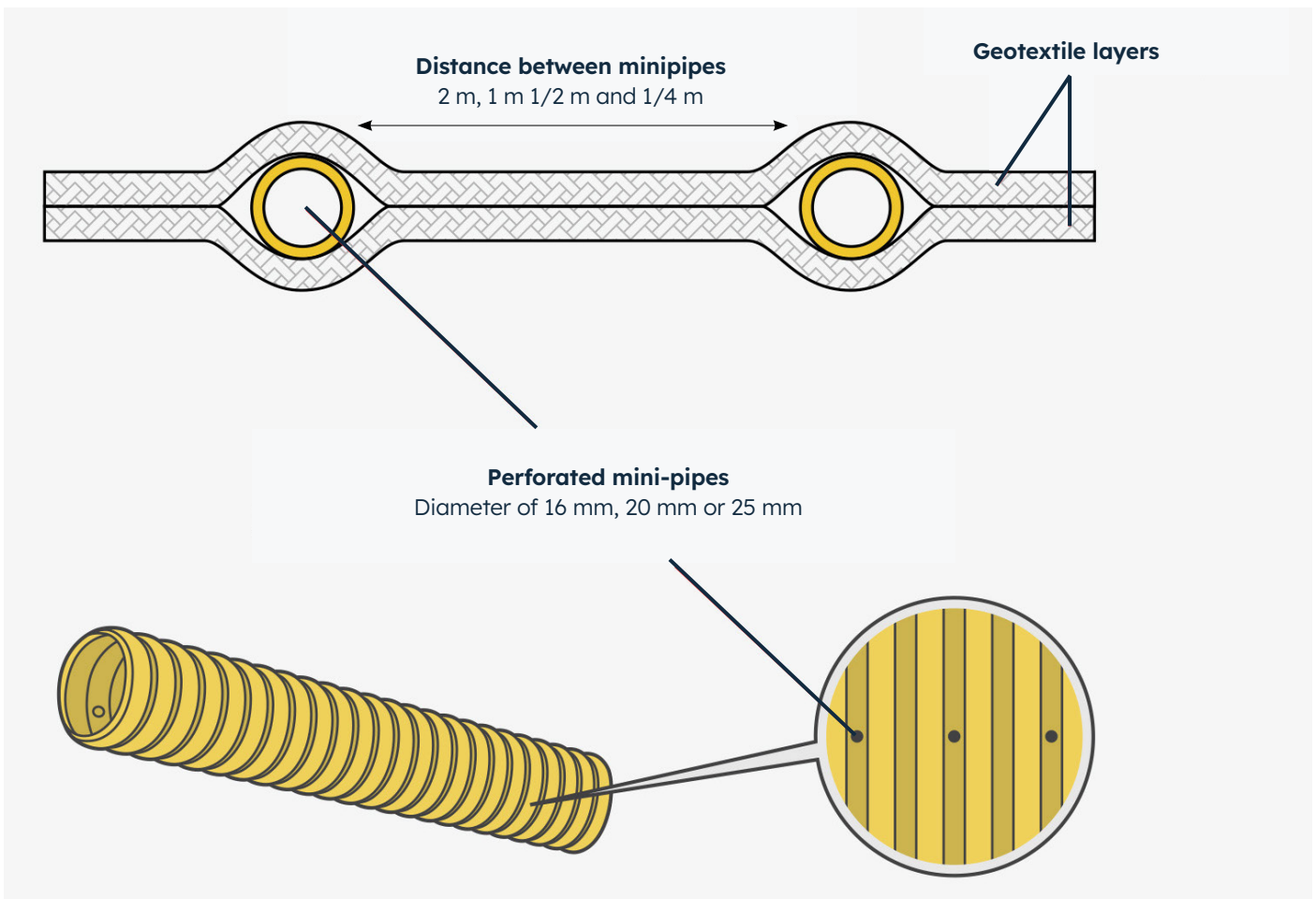


# Performance of full coverage drainage nets vs. multi-linear tube composites

Geonet geocomposites provide blanket drainage. They can be designed and selected to be equivalent to a layer of granular drainage material. Geonet technology performance has been proven and extensively used around the world for more than three decades. Multi-linear tube geocomposites, on the other hand, are made of nonwoven geotextiles and a series of embedded corrugated polypropylene perforated tubes spaced at regular intervals, as shown below from their producer's website.



## Multi-linear tube composite

Multi-linear tube composites are completely different from geonet geocomposites. They are not uniform products. Physically they have variable thickness across the roll width, with and without tubes embedded. In addition, the spacing between tubes can also be variable, and hydraulically they also have variable performance. As a result, multi-linear tube composites cannot be tested, designed with, and claimed as equivalency to geonet geocomposites.

## Transmissivity tests

The industry test method is ASTM D4716 (standard test method for determining the in-plane flow rate per unit width and hydraulic transmissivity of a geosynthetic using a constant head). Multi-linear tube composite cannot use this test method to determine the flow rate or transmissivity for several reasons.

First, ASTM D4716 requires a specimen size of a 12 in by 12 in (305 mm x 305 mm) loaded area of the representative product. With tube spacing in multi-linear tube composite products varying from 10 in (0.25 m) to as wide as 80 in (2 m), a specimen with a tube in the middle is not representative of the performance of a unit width product as required by the standard.

Second, when an attempt is made to perform ASTM D4716 test on multi-linear tube composite, it requires a bedding soil and a cover soil on top of the product in the transmissivity setup. This test setup not only significantly deviates from the ASTM D4716 test procedures, but also causes inconsistency in transmissivity calculations. It is not clear how flows through the bedding and cover soils are separated and excluded from the liquid collected and in the calculations. ASTM D4716 measures the flow rate and transmissivity of a geosynthetic product, not the flow rate or transmissivity through a soil/geosynthetic system.

Third, multi-linear tube composites cannot be tested between two plates in accordance with ASTM D4716, which is used to test the performance as a geocomposite between two liners or as a quality control test.

## Drainage design

Drainage tubes have almost no transmissivity along nonwoven geotextiles and have concentrated flows through their tubes; as a result, standard hydraulic head equations cannot be applied to calculate the head buildup over a liner. The EPA HELP model cannot be used either. Simply, there is no representative thickness and hydraulic conductivity available as a design input.

## Clogging concerns

Based on extensive laboratory and field tests, GSI published its GRI report #3 titled "Leachate clogging assessment of geotextile and soil landfill filters" in 1989 and updated the 180-page report #15 in 1995. This report recommends and concludes that "In the three sites with little to no leachate flowing out of the collection pipes, a geotextile filter was the culprit with clear indications of excessive clogging. In all three cases, the geotextile filter was wrapped directly around the perforated removal pipes, i.e. it was so-called "socked pipe". This configuration must simply cease to be designed and installed." If the limited number of micro holes in drainage tubes become clogged due to biological activities or particles, its drain function becomes eliminated.

In conclusion, multi-linear tube composites are completely different from proven geonet geocomposites. To claim any equivalency to a geonet geocomposite, a multi-linear tube composite product not only must demonstrate proper transmissivity tests and design equations, but also address clogging vulnerability and additional stresses applied to the liner due to the presence of those tubes. Thus, a proposal to substitute a geonet geocomposite with a multi-linear tube composite, logically requires a different permit.

## References

Butalia, T.S., "CCP in Constructed Landfills: Characteristics, Beneficial Use, Disposal & Impact on Geocomposite Leachate Collection Systems", GSE Technical Seminar, 18 October 2012, Chantilly, VA.

Schmitt, N. & Cole, B., "Evaluation of Drainage Layer Alternatives for Proposed CCP Landfill Liner", GSE Technical Seminar, 18 October 2012, Chantilly, VA.

Solmax is not a design or engineering professional and has not performed any such design services to determine if Solmax's goods comply with any project plans or specifications, or with the application or use of Solmax's goods to any particular system, project, purpose, installation, or specification.

