



**San Francisco
Water Power Sewer**
Services of the San Francisco Public Utilities Commission

Urban Watershed Management Program
ATTN: Stormwater Review
525 Golden Gate Ave, 11th Floor
SAN FRANCISCO, CA 94102
stormwaterreview@sfgwater.org

Annual Self-Certification Checklist

PERMEABLE PAVEMENT

(AKA: pervious paving, porous pavement, permeable unit pavers, pervious concrete, pervious asphalt, grass pavers, green parking, porous turf blocks)

Inspection Date: _____ **Address:** _____ **Block / Lot #** _____ **Installation Date:** _____

Inspected By: Name: _____ **Phone:** _____ Property Owner Site Manager Contractor Other: _____

INSTRUCTIONS: All inspections, maintenance tasks and repairs are to be completed prior to the beginning of the rainy season (October 15). Mark all status boxes with and S or U, where S = Satisfactory (no maintenance required), and U = Unsatisfactory (maintenance required). See the Permeable Pavement Inspection instructions included in this packet for detailed descriptions of conditions requiring maintenance and further action.

Item #	Inspection Item Description	Status	Indicate Action Required or Action Planned	Indicate Action Taken (Include Date Completed)
1	Surface ponding evident / significantly reduced infiltration rate			
2	Silt and sediment deposited on pavement surface			
3	Trash and large debris accumulation on pavement surface			
4	Excessive drawdown time of the aggregate storage layer > 48 hrs.			
5	Excessive oil staining on pavement surface			
6	Weed growth in paver joints / expansion joints			

7	Cracks and displacement / settlement of permeable pavement / broken pavers			
8	Destabilized contributing landscape areas / erosion of surrounding landscape areas (if applicable)			
Item #	Inspection Item Description	Status	Indicate Action Required or Action Planned	Indicate Action Taken (Include Date Completed)
9	Destabilized contributing paved areas / spalling* and raveling* of adjacent standard pavement (if applicable)			
10	Unauthorized modifications			
11	Utility cuts / other surface repairs evident and improperly patched (if applicable)			
12	Permeable pavement surface raveling and spalling / deterioration			
13	Potholes forming / pavers missing			
14	Loss of paver jointing material (if applicable)			
15	Visible surface contaminants / pollution			
16	Catch basin / overflow structure blockage			
17	Underdrain blockage (if applicable)			
18	Vegetation damage / bare spots and/or weed growth in turf paver or grass paver type systems (if applicable)			
19	Structural damage (planter edges, check dams or outlet structure)			

*Definitions: Spalling: Cracking, breaking or chipping of joint/crack edges. Usually occurs within about 2 ft. of joint/crack edge.

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Raveling: The progressive disintegration of an asphalt layer from the surface downward as a result of the dislodgement of aggregate particles. It usually starts with the loss of fine aggregate (fines) and advances to the loss of larger aggregate sizes.

Signature: _____ Date: _____



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NOTE: These instructions are intended to be a companion piece to the Annual Self-Certification Checklist. The information contained herein is to be used to help the preparer of the Annual Self-Certification Checklist accurately conduct an inspection and properly complete the form.

Abbreviations: SMR: San Francisco Stormwater Management Regulations and Design Guidelines; SCP: Stormwater Control Plan; SMO: San Francisco Stormwater Management Ordinance; BMP: Best Management Practice (Permeable Pavement); GI: Green Infrastructure

Item #	Inspection Item Description	Inspection Instructions and Explanation
1	Surface ponding evident / significantly reduced infiltration rate	<p>Area of Concern: Several maintenance related issues can lead to a reduced infiltration rate and surface ponding in permeable pavement installations. Pavement clogging can prevent stormwater from flowing through the pavement surface and reaching the aggregate storage layer beneath. Additionally, if the aggregate storage layer fails to draw down completely within 48 hours, subsequent rainfall may begin to pond on the pavement surface as the volume of water builds up in the pavement section.</p> <p>To determine if surface ponding is being caused by clogging, a test for the infiltration rate of the permeable pavement surface must be conducted. The following test procedures cover the three most common permeable pavement types:</p> <ul style="list-style-type: none"> • Permeable Pavers - Standard Test Method for Surface Infiltration Rate of Permeable Unit Pavement Systems - ASTM C1781/C1781M - 13 • Pervious Concrete and Porous Asphalt - Standard Test Method for Infiltration Rate of In Place Pervious Concrete - ASTM C1701/C1701M - 09 <p>Maintenance Solution: If it is determined that the surface ponding is a result of pavement clogging, then steps must be taken to clean the pavement surface and restore permeability. Permeable pavements can be cleaned by vacuuming or vacuuming combined with pressure washing. For more information on ponded water and extended drawdown time of the aggregate storage layer, see Item #4 below.</p>
2	Silt and sediment deposited on pavement surface	<p>Area of Concern: Excessive silt and sediment accumulation causes significant problems in permeable pavement installations. Silt and sediment will clog or inhibit the infiltration capacity of the pavement surface. Clogged or inhibited filtration capacity could lead to surface ponding and flooding.</p> <p>Maintenance Solution: All silt and sediment should be removed from permeable pavement by vacuuming before the start of the rainy season (October 15) and at least twice per year, or as frequently as site conditions dictate, and discarded at an appropriate facility.</p>

Item #	Inspection Item Description	Inspection Instructions and Explanation
3	Trash and large debris accumulation on pavement surface	<p>Area of Concern: Excessive trash or debris accumulation causes problems in permeable pavement installations that go beyond poor aesthetics. Trash and debris accumulation can clog or inhibit the infiltration capacity of the pavement surface and clog outflow structure grates. Clogged or inhibited filtration capacity could lead to surface ponding. Clogged outflow structure grates can lead to overflowing and ponding.</p> <p>Maintenance Solution: All trash and debris should be removed from permeable pavement before the start of the rainy season (October 15) or as frequently as site conditions dictate, and discarded at an appropriate facility.</p>
4	Extended drawdown time of the aggregate storage layer > 48 hrs.	<p>Area of Concern: If properly designed and built, extended storage aggregate drawdown times beyond 48 hours in permeable pavement installations can be related to several problems such as:</p> <ul style="list-style-type: none"> • blockage or clogging of the underdrains, outflow, or overflow structure (if applicable). • clogging of the aggregate storage layer, choking layer, or bedding layer • clogging of geotextiles (if applicable) <p>Inspecting the underdrain for clogging can be done visually by looking for standing water in the cleanout or by running a garden hose into the cleanout and determining if the water flows freely or backs up and overtops the cleanout pipe. Alternately, video inspection of the underdrain pipe may be performed to determine the source of the underdrain failure.</p> <p>Inspecting the outflow structure or sand trap can be done by removing the lid or grate from the structure and visually inspecting for standing water or excessive debris accumulation.</p> <p>Maintenance Solution: Clogged underdrains and outflow structures can be cleared by jetting or snaking the underdrain pipe or culvert that connects the structure to the sewer, and by removing accumulated debris and sediment from the bottom of the structure.</p> <p>If aggregate or geotextile clogging is suspected, further investigation must be conducted to verify the problem. The removal of clogged subsurface aggregates and geotextiles requires the removal of the pavement surface and reconstruction of the permeable pavement system.</p>
5	Excessive oil staining on pavement surface	<p>Area of Concern: Oil leaks from vehicles can create staining on the pavement surface. This staining can cause the pavement surface to have a reduced infiltration capacity and may even create contamination issues depending on the quantity of oil that created the stain and how far the oil seeped into the pavement.</p> <p>Maintenance Solution: Oil stains must be pressure washed from the pavement when the percentage of the stained surface reaches 10% of the square footage of the overall permeable pavement surface or as often as site conditions dictate. Larger stains may require the removal and replacement of the affected pavement surface and possibly some of the subsurface aggregates. See Item #14 below for larger spills and contamination issues.</p> <p>Hydrocarbon/oil pan drippings may be remediated by the use of products such as S-200 Oilgone from International Environmental Products, LLC, or equivalent.</p>
6	Weed growth in paver joints / expansion joints	<p>Area of Concern: Noxious and invasive weeds must be removed when they cover more that 10% of the pavement surface. Noxious and invasive weeds are highly damaging to pavements and the natural and built environment. These weeds interfere with the structural stability of the pavement, reduce infiltration, and increase the amount of debris that is deposited on the pavement surface.</p> <p>Maintenance Solution: Best practices call for weed removal on a monthly basis, regardless of cover percentage. Weed removal must include the entire root structure and the weeds must be discarded at an appropriate facility to prevent spreading of invasive species. California's Pest Prevention System (PPS) and the California Food and Agricultural Code (FAC) Appendix D set regulations and laws pertaining to weed removal and disposal.</p>



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Item #	Inspection Item Description	Inspection Instructions and Explanation
7	Cracks and displacement / settlement of permeable pavement / broken pavers	<p>Area of Concern: See item #s 11, 12, 13, and 19</p>
8	Destabilized contributing landscape areas / erosion of surrounding landscape areas (if applicable)	<p>Area of Concern: All surrounding landscaped areas that contribute runoff to the permeable pavement surface must be stabilized with turf, mulch, or groundcover plantings to eliminate erosion and sources of silt and sediment that can be conveyed onto the permeable pavement surface and cause clogging. Sediment-laden runoff must be physically blocked and diverted from draining onto the permeable pavement by curbs, berms, sandbags, straw wattles, and/or silt fencing.</p> <p>Maintenance Solution: Any bare spots adjacent to the permeable pavement where soil is visible must be re-covered with turf, mulch, or groundcover plantings ASAP. The added plantings or mulch must meet the material thickness and type specified in the design. Temporary erosion and sedimentation controls can also be installed to immediately protect the adjacent permeable pavement until the replacement plantings are fully grown-in. Alternatively, these surrounding landscaped areas can be graded away from the permeable pavement.</p>
9	Destabilized contributing paved areas / spalling* and raveling* of adjacent standard pavement (if applicable)	<p>Area of Concern: Adjacent standard pavements that drain onto permeable pavements can be sources of silt, fines, and sediment that can clog permeable pavement surfaces. These standard pavement surfaces must be cleaned regularly to eliminate or minimize the clogging risk that they pose to the adjacent permeable pavement.</p> <p>Standard asphalt pavement is the largest contributor of fines, silt, and sediment, especially during the first two years after installation as the asphalt surface weathers and sheds sand/fine aggregates from its surface.</p> <p>Additionally, structurally deficient adjacent pavements (both concrete and asphalt) that are undergoing spalling or raveling can contribute large amounts of fines silt and sediment to the adjacent permeable paving.</p> <p>Maintenance Solution: Deteriorating pavements must be repaired as soon as possible to minimize further degradation. A similar situation will also occur when adjacent pavements undergo grinding / milling and resurfacing / repaving. During these operations, the adjacent permeable pavement must be protected from the resurfacing / repaving operations.</p>

Item #	Inspection Item Description	Inspection Instructions and Explanation
10	Unauthorized modifications	<p>Area of Concern: Unauthorized modifications consist of any changes to a permeable pavement installation that deviate from the approved construction documents. These modifications can take place during construction (i.e., pavement or aggregate substitutions with inferior components) or can happen over time after the permeable pavement is constructed (i.e., reducing the footprint of the permeable pavement to accommodate an addition to a nearby structure).</p> <p>The SMR Maintenance Agreement Exhibit B recorded on the deed of the property provides the original approved construction documents that can be referred to and used to determine if modifications have been made.</p> <p>Maintenance Solution: All unauthorized modifications must be corrected by returning the BMP to its original configuration, as described in the approved construction documents contained in the SMR Maintenance Agreement Exhibit B.</p>
11	Utility cuts / other surface repairs evident and improperly patched (if applicable)	<p>Area of Concern: Underground utility repairs or construction can require the cutting and removal of sections of permeable pavements to provide access to subsurface facilities. The removal and replacement process must be correctly completed to ensure that the structural integrity and function of the permeable pavement is not compromised.</p> <p>Maintenance Solution: While working on permeable pavement, all surrounding surfaces must be protected from sediment and fines created by the utility work. Saw cutting work must be performed by wet cutting, vacuumed, and the saw cutting residue must be washed off the surface after vacuuming before it is allowed to dry. The following is the required patching standard for the three most common permeable pavement surfaces:</p> <ul style="list-style-type: none"> • Permeable Interlocking Concrete Pavers (PICP) – the PICP surface must be replaced in-kind, preferably with the pavers that were removed from the utility cut area to eliminate a variation in color between the existing in-place pavers and new pavers added to the patch. The patch size must be increased by two times the shortest dimension of the excavation beyond the outside edge of the excavation to ensure a smooth transition from the undisturbed pavers to the patched paver area. All subsurface aggregate that was removed to access the subsurface facility must be replaced in-kind with new materials, matching the existing section thicknesses (excavated aggregates must not be reused due to the possibility of contamination with dirt and fines). The new patch must also be left slightly higher than the surrounding existing surface (1/4" to 3/8") to allow for settlement of the patch. • Pervious Concrete – Every effort must be made to replace the surface in-kind. Small patches can be replaced with standard non-pervious concrete (by permission and approval from the SFPUC) if the patch size is 10% or less than the entire permeable surface that was disturbed. Otherwise, the entire pavement surface must be removed and replaced to the nearest joint and/or the patch size must be increased by two times the shortest dimension of the excavation beyond the outside edge of the excavation to ensure a smooth transition from the undisturbed pavers to the patched paver area. All subsurface aggregate that was removed to access the subsurface facility must be replaced in-kind with new materials, matching the existing section thicknesses (excavated aggregates must not be reused due to the possibility of contamination with dirt and fines). The new patch must also be left slightly higher than the surrounding existing surface (1/4" to 3/8") to allow for settlement of the patch. • Porous Asphalt – Every effort must be made to replace the surface in-kind. Small patches can be replaced with standard non-porous asphalt (by permission and approval from the SFPUC) if the patch size is 10% or less than the entire permeable surface that was disturbed. The patch size must be increased by two times the shortest dimension of the excavation beyond the outside edge of the excavation to ensure a smooth transition from the undisturbed pavers to the patched paver area. All subsurface aggregate that was removed to access the subsurface facility must be replaced in-kind with new materials, matching the existing section thicknesses (excavated aggregates must not be reused due to the possibility of contamination with dirt and fines). The new patch must also be left slightly higher than the surrounding existing surface (1/4" to 3/8") to allow for settlement of the patch.
12	Permeable pavement surface raveling and spalling / deterioration	<p>Area of Concern: Structurally deficient permeable pavements that are undergoing spalling or raveling degradation can contribute large amounts of fines, silt, and sediment that can cause clogging and a lack of infiltration capacity. These deteriorating pavements must be repaired as soon as possible to minimize further degradation.</p> <p>Additionally, large pieces of aggregate that break off from the pavement surface can create further damage to the permeable pavement surface as these loose aggregates are driven or walked over, further abrading the deteriorating surface.</p> <p>Maintenance Solution: Loose materials must be removed by sweeping or vacuuming.</p>



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13	Potholes forming / pavers missing	<p>Area of Concern: See Item #12 above for minor pothole formation.</p> <p>See Item #19 below for major pothole formation and severe structural deterioration.</p> <p>Maintenance Solution: Surface repairs must be handled in the same manner as a utility cut patch, minus the removal and replacement of the sub-base and base aggregate, unless the structural deterioration was determined to be caused by base failure. If a base failure is suspected, consult with a licensed civil and geotechnical engineer for repair options.</p>
14	Loss of paver jointing material (if applicable)	<p>Area of Concern: Gapped PICP rely on jointing material (typically fine aggregate like AASHTO #8, #89, or #9) to provide structural stability and an initial filtering of sediment and fines before those materials reach and clog the aggregate bedding layer beneath the pavers. Over time, traffic and vacuuming can reduce the amount of jointing material.</p> <p>Maintenance Solution: Jointing material must be replenished periodically over the life of the installation as frequently as site conditions dictate or after pressure washing. The replacement jointing material must meet the same specs as the material that was used during installation.</p>
15	Visible surface contaminants / pollution	<p>Area of Concern: Visible surface contaminants and pollution can range from inert substances that can cause permeable pavement clogging to hazardous substances that impact plant, environmental, or human health.</p> <p>Examples of inert contaminants are masonry, plaster or concrete “washout,” and masonry or roadway saw cutting slurry and residue. Examples of hazardous contaminants are petroleum-based substances, caustic chemicals, pesticides, and herbicides. These pollutants can often be identified by sight or smell when they become deposited on the surface of a permeable pavement.</p> <p>If pollutants are detected, investigations must be conducted to determine the source of the contaminant, mitigate that source, and then take steps to clean up the contamination.</p> <p>Maintenance Solution: For inert substances, cleanup can typically be conducted by regular maintenance personnel by simply scraping off, pressure washing, vacuuming, and discarding the contaminated material at an appropriate facility. Hazardous substance cleanup will require specially trained and licensed contractors and special disposal conforming to local and national laws and regulations.</p>

Item #	Inspection Item Description	Inspection Instructions and Explanation
16	Catch basin / overflow structure blockage	<p>Area of Concern: Trash, debris, and sediment can create blockages at the overflow structure or catch basins built into permeable pavement systems, inhibiting the flow of water out of the facility or inhibiting the emergency overflow measures designed into the project. Catch basin and overflow structure blockages can create excessive ponding within and around the area of the permeable pavement installation, potentially leading to hazardous conditions and property damage.</p> <p>Maintenance Solution: Blockages must be cleared before the start of the rainy season (October 15), before each forecast storm if site conditions require, and/or as frequently as site conditions dictate. Trash and debris must be removed by hand or with hand tools and disposed of at an appropriate facility. Overflow structures and catch basin grates, sumps, and traps must be cleared of debris by hand, hand tools, or vactor truck.</p>
17	Underdrain blockage (if applicable)	<p>Area of Concern: Inspecting the underdrain for clogging can be done visually by looking for standing water in the cleanout or by running a garden hose into the cleanout and determining if the water flows freely or backs up and overtops the cleanout pipe. Alternately, video inspection of the underdrain pipe may be performed to determine the source of the underdrain failure.</p> <p>Maintenance Solution: Clogged underdrains can be cleared by jetting or snaking the underdrain pipe or culvert that connects the structure to the sewer and by removing accumulated debris and sediment from the bottom of the pipes.</p>
18	Vegetation damage / bare spots and/or weed growth in turf paver or grass paver type systems (if applicable)	<p>Area of Concern: Vegetation plays an important role in the function of a turf or grass paver system. In addition to evapotranspiration, plant roots help aerate the soil and minimize soil compaction, replenish organic materials in the soil, and provide a habitat for beneficial bacterial that aids in the biological breakdown and mitigation of pollutants deposited by stormwater into the planting medium.</p> <p>For a turf or grass paver system to function properly, it needs consistent and healthy plant cover. Bare spots created by missing plants give invasive weeds an opportunity to grow. This invasive weed growth will crowd out the beneficial plant species over time, reducing the effectiveness of the turf or grass paver system.</p> <p>Maintenance Solution: Dead, diseased, dying, or missing plants must be replaced. If a large amount of plants have died off, consult with a horticultural expert on the cause of the die-off and remedy the cause before replanting.</p>
19	Structural damage (curbs, pavement edging, overflow or underdrain structure)	<p>Area of Concern: For minor structural damage, refer to Item #s 11, 12, and 13 above.</p> <p>More significant structural damage, such as damage caused by auto accidents, nearby construction work, or natural disasters must be repaired as soon as possible.</p> <p>Maintenance Solution: Major repairs can consist of removal and replacement of the entire permeable pavement surface, damaged curbs, pavement edging, overflow or underdrain structures, or structural bracing and supplemental reinforcement of failing structural components.</p>

*Definitions: Spalling - Cracking, breaking or chipping of joint/crack edges. Usually occurs within about 2 ft. of joint/crack edge.
Raveling - The progressive disintegration of an asphalt layer from the surface downward as a result of the dislodgement of aggregate particles. It usually starts with the loss of fine aggregate (fines) and advances to the loss of larger aggregate sizes.