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HOW TO ASSESS RETENTION/DRAINAGE SHEETS

e.g., Meadowflor™, Floradrain®, Floratec®

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There are many sheet drains available for integration in green roof designs. Roofscapes, Inc. can provide a half-dozen products, each tailored to different types of applications.

In general, sheet drains fall into two categories, drainage-only sheets and retention/ drainage sheets. The retention/drainage sheets have cup-like or egg-carton-like depressions in their upper surface that can retain small quantities of water. Roofscapes, Inc. uses retention/drainage sheets in its **Type V Roofmeadow® green roof assemblies**. These assemblies are equivalent in design and performance to the American Hydrotech Garden Roof® assemblies.

When 'Volume' Doesn't Really Mean Volume

Much has been made by some green roof providers about the water-holding capabilities of the retention/drainage sheets. **However, the actual performance of these components is not what one might initially believe. This is why:**

1. European manufacturer's of these products quote a 'füllvolumen.' The füllvolumen is often represented in the United States (and also by some marketers in Europe) as a water-holding volume. This is seldom the case (see below). **In fact, true water-holding capacity of these sheets is usually a fraction of the quoted volume.**

2. The ‘füllvolumen’ is actually the volume of **sand or media** that is required to completely bury the asperities on the sheets.

3. It is often not practical to bridge the sheet with a filter fabric. The reason is two-fold.
 - Fabrics cannot be relied upon to bridge large gaps indefinitely, and over years or decades of use, the fabric will be forced down into the depressions.
 - If one were to successfully bridge most of these sheets with a fabric, the plant roots would first encounter a large air gap (see below) separating the water-filled depressions from the plant growing medium. This is a decidedly inhospitable environment for most plants.

In practice, the depressions in the retention/drainage sheets deeper than 25 mm (about one inch) are always filled with a granular medium. Retention drainage sheets have been frequently used when the green roof media has a relatively low water-holding capacity. By placing the media in cup-like depressions, the effective water-holding capacity of the media is improved. **When high performance media are used, retention/drainage sheets can usually be regarded as superfluous.**

How to Interpret Water-Holding Capacity

If you fill an **egg-carton-like sheet** with water, you will discover that water starts to escape as soon as the bottom 1/2 of the sheet is filled. This is what happens in the green roof also. (Remember that the quoted ‘volume’ is based on filling the sheets with sand, which does not run away through the valleys like water.) One realizes immediately that if you covered the sheet with a fabric and did not first fill the sheet with media, that an air gap would be created between the bottom of the fabric and the top of the water.

The actual water-holding capacity is often less than one might imagine. To illustrate, let us look at three Meadowflor™ retention/drainage sheets that are offered by Roofscapes, Inc. Note that the Type B-25, and B-40 sheets follow the egg-carton-like pattern, and are equivalents to the American Hydrotech Floradrain® FD-25 and FD-40 sheets. In fact, their ‘füllvolumens’ are equal to, or slightly greater, than the corresponding American Hydrotech products. The third, our Type A-20 sheet, has a different design but provides similar water-holding capabilities.

	B-25 gal/sf (l/m ²)	B-40 gal/sf (l/m ²)	A-20 gal/sf (l/m ²)
Quoted Sheet Volume ¹	0.245 (10)	0.442 (18)	0.133 (5.3)
Actual Water-Holding Capacity (without media filling depressions)	0.12 (4.9) ²	0.23 (9.4)	0.13 (5.3) ²
Water-Holding Capacity (when depressions are filled with media)	0.048 (2.0)	0.092 (3.8) ²	0.052 (2.1)

¹ The ‘füllvolumen,’ or volume of sand required to completely cover the sheet.

² Typical installation configuration.

The bolded values are the water holding capacities when the sheets are installed according to the manufacturer's recommendations. Therefore, the types of retention/ drainage sheets in common use offer similar performance and will retain the equivalent of about 0.16 inches of water per square foot (0.10 gallons per square foot). While these sheets can provide some additional water retention, it is also apparent that the choice of media is a much more important factor in moisture management. **Many green roof media will retain more than 30% water by volume. Therefore, the incorporation of a retention/drainage sheet is frequently an unnecessary additional expense.**

Note that the Type A Meadowflor™ retention/drainage sheets will not create an air gap when covered with a fabric. They also provide an equivalent water-holding capacity to egg-carton-like sheets that are twice or three times taller.

It is also important to keep in mind that retention/drainage sheets cannot be used in combination with base-level trickle irrigation systems. Drip or overhead spray systems are required in irrigated designs using retention/drainage sheets, with the resulting loss of moisture through evaporation.

Meadowflor™ Retention/Drainage Sheets

Type B-25 & 40

(Equivalent. to Floradrain® FD25 & FD40)

Installed capacities:

0.12 and **.092 gal/sf**, respectively

Type A-20

Installed capacity:

0.13 gal/sf

