

## Mechanical Properties of Waste Clay Brick Based Geopolymer Cured at Various Temperature

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**Abstract :** Geopolymer binders as an alternative binder system to ordinary Portland cement are the focus of the past 2 decades of researches. In order to eliminate CO<sub>2</sub> emission by cement manufacturing and utilizing construction waste as a source material, clean waste clay bricks which are the waste from Levent Brick factory was activated with a mixture of sodium hydroxide and sodium silicate solution. 12 molarity of sodium hydroxide solution was used and the ratio of sodium silicate to sodium hydroxide was 2.5. Alkaline solution to clay brick powder ratio of 0.35, 0.4, 0.45, and 0.5 was studied. Alkaline solution to powder ratio of 0.4 was found to be optimum ratio to have the same workability as ordinary Portland cement paste. Compressive strength of the clay brick based geopolymer paste samples was evaluated under different curing temperatures and curing durations. One day compressive strength of 57.3 MPa after curing at 85°C for 24 hours was obtained which was higher than 7 days compressive strength of ordinary Portland cement paste. The highest compressive strength 71.4 MPa was achieved at seventh day age for the geopolymer paste samples cured at 85°C for 24 hours. It was found that 8 hour curing at elevated temperature 85°C, is sufficient to get 96% of total strength. 37.4 MPa strength at seventh day of clay brick based geopolymer sample cured at room temperature was achieved. Water absorption around 10% was found for clay brick based geopolymer samples cured at different temperatures with compare to 9.14% water absorption of ordinary Portland cement paste. The clay brick based geopolymer binder can have the potentiality to be used as an alternative binder to Portland cement in a case that the heat treatment provided. Further studies are needed in order to produce the binder in a way that can harden and gain strength without any elevated curing.

**Keywords :** construction and demolition waste, geopolymer, clay brick, compressive strength.

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