PAVING THE WAY

Growing use of permeable surface materials creates challenges, opportunities for winter operations

By DIANA CLONCH

Permeable pavements, in a variety of types, are becoming more common among the types of surfaces requiring winter maintenance services. In particular, low volume streets, parking areas, driveways and footpaths are being constructed of permeable materials to reduce stormwater runoff and improve overall water quality. Since permeable pavements are of a different design than the typical impermeable asphalt and concrete surfaces, maintenance options, including winter operations, require treatment options that are likewise different.

Although not necessarily a new concept, permeable pavements have evolved in design, composition and popularity over the last few years. Though compacted gravel surfaces, turf and paver bricks have long been used, porous asphalt and pervious concrete have become increasingly popular due to their excellent stormwater management properties and as a best practice to help meet National Pollutant Discharge Elimination Permitting requirements and control flooding.

PERMEABLE As shown at left, permeable pavements allow more water to penetrate the surface instead of running off.

PHOTOS: NRMCA

How permeable pavements work

Permeable pavements are designed to allow water (rain or snowmelt) to seep through voids in the surface material into the base material, which is designed for temporary storage and further filtration. This slows the runoff and removes solids and contaminants before the water eventually enters the ground and ground water supply. A typical cross-section for a permeable pavement includes the porous or pervious surface (asphalt, concrete, pavers) placed atop various levels and gradations of gravel sub-base, which may or may not include geotextile fabric and drain tile. The surface course has a high percentage of voids that allow water to filter through to the base instead of ponding or running across the surface.

In appearance and texture, the surface of pervious asphalt is somewhat coarser but still resembles a traditional asphalt surface. The surface of porous concrete is coarser, with larger sized aggregate exposed and not as smooth as traditional impervious concrete surfaces.

The Pennsylvania Stormwater BMP Manual 2006 notes that pervious asphalt and concrete surfaces provide better traction for walking paths in rain or snow conditions. Other studies likewise report higher traction values during winter for pervious surfaces compared to impervious.

Permeable pavements are reported to heat and cool differently from

traditional pavement types due in large part to the higher percentage of voids, thus having the tendency to more closely follow air temperature trends. In addition, not only can the water retained in the underlying gravel base impact temperatures, but the underlying stone bed tends to absorb and retain heat so that freezing rain and snow melt faster.

Winter operations impact

Although there is some debate within the industry regarding the use of such pavements (depending upon design) for high volume areas due primarily to traffic and/or contaminant level loading issues, ample data exists to show these systems are performing well in lower volume locations. As research and practical application have proven, the many benefits of permeable pavements associated with stormwater management, pollution control and pavement durability and performance make it likely that the installation trend will continue.

Design criteria for permeable pavements seems well defined with guidance available through professional organizations, various state departments and industry experts. On the other hand, maintenance, especially winter operations, seems to be an area for debate and ongoing discovery. Depending upon the type of permeable pavement in question and the source of information, it is not uncommon to find conflicting recommendations.

Concerns regarding issues with winter maintenance tend to focus on not restricting filtration properties and preserving the integrity of the pavement. Understanding the intended design of these surfaces (filtering water), fully explains the need to not restrict the voids in the pavement with applications of abrasives. Using sand or other abrasive materials clogs the voids and

WINTER MANAGEMENT

PHOTO: NRMCA

In review of available best practices as currently established within the industry by various state road departments, industry organizations and product providers, a few highlights are as follows:

- Adequate plowing after storm events to remove snow and ice
- Plowing in a method to not damage the surface (especially porous concrete and decorative pavers) such as use of polyurethane blades, rubber blades, blades with a wide footprint, slightly raised blades and avoiding heavy down pressure, or other mechanical removal such as a snow blower. Skid steers and back dragging are not recommended on pervious concrete.
- Avoid over-plowing — recognition by the operator that after plowing a pervious concrete surface that snow will still be present in the surface voids.
- Avoid use of sand or other abrasives to avoid clogging the voids in the system.
- Apply chemicals suitable for the event and pavement type, considering site-specific characteristics such as type of surface, color of surface and amount of shade, and adjust amounts accordingly.
- Apply chemicals to control snow and ice not removed by plowing.
- Do not store snow on pervious pavements to avoid drainage of contaminates into the system.

Depending upon the type of pavement being serviced, numerous references exist to assist in determining how to best provide winter maintenance.

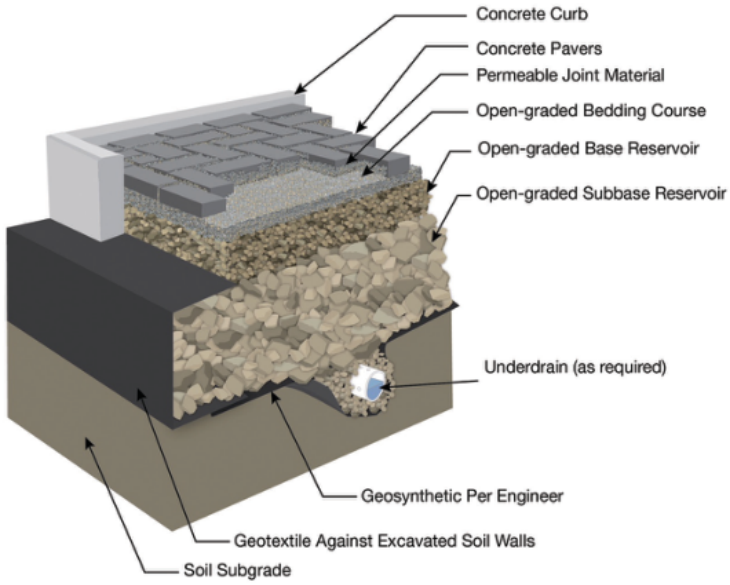
Continued from page 35
prohibits filtration. Maintaining the integrity of the permeable pavement also requires attention to plowing methods to not destroy the coarse surface (or in some designs, a reinforced surface) by aggressive plowing and not overusing chemicals that may escalate pavement deterioration.

Chemical application know-how

Lastly, permeable pavements require attention to deicing chemical application rates. Since these pavements heat and cool differently than their impermeable counterparts and eliminate standing and ponding water, chemical application rates should also vary. Depending upon specific impermeable pavement type, research and field studies cite sizeable reductions in typical chemical applications required to meet desired levels of service.

Porous asphalt has been found to require up to 70% less chemical or more over the duration of a winter season while still achieving desired levels of service. Porous concrete, when first adequately plowed after an event, also requires less chemical. Color differences among surfaces may also impact temperatures and, conversely, the amount of required deicer.

In addition to the heating and cooling properties of the impermeable pavements impacting the amount of needed deicer, the reduction in the overall amount of chemicals required is attributed to the impervious system's ability to filter away the surface water before it can refreeze, thus eliminating the need for reapplication. Although initial applications following an



PHOTOS: INTERLOCKING CONCRETE PAVEMENT INSTITUTE

CREATING A VOID During winter maintenance, proper removal techniques are needed to prevent clogging the voids that facilitate the drainage.

event may be comparable to that of traditional surfaces, the need for reapplication is greatly reduced if not eliminated.

Chemical applications on impervious surfaces may show a longer residual as moisture on the surfaces quickly drains away without melting the solids. However, once melting occurs the dissolved solids in the water will drain through the system and into the ground water.

Depending upon the imperviable material, some promote severely restricting or eliminating the use of chlorides and/or acetates (especially on concrete). Numerous references can be found to support this, including the National Ready Mixed Concrete Association, Pervious Concrete Pavement Maintenance and Operations Guide (***www.perviouspavement.org***).

The major takeaway is recognition that pavement design is different on permeable surfaces than traditional impervious services, and requires adjustment in treatment type. As prescribed winter maintenance practices for impermeable surfaces continue to evolve through ongoing research and practical application, it is important that contractors do their research to ensure they understand the variables involved in servicing these sites and treat them with care. SB

Diana Clonch is in industry consultant with over 30 years of experience in snow and ice control. Email her at dwclonch@gmail.com.