

Appendix G
Pervious Concrete Pavement Design References



TETRA TECH, INC.

MEMORANDUM

Date: February 19, 2013
To: City of Omaha
From: Carol Hufnagel, Anne Thomas
Subject: Portland Pervious Cement Concrete (PPCC) Information
Contract: EP-C-11-009
US EPA Green Infrastructure Community Partners Project

Maintenance References:

Coughlin, J. P., Campbell, C. D., and Mays, D. C. (January 2012). Infiltration and Clogging by Sand and Clay in a Pervious Concrete Pavement System. *Journal of Hydrologic Engineering, ASCE*. 17:68-73.

North Carolina Department of Environment and Natural Resources. (October 2012). Stormwater Best Management Practices Manual, Chapter 18, Permeable Pavement. Last accessed February 18, 2013. <http://portal.ncdenr.org/web/wq/ws/su/bmp-manual>

North Carolina State University Cooperative Extension. (2011). Urban Waterways: Maintaining Permeable Pavements. Last accessed February 18, 2013.
<http://www.bae.ncsu.edu/stormwater/PublicationFiles/PermPaveMaintenance2011.pdf>

Design Guidance:

Permeable pavement excerpt from the Draft City of Dublin, OH Stormwater Management Design Manual (Attachment 1)

Permeable pavement excerpt from the San Diego Low Impact Development Design Manual (Attachment 2)

Permeable pavement underdrain and outlet excerpt from Chapter 18, Permeable Pavement of the North Carolina Department of Environment and Natural Resources Stormwater BMP Manual (Attachment 3)

Cost References:

Pervious Concrete Sidewalk, 6" \$6/SF for materials and installation Maywood, Toledo project

Porous Concrete, \$2-\$6/SF for materials and installation (no mention of thickness)

http://www.epa.gov/heatisld/images/extra/level3_pavingproducts.html#7

Pervious concrete - \$118.8/CY (May, 2010) including tax. 6 inches thick = \$19.80/SY.

Calculated: \$3.65/SF @ 10-inch thicknesses Wang, Y. and Wang, G. (2011) Improvement of Porous Pavement. <http://www.usgbc.org/ShowFile.aspx?DocumentID=9915>

Pervious Concrete - \$2 – \$7 /SF for 2-4 inches deep National Cooperative Highway Research Program (NCHRP), Evaluation of Best Management Practices for Highway Runoff Control: Low Impact Development Design Manual for Highway Runoff Control, Project 25-20(01), 2005 (page 10-3)

Sultan, WA residential street. (2006) 8 inches thick with 8-inch of aggregate storage
\$196,000/32,000 SF = \$6.13/SF ~\$7.66/Sf for 10-inch PPCC with 8-inch of aggregate storage ;
\$7.17/SF for only 10-inch PPCC

<http://www.concretenetwork.com/pervious/design-ideas/pervious-concrete-washington.html>

32nd Street SW, Seattle pervious Concrete 2005 – 8" PPCC over 18" subbase \$85 - \$165/SY for pavement, excavation, subbase, side barriers, and underdrains. Calculation: \$9 - \$18/SF; ~\$8-\$17 without aggregate

<http://depts.washington.edu/uwbg/docs/stormwater/PorousPaveStudy.pdf>

N. Gay Avenue Portland, OR, 10" PPCC over 6" subbase connected to 20ft x 20ft sewer trench below.– full street (2005) reused existing curb, 25-year storm \$256,000/32,000SF = \$8/SF with PPCC and aggregate (Excavation included with utility work??) Calculation: \$8/SF - \$0.37/SF for aggregate = \$7.63/SF for PPCC only

<http://www.portlandoregon.gov/bes/article/196785>

Strength References:

Marks, A. Pervious Concrete Pavement – How Important is Compressive Strength?. Vol. 3, Number 3.

[http://www.rmc-](http://www.rmc-foundation.org/images/PCRC%20Files/Structural%20Design%20&%20Properties/PvC%20Pvmt-Compressive%20Strength.pdf)

[foundation.org/images/PCRC%20Files/Structural%20Design%20&%20Properties/PvC%20Pvmt-Compressive%20Strength.pdf](http://www.rmc-foundation.org/images/PCRC%20Files/Structural%20Design%20&%20Properties/PvC%20Pvmt-Compressive%20Strength.pdf)

Chopra, M., Wanielista, M., Mulligan, A. M. (January 2007). Compressive Strength of Pervious Concrete Pavements. <http://www.rmc-foundation.org/images/PCRC%20Files/Structural%20Design%20&%20Properties/Compressive%20Strength.pdf>

Specification References:

Pervious Concrete spec ACI 522.1-08 \$34.50
<http://www.concrete.org/bookstorenet/productdetail.aspx?itemid=522108>

Roadway Details:

Seattle, WA 32nd Street pervious concrete road.
http://www.seattle.gov/util/groups/public/@spu/@usm/documents/webcontent/spu02_020005.pdf

Aggregate Void References:

ASTM C29 Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate

Roadway Performance Reference:

Schaefer, V. R., Kevern, J. T., Izevbekhai, B., Wang, K., Cutler, H. E., and Wiegand, P. (2010). Construction and performance of Pervious Concrete Overlay at Minnesota Road Research Project. *Transportation Research Board: Journal of the Transportation Research Board*. 2164:82-88.