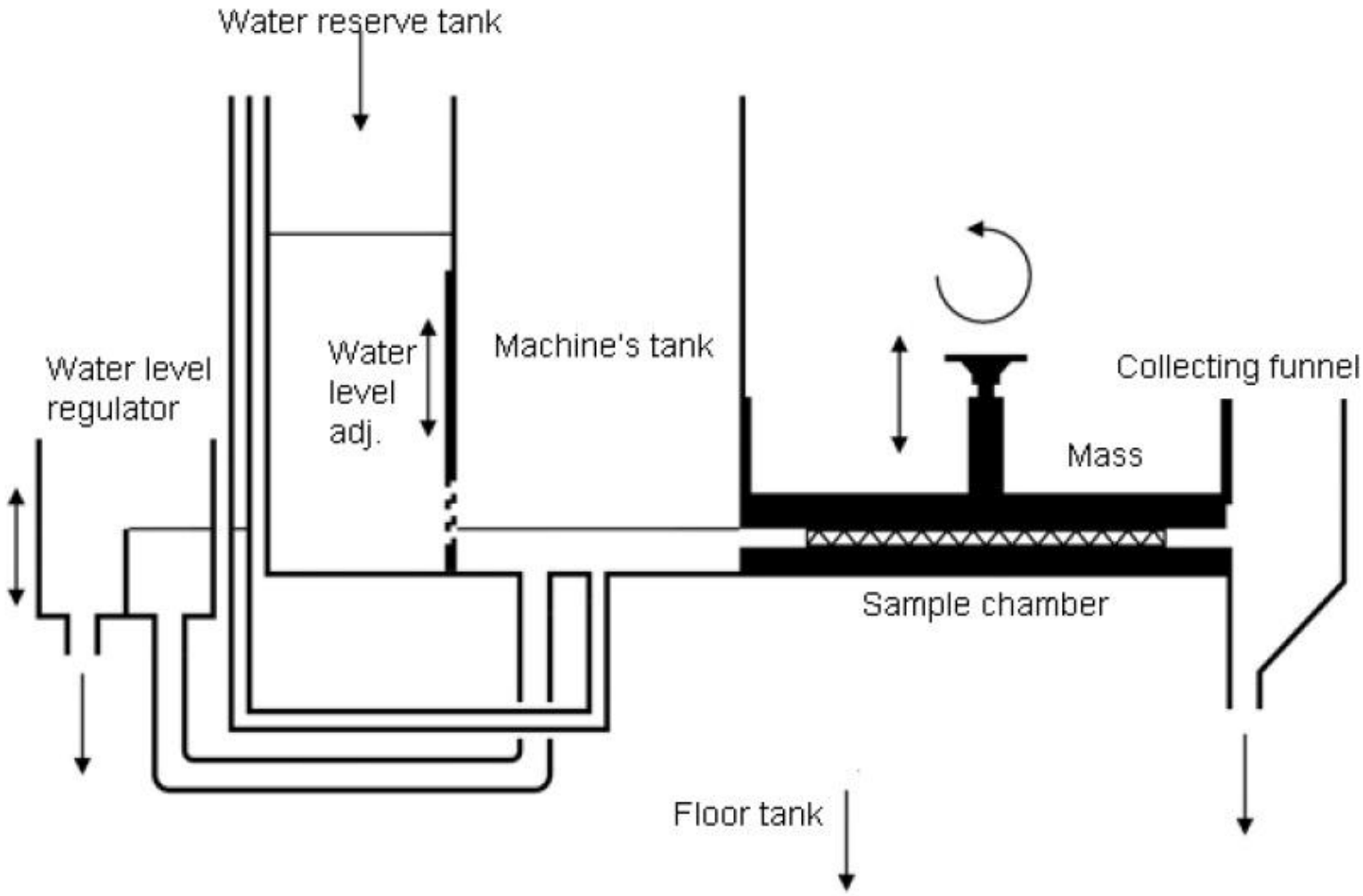
- Calamities of once every 25 years
- Standard thickness 500 mm
- Building thinner systems possible when:
  - Precipitation 1: 10 year without flooding (+/- 35 mm/hour)
  - Sufficient load spreading (500 kPa => 25 kPa)
  - When subbase and base < 400 mm: frost not within 25 days under the system (to prevent deformation due to freezing):
    - Thermal isolation
    - Building in an impermeable layer with sufficiently low water head.

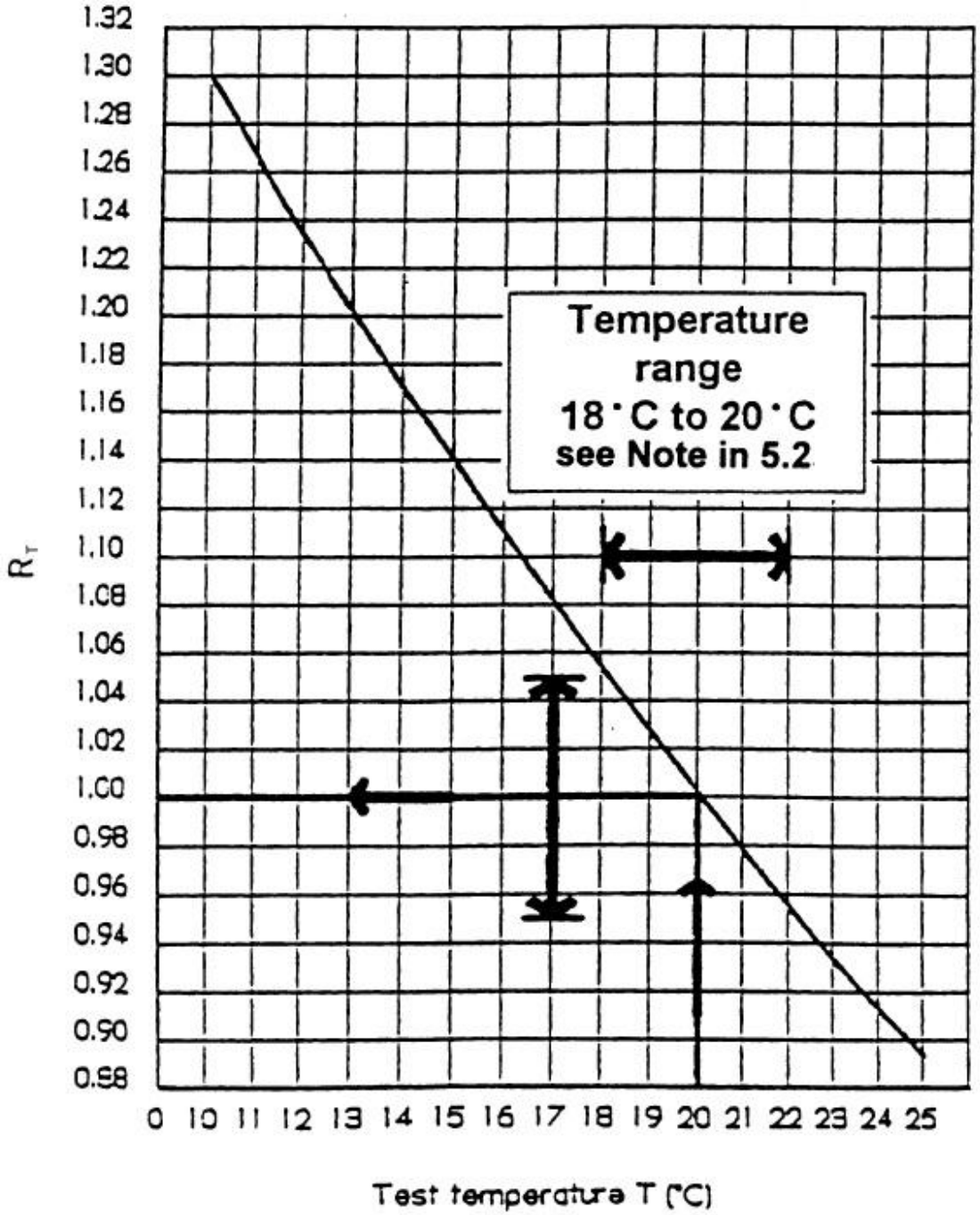
Horizontal drainage

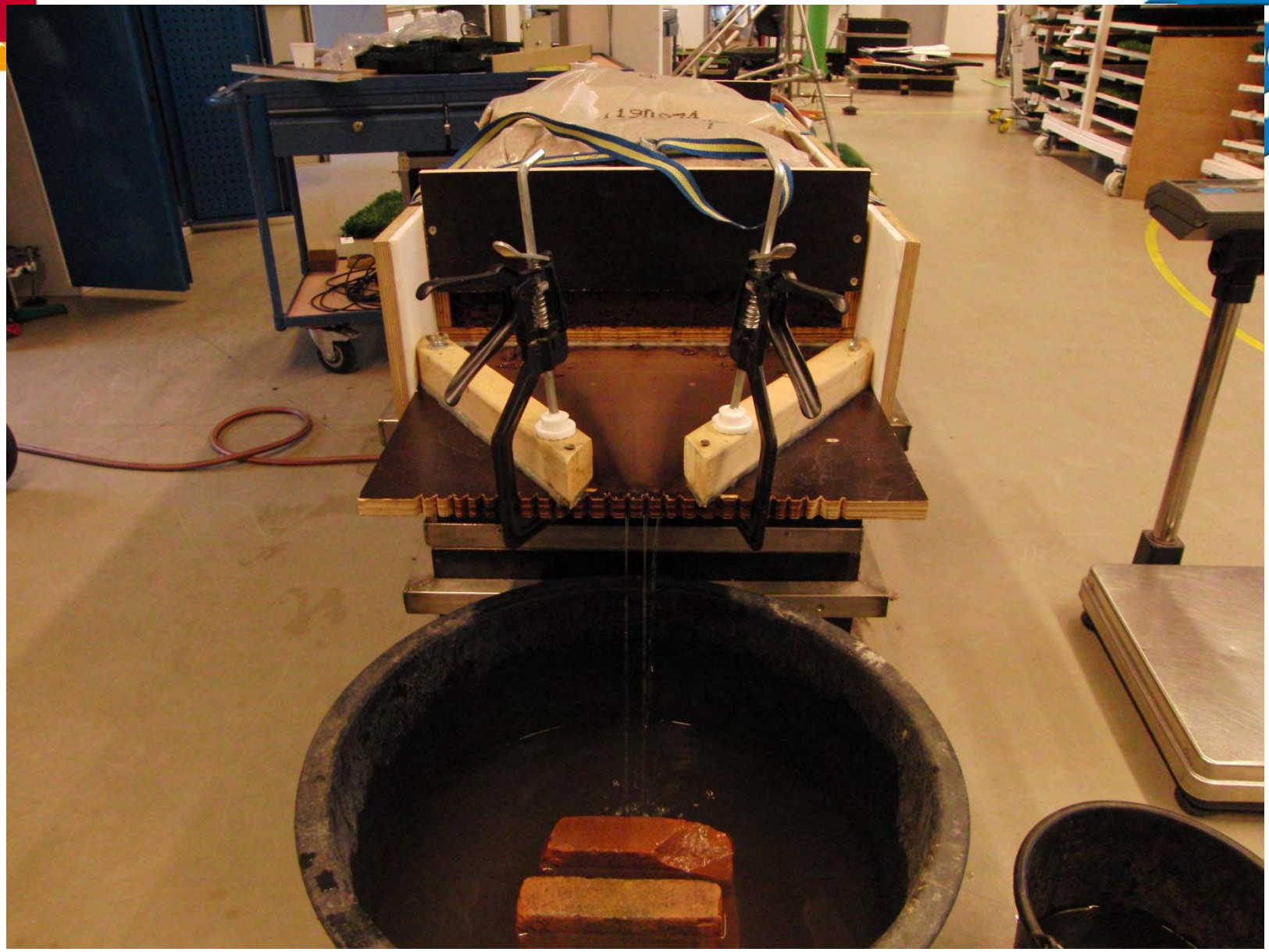


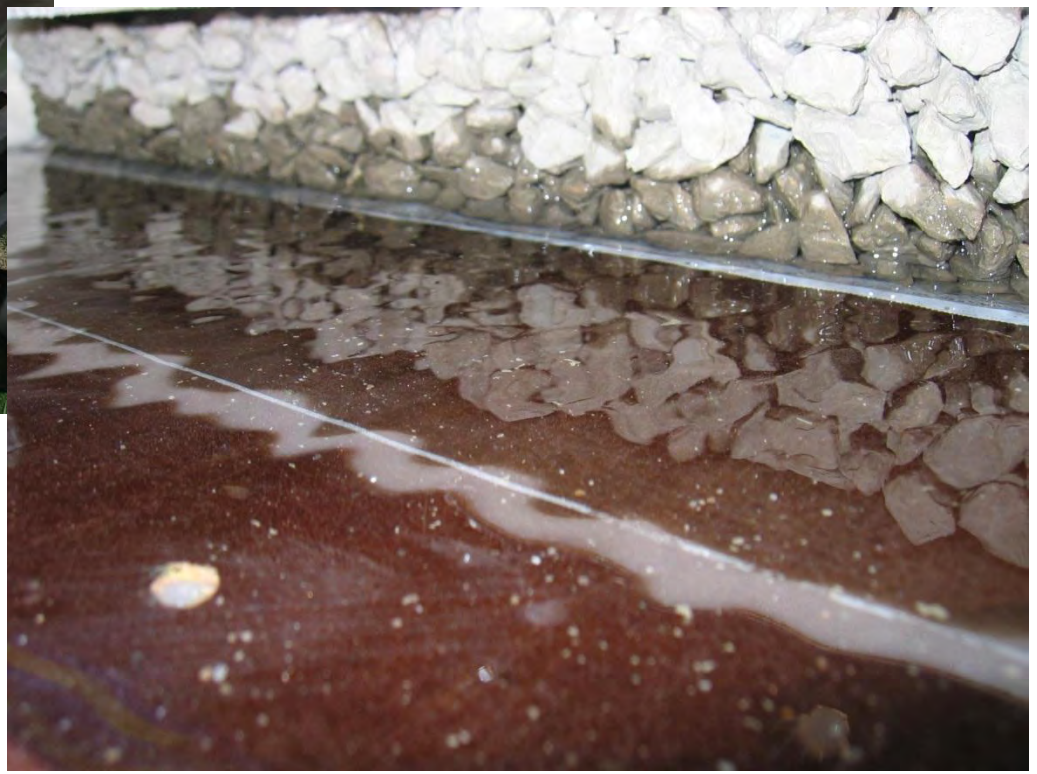


Principle (EN ISO 12958)



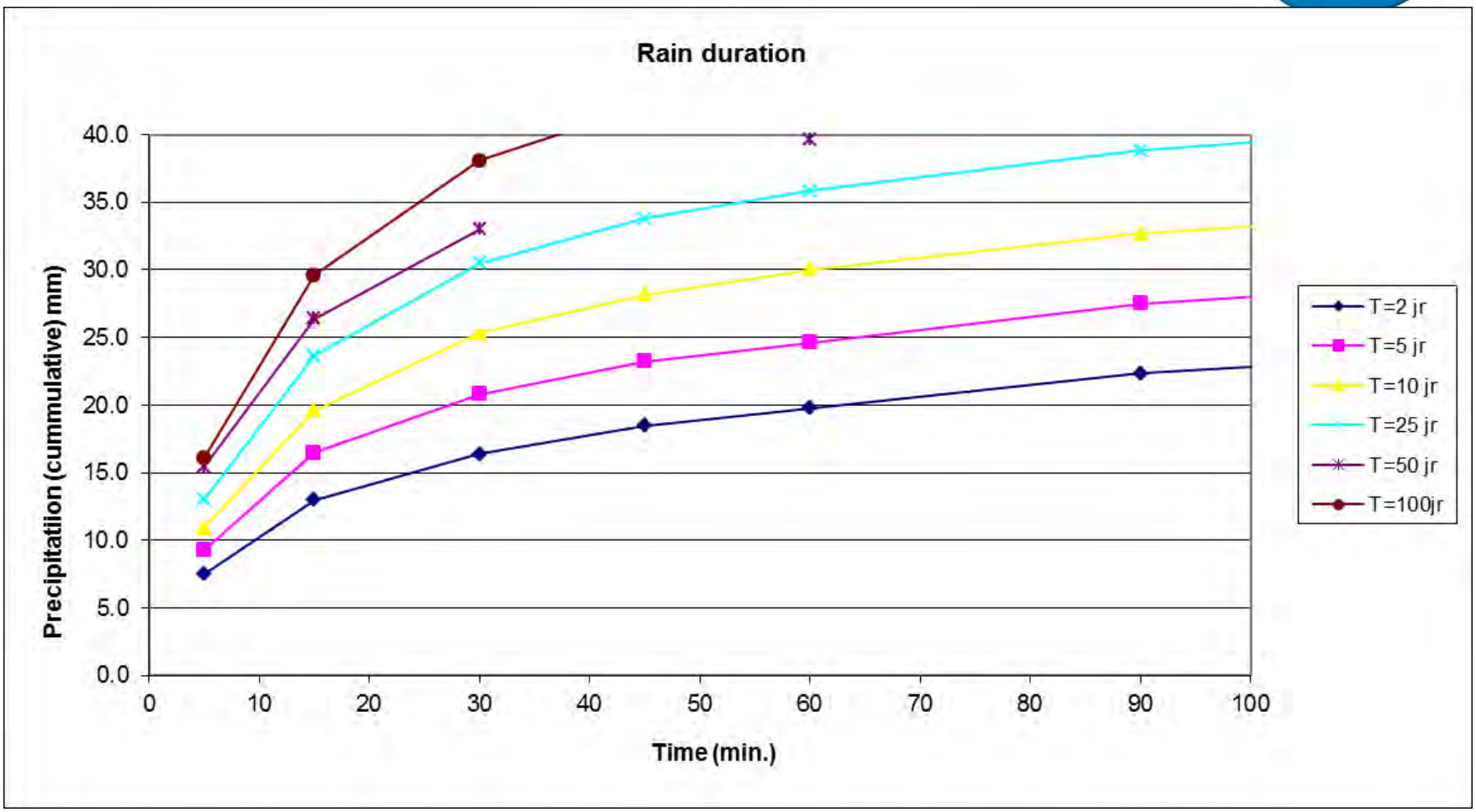

1.32
1.30
1.28
1.26
1.24
1.22
1.20
1.18
1.16
1.14
1.12
1.10
1.08
1.06
1.04
1.02
1.00
0.98
0.96
0.94
0.92
0.90
0.88
R_T
0 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Test temperature T (°C)
Temperature range
18 °C to 20 °C
see Note in 5.2





Differences Italy / Netherlands

- Size of sample (0.2*0.35 / 0.5*1.0)
- Slope of the field (0.6% / 0.3%)
- Pressure on sample more or less equal (15 kg / 2 kPa)
- Sample holder built around sample
- Requirement (Italy 0.25 l/s.m at 0.6%)


Rain duration
Precipitation (cummulative) mm
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0
10
20
30
40
50
60
70
80
90
100
Time (min.)
T=2 jr
T=5 jr
T=10 jr
T=25 jr
T=50 jr
T=100jr

Proposed Standard

Based on statistical precipitation once every 10 years

Storage (mm)		Vertical Drainage (*) (mm/day)	OR	Horizontal Drainage (l/m.s) **) At width B of half the field		
				B = 36 m	B = 30 m	B = 1 m
5		1763		0,73458	0,61215	0,0204050000
10		916		0,38167	0,31806	0,0106019444
15		501		0,20875	0,17396	0,0057986111
20		265		0,11042	0,09201	0,0030671296
25		127		0,05292	0,04410	0,0014699074
30		63		0,02625	0,02188	0,0007291667
40		19		0,00792	0,00660	0,0002199074
50		9		0,00375	0,00313	0,0001041667

That’s all folks