Module 3.3: Intermediate LID Design: Permeable Pavement
Section 4: Permeable Pavement Construction

Construction Considerations

Sequencing

The construction process has to be carefully thought out prior to actual work to ensure the infiltration integrity of the subgrade and the finished pavement. The layout of haul roads and the sequencing of project activities have to be well mapped out to minimize construction traffic on the subgrade. One way to accomplish this is to set the rough grade at approximately 6 inches above the final grade. When completing the subgrade to its proper final elevation, the excavator is on the rough raised subgrade while pulling material back with it, ensuring that no traffic drives directly on the finished subgrade. The infiltration capacity of the subgrade soil, determined in the siting and design phase, will not be compromised.

Example of an excavator pulling material back to ensure subgrade is at the proper final elevation without allowing heavy equipment on the finished subgrade

Similarly, the aggregate base also has to be carefully installed to ensure its structure and capacity to infiltrate are not compromised. Critical considerations include:

1. Not driving directly on finished subgrade
2. Install aggregate base by back-dumping and spreading on top aggregate base
3. Drive the excavator backwards onto the dumped aggregate base, pulling the aggregate to a rough grade elevation that is about 6 to 12 inches above the final grade.

Example of aggregate base being loaded around the edges of a facility in order to protect the subgrade

Temporary Erosion & Sediment Control (TESC)

Element 13 – Protect Low Impact Development (LID) BMPs – in the Construction Stormwater Pollution Prevention Plan (SWPPP) states that any LID elements on a project site must be protected from sedimentation. There must also be contingencies in place should those TESC protections become compromised.

Typical components of a temporary erosion and sediment control (TESC) plan are to ensure that:

1. Protection (TESC and Flow Diversion) measures are installed prior to final excavation.
2. Prime contractor informs other sub-contractors of the requirements for working around permeable pavement systems.
3. Erosion Control is maintained both BEFORE, DURING, and AFTER construction.
4. Areas adjacent to the project are permanently stabilized.

Poorly maintained TESC during construction (note the upslope soil posing a clogging concern for the underlying pervious concrete sidewalk)
Photo provided by MIG | SvR

Even with the best planning and implementation of a TESC plan, there is the possibility of unplanned circumstances compromising that plan. Extraordinary climatic conditions, catastrophic power failures, equipment malfunction, or other unforeseen events have to be addressed and corrected. Ensuring proper communication between designers and construction personnel, regular site visits, and quick remedial actions when these contingencies arise are key to ensuring the success of the project.

Example of a situation where TESC is in place and functioning properly, but additional protections need to take place due to extraordinary climactic conditions
Photo provided by MIG | SvR

Post-Construction Verification

Post-construction verification of permeable pavements is another area where specifics are still being quantified. The appropriate verification testing procedures are not in place for permeable pavements. However, there are a couple of infiltration tests that are being used, these are ASTM C1701 for concrete and asphalt, and ASTM C1781 for pavers. ASTM C1701, for example, is generally used in the Operation and Maintenance realm to determine when maintenance is needed. A new installation of concrete or asphalt will have a high infiltration rate. Knowing the exact infiltration rate requirement to put in the project specs for verification is a challenge, however. There is a lot of discussion currently underway to formalize these infiltration testing procedures. It is important to check with the local jurisdiction on whether there are specific tests in place.

Infiltration test ASTM C1701

Aesthetics is another important criterion that has to be evaluated post construction. There are no tests that have been formalized to assess permeable pavement aesthetics, but it is recommended to try to quantify descriptors of what is desired at completion. Examples may include uniformity of surface and/or surface texture (for example, divots in parking lots can be a problem for shopping cart users). A suggestion is to have a panel on site that meets the desired aesthetic outcome. During post construction verification, the panel can be used as a guide to compare across the site.

It is also important to ensure that final elevations don't have substantial differential settlement between the project site and adjacent property. This would lead to future maintenance issues such as sediment migration, or in the case of plastic grids, potential tripping hazards. When working with open celled plastic grids, be sure to check that staking is per manufacturer recommendations, otherwise grids may curl up at the edges.

Improperly installed open celled plastic grid