

## Fly Ash Based Geopolymer Concrete as Curbs, Pavement Bricks, and Wall Bricks

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**Abstract :** Ordinary Portland Cement (OPC) takes a big role as a concrete binder in infrastructure construction purposes, nevertheless, it produces CO<sub>2</sub> emissions abundantly. To reduce the CO<sub>2</sub> emissions produced by OPC concrete, nowadays, geopolymer material become one of the solutions due to it being a binder made from waste with pozzolan material. In concrete industries, geopolymer concrete has evolved as a more environmentally friendly material than OPC concrete. The geopolymer concrete was created without the usage of OPC known as cementless concrete materials. Geopolymer concrete obtains silicon and aluminum from industrial by-products such as fly ash, ground granulated blast furnace slag, and kaolinite. A highly alkaline solution chemically activates Si and Al, forming a matrix that holds together the loose aggregates as well as additional unreacted components in the mixture. They are then dissolved in alkaline activating solutions, where they polymerize into molecular chains, resulting in rigid binders. This research aims to get an eco-friendly material that can reduce the use of OPC as a binder and be used for infrastructure development end-products such as Curbs, Pavement Bricks, and Wall Bricks. This research was conducted as applied research to develop new products of environmentally friendly materials by utilizing fly ash and employed for infrastructure development, particularly for the production of end products such as Curbs, Pavement Bricks, and Wall Bricks. Three types of end products with various dimensions and mix designs have been made and tested in the laboratory, resulting in quantitative datasets to be used for identifying patterns and relationships among density, compressive strength, flexural strength, and water absorption. The result found that geopolymer binders can be used for the production of curbs, pavement bricks, and wall bricks. Geopolymer curbs have an average compressive strength of 19,36 MPa, which can be determined as K-233 concrete. Geopolymer pavement bricks have an average compressive strength of 20,79 MPa. It can be used in parking areas and determined as the grade B of pavement bricks according to SNI 03-0691-1996. Geopolymer wall bricks have an average compressive strength of 11,24 MPa, which can be determined as the grade I of Wall Bricks according to SNI 03-0349-1989.

**Keywords :** absorption, compressive strength, curbs, end products, geopolymer, pavement bricks, wall bricks

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