

**PROPERTIES OF CONTROLLED LOW-STRENGTH MATERIAL MADE  
WITH WOOD FLY ASH**

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**ABSTRACT**

Properties of Controlled Low-Strength Material (CLSM) made with wood fly ash as a major component are presented in this paper. Series of CLSM mixtures were made with various sources of wood fly ash from USA and Canada. Two series of CLSM mixtures contained cement, wood fly ash, and sand, whereas third series also contained Class C fly ash besides cement, wood fly ash, and sand. First two series of CLSM mixtures had up to 90% of wood fly ash as a part of the mixture, whereas third CLSM mixture had wood fly ash and up to 65% of Class C fly ash. Tests were performed in accordance with ASTM standards and/or ACI procedures for flow, density, bleed-water, settlement, compressive strength, and permeability. Ambient air and CLSM slurry temperatures were recorded.

Test results indicate that compressive strength of CLSM mixtures was between 0.3 MPa to 0.8 MPa at 28-day, and between 1 MPa to 5.7 MPa at 182-day. Permeability of CLSM mixtures was between  $3.3 \times 10^{-5}$  to  $6.8 \times 10^{-5}$  cm/sec at 63-day, and  $2.1 \times 10^{-5}$  to  $3.9 \times 10^{-5}$  cm/sec at 91-day. In general, permeability values for CLSM mixtures decreased with an increase in age due to increase in strength leading to improved microstructure for these CLSM mixtures.