Permeable Pavement
(1008)

Wisconsin Department of Natural Resources
Conservation Practice Standard

I. Definition

A pavement system designed to achieve water quality and quantity benefits by allowing movement of stormwater through the pavement surface and into a base/subbase reservoir. Examples include *pervious concrete*, *porous asphalt* and *permeable pavers/blocks*.

II. Purpose

This practice may be applied individually or as part of a stormwater management system to support one or more of the following purposes:

- Promote stormwater *infiltration*, groundwater recharge, and stream baseflow preservation
- Reduce the discharge of stormwater pollutants to surface waters
- Reduce stormwater discharge volumes and rates
- Reduce the temperature of stormwater discharges

III. Conditions Where Practice Applies

Permeable pavement systems are an alternative to other pavements and stormwater control measures in areas where mitigating the adverse impacts of stormwater discharges is an objective or requirement.

Permeable pavement systems are most effective in areas where subsoil and groundwater conditions are suitable for stormwater infiltration, and the risk for groundwater contamination is minimized. Appropriate conditions for infiltration are identified in ss. NR 151.124 and NR 151.241, Wis. Adm. Code.

Permeable pavement systems may be used in areas where infiltration is prohibited by regulations or limited by soil or groundwater conditions when *liners* that inhibit infiltration, and subsurface drainage mechanisms, are installed. However, permeable pavement may not be used in industrial storage and loading areas or vehicle fueling and maintenance areas.

IV. Federal, State and Local Laws

Users of this standard shall be aware of applicable federal, state and local laws, rules, and regulations or permit requirements governing permeable pavement systems. This standard does not contain the text of federal, state or local laws.

V. Criteria

A. Site Criteria – Evaluate and locate permeable pavement systems in accordance with the following criteria:

1. For systems that will infiltrate water into the soil subgrade, evaluate the site in accordance with WDNR Conservation Practice Standard 1002 – "Site Evaluation for Stormwater Infiltration".

2. For systems that will <u>not</u> infiltrate water into the soil subgrade, conduct a site evaluation of sufficient detail to establish site-specific conditions, including soil types and depth to *seasonal high groundwater*.

3. If a hydraulic connection is possible, permeable pavement

[1]Words in the standard that are shown in italics are described in X. Definitions. The words are italicized the first time they are used in the text.

systems shall be located as follows:

a. No closer than 50 feet from any *POWTS* dispersal cell, to avoid adverse impacts such as cross contamination or hydraulic overloading.

b. No closer than 10 feet from adjacent building foundations, to avoid adverse impacts such as structural instability, water in basements or short circuiting of the infiltration process, unless liners or other measures are used to protect against such impacts.

B. Pavement Surface Design – Permeable pavement surface materials and installation shall be in accordance with industry standards for their intended use:

1. Pervious Concrete - Comply with American Concrete Institute Specification for Pervious Concrete Pavement or recommendations of the Wisconsin or National Ready Mixed Concrete Associations.

2. Porous Asphalt - Comply with recommendations of the Wisconsin, or National Asphalt Pavement Associations.

3. Permeable Pavers/Blocks - Comply with recommendations published by the Interlocking Concrete Pavement Institute, Brick Industry Association or National Concrete Masonry Association.

4. Other Pavement Surfaces – For permeable pavement surfaces that are not specifically mentioned in this technical standard, comply with the appropriate industry standards or recommendations.

C. Pavement Surface Infiltration Properties – Installed permeable pavement surfaces shall meet the following infiltration criteria:

1. The surface infiltration rate upon completion of the installation shall be at least 100 in/hr.

2. The in-service surface infiltration rate shall be no lower than 10 in/hr. For the purpose of this technical standard, permeable pavement surfaces with measured surface infiltration rates of less than 10 in/hr shall be considered failed.

Note: Surface infiltration rates in excess of 100 in/hr have been documented for various permeable pavement surfaces. However, for the purpose of this technical standard, the required initial and in service surface infiltration rates represent the minimum operating range for permeable pavements.

Initial and in-service surface infiltration rate testing is not mandatory per this technical standard. However, surface infiltration rate testing may be required by the *administering authority* when there are questions or concerns regarding the surface infiltration rate.

D. Pavement Surface Infiltration Design – A pavement surface infiltration design analysis shall be conducted using an accepted *continuous simulation model* (e.g., WinSLAMM). The model shall be run over the entire anticipated pavement lifecycle to verify that the pavement surface infiltration rate will be no lower than 10 inches per hour (in/hr) at any time during the pavement life, by design. The following model input parameters shall be used:

1. Rainfall data that is appropriate for the site as determined by the administering authority.

2. An initial pavement surface infiltration rate of 100 in/hr.

3. A *surface clogging capacity* of 0.06 pounds per square foot (lbs/sf) of permeable pavement surface area.

4. A *pavement surface cleaning efficiency* of 50%.

Note: A detailed description of the model input parameters and sample calculations are found in the Standard 1008 - Technical Note.

E. Pretreatment for Subgrade Infiltration – Permeable pavement systems that will infiltrate water into the soil subgrade shall be designed to provide acceptable pretreatment in accordance with s. NR 151.124(7), Wis. Adm. Code. Permeable pavement systems that are designed to meet the following criteria are considered acceptable pretreatment (see Figure 1):

1. The *permeable pavement surface percent voids* shall be less than 25%.

2. For permeable pavement surfaces with open joints (e.g., pavers or blocks), a minimum of 5 inches of ASTM C-33 No. 8, 89, 9 or 57 aggregate shall be provided. This aggregate layer can be installed directly below the pavement units or as a combination of the joint filled depth and the bedding course depth as long as the total depth of aggregate is at least 5 inches.

3. The aggregate storage reservoir depth shall be a minimum of 12 inches regardless of the presence of an underdrain or the underdrain invert elevation.

Note: The required conditions for the underdrain discharge credit are the same as the underdrain discharge credit (see Criteria V.L.).

F. Pavement Surface *Run-on* – Run-on from other *source areas* may be directed onto permeable pavement surfaces depending on the potential for surface clogging or groundwater contamination in accordance with the following criteria:

1. Prohibited Source Areas - Run-on to permeable pavement surfaces from the following source areas is prohibited:

   a. Industrial storage and loading areas.

   b. Vehicle fueling and maintenance areas.

   c. Construction sites and other disturbed lands.

   d. Agricultural lands.

   e. *Unstable landscape areas* excepting when a grass filter strip with a slope of less than 5% and a flow length of at least 5 feet is provided between the landscape area and the permeable pavement.

2. Impervious Source Areas

   a. To minimize the potential for pavement surface clogging, the ratio of impervious run-on area to permeable pavement surface area shall be in accordance with Table 1.

   b. For run-on areas that consist of more than one source area type, the permeable pavement surface area shall be in accordance with Equation 1.

Table 1 – *Run-on Ratio* to Minimize Pavement Surface Clogging Potential		
Source Area Class	**Impervious Source Area Type**	**Run-on Ratio**
A	• Roads	≤ 3:1
B	• Parking lots • Rooftops • Sidewalks • Residential driveways	≤ 5:1

Equation 1

$$\mathbf{PPSA} \geq \tfrac{1}{3}\mathbf{A} + \tfrac{1}{5}\mathbf{B}$$

Where:

PPSA = Permeable pavement surface area

A = Source Area Class A contributing drainage area

B = Source Area Class B contributing drainage area

3. Pervious Source Areas

   a. Run-on from *stable landscape areas* shall be minimized.

   b. Run-on from *lawns* shall be determined based on an assessment of site-specific conditions and maintenance plans.

Note: Additional information regarding run-on ratios and source areas is provided in Considerations (See Considerations VI.A through VI.D.).

4. *Effective Infiltration Area* – For permeable pavement systems that will receive run-on from road and/or parking lot source areas, and infiltrate water into the soil subgrade, the ratio of run-on area to effective infiltration area shall be no greater than 3:1 (see Figure 2).

   Note: In cases where the run-on ratio exceeds 3:1, the effective infiltration area will need to be larger than the permeable pavement surface area in order to comply with the effective infiltration area requirement. Effective infiltration areas can be increased by extending the aggregate storage reservoir under conventional pavement surfaces or in other appropriate areas.

G. ***Pavement Surface Cleaning*** **–** Cleaning of the pavement surface shall be conducted at least twice per year using industry recommended methods, such as regenerative air or vacuum sweeping.

Note: A surface cleaning frequency greater than twice per year can be included in the pavement surface infiltration design analysis and specified in the operation and maintenance plan.

H. Aggregate Storage Reservoir – Aggregate storage reservoirs shall be designed to achieve site-specific pavement structural requirements and stormwater management goals:

1. Aggregate Specifications – The following specifications shall apply to pavement base and storage reservoir aggregate:

   a. Use *open graded base* consisting of crushed stone or crushed gravel with no greater than 5% passing the No. 200 sieve.

   b. Provide a minimum *porosity* of 30% per ASTM C29 Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate.

c. Comply with soundness, wear, and fracture requirements listed in Wisconsin DOT Standard Specifications Section 301.2.4.5 - Aggregate Base Physical Properties.

d. Comply with construction requirement in Wisconsin DOT Standard Specifications Section 301.3 or administering authority.

2. Subgrade Slope - The slope of the subgrade shall be as flat as possible but no greater than 2%. If necessary, a series of aggregate storage reservoir cells shall be designed and constructed to prevent seepage through downgradient portions of the permeable pavement surface.

I. Pavement System Drainage – Permeable pavement systems shall be designed to ensure that the base and subbase drain adequately:

1. By design, water shall not be retained in the system (including the aggregate storage reservoir) for more than 72 hours following the cessation of a rain event.

2. Drainage from the system shall occur by infiltration to the soil subgrade and/or discharge from underdrains (or equivalent mechanisms).

3. At least one observation well shall be installed to allow for visual monitoring of pavement system drainage when the system does not include an underdrain, or the system includes an underdrain that is located above the bottom of the aggregate storage reservoir. For permeable pavement systems exceeding one acre, an additional one observation well per acre shall be installed. Observation wells typically consist of perforated pipes extended vertically from the pavement surface to the aggregate storage reservoir/subgrade soil interface.

J. Soil Design Infiltration Rate – For permeable pavement systems that will infiltrate water into the soil subgrade, the *design infiltration rate* shall be determined in accordance with WDNR Conservation Practice Standard 1002.

K. Underdrains- If necessary, perforated underdrain piping or an equivalent drainage mechanism shall be designed and installed at the appropriate elevation to ensure that the aggregate storage reservoir will drain down in less than 72 hours:

1. Size and Material – Perforated pipes shall have a minimum diameter of 4 inches.

2. Perforations – The total opening area of all perforation holes combined shall be sufficient to allow the pipe to discharge at design capacity.

3. Pipe Protection – Perforated pipes shall have an aggregate bedding layer of at least 4 inches on all sides. The storage reservoir aggregate may be used for pipe protection.

4. Outlet – Discharges from the underdrain or equivalent drainage mechanism shall be non-erosive.

L. Pollutant Removal Credit - Total suspended solids (TSS) and total phosphorus (TP) removal efficiency for permeable pavement system shall be determined as follows:

1. No pollutant removal credit shall be provided for the portion of the average annual runoff volume that does not infiltrate through the pavement surface.

2. A pollutant removal credit of 100% shall be provided for the portion of

the average annual runoff volume that infiltrates into the subgrade soils.

3. Pollutant removal credit shall be provided (Table 2) for the portion of the average annual runoff volume that passes through the pavement surface and discharges through underdrain piping (or equivalent) if all of the following conditions are met (see Figure 1):

   a. The permeable pavement surface percent voids shall be less than 25%.

   b. For permeable pavement surfaces with open joints (e.g., pavers or blocks), a minimum of 5 inches of ASTM C-33 No. 8, 89, 9 or 57 aggregate shall be provided. This aggregate layer can be installed directly below the pavement units or as a combination of the joint filled depth and the bedding course depth as long as the total depth of aggregate is at least 5 inches.

   c. The aggregate storage reservoir depth shall be a minimum of 12 inches regardless of the presence of an underdrain or the underdrain invert elevation.

   If each of these conditions is met, underdrain discharge pollutant removal credit shall be selected from Table 2 unless site-specific credit is determined using accepted computational methods.

Table 2. Permeable Pavement Underdrain Discharge Credit

TSS Removal Credit	TP Removal Credit
65%	35%

Note: The required conditions for the underdrain discharge credit are the same as the infiltration pretreatment criteria (see Criteria V.E.).

M. Infiltration Volume and Pollutant Load Reduction - Infiltration volume and/or pollutant load reductions provided by permeable pavement systems shall be quantified using a model (e.g., WinSLAMM) or other accepted computational methods:

1. Model Input Parameters – The model input parameters identified for pavement surface infiltration design (see Criteria V.C.) shall be used for infiltration volume and pollutant load reduction calculations.

2. Model Results – For regulatory purposes, model results for the anticipated pavement life shall be annualized.

N. Peak Discharge Rate Control - Accepted stormwater hydrologic and hydraulic computational methods shall be used to determine the peak discharge rate control provided by permeable pavement systems.

O. Thermal Mitigation – Accepted computational methods shall be used to determine stormwater temperature reductions provided by permeable pavement systems.

P. Construction Practices – Potential adverse impacts associated with construction operations shall be minimized or mitigated as follows:

1. Prior to the start of construction, the schedule of permeable pavement system construction relative to other construction operations at the site shall be determined.

2. Protect the subgrade soil interface, aggregate storage reservoir and pavement surface from construction site runoff until achieving *final stabilization*:

   a. Where possible, divert runoff from disturbed areas away from

entering the permeable pavement system.

b. If runoff diversion is not possible, protect the permeable pavement system in a manner that prevents sediment and pollutants from entering to the maximum extent practicable.

3. For systems that will infiltrate to the subgrade soil:

   a. Protect the soil subgrade from *over compaction* by construction equipment.

   b. Suspend construction if residual soil moisture contributes significantly to the potential for soil smearing, clumping or other forms of compaction.

4. Protect the subgrade soil interface, aggregate storage reservoir and pavement surface from other construction site operations, such as landscaping equipment operation or material storage.

5. Aggregate shall be stored and handled to keep sediment-free and placed to avoid segregation of the aggregate.

6. When construction is complete, inspect the permeable pavement surface and, if necessary, clean the surface using industry recommended methods, such as regenerative air or vacuum sweeping.

VI. Considerations

A. Permeable pavement surfaces are highly susceptible to clogging from source area runoff containing significant sediment or particulate loads. Consider limiting run-on to source areas such as other pavements, sidewalks or roofs.

B. The susceptibility of permeable pavement surfaces to clogging can increase with increasing run-on ratios. The type of run-on source area should be carefully considered when the run-on ratio will exceed 2:1. A higher cleaning frequency may be required based on the site-specific run-on ratio and source area characteristics.

C. High run-on ratios may reduce the effective life of permeable pavement systems.

D. Runoff from run-on source areas should be distributed as evenly as possible across the permeable pavement area.

E. Consider conducting surface cleaning operations during spring and fall.

F. Selection of smaller sized aggregate (e.g., ¾ inch No. 57 stone rather than 3 inch No. 2 stone) for the aggregate storage reservoir will reduce the rate of discharge along the subgrade slope and the rate of accumulation at the downgradient end of the system that can result in seepage through to the surface.

G. Permeable pavement systems that will infiltrate into the subgrade soil should be located a sufficient distance from downgradient steep slopes to minimize the potential for slope failures or erosion due to seepage.

H. For the aggregate storage reservoir, consider using open graded base consisting of crushed stone or crushed gravel with no greater than 2% passing the No. 200 sieve if available.

I. Caution should be used when discharging runoff directly to the aggregate storage reservoir (e.g., roof downspouts). Without proper energy dissipation, high velocity/ high pressure discharges can displace the aggregate, leading to failure of the pavement. Further caution should be exercised to prevent the discharge of

organic and other debris directly to the aggregate storage reservoir that can potentially clog the system.

J. The use of geotextile filter fabrics, underdrain check valves or underdrain clean-out ports may be considered where appropriate.

K. Consider constructing the permeable pavement system as late in the site construction schedule as possible.

L. Consider the potential impact of seasonal high groundwater on all permeable pavement systems.

M. Consider minimizing the use of road salt (sodium chloride) on permeable pavement and run-on surfaces to reduce the potential for the development of sodic soil conditions that could reduce subgrade soil infiltration rates.

N. If the subgrade soil is over compacted during construction, consider refracturing or ripping the soil subgrade to a depth of 12 to 20 inches. Additional base/subbase aggregate may be needed, as well as additional compaction of these materials, to reduce the risk of surface settlement and to render a stable structure for supporting vehicular traffic.

O. Consider conducting subgrade inspections to verify compliance with design parameters prior to system installation.

P. Consider installing signage to identify the location and purpose of the permeable pavement system. Signage should also identify any activities that should not occur on permeable pavement surfaces (e.g., material handling, seal-coating) and run-on areas.

VII. Plans and Specifications

A. The following design and construction documents shall be prepared for each site in accordance with the criteria in this standard:

1. A design report that describes the requirements for applying the permeable pavement system to achieve its intended use and objectives, including the following:

   a. Hydrologic and hydraulic computations and pollutant removal calculations for the design of the permeable pavement system.

   b. A plan showing the tributary area, flow paths and run-on ratio(s) for the permeable pavement system.

   c. Documents or reports that support any infiltration design parameters, including infiltration rate field test results and soil boring logs that identify the depth to seasonal high groundwater.

2. Plans and specifications that identify materials, construction processes and sequence, location, size and elevations of all components of the system, allowing for the determination upon completion of compliance of the permeable pavement system with the design report and this standard.

3. Include the following on plans:

   a. Erosion and sediment control measures to prevent the discharge of sediment during construction and clogging of any portion of the permeable pavement installation.

   b. Plan views of the permeable pavement system showing its shape, dimensions, grades, underdrain locations and elevations (if applicable), and observation wells and control

structures, including surface and pipe invert elevations.

c. Longitudinal and/or cross-sectional views of the pervious pavement system, showing locations and depths of system components.

Note: A single cross-section may provide sufficient detail in some cases.

4. Include the following in specifications:

a. A description of the contractor's responsibilities.

b. A requirement for the contractor to submit test reports and other evidence that materials for the project meet the specifications.

c. A requirement for the contractor to provide documentation demonstrating training in construction of the permeable pavement systems or acceptable experience and references in the construction of permeable pavement systems. Examples include pervious pavement technician by the National Ready Mix Concrete Association, or a certificate for a permeable interlocking concrete pavement technician from the Interlocking Concrete Pavement Institute.

d. Descriptions of applicable standards, material requirements and installation procedures.

e. Requirements for system acceptance at the conclusion of construction.

VIII. Operations and Maintenance

A. An operation and maintenance plan shall be written for the intended life of the permeable pavement system. The plan shall include an inspection checklist and schedule.

B. The following activities shall be prohibited from occurring on the permeable pavement surface:

1. Temporary or permanent stockpiling of soil or other material that can potentially cause or contribute to clogging.

2. Application of pavement seal-coating.

3. Application of sand for deicing.

C. Inspection of the permeable pavement system shall be conducted at least once per year to evaluate the following:

1. Pavement Condition – Inspect permeable pavement surfaces for settlement, deformation or cracking.

2. Surface Infiltration – Inspect permeable pavement surfaces for sedimentation or evidence of ponding.

3. Drainage – Inspect observation wells 72 hours after a rain event of 0.5 inches or greater to verify that the aggregate storage reservoir is draining down effectively.

4. Outfalls - Inspect underdrain outfall locations for obstructions and erosion.

5. Run-on Areas – Inspect run-on areas for adequate cover and stability.

D. Maintenance of the permeable pavement system shall be conducted as follows:

1. Clean the pavement surface using industry recommended methods, such as regenerative air or vacuum sweeping, at least twice per year in accordance with Section V.G.

2. If water ponding persists on the pavement surface after a storm event, clean the pavement surface to mitigate clogging.

3. Repair any settlement, deformations or cracking that are significant enough to adversely impact the water quality function of the system.

4. Repair blocked, restricted or eroding underdrain outfalls.

5. Repair and/or replant eroding run-on areas.

6. For permeable pavers/blocks with joints that are filled with aggregate:

   a. Replenish the joint aggregate in accordance with industry recommendations.

   b. If necessary, remediate the system by extracting accumulated debris and aggregate from the joints using a vacuum and re-filling the joints with new aggregate.

7. For porous asphalt and pervious concrete, repairs may be done with conventional impervious materials if the total impervious repair areas do not exceed 10% of the original permeable surface area and runoff from the repair areas will run on to adjacent permeable areas. The 10% threshold may only be exceeded if design calculations confirm that the system is still able to accept the full loading for which it was originally designed.

E. If the pavement surface infiltration rate is questionable at any time during the effective life of the pavement, the administering authority may require infiltration rate testing to verify that the surface infiltration rate is no lower than 10 in/hr. If the surface infiltration rate is lower than 10 in/hr, appropriate action shall be taken to restore the infiltration rate to an acceptable level based on the remaining effective life of the pavement.

F. If verification of in place pavement surface infiltration rates is necessary, conduct pavement surface infiltration rate testing per ASTM C1701 Standard Test Method for Infiltration Rate of In Place Pervious Concrete for pervious concrete and porous asphalt, ASTM C1781 Standard Test Method of Surface Infiltration Rate of Permeable Unit Pavement Systems for permeable pavers/blocks or other methods approved by the administering authority.

G. Qualified personnel, as determined by the administering authority, shall perform inspection, infiltration testing and maintenance work.

H. All inspection, infiltration testing and maintenance activities shall be documented in written reports. All written reports shall be made available on request by the administering authority.

IX. References

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X. Definitions

Administering Authority (V.C.): State and/or local units of government with stormwater management regulatory authority.

Continuous Simulation Model (V.D.): A computer model that continuously tracks system response over time according to a set of equations.

Design Infiltration Rate (V.J.): The infiltration rate of the native soil selected as a basis to size an infiltration device per Reference 1002.

Effective Infiltration Area (V.F.4.): The area of the infiltration system that is used to infiltrate runoff to the native soil as defined in s. NR 151.002(12), Wis. Adm. Code.

Final Stabilization (V.P.2.): All land disturbing construction activities at the construction site have been completed and a uniform perennial vegetative cover has been established with a minimum density of 70% for unpaved areas and areas not covered by permanent structures.

Infiltration (II): Entry and movement of precipitation or runoff into or through the soil.

Infiltration includes water that may be subsequently evapo-transpired. Infiltration does not include water discharged through underdrains or overflow devices.

Lawns (V.F.3.b.): An area that is covered with grass and maintained in a healthy condition by conducting necessary maintenance activities, such as routine mowing and compaction mitigation. The grass cover shall be uniform with a minimum density of 70% and no erosion rills or gullies.

Liners (III): Barriers made of appropriate materials, such as clay or high density polyethylene (HDPE), that minimize the migration of water.

Open Graded Base (V.H.1.a.) – Crushed stone, crushed gravel or crushed concrete as described in Wisconsin DOT Standard Specifications Section 310.2 Open Graded Base.

Over Compaction (V.P.3.a.): Densification of soil where porosity and/or permeability are reduced below design values.

Pavement Surface Cleaning (V.G.): Routine removal of material accumulated on or near the pavement surface.

Pavement Surface Cleaning Efficiency (V.D.4.): The percentage of the reduction in surface infiltration rate that occurs between cleaning events that is restored after cleaning.

Permeable (Title): For the purposes of this standard, permeable is used interchangeably with the words pervious and porous.

Permeable Pavement Surface Percent Voids (V.E.1.): The area of the voids over the total area expressed as a percent. Percent voids can also be referred to as percent open area.

Permeable Pavers/Blocks (I): Paver or block units when assembled into a pattern allowing water to drain through the joints.

Pervious Concrete (I): Concrete with a lower concentration of fine aggregates allowing water to drain through.

Porosity (V.H.1.b.): The volume of voids over the total volume expressed as a percent. Porosity is sometimes referred to as void ratio. However, void ratio is technically defined as the volume of voids over the volume of solids.

Porous Asphalt (I): Asphalt with a lower concentration of fine aggregates allowing water to drain through.

POWTS (V.A.3.a.): A private on-site waste treatment system.

Run-on (V.F.): Runoff from pavement or other source areas that drains onto the permeable pavement surface.

Run-on Ratio (Table 1): The ratio of the run-on source area to permeable pavement surface area.

Seasonal High Groundwater (V.A.2.): The higher of either the elevation to which the soil is saturated as observed as a free water surface in an unlined hole, or the elevation to which the soil has been seasonally or periodically saturated (hydric) as indicated by soil color patterns throughout the soil profile.

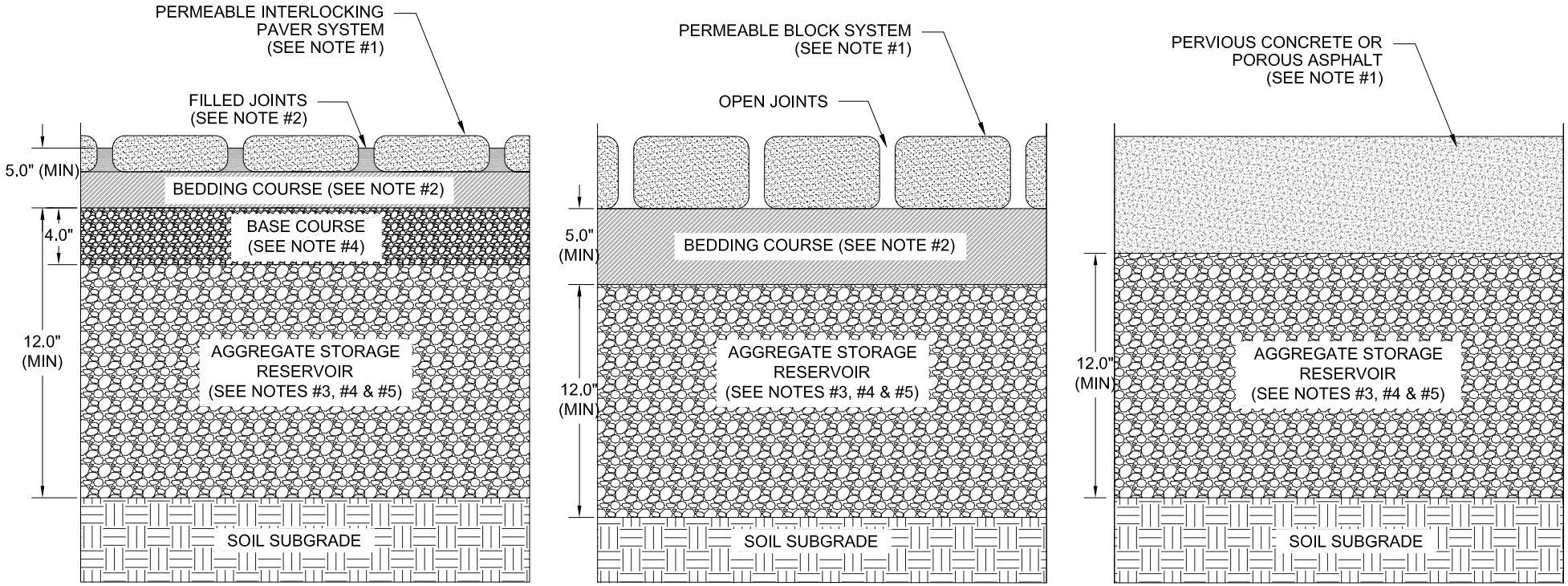
Source Areas (V.F.): A component of urban land use including rooftops, sidewalks, driveways, parking lots, storage areas, streets and lawns from which urban runoff pollutants and volumes are generated during periods of snow melt and rainfall runoff.

Stable Landscape Areas (V.F.3.a.): Planting beds that consist of annual and/or perennial vegetation with no areas of bare soil or application of wood-based mulch.

Surface Clogging Capacity (V.D.3.): The capacity of the permeable pavement surface to accumulate pollutants to the point where void spaces are full and surface infiltration can no longer occur.

Unstable Landscape Areas (V.F.1.e.): Planting beds that consist of annual and/or perennial vegetation with areas of bare soil or application of wood-based mulch.

FIGURE 1. CRITERIA FOR UNDERDRAIN DISCHARGE AND INFILTRATION PRETREATMENT CREDITS



INTERLOCKING PAVERS

BLOCKS

PERVIOUS CONCRETE OR POROUS ASPHALT

NOTES:

1. PAVEMENT SURFACE PERCENT VOIDS SHALL BE LESS THAN 25%.
2. JOINT STONE AND BEDDING COURSE SHALL CONSIST OF ASTM C-33, 8, 9, 89, OR 57 AGGREGATE.
3. AGGREGATE STORAGE RESERVOIR DEPTH SHALL BE A MINIMUM OF 12 INCHES.
4. BASE AND / OR SUBBASE COURSES WITH MINIMUM POROSITY OF 30% CAN BE CONSIDERED AGGREGATE STORAGE RESERVOIR. BASE COURSE FOR PERMEABLE INTERLOCKING PAVERS SHALL BE 4.0" DEPTH OF ASTM C-33, 57 AGGREGATE AND CAN BE CONSIDERED PART OF THE AGGREGATE STORAGE DEPTH.
5. UNDERDRAINS CAN BE LOCATED WITHIN OR BELOW THE AGGREGATE STORAGE RESERVOIR. UNDERDRAINS (OR EQUIVALENT) ARE REQUIRED IF THE AGGREGATE STORAGE RESERVOIR DRAIN DOWN TIME WILL EXCEED 72 HOURS.

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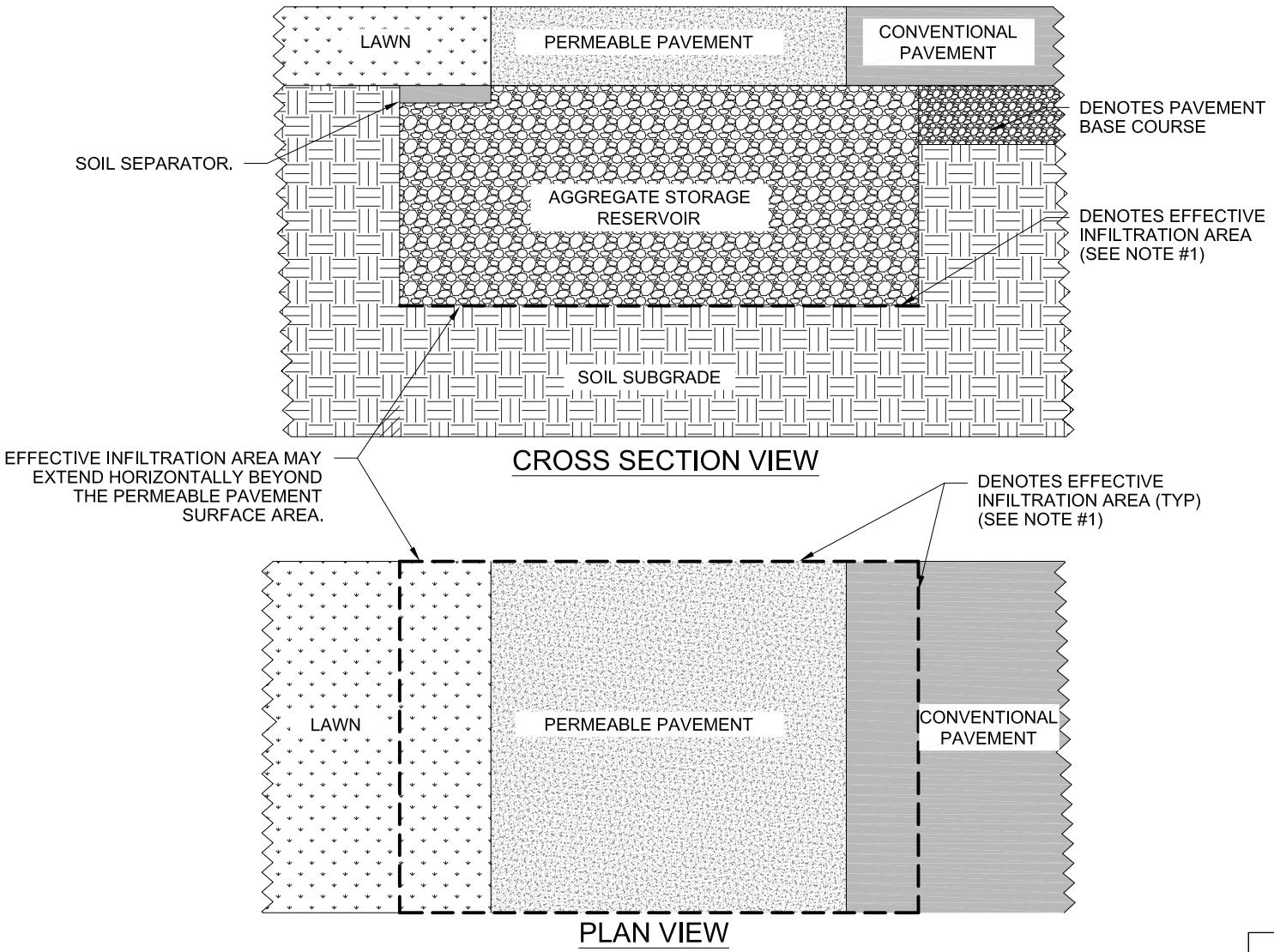
NOT TO SCALE

FIGURE 2. EFFECTIVE INFILTRATION AREA



NOTES:

1. THE EFFECTIVE INFILTRATION AREA CAN BE INCREASED BY EXTENDING THE AGGREGATE STORAGE RESERVOIR UNDER CONVENTIONAL PAVEMENT SURFACES OR IN OTHER APPROPRIATE AREAS, SUCH AS LAWNS WITH SOIL SEPARATOR (e.g., FILTER FABRIC).

2. EFFECTIVE INFILTRATION AREA IS THE AREA USED TO INFILTRATE RUNOFF INTO THE SOIL SUBGRADE AS DEFINED IN s. NR 151.002(12) OF THE WIS. ADM. CODE.

3. FOR PERMEABLE PAVEMENT SYSTEMS THAT WILL RECEIVE RUN-ON FROM ROAD AND / OR PARKING LOT SOURCE AREAS, THE RATIO OF RUN-ON AREA TO EFFECTIVE INFILTRATION AREA SHALL BE NO GREATER THAN 3:1.

WISCONSIN DEPT. OF NATURAL RESOURCES

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