7. GREEN ALLEY

7.1 DESCRIPTION
A green alley is a type of stormwater quality facility applied to alleys. A green alley is intended to provide water quality treatment of runoff from the alley though the use of permeable pavement, although may be modified to provide some level of water quality treatment for adjoining development. This fact sheet illustrates the configuration of a green alley serving the water quality needs of the alley itself. The alley slopes toward a central permeable pavement section. Stormwater runoff flows off standard pavement into the permeable section, infiltrates vertically downward, and exits through an underdrain. The main treatment process consists of filtration through the permeable pavement media. Except as noted, a green alley follows the design guidance provided in the Permeable Pavement Fact Sheet in Urban Drainage and Flood Control District’s (UDFCD) Urban Storm Drainage Criteria Manual, Volume 3 (USDCM Vol. 3). This fact sheet provides specific design guidance for the application of permeable pavement to a green alley. Detailed drawings and notes are provided at the back of this fact sheet to further illustrate the design of green alleys.

Figure 27 illustrates how permeable pavements can be integrated into a typical urban alley. The figure shows the basic elements of the green alley in cross section and in perspective.

FIGURE 27. Green Alley
(Source: Stream Design, 2015.)
7. USES AND RECOMMENDATIONS

When constructing a green alley, the permeable pavement typically is intended to run the full block length of the alley. Permeable pavement in the central third of the alley width can serve the water quality needs of the entire alley. Greater width would be necessary if portions of the adjacent buildings drain to the alley are intended to be treated.

A green alley should not be used in areas where hazardous materials are loaded, unloaded, or stored. Where other concerns regarding potential contamination (spill, groundwater, or soil) exist, the facility should be provided with an impermeable liner. In all cases, the outlet from the underdrain must be accessible by way of an inlet or manhole.

7.3 GREEN ALLEY AESTHETICS AND URBAN DESIGN

Green alleys can be important elements in the ultra-urban streetscape. The significant use of PICP in this BMP provides opportunities to greatly increase the attractiveness of alleys, making them appear more pedestrian friendly and less industrial. As with all improvements within the public right of way, green alleys should take a cue from existing district/neighborhood streetscape improvements, and where applicable, should use similar materials, colors, and textures to reinforce the cohesiveness of the urban context. All green alley improvements should meet Americans with Disabilities Act (ADA) guidelines, and be constructed with heavy duty materials and interlocking patterns to withstand AASHTO LRFD HL-93 (equivalent to HS-20) loading for heavy truck traffic common to most alleys.

7.4 GEOMETRY

The conceptual design details at the back of this fact sheet illustrate the geometry and design features of a green alley. The details are intended to provide a basis for the designer’s final construction documents, although a site specific design will be necessary for addressing geotechnical issues, structural design, utility protection and relocation, tying in underdrain to a downstream storm drain or outfall, and associated final design and construction document preparation tasks.

7.5 DESIGN CRITERIA AND CONSIDERATIONS

SIZING FOR WATER QUALITY

In keeping with the discussion on width, the size of the PICP is to be based on a run-on ratio including rooftops of up to 5 to 1. This is applied separately on each side of the flow line of the alley.

UTILITIES

It is important to investigate existing and planned underground utilities and to avoid utility conflicts. It is also critical to understand the condition of existing utilities so that impacts that might be associated with the installation of the green alley improvements can be avoided or mitigated.

OTHER COMPONENTS OF GREEN ALLEY DESIGN

Section 2.2 Design Criteria provides information regarding the following components of a green alley:

- underdrain system
- liner
7. GREEN ALLEY

7.6 GREEN ALLEY DETAILS

A typical design of a green alley is illustrated in a series of detail drawings in this section. The details indicate various elements of the green alley and representative dimensions. The designer is responsible for preparing final construction drawings suitable for the specific conditions, water quality requirements, utilities and constraints existing in the location where the BMP is to be sited. A geotechnical engineer shall consult on soil conditions and recommendations for lining. A structural engineer, with input from the geotechnical engineer shall design concrete elements, including wall thickness, reinforcing (reinforcing shown in details is representative only), any foundation components such as footings or bottom slab, and subgrade/bedding/backfill specifications. A site-specific design will also be necessary addressing utility protection and relocation, tying in underdrain to a downstream storm drain or outfall, and associated final design and construction document preparation tasks.

The following design notes apply to the detail drawings.

DESIGN NOTES

1. PICP AND UNDERLYING MATERIALS SHALL BE DESIGNED FOR HS-20 LOADING CONDITIONS AND SHALL MEET THE REQUIREMENTS OF USDCM VOLUME 3.
2. THE UNDERDRAIN SHALL MEET THE MATERIAL AND SLOT SPECIFICATIONS IDENTIFIED IN USDCM VOLUME 3.
3. FILTER MATERIAL SHALL MEET THE SPECIFICATIONS IDENTIFIED IN USDCM VOLUME 3. FILTER MATERIAL SHALL BE COMPACTED TO A DENSITY OF NOT LESS THAN 70 PERCENT OF RELATIVE DENSITY DETERMINED IN ACCORDANCE WITH ASTM D4253 AND D4254 (FOR FINES CONTENT LESS THAN 5 PERCENT).
4. THE UNDERDRAIN CLEANOUT SHALL CONSIST OF 4 INCH POLYVINYL CHLORIDE (PVC) PIPE WITH TWO 45 DEGREE BENDS AND A THREADED CAP SET 2 INCHES BELOW THE TOP OF THE PAVEMENT. PVC CLEANOUT SHOULD BE LOCATED IN A VALVE BOX SET WITHIN THE PICP AREA. FILTER MATERIAL SHOULD BE PLACED INSIDE THE VALVE BOX AROUND THE CLEANOUT. THE VALVE BOX SHALL HAVE A REMOVABLE PLATE OR GRATE FLUSH WITH PAVEMENT AND SHALL BE DESIGNED FOR HS-20 LOADING.
5. THE UNDERDRAIN OUTLET SHALL BE IN ACCORDANCE WITH THE USDCM VOLUME 3 PERMEABLE PAVEMENT SYSTEMS CRITERIA.
6. STRUCTURAL BACKFILL SHALL CONSIST OF CDOT CLASS 1 OR 2 STRUCTURE BACKFILL, AS DETERMINED BY ENGINEER AND COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698.
7. STRUCTURAL ENGINEER, WITH INPUT FROM GEOTECHNICAL ENGINEER, SHALL DESIGN WALL DIMENSIONS, REINFORCING, ANY FOUNDATION COMPONENTS SUCH AS FOOTINGS OR BOTTOM SLAB, AND SUBGRADE/BEDDING/BACKFILL SPECIFICATIONS.
8. COVER SHALL SUPPORT HS-20 LOADING AND CONSIST OF NEENAH R-4999 HEAVY DUTY BOLTED TRENCH GRATE TYPE D (SOLID) OR APPROVED EQUIVALENT – CATALOGUE NO. R-4999-HX FOR SPAN OF 2 FEET AND R-4999-MX FOR SPAN OF 3 FEET. THE LENGTH OF THE INLET COVER SHOULD BE FIELD CUT TO FIT OUTLET BOX.
9. LINER (IF SPECIFIED) SHALL BE A MINIMUM OF 30 MIL THICK PVC GEOMEMBRANE AND SHALL BE THERMALLY WELDED.
FIGURE 28. Green Alley Details
(Source: Muller Engineering, 2015.)

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Ultra-Urban Green Infrastructure Guidelines

GREEN ALLEY - SECTION 1

GREEN ALLEY - SECTION 2

1. SUPERSCRIPT NUMBERS REFER TO DESIGN NOTES PRECEDING THESE DETAILS