

**AN ABSTRACT OF A THESIS**  
**PERVIOUS CONCRETE MIXTURE DESIGN**  
**BY THE UNIT WEIGHT METHOD**

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The use of Pervious Portland Cement Concrete (Pervious PCC) pavement has become increasingly more common in the ready mix industry. However, many concerns have yet to be addressed in how the mix design process affects fresh and hardened concrete properties during and after placement. Finding a solution based on the fresh concrete properties obtained in laboratory testing would allow the ready mix industry to significantly reduce overhead costs and dramatically reduce field placement testing. The purpose of this study was to run a series of tests using different aggregate gradations and proportions to determine if any correlations are present between the newly published ASTM C 1688 test method results and those of the ASTM D 7063 test method using the newly proposed Tennessee Concrete Association's Mix Design by Unit Weight Method. Core compressive strengths and ASTM C 1688 voids were also evaluated to determine if correlations were present. The ability to correlate field placement strengths based upon fresh void contents obtained in a laboratory setting would further elucidate this proposed method. Three aggregate gradations were chosen which closely followed ASTM C 33; a No. 7, No. 8 and a No. 89.

Mix designs were carried out using the proposed Tennessee Concrete Association's Mixture Design by Unit Weight procedure. Nineteen mix designs were completed to obtain the ASTM C 1688 void contents and unit weights of the fresh concrete mixtures while maintaining a constant water-to-cement (w/cm) ratio and varying the cementitious contents. Alternatively, fifteen additional specimens were cast to obtain the ASTM C 1688 void contents and unit weights while varying the w/cm ratio and holding the cementitious materials content constant. These design methods were chosen to show the versatility of the proposed mix design method developed by the Tennessee Concrete Association.

ASTM C 1688 voids ranged from 6.0% to 22.3% across all the mix designs and the averaged compressive strengths ranged from 1090 psi to 4520 psi. The ASTM D 7063 void contents ranged from 18.1% to 33.1%. Good relationships were found between the ASTM C 1688 void contents and the ASTM D 7063 void contents for each of the aggregate gradations. A strong relationship between the ASTM C 1688 void contents and the averaged core compressive strengths were also observed.