BRADLEY UNIVERSITY

Permeable Pavement Materials

Progress Report on the Work Performed Under IAPA Scholarship

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12/19/2016

Introduction

Porous asphalt pavement is a type of pavement that allow for drainage to occur without or with minimal runoff. Other names for are pervious asphalt, pervious pavement and open graded friction course, or Open Graded Friction Course (OGFC). OGFC pavement design is becoming increasingly popular because of it positive environmental impacts. Reducing runoff from road and walk ways eliminates water retention and storm water systems. OGFC allows water to be immediately returned to the ground water tables rather than being added to sewers and then to treatment plants. Reducing the amount of water sent to waste water treatment plants by eliminating the storm water runoff would greatly reduce operating costs. With the great benefits, comes challenges that need to be overcome to achieve the best product.

Materials

Pervious asphalt design varies depending on what region of the world it is being prepared and poured. Countries is the same region have design criteria that is not similar to each other. Some countries put a higher value on noise reduction whereas other countries put an emphasis on lifespan. What is highly valued in a design mix is shown through the gradation of aggregate, binders and ratios used. A perfect mix to one is not necessarily a perfect mix to another.

Within the United States, a similar trend is found. While the states in the same region tend to have similar criteria and design mixes. This paper will go into detail about the mix design, gradation of aggregates, etc.

> "Based on experiences of different states in the United States, European progress, and internal research, NCAT published a mixture design method for the new generation of opengraded friction courses in 2000. This method has been enhanced during recent years,

based on additional research. The design process involves the following steps: 1) materials selection, 2) selection of design gradation, 3) determination of optimum asphalt content, and 4) evaluation for moisture susceptibility. [1]"

Current progress that is being made, relies on research done in other countries to get a more well-rounded report. There is a four step process that has NCAT has adopted from other states and countries.

The first step involves selecting a material that will ensure the highest strength, permeability, and least noise. There are many different types of material that can be used in pervious asphalt. Recycled materials are being used with higher frequency and recycling materials lowers cost and is better for the environment. Another consideration for materials is the strength and angularity of the material. These factors all play into the overall strength and permeability of the asphalt. This is when the binder type is selected based on the overall standard that is to be achieved and the type of aggregated used.

The second step refers to the variation in size of the aggregate used in the asphalt. According to the NCAT specifications, "The design gradation is then determined based on this concept and the recommended gradation for OGFC. Sieve, mm (inch) Percent Passing 19 (0.75) 100 12.5 (0.5) 8-100 9.5 (0.37) 35-60 4.75 (0.19) 10-25 2.36 (0.09) 5-10 0.075 (0.003) 2-4 [1]. This is a typical grain size distribution used in the mix design of an open grade friction course. The gradation is very important because it determines the amount of voids that are present in the asphalt which directly relates to the permeability of the asphalt. A high percentage of air voids means a lower percentage of contact area, which creates a new issue of strength.

When designing pavement, the strength and flexibility are among the highest considerations because the stronger it is, the longer the pavement will last. This is not only important for cost reasons, but environment reasons. To ensure the proper strengths are achieved, the air voids must be at an optimum ratio. This is all dependent of the gradation of the aggregate. Void ratios will be further analyzed in another portion of this report.

The third and fourth step of the mix design will be reported in the final copy of the report.

References:

1) http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/0-5262-1.pdf