The Water-Holding Capacity of Perlite

The natural size and unique structure of expanded perlite makes an ideal framework to hold water.

Perlite holds water in one of three ways: in between individual grains, in channels leading to the cores of the grains and on the highly irregular surfaces of each particle (Fig. 1). The surface of perlite is made up of the outer convex shells of glass bubbles and concave openings, so each particle can soak up a good amount of water. While perlite can hold a variety of liquids, many of the actual applications involve water, so it is used here to illustrate and simplify this process.

Gradation Affects Capacity
The amount of water taken up by particles of perlite is largely dependent on particle sizes. Just as fine, clay-rich soil holds more moisture than coarse, sandy soil, different particle size distributions of expanded perlite hold more moisture than others (Fig. 2).

Moisture Retention and Release
Some applications need water or other liquids to remain in the perlite, while other applications benefit from the release or drainage that perlite provides. The perlite industry provides both coarse grades that drain liquid easily, and fine grades with lower porosity that retain more water for longer periods of time.

Figure 3 (below) illustrates a method used by the greenhouse and nursery industry to visualize moisture retention and release in growing media. In this

Water release curves for different grades of perlite offer a way of visualizing drain-down and suction exerted by plant roots on soil. (Graph courtesy of Supreme Perlite)
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<table>
<thead>
<tr>
<th>WATER-HOLDING CAPACITY</th>
<th>COARSE</th>
<th>MEDIUM</th>
<th>FINE</th>
<th>EXTRA FINE</th>
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</thead>
<tbody>
<tr>
<td>20-40%</td>
<td>VERY FAST</td>
<td>FAST</td>
<td>SLOW</td>
<td>VERY SLOW</td>
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<tr>
<td>30-50%</td>
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<td>40-60%</td>
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<tr>
<td>60-90%</td>
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Drainage rates for perlite are another factor affected by the different densities, particle sizes and shapes of the various grades available. Larger particle sizes tend to drain more quickly, while finer grades naturally hold on to liquid for longer periods of time and drain more slowly (see Tbl. 1).

Water-holding Applications

Many applications take advantage of perlite’s moisture-holding capacity. Among the most successful are:

- Soilless growing media
- Seed starting
- Plant propagation
- Hydroponic growing
- Vegetated roofs
- Stormwater biofiltration
- Turf underlayment
- Native soil amendment

In the arid Middle East, perlite has been used with success as an absorbent layer between the root zone.
and desert sand (Fig. 6). Reports are that less than 50% of the normal water usage is needed to maintain the quality of sod and other plantings.

In a separate example, farmers in the United States have begun adding perlite to their fields to improve workability, air and water-holding capacity to their soil (Fig 7). Perlite helps combat compaction in native soils and helps increase the level of healthy biological activity by increasing oxygen in the root zone.

As a general rule, clay-rich soils need coarser grade perlite to provide good drainage while medium grade perlite offers a balance between air and water-holding capacity. Fine grades will help with moisture retention in fast draining sandy soils. Ask your perlite supplier for help determining what grade of perlite is best suited for your soil.

**Perlite, Water Conservation & Sustainability**

Perlite has an important role to play in conserving the world's fresh-water resources. Intensive greenhouse and container growing (Fig.8), produces greater yields per acre, and is often a more efficient use of water than field growing. Even in very arid regions, perlite can be used as a growing medium to feed the local population using limited resources.

As opposed to other growing media, perlite readily gives up its water to plants, meaning plants expend less energy extracting water from growth substrates, and put more energy into root and vegetative development. And since perlite is derived from natural sources, growing media containing perlite can be composted or recycled after use and won't add to the global landfill crisis.

There are endless possibilities of how this versatile mineral can be used to store and release water, nutrients and other liquids. For help with your application, contact your local perlite manufacturer or supplier today.