

BRADLEY UNIVERSITY

Permeable Pavement Cost Benefit Analysis

Progress Report on the Work Performed Under IAPA
Scholarship

Sarah Elderzi

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Objective:

The objective of this research is to verify that the use of permeable asphalt pavement will have a higher benefit-cost than conventional asphalt pavement. For this research, “Illinois Crash Facts & Statics” for the year 2014 is used. Also, the Peoria City is chosen as the model City with approximately 368 km highway roads, assuming that the pavements are constructed as permeable pavements. From this research, we will calculate the benefit-cost ratio for permeable pavement.

Methods and Assumptions:

It was reported that in 2014 there were 4,538 crashes. By dividing this by 12, the monthly average of crashes was found. Assuming that half of the year is considered “wet months,” the total crashes that were due to wet weather could be found by then multiplying that number by 6. After finding that the reduction of accidents to be 0.2963, and the dollar value of property and vehicle costs of accidents to be \$1,000, multiplying all these will determine the dollar value of accidents. Out of the 4,538 crashes that happened in the year 2014, 19 of them were fatal crashes. By using the same method used to find the dollar value of accidents, the value of human life could also be found, considering that the average cost of the human life is 9.6×10^6 in dollar value according to the “Value of a Statistical Life in the United States of the US Department of Transportation.” The Santa Barbara Unit Hydrograph (SBUH) method is used to calculate the runoff from the permeable pavements. A 24-hour rainfall depth of 76 mm is chosen based on the 2-year 24-hour rainfall for central Illinois. For the permeable pavements, it is observed that the maximum runoff depth is 0.16 mm at 7.83 hours which is approximately three times lower than the conventional AC Pavements. The benefit-cost analysis considers a reduction in accident rate

on the pavements in the winter and the monsoon that caused by the slippery pavements and hydroplaning, respectively. The cost of permeable pavement construction is 1.4 times higher than constructing conventional AC Pavements in Peoria City. The reduction of snow plow operation and the use of salt also is a part of the benefit of permeable pavement. It has been quantified that the benefit-cost ratio of constructing permeable AC pavement is more than ten times higher compared to the conventional AC pavements.