Residential Permeable Pavement

SPECIFIC DETAILS

ROLE OF PERMEABLE PAVEMENT

The objective, when building a permeable pavement system, is to allow rainwater to infiltrate the underlying soil. The stormwater will be stored in the subbase of the paved area instead of running off to the sewer system. The open graded subbase material will provide storage for the runwater that is collected and will be held for a period of time.Subsequently, the natural permeability of the soil beneath the subbgrade will allow the accumulated water to gradually return to the ground table, thus pursuing its natural cycle.

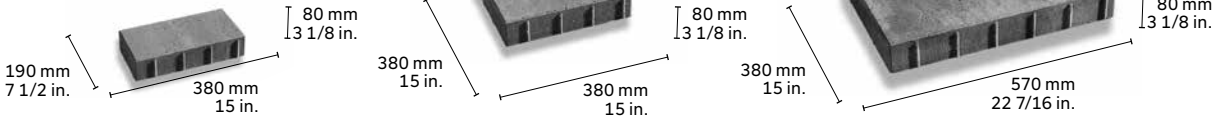
CONCRETE PAVERS USED IN THE CONSTRUCTION OF PERMEABLE PAVEMENT

Specifically designed concrete pavers can be used for the construction of a permeable pavement. The joints between the pavers, which are filled with a permeable granular material, have the required porosity to channel water into the system.

DESIGN AND CONSTRUCTION

Before undertaking any construction work, an engineer experienced in the field of hydrology should be consulted, in order to obtain an accurate history of local precipitation and the amount of rainwater or drainage from neighbouring surfaces that will run through the permeable paved area.

MELVILLE AQUA PAVERS



MONDRIAN PLUS PAVERS

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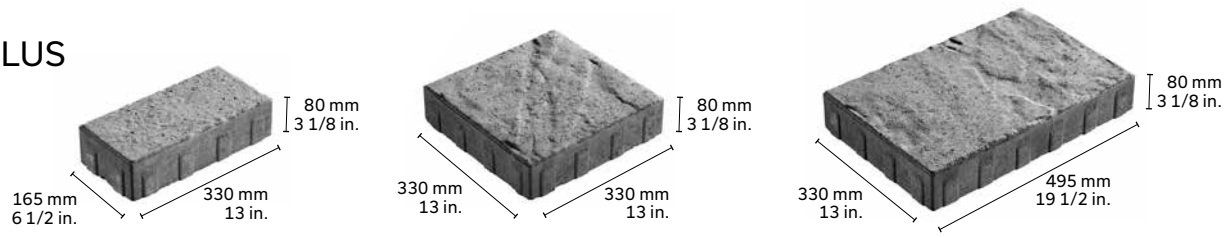

TRAFALGAR 60 PAVERS

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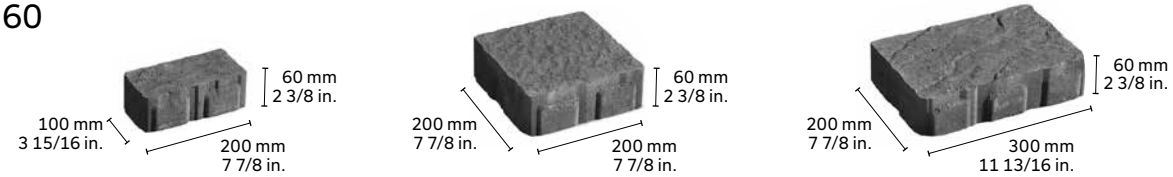

VENDOME PAVERS

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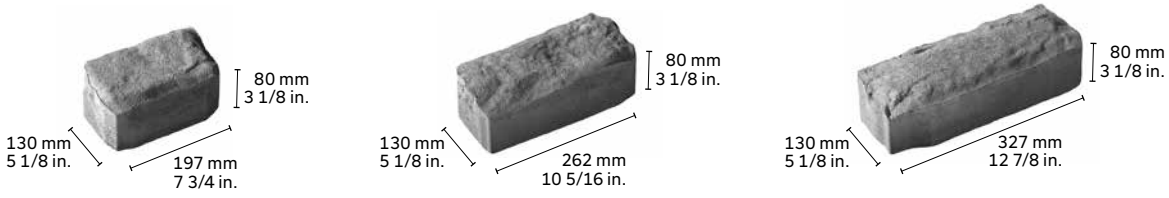
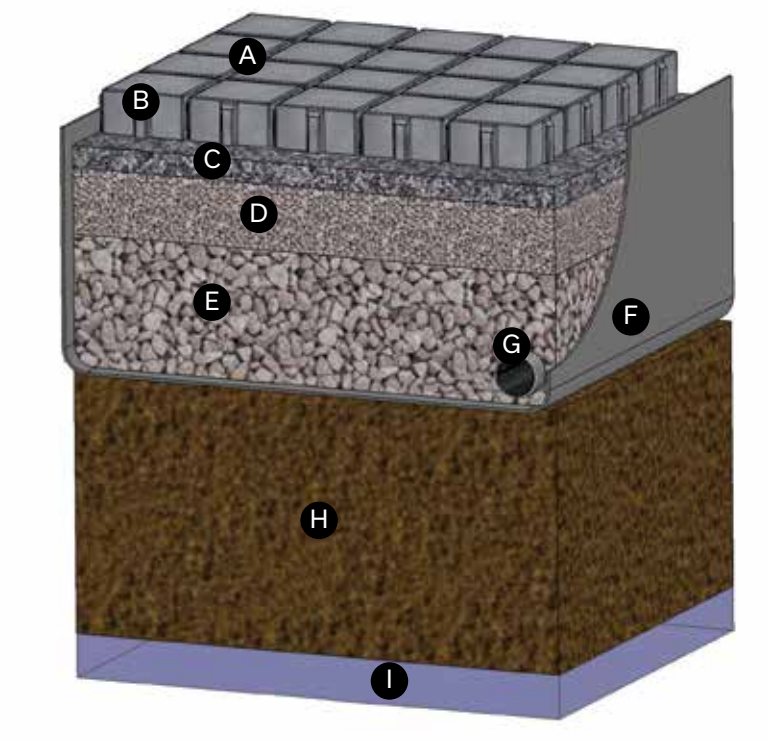


TECHNOLOGY - DESIGN AND CONSTRUCTION

A detailed study is also required to determine the permeability of the undisturbed soil present beneath the permeable materials, as well as proximity to the groundwater table, rock bed, etc. The technical data gathered will make it possible to design effective permeable pavement**, i. e., pavement where the volume of the subgrade's intergranular basin is sufficient to collect the projected amount of rainwater, and where the permeability of the soil is adequate (permeability coefficient exceeding 2x10-6m/sec. or 0. 27 inches/hour) to allow the water to return naturally to the groundwater table before another major rainfall. Failing this, it will be necessary to build a drainage system into the subbase, perhaps even on the surface of the pavement (which should always have a minimum 1% slope) as a complementary measure to evacuate residual rainwater and avoid any overflow or flooding of the structure in service. Melting snow and winter rains must also be taken into account.

Construction must be carried out by a competent contractor in strict compliance with plans and specifications. Moreover, materials must be selected with considerable care to obtain the required permeability. (The minimum requirement for the permeability of the pavers is 100 in/hr).

TYPICAL CROSS-SECTION OF A PERMEABLE PAVEMENT



- A Joint filler - 2.5 to 5 mm crushed stone
- B Permeable paver
- C Compacted bedding (50 mm max.) 2.5 to 10 mm crushed stone
- D Compacted upper subbase (100 to 150 mm) 14 to 28 mm crushed stone
- E Compacted lower subbase (min. 300 mm) 40 to 80 mm crushed stone
- F Geotextile
- G Optional perforated drain (see ICIPI recommendations)
- H Subgrade (thickness: min. 600 mm)
- I Groundwater table (or cliff)

* Permacon strongly recommends the ICPI website (Interlocking Concrete Pavement Institute) at the following address www.icpi.org (items: permeable pavers) before undertaking any studies or work on permeable pavement using concrete pavers.
** Application software has been developed for this purpose. See the ICPI website.

ADVANTAGES AND BENEFITS

These can be summarized as follows:

> Excellent way of avoiding the construction of new impermeable surfaces

> Significantly reduces the volume of rainwater channelled to a storm sewer

> Eliminates the need to dig catch basins for surface water

> Reduces the quantity of toxic and suspended matter in the storm system

> Improves the comfort and safety of users during rainfalls (survival of the natural environment, plants, trees, etc.)

> Actively contributes to reloading the groundwater table

> Reduces occasional risk of flooding paved areas

> Reduces the risk of soil erosion by reducing the runoff speed of surface water

> Reduces development costs in new sectors, by avoiding oversized rainwater management works

> Provides a durable concrete paver structure capable of withstanding freeze-thaw cycles and deicing salts

> Favours sustainable development - possibility of earning 2 LEED points (Leadership in Energy and Environmental Design) from the Canada Green Building Council) - in the area of ecological site development, paragraph 6. 1 *Flow and Quantity* and paragraph 6. 2 *Water Treatment*

A MINIMAL SEASONAL MAINTENANCE ALLOWS AN ADEQUATE PERFORMANCE OF THE STRUCTURE THAT CAN EXCEED 25 YEARS.

PERMEABLE PAVEMENT LIMITATIONS

While permeable pavement provides many advantages, it should be recalled that it is not the solution for every project that comes up. It does have its shortcomings, as shown below:

> Requires greater design and construction expertise

> A solution that should be avoided in the presence of rock or a groundwater table too close to the surface [distance of less than 600 mm - 24 in.)

> A solution that should be avoided where there are steep slopes near the permeable pavement (slopes exceeding 20%)

> A solution that should be avoided when the permeable pavement's slope exceeds 5%

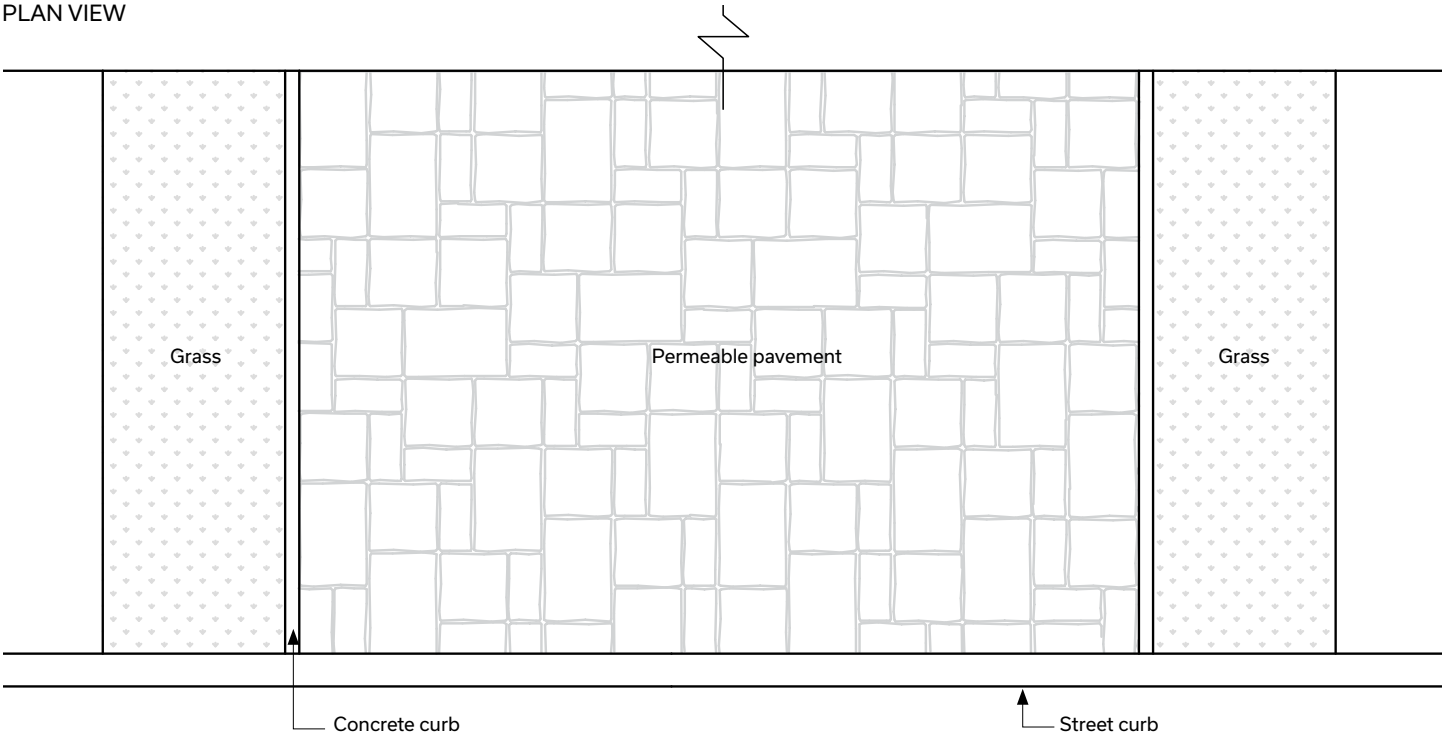
> High risk of contaminating the groundwater reservoir near the draining subgrade (minimum 30-metre protective strip required, in keeping with prevailing regulations)

> High risk of progressive clogging of the drainage layers over the long term, because of the significant quantity of fine particles in suspension. These result in particular from the application of road abrasives rich in fine particles, and which could, over time, reduce the structure's permeability. With a minimum of seasonal maintenance, the structure could perform effectively for more than 25 years.

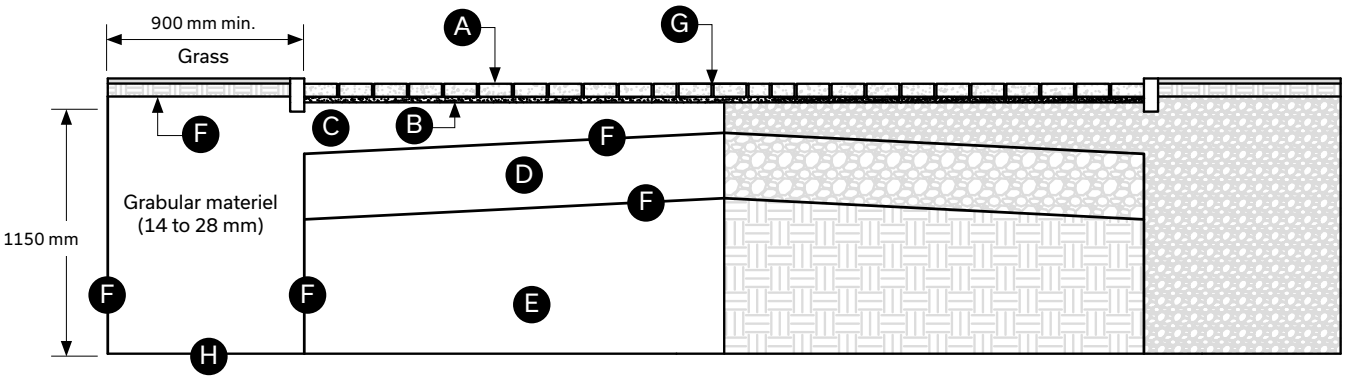
> A solution that should be avoided when a road's standard base course is too close to the drainage layer (minimum 6 m protective zone required)

PERMEABLE PAVEMENT CROSS-SECTION (RESIDENTIAL)

PLAN VIEW



CROSS-SECTION



- A Permeable paver 60 or 80 mm (Melville Aqua, Mondrian Plus, Trafalgar, Vendome)
- B Open-graded bedding course 25 to 50 mm (open-graded aggregate 2.5 to 5 mm)
- C Upper base, open-graded aggregate 100 to 150 mm (clear crushed stone 14 to 28 mm)
- D Lower aggregate base 300 to 450 mm (0 to 20 mm crushed stone) compacted to 95% modified Proctor density
- E Existing soil with adequate bearing capacity (minimum of 150 kN/m^2)
- F Geotextile membrane (with 2% minimum slope, if required)
- G Permeable joint material (open-graded aggregate 2.5 to 5 mm)
- H Existing soil with a minimum infiltration rate of 3 in/hour (to be validated with tests)